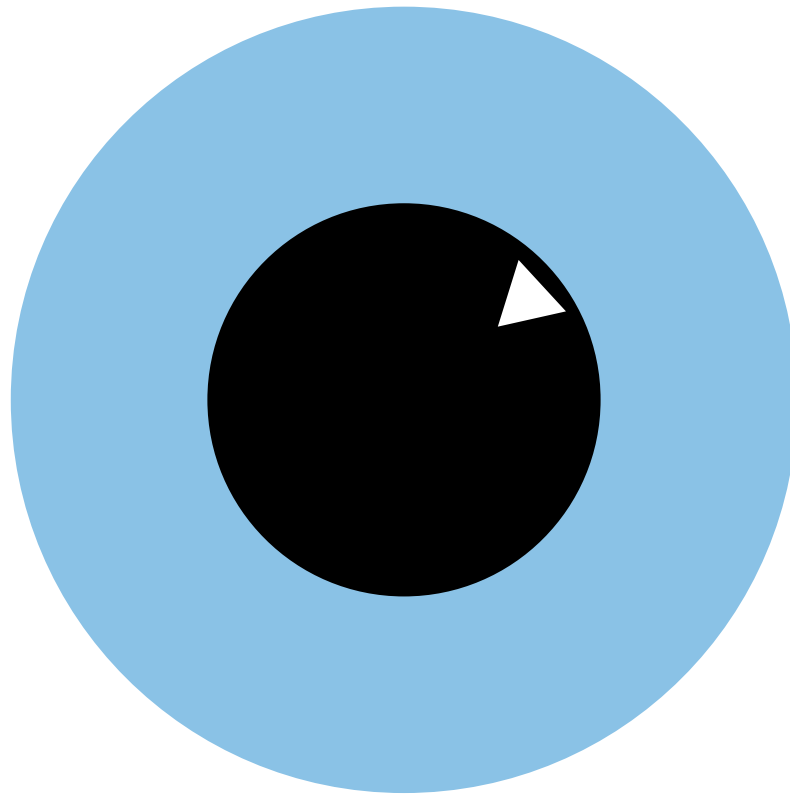


Eyes on the Future Ireland 2008

Prof AJ Jackson and Prof C O'Brien

ViSPA

Vision Impaired Service Providers Alliance



Eyes on the Future Ireland 2008:

A study into the prevalence of blindness
and vision impairment

Principal Authors: Prof AJ Jackson and Prof C O'Brien

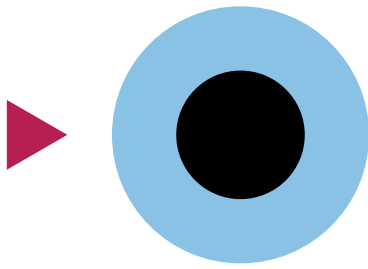
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Eyes on the Future Ireland

A study into the prevalence of blindness and vision impairment in Ireland, 2008.

Contents

1. Foreword	4
2. Executive Summary	7
3. Introduction	10
4. Study Design	14
5. Vision Impairment and the Eye	20
6. Vision Impairment in Ireland	24
7. Social and Economic Implications	28
8. Main Causes of Blindness and Vision Impairment	31
9. Projected Estimates of Blindness and Vision Impairment in Ireland	62
10. Co-Authors and Acknowledgements	66
11. Appendix 1 - Glossary	67
12. Appendix 2 - Visual Acuity Conversion Chart	69
13. References	70
14. Authors biographies	78



Section 1 Foreword

In Ireland today, there are more than 13,000 people who are blind or vision impaired and known to NCBI (National Council for the Blind of Ireland).

Of this total figure approximately two-thirds of people meet the criteria of being legally blind, while the remaining third do not. This second group, while not being legally blind, do have significantly low vision and have been referred to NCBI by health care professionals so that they can benefit from the early intervention of rehabilitation services and support that will assist them in living with sight loss.

While the number of people in contact with NCBI has grown significantly in the past 10 years, it is thought that this figure underestimates the overall numbers by approximately 30%. There may be a further 4000 – 5000 people throughout the country that have significant difficulties with their eyesight but, for a variety of reasons, have either not been identified, or sought out the services that are available to them.

Our knowledge and understanding of the real number of people with significantly impaired vision, whether registered or not, must be greatly improved if we are to be effective in planning and delivering services to the people who are living with sight loss throughout the country.

Without robust, reliable and accurate information regarding blindness and vision impairment, it will be impossible to accurately plan and provide services to the growing number of people that require assistance in living with sight loss and in enabling them to maintain their independence.

The Vision Impaired Services Providers Alliance (VISPA) was formed earlier this year by the four main organisations that provide services to people who are blind or vision impaired to ensure that we rise to this challenge. Our aim is to ensure that we, as a group, have the ability and, crucially, the resources and capacity to meet the changing needs and diverse demands of a rapidly increasing proportion of the population.

Our founding objectives are in direct support of the resolution adopted by the World Health Assembly 2003, which urged the implementation of Vision 2020 strategies to tackle the challenges of vision impairment at a national level. Through working together as service providers, we seek collaboratively to: improve eye health, illuminate possible causes of sight loss, develop robust support services for people living with sight loss and to encourage service user participation in the process.

Throughout the process it has become increasingly clear that there is a genuine and pressing need to ensure that the information available from NCBI's database is not used in isolation. To make realistic projections on the true extent of blindness and vision impairment in Ireland we must use the information available from leading epidemiological studies from across the developed world. This way we ensure that we get a more accurate picture of the potential prevalence of sight loss in Ireland.

To do this, VISPA enlisted **Professor Jonathan Jackson, Royal Victoria Hospital and Queen's University Belfast**, and **Professor Colm O'Brien, Mater Misericordiae University Hospital Dublin**, to lead the first stages of a study into this subject.

The results of the Professors' study, detailed in this report, will inform us greatly in our discussions with government and the Health Service Executive (HSE). This scientific estimate of the numbers of individuals with vision impairments will empower VISPA to lobby for the adequate provision of funding for services to people who are blind and vision impaired and to secure additional investment in eye health care.

By publishing the report at the inaugural VISPA annual conference in October 2008, it is our aim to generate greater awareness of blindness and vision impairment. Our goal is to ensure that eye health and eye care move up the list of priorities among the general population and that people have a responsibility for their eyesight and their eye health. It is only through widespread education and increased understanding that we can reduce avoidable sight loss. Greater awareness of sight loss is also essential to ensure that people who are blind or vision impaired have access to the services and support they require.

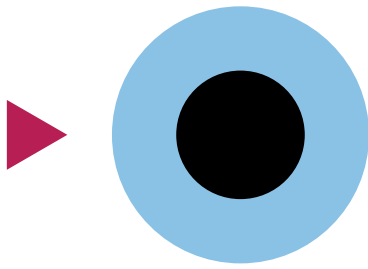
To that end VISPA will be pressing for a full epidemiological ophthalmic study that builds on this report's findings, recommendations and conclusions.

Patrick Quinn, Fighting Blindness

Padraig Mallon, Irish Guide Dogs for the Blind

Des Kenny, NCBI (National Council for the Blind of Ireland)

Brian Allen, St Joseph's Centre for the Visually Impaired

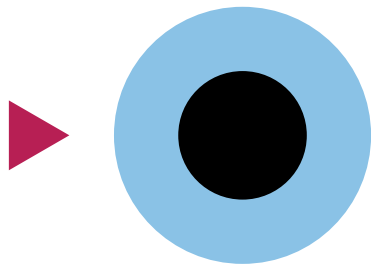


Section 2 Executive Summary

- ▶ Blindness and vision impairment have a major impact on peoples' daily lives. They cause both personal hardship and have significant economic implications for society
- ▶ This report is based on six recently published, large-scale, community based surveys of ocular disease and vision impairment.
- ▶ Analysis of these papers indicate that a large proportion of the older population suffers from sight loss which in many cases is almost entirely preventable with early detection and treatment, or is easily remedied by wearing prescribed spectacles.
- ▶ The major ocular diseases causing vision impairment are:
 - ▶ Cataracts
 - ▶ Age Related Macular Degeneration (AMD)
 - ▶ Glaucoma
 - ▶ Diabetic Eye Disease
 - ▶ Retinitis Pigmentosa
- ▶ In addition there are an estimated 30,000 people in the Republic of Ireland suffering from sight loss as a result of not having the appropriate spectacle correction.
- ▶ Currently there are approximately 9,500 people that are known to be legally blind in the Republic of Ireland
- ▶ This figure increases to 13,000 people if those known to NCBI as blind and vision impaired are included.

- ▶ From the data that is currently available, these figures would appear to underestimate the true extent of blindness by 30-40%.
- ▶ The number of adults in contact with NCBI increased by a figure of 37% between 1996 and 2003.
- ▶ The annual cost of blindness or vision impairment to the state is estimated to be between €100 - €200 million per annum (based on UK data).
- ▶ The annual cost of providing comprehensive care for the main causes of vision loss and vision impairment is estimated to be between €300 million (using data from the USA) and €550 million (based on Australian data).
- ▶ The number of blind people in the Republic of Ireland (using WHO definitions) aged 55 years and over is likely to increase by 170% between 2006 and 2031.
- ▶ The number of vision impaired people in Ireland (using WHO definitions) aged 55 and over will increase by 180% between 2006 and 2031.
- ▶ The projected increase in the older age group in this country over the next 25 years will place a significant demand on the provision of timely cataract surgical intervention to prevent unnecessary and avoidable impaired vision in this age group.
- ▶ Forty four percent of people newly referred to NCBI in 2006 suffered from AMD. With the changing demographic this figure will increase significantly over the next 25 years.
- ▶ Screening and early treatment strategies are vital in the prevention of vision loss due to glaucoma and diabetic retinopathy.

- ▶ There is a need to improve public awareness of eye health, the importance of regular sight tests, eye examinations and appropriate spectacles.
- ▶ The current estimates and projections of future burden have huge implications for ophthalmology service requirements and the organisations providing rehabilitation and other support services in Ireland over the next 25 years. It is hoped that they will form the basis of a comprehensive planning process for this sector of the population into the future.



Section 3 Introduction

Our view of the world around us is influenced very heavily by information provided by our visual system. In many of us, this view changes as the various components of the visual system age.

Conditions such as glaucoma, cataract and age related macular degeneration (AMD) all cause a reduction or diminution of vision and these become more and more common in older age. In this study we have sought to estimate the likely occurrence of existing (prevalence) or new cases (incidence) of sight threatening eye disease in the Republic of Ireland and its impact on life quality.

In identifying the **prevalence** and **incidence** of **impairment**, **disability** and **handicap** associated with **disorders** of the visual system, it is imperative that those responsible for the provision of care use definitions and classifications that allow accurate comparisons from subject group to subject group, region to region and nation to nation. The definitions used in this report are laid out in the Glossary. Vision impairment and blindness research literature has, however, unfortunately been plagued with inconsistencies in this area. It has, for example, been estimated that on a worldwide scale up to 65 different definitions of blindness and poor vision have been

used in literature on the subject (Jackson Wolffsohn 2007). In preparing this report, we have adopted, as our first preference, vision specific terminology and classifications consistent with those used by the World Health Organisation (Table 2). In recognition of the fact that some major epidemiological studies from across the world have, for important local and methodological reasons, used alternative definitions, we also chose to include these alternative classifications and definitions. In making extrapolations relevant to Ireland, we have once again attempted, where possible, to major on the WHO definitions and classifications although, in those cases where we believe the use of other definitions and classifications help to illustrate a specific point, these have been used.

The definitions of “**Vision Impairment**”, “**Low Vision**” and “**Blindness**” used by the authors of this text, unless referencing those used by other published authorities, are as listed in the Glossary. Generally speaking those with low vision can be assisted to make better use of residual vision while those who are blind are more likely to benefit from alternative technologies such as digital and audio formats and substituting existing skills with new rehabilitation techniques, mobility training and independent living skills.

Collectively, those from both groups can be considered to be vision impaired. In the United Kingdom the definitions of vision impairment are of “Blindness” and “Partial Sight”. “Blindness” refers to those who are “so blind as to be unable to perform work for which eyesight is essential” and “Partial Sight” to “those who are substantially and permanently handicapped by defective vision caused by congenital defect and/or injury”. In the

Republic of Ireland, where there is one as opposed to two legal definitions, the definition of blindness is “best corrected visual acuity of 6/60 or less in the better eye or visual fields subtending an angle of 20 degrees or less.

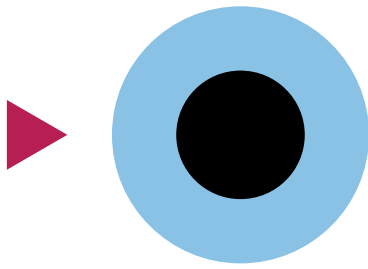
In the United States, reference is usually made to “Legal Blindness” whereas throughout Europe definitions differ from country to country. Most service co-ordinators, irrespective of country of origin, provide guidance on the specific level of sight loss needed to qualify individuals as eligible for registration and thus able to avail of support, entitlements and benefits. The guidance is usually linked to those definitions and classifications recognised within that state’s legal framework.

The situation is further compounded by the fact that, looking at vision impairment on a disease by disease basis, medical/ ophthalmic terminology can be confusing, depending on the origin of the publication. North American publications sometimes use different terminology from that used in Europe. Even something as fundamental as visual resolution or visual acuity can be quantified differently by different authors. In American texts, normal vision is referred to as 20/20, whereas in the United Kingdom and the Republic of Ireland an identical level of vision is 6/6. In European clinical publications this level of vision is often expressed in decimal format as 1.0 whereas in academic literature reporting on clinical trials an identical level of vision will be specified as 0.0 LogMAR (Appendix 2).

In light of these factors and the lack of any specific Irish epidemiological data on vision impairment, it is extremely difficult at present to predict, with any degree of accuracy or confidence, the medical, social or rehabilitation needs within

society which are likely to develop over the next 10-20 years as a result of eye disease.

This report seeks, through a review of what is available in peer reviewed literature on vision impairment, to compare and contrast data from selected population groups deemed similar to that of the Republic of Ireland and thereafter to make predictions about future needs.



Section 4 Study Design

In this study, the methods used to identify data which can be used for comparative purposes include a review of published literature on the prevalence and incidence of blindness, low vision and vision impairment in developed countries. Specific attention has been paid to what is known about adult vision impairment and to what we, the authors, feel are the major causes of vision impairment in the Republic of Ireland.

Subsequent review of what was available resulted in a further refinement of the methodology to ensure that those studies selected for specific attention were those which dealt with a population group which could be considered ethnically comparable with that of the Irish population. Particular attention was paid to studies of population groups in Northern Europe, Australia and North America. Population based studies which used relatively standardised data collection methodology, and which commenced within the last 25 years and are ongoing, were prioritised. As a result the following key studies were selected for comparison :-

1. Beaver Dam Eye Study (USA)
2. Blue Mountains Eye Study (Australia)
3. Rotterdam Study (Europe)
4. Copenhagen City Eye Study (Europe)
5. Melbourne Visual Impairment Project (Australia)
6. MRC/UK Trial of Assessment and Management of Older People

Direct comparison is not, however, always possible as study co-ordinating teams may have, for logistical and methodological reasons specific to their location and research question, selected differing age specific reference rates and vision impairment criteria. Studies which make specific reference to vision impairment and blindness in Ireland have also been referenced. Table 1 provides some of the methodological background, demographic data and the principle methodological references relevant to each of the studies selected for comparison. Table 2 illustrates the definitions of vision impairment and blindness referred to by the authors of each of these studies.

Table 1: Table of Epidemiological Studies

Study Centre	Lead Specialists	Population Profile	Study Sample	Methodology
Beaver Dam Wisconsin (USA)	Klein, Klein & Linton	Age range 43-86 yrs	3583	Population based cohort survey
Blue Mountains Sydney (Australia)	Mitchell, Smith Wang Attebo & Foran	Age 49 yrs and older	3654	Population based cohort study
Copenhagen City (Denmark)	Buch & Nielsen	Age 20-84 yrs	9980	Population based cross-sectional study
Rotterdam (Holland)	Klaver, Hofman & De Jong	Age 55-98 years	7983 (6775 oph exam)	Single centre prospective follow up study
MRC National (UK)	Evans, Wormald & Fletcher	Age 75+ yrs	13936	Population based cross-sectional study
Melbourne (Australia)	Taylor, van Newkirk, Weih & Livingstone	Age 40 yrs and older	5147	Randomly selected clusters from 14 centres

Table of Epidemiological Studies on Vision Impairment from Geographical Areas suitable for Comparison with Ireland (Search strategy combined study location with each of the terms vision/visual impairment/blindness, cataract, glaucoma, retinitis pigmentosa, macular degeneration, refractive error and diabetes/diabetic retinopathy).

Table 1: Table of Epidemiological Studies (continued)

Study Centre	Assessment Procedure	Methodological Reference	Reviewed Papers	Publication Dates
Beaver Dam Wisconsin (USA)	Comprehensive ophthalmic investigation	Klein et al 1991	104	1990-2008
Blue Mountains Sydney (Australia)	Visual assessment and ophthalmic examination	Attebo et al 1996	134	1995-2008
Copenhagen City (Denmark)	Standardised interview and questionnaire. Ophthalmological examination	Buch et al 2004	8	2001-2007
Rotterdam (Holland)	Home interview and comprehensive ophthalmic screening examination	Hofman et al 1991	41	1994-2008
MRC National (UK)	Detailed health assessment including VA	Fletcher et al 2002 and Evans et al 2002	4	2002-2008
Melbourne (Australia)	Census, interview and ophthalmic examination	Livingstone et al 1994	17	1994-2006



Table 2: Definitions of Blindness

World Health Organisation (1979) Criteria

- ▶ **Blindness:** BCVA $<3/60$ in the better eye or a visual field not greater than 10 degrees around central fixation
- ▶ **Low Vision (VI):** BCVA $<6/18$ but not less than $3/60$ in the better eye

United States (US) Criteria

- ▶ **Blindness:** BCVA = $6/60$ or less in the better eye
- ▶ **Visual impairment (VI):** BCVA $<6/12$ but $>6/60$ in better eye

Melbourne Criteria

- ▶ **Mild VI:** BCVA $<6/12$ and $>6/18$ and/or homonymous hemianopia
- ▶ **Moderate VI:** BCVA $<6/18$ and $>6/60$ and/or visual field <20 degrees and >10
- ▶ **Severe VI:** BCVA $<6/60$ and $>3/60$ and/or visual field <10 degrees and >5
- ▶ **Profound VI:** BCVA $<3/60$ and/or visual field <5 degrees

(Taylor et al 1997)

Blue Mountains criteria

- ▶ **Mild VI:** BCVA (better eye) $6/12-6/19$
- ▶ **Moderate VI:** BCVA (better eye) $6/24-6/48$
- ▶ **Severe VI:** BCVA (better eye) $6/60$ or worse

(Attebo et al 1996)

Table 2: Definitions of Blindness (continued)

Rotterdam Study criteria

Used both WHO and US definitions of visual impairment and blindness

(Klaver et al 1998)

Copenhagen city eye study

- ▶ **Visual Impairment:** BCVA (better eye) <6/12 and >6/60
- ▶ **Blindness:** BCVA (better eye) 6/60 or worse and/or visual field <10°

(Buch et al 2004)

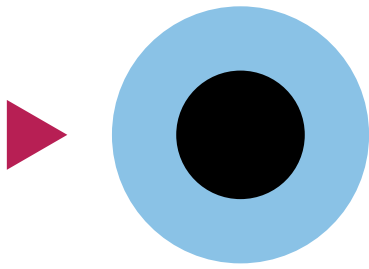
MRC trial criteria

Visual impairment was defined as binocular acuity (habitual) of <6/18

(Evans et al 2004)

Table of definitions of blindness and vision impairment used in the key studies referenced in this report. Where necessary, acuities have been transformed from LogMAR equivalents, European decimal and US Snellen to metric Snellen for sake of comparison (Appendix 2 illustrates the principles of conversion).

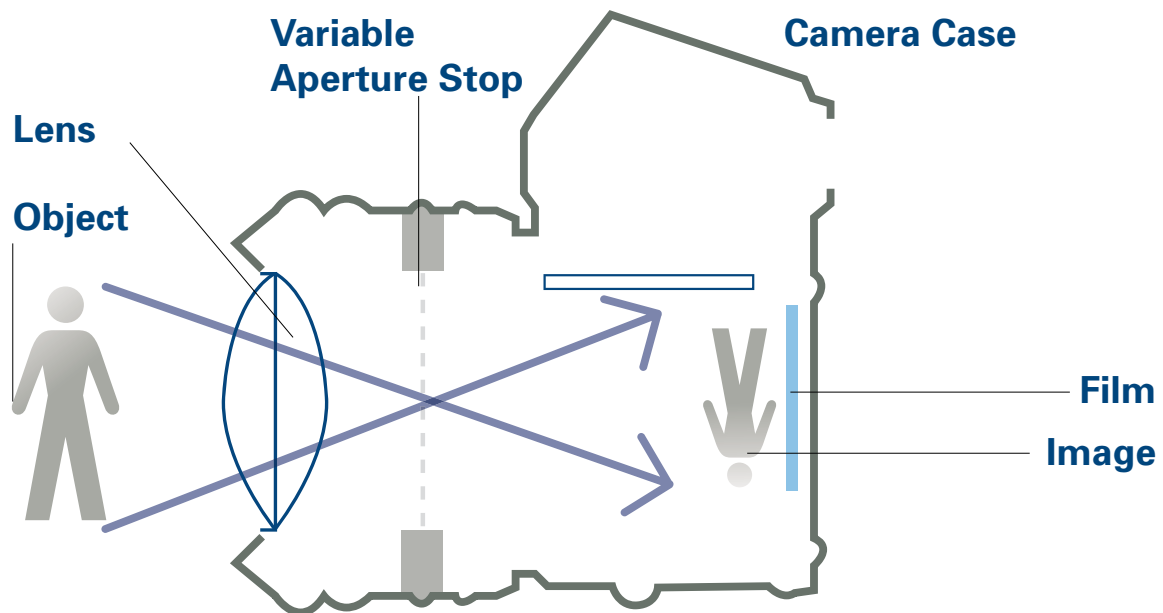
Each of the studies referred to in this report are population based prevalence or cumulative incidence studies. Data from these studies has been used to arrive at an estimate of the current prevalence of vision impairment in Ireland and, using the projected populations for 2016, 2026 and 2031, to estimate the expected burden of vision impairment over the next 25 years (Section 9).



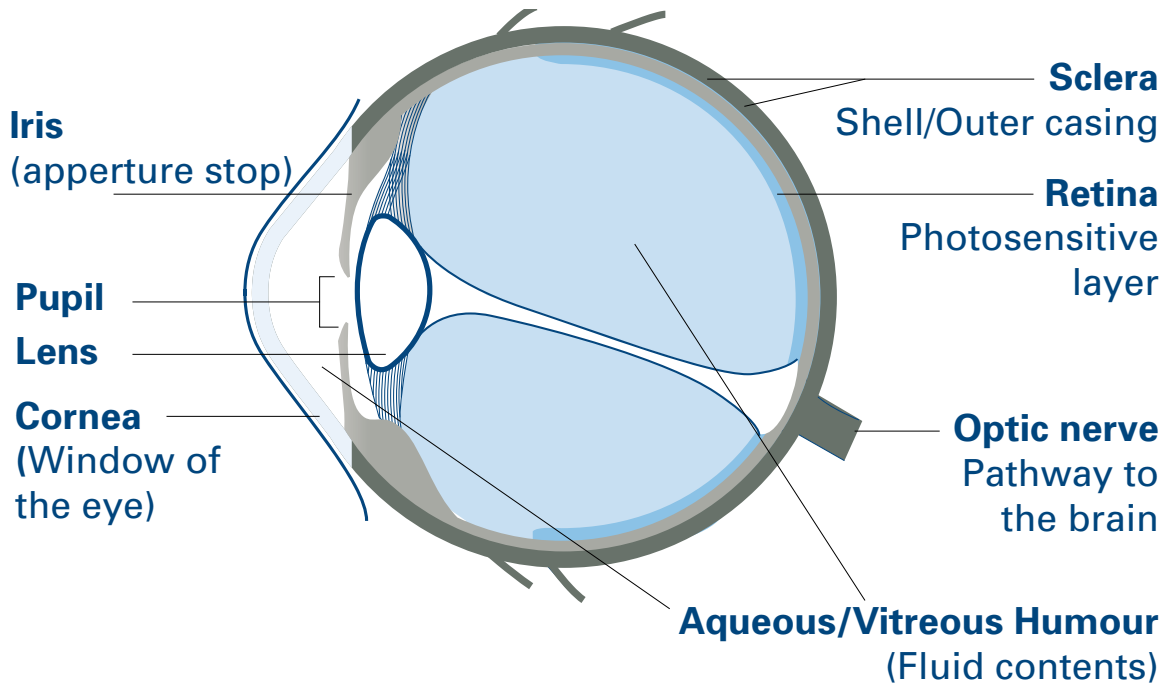
Section 5 Vision Impairment and the Eye

The eye is, in effect, a complex optical instrument that provides the brain with approximately 80% of the sensory information that we need to interact with our world. Like a camera, it has a combination of optical components (cornea and crystalline lens) which help focus light, an aperture stop (iris/pupil) which controls the amount of light entering the eye, and a photo sensitive layer (retina) which captures images of the world we see and sends information about these images back to our digital capture and storage system (brain).

Figure 1: Cross-section of a camera, illustrating key components



► **Figure 2:** Cross-section of the eye, illustrating how the components are similar to the camera



In order to see clearly, the optical components must be of a power such that images are focused sharply on the retina. Any deviation from perfect focus is referred to as “refractive error” resulting in a blurred image which requires an optical correction (spectacles or contact lenses). Damage or disease (cataract, glaucoma, AMD, diabetic eye disease, retinitis pigmentosa) affecting any of the eye’s constituent parts will also reduce the clarity of the image or the quality of the messages sent to the brain. The impact these conditions have on vision is dependent on the extent of the damage or disruption and on the anatomical (structural) and physiological (functional) characteristics of the tissue affected. Cataract, for example, causes us to have blurred vision, glare

sensitivity and a reduction in contrast detection. Glaucoma and retinitis pigmentosa both cause our panoramic visual fields to constrict whereas diabetic maculopathy and age related macular degeneration cause disruption of our central vision and associated reading impairment.

Findings from each of the studies referred to in the previous section have been widely published and include a vast array of information on the medical, social and economic impact of the leading causes of vision impairment and blindness affecting adults of 40 years and older in Europe, North America and Australia. Specific publications from each study also highlight the overall prevalence and/or incidence of vision impairment and blindness and it is this data which is most important within the context of this particular report.

The **Melbourne** team have, for example, shown that at time of presentation approximately 4% of all study participants aged 40 years and older have mild ($VA < 6/12$) to severe ($VA < 3/60$) vision impairment in their better eye. More strikingly, they found that nearly 3 times more people were vision impaired because of visual field loss than visual acuity loss (Taylor et al 1997).

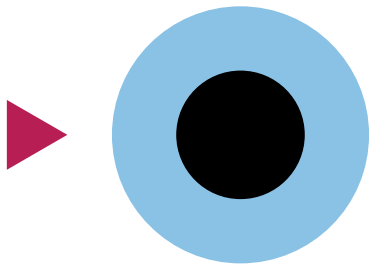
The team from **Beaver Dam** have identified a prevalence rate of moderate vision impairment in the better eye ($VA < 6/12$) and legal blindness ($VA < 6/60$), after full refraction, as increasing from 0.8% and 0.1% respectively, in those aged 43 to 54 years, to 21.1% and 2.0% in those 75 years and older (Klein et al 1991).

The team from **Blue Mountains** provide remarkably similar data demonstrating that the prevalence of best corrected bilateral visual acuities of 6/12 or worse increases from 0.6% in those

aged 49 to 56 years, to 28% in those aged 85 years and older (Wang et al 2000). The overall prevalence of mild ($VA < 6/12$), moderate ($VA < 6/24$) and severe ($VA < 6/60$) vision impairment in those aged 49 years and older were 3.4%, 0.6% and 0.7% respectively (Attebo et al 1996).

European data from the large **Rotterdam study**, which defines blindness and vision impairment in accordance with the WHO classification, indicates that the prevalence of blindness increases from 0.1% in those aged 55 to 64 years to 3.9% in those aged 85 years and older. The prevalence of vision impairment in the two age groups increases almost exponentially from 0.1% (55-64 years) to 11.8% (over 85 years) (Klaver et al 1998).

This rapid increase in the prevalence of vision impairment in the elderly has been confirmed in both the **MRC/UK** and **Copenhagen City** studies. Evans and co-workers found that 12.5% of those 75 years and older and 23.5% of those 85 years and older had significantly impaired sight ($VA < 6/18$) (Evans et al 2002). The prevalence of vision impairment, ($VA < 6/12$), in Copenhagen was also found to increase from 2.6% in those aged 70 to 74 years to 4.8% in those aged 75 to 80 years (Buch H et al 2001).



Section 6 Vision Impairment in Ireland

Of 138 publications referencing blindness/vision impairment and Ireland, less than 6 make specific reference to the overall prevalence of impaired sight on the island. Most papers published deal with childhood vision impairment, ophthalmic medical findings, laboratory research and individual factors associated with specific types of sight loss which may only affect one eye (i.e. trauma). Flanagan and co-workers have identified the prevalence of childhood vision impairment (VA <6/18) in urban Northern Ireland to be 1.6 per 1000. In almost 50% of cases, the diagnosis which was associated with multiple disability, was of cortical visual impairment (Flanagan et al 2003). Results from the Republic of Ireland, adopting the WHO definitions of blindness, showed an increase from 0.2 per 1000 in 1989 to 0.5 per 1000 in 2004 in childhood blindness (Khan et al 2007).

Of those papers which do make reference to the overall prevalence of impaired vision and blindness in adults virtually all draw specifically from data held on the respective blind registers in both the Republic of Ireland and Northern Ireland. Kelliher and co-workers reviewing the 2003 register highlight that numbers on the register have increased by 37% since 1996. The current overall prevalence rate runs at 0.22% and, of those newly registered, 40% are 80 years old or older. The main causes for registration are age related macular degeneration (25%), glaucoma (12%), cataract (11%), retinitis pigmentosa (7%), myopic degeneration (5%) and diabetic retinopathy (5%).

When compared with earlier data gleaned from a review of the register in 1996, there appears to have been a 113% increase in age related macular degeneration and a 120% increase in diabetic retinopathy (Munier et al 1998, Kelliher et al 2006).

Comparative data gathered in Northern Ireland indicated a higher overall prevalence of registration (0.35%). The 3 main causes were age related macular degeneration, glaucoma and diabetic retinopathy. Diabetic retinopathy ranked higher, as a cause of vision impairment, than in the Republic of Ireland (Canavan et al 1997).

A review of current Irish Blind registration (2007/08) data reveals information on only 5 of the 6 major causes of vision impairment referred to in this report. Table 3 illustrates the number of people that qualify as legally blind that are registered with NCBI due to these 5 causes. Specific attention has, however, been paid to figures for those 45 years old and older, data having been broken down by decade.

Table 1: Numbers Registered by Age and Condition

Age Range (Years)	Cataract	Glaucoma	Age Related Macular Degeneration	Diabetic Retinopathy	RP	Total Registered
45-54	26	21	12	36	105	766
55-64	38	29	38	55	116	886
65-74	35	66	138	82	69	985
75-84	41	142	745	80	58	1952
85+	63	276	1311	36	22	2955

Table of the numbers registered as blind, or awaiting registration in the Republic of Ireland (2007/2008) due to five major causes of adult blindness.

It is, however, now universally agreed that data obtained specifically from national registers of blindness and vision impairment significantly underestimates the true prevalence of vision impairment in general and of low vision in particular (Robinson et al 1994) (Kelliher et al 2006).

In attempting to estimate the current prevalence of blindness and vision impairment in Ireland, we have used the Melbourne (Dimitrov et al 2003), Rotterdam (Klaver et al 1998) and Copenhagen (Buchs et al 2001) study findings to produce age-specific rates for those 50 years old and over.

Data published in papers from each of these studies has been presented in such a way that estimates can be calculated using WHO criterion (Tables 2 and 3). Collectively using these criterion it seems likely that there are some 4,000 persons aged 55 years and over currently blind ($VA < 3/60$) in Ireland. Estimates of vision impairment differ significantly ($VA < 6/18 - 3/60$) from study to study. If, however, we select the relatively conservative Rotterdam study findings for comparison it is likely that there are more than 11,000 people that meet the WHO criterion for vision impairment. The figure calculated using Melbourne data would be almost double that of Rotterdam (24,000).

If one chose Blue Mountains data as the comparison the figures would be much higher. The prevalence of vision impairment in those 50 years old and over as defined by a Visual Acuity of $< 6/12$ (that deemed necessary for driving) would rise to a staggering 8.4% (96,000). Following refraction and the provision of appropriate spectacles this figure would be expected to drop to 6.7% (77,000) (Foran et al 2002).

Table 2: Estimates of Current Prevalence of Blindness (WHO Criteria) in Ireland

Ireland		Rotterdam		Ireland		Copenhagen		Melbourne**	
Age Group	2006 Pop Irl*	Rate (%)	Est N	Age Group	2006 Pop Irl*	Rate (%)	Est N	Rate (%)	Est N
55-64	407,055	0.12	488	50-59	472,396			0	0
65-74	262,548	0.17	446	60-69	352,123	0.21	739	0.3	1,056
75-84	157,350	0.64	1,007	70-79	211,618	0.89	1,883	0	0
85+	48,028	3.92	1,882	80+	112,912			4.82	5,442
			3,823				2,623		6,499

* Population of Ireland, 2006, Central Statistics Office, Dublin

** Rates reported for Profound Visual Impairment

Table 3: Estimates of Current Prevalence of Low Vision/ Visual Impairment (WHO Criteria) in Ireland

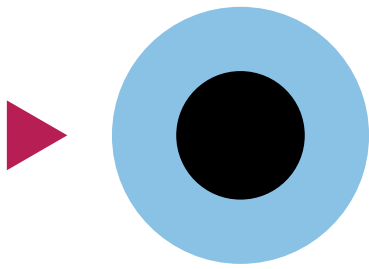
Ireland			Rotterdam			Ireland			Melbourne**		
Age Group	2006 Pop Irl*	Rate (%)	Est N	Age Group	2006 Pop Irl*	Rate (%)	Est N	Age Group	2006 Pop Irl*	Rate (%)	Est N
55-64	407,055	0.12	488	50-59	472,396	0.25	1,181				
65-74	262,548	0.37	971	60-69	352,123	1.04	3,662				
75-84	157,350	2.58	4,060	70-79	211,618	1.93	4,084				
85+	48,028	11.76	5,648	80+	112,912	13.25	14,961				
			11,168				23,888				

* Population of Ireland, 2006, Central Statistics Office, Dublin

** Rates reported for Moderate and Severe Visual Impairment

Results from Beaver Dam would produce similar figures to those from the Blue Mountains study - the prevalence of vision impairment has risen to 8% of the study population over a 15 year follow up period (Klein et al 2006).

In the sections that follow, the impact of each of the 6 major causes of impaired vision affecting adults living in the developed world will be explained and the extent of the impact these conditions are likely to have on an Irish population now, and over the next 20 years will be reviewed. Reference will also be made to the impact that impaired vision has on "Quality of Life". Central to this is the relationship between impaired vision and social isolation, falls, hospitalisation, depression and poverty. Nowhere are these relationships more clearly defined than amongst older people where the cost of health and social care associated with failing sight are significant (Ivers et al, 1998), (Klein et al, 1998), (Horowitz et al, 1998), (Evans et al, 1998).



Section 7 Social and Economic Implications

Loss of sight has a major personal impact on people's daily lives but there is also a major economic impact on individuals, families, support agencies, society and the state. When calculating the economic burden of vision impairment, it has to be recognised that there are both direct and indirect costs involved.

Under the heading of direct costs, a significant proportion relates to the considerable expenditure on health care service utilisation including all healthcare staff, equipment, drug costs, and procedures. Other direct costs arise from hospital admissions due to falls, fractured bones, accidents and depression associated with vision impairment. It has been long recognised that poor eyesight is a major contributing factor to falls and fractures in the elderly. Estimates for direct costs have focused mainly on the major eye diseases (cataracts, glaucoma, AMD and diabetic retinopathy).

Indirect financial costs associated with vision impairment result from disability, personal lost earnings and productivity, and the economy's reduced capacity to produce goods and services. Included in these factors are the costs of carers, special aids and devices and household modifications. The loss of earning capacity has implications for lost tax revenue and less consumption of goods, and has an impact on employment rates and preventative illness/death.

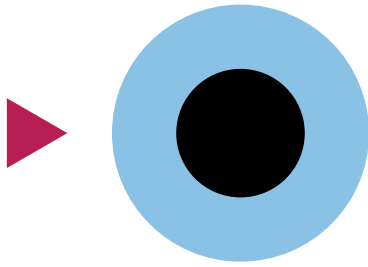
Therefore vision impairment has a significant impact on an individual's lifetime costs and the annual costs to government and supporting agencies. Measuring costs of healthcare is essential if

the cost effectiveness of prevention/screening and treatment is to be calculated.

In a recent publication by Rein and co-workers it was estimated that the total annual financial burden of major adult vision disorders was US\$35 Billion in the United States (population of 300 million) (Rein et al 2006). The breakdown of this figure indicates that 46% were direct costs, and 54% indirect costs. In Australia, which has a population of 22.5 million people, a recent report calculated that the annual total financial costs were AU\$5 Billion (35% direct costs) (Taylor et al 2006). A supplementary finding is that within Australia for every dollar spent on eye care and the reduction of sight loss, there could be a 4.8 fold financial return to communities (Taylor et al 2007).

The above figures are for the total cost of care for the major vision disorders and not just the costs associated with vision impairment alone. Nevertheless, if we extrapolate the above data to the current Irish population of 4.5 million, the total annual cost to provide comprehensive care of the main causes of vision loss and vision impairment would amount to €300 million (based on the US report) or €550 million (using the Australian data).

In a study commissioned by the Guide Dogs for the Blind Association in the United Kingdom the authors calculated the total annual costs for those registered blind or partially sighted in England as ranging from £1.4 to £2.9 billion (GDBA 2003). Applied to the Irish population, this would suggest that the annual costs for those registered as vision impaired (in terms of social benefits and productivity losses alone) should range between €100 – €200 million. Given the known underreporting of those eligible for blind registration of up to 30 – 40% of all vision impaired people, the true cost could range between €140 and €280 million per annum.



Section 8 The Main Causes of Blindness and Vision Impairment in Ireland

The six main ocular conditions resulting in significant vision impairment identified in the referenced population based surveys are:

A: Optical/Refractive Errors

B: Cataract

C: Glaucoma

D: Age Related Macular Degeneration (AMD)

E: Diabetic Eye Disease

F: Retinitis Pigmentosa

Eyes on the future Ireland

Optical/Refractive Errors



Section 8A

Optical/Refractive Errors: Why People Wear Glasses

When a patient becomes aware of the fact that their vision is no longer as clear as they expect it to be, the first question that should be asked is “Could the poor vision be caused by a refractive error/would new glasses help?”. Uncorrected refractive error causes blurred vision at either distance, near (close up) or both and is often associated with eyestrain. There are different types of refractive error but, irrespective of the cause, the extent of blur is directly related to the magnitude of the error.

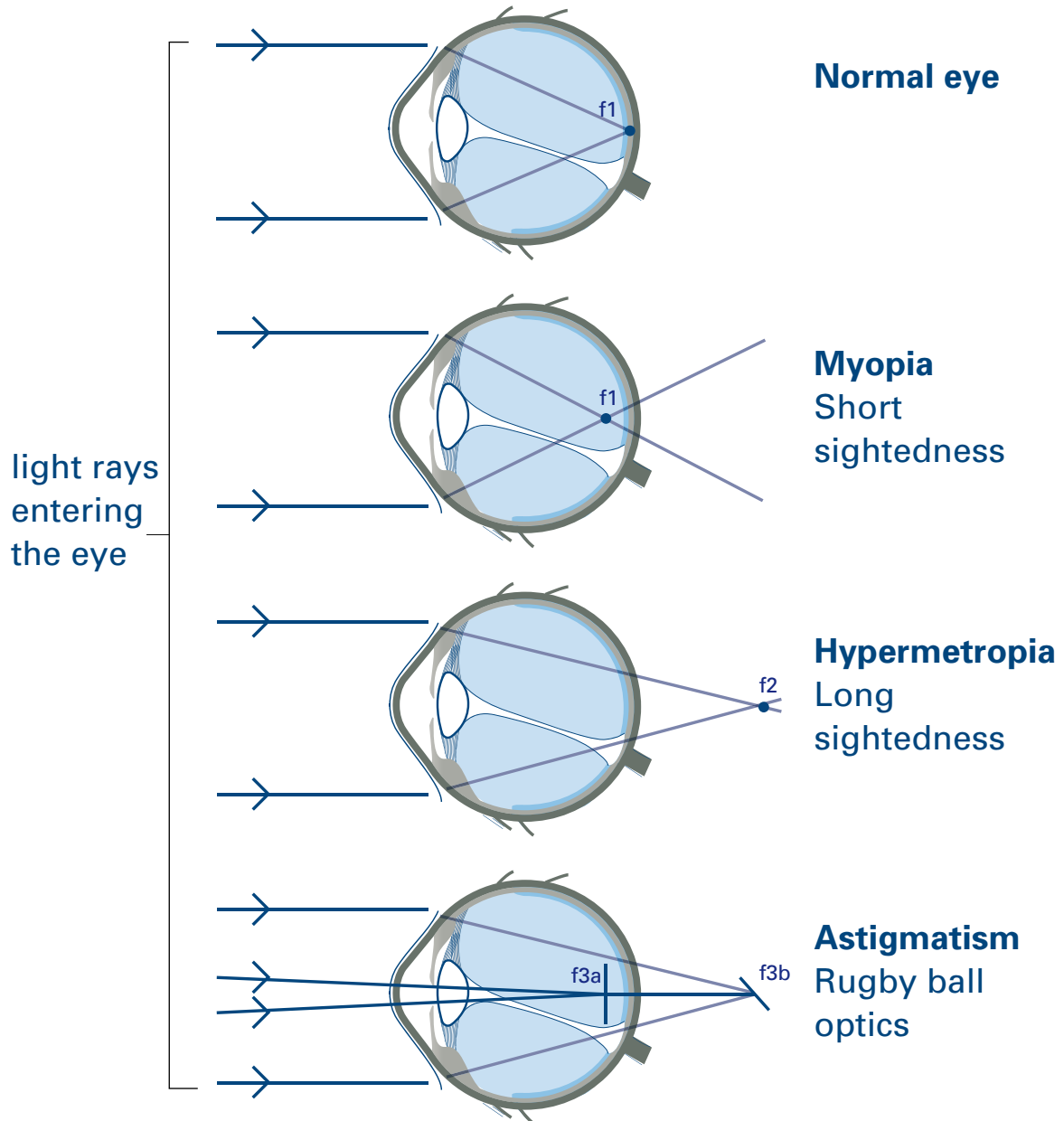
Short-sighted individuals (myopes) have blurred, uncorrected distance vision but often surprise themselves by seeing clearly at near without glasses. (Figure 3) When glasses are prescribed for teenagers, they are usually to correct short-sightedness.

Uncorrected long-sighted individuals (hypermetropes) have to work their intraocular muscles hard to see clearly at any distance, although the effort required is generally greatest at near. Those with astigmatism, often described as the rugby ball effect, have blurred unaided vision at all working distances. An additional complication of refractive error is that all of us, as we approach our mid 40s, begin to lose focusing power with the result that reading becomes more problematic. This condition, often remedied by simple reading glasses, is referred to as presbyopia.

Irrespective of the cause of refractive error (myopia, hypermetropia, astigmatism or presbyopia), the resulting blur can be corrected optically using spectacles, contact lenses or refractive surgery. The merits of all 3 types of correction vary and need to be considered on an individual basis.

Figure 3: Illustration of uncorrected refractive error.

Note how in the Myopic eye the focal point (f_1) is in front of the retina, whereas in the Hypermetropic eye, f_2 is behind the retina. In the astigmatic eye there is no single focal point. In all 3 cases of error, the image formed on the retina will be out of focus.



Although it is now widely recognised that the prevalence of uncorrected refractive error increases with age, as changes occur to the optical components within the eye, most of the early epidemiological studies on vision impairment overlooked the significance of this.

In this context, it is the findings from the Australian studies that prove most interesting. The **Melbourne** team have quite clearly demonstrated that the most common cause of bilateral vision impairment amongst those 40 years old and older was uncorrected refractive error. The prevalence of impaired sight resulting in a failure to meet driving requirements (VA <6/12), rising from 0.48% in those aged 40 to 49 years to 14.5% in those 90 years and older. These findings were unexpected in that Australians have access to publicly funded optometric/optician services (Weih et al 2000). Similar findings have recently been reported from the United Kingdom where 26% of those 75 years and older identified as having had a presenting VA of <6/18, were deemed to have vision loss of refractive origin (Evans et al 2004).

There is no data currently available on the prevalence of uncorrected refractive error in Ireland. If, however, one were to extrapolate from the Australian data, it could be anticipated that 2.2% of the population (30,000) aged 45 years and older would have impaired sight as a result of uncorrected refractive error. Of note, however, is that in contrast to Australia, free access to optometric/optical services is not available to all. The Association of Optometrists Ireland, for example, state that about 30% of the state's adult population are unable to avail of free eye care (www.optometrists.ie/asp/section.asp?s=34). The result of these findings is that the figure of those rendered vision impaired as a result of uncorrected refractive error is

likely to be much higher than in Australia. All that is required is a conventional eye test and the provision of simple spectacles.

▶ The key messages concerning uncorrected refractive error are simple :-

1. The authors estimate that in excess of 30,000 adults in Ireland are living with significant sight loss due to uncorrected refractive error (i.e. they have either no spectacles or require new spectacles).
2. Refractive error changes with ageing with the result that new glasses may help to correct deteriorating vision as we get older.
3. Routine eye examinations can easily identify and quantify the impact of uncorrected refractive error and should result in the provision of an appropriate optical correction.

Eyes on the future Ireland

Cataract



Normal Vision



Cataract

Section 8B – Cataract

As mentioned previously, the eyes' crystalline lens is responsible for focusing light rays entering the eye sharply on the retina. In its normal state, the lens is transparent but as it ages it becomes cloudy or opaque. Ageing is the commonest cause of cataract although it may occur secondary to trauma, inflammation or in association with other diseases which can affect vision (i.e. diabetes). It is the opacity, or clouding, within the lens that is referred to as cataract.

As one would expect of any opacity or optical defect within a lens, cataract results in a deterioration of vision. It is associated with symptoms of blurring, haze and changing refractive error and eyestrain. It is when undertaking detailed visual tasks such as reading, face recognition or driving, particularly when in the presence of glare, that difficulties arise and symptoms are most apparent. Most individuals experiencing cataract will be aware of the fact that vision in one or both eyes is not as good as it was. The fact that the condition is slowly progressive often disguises this and the individual may not be acutely aware of the impairment until it is fairly advanced. The impact cataract has on the subject's quality of life is directly linked to the extent of the cataract and the visual requirements of the individuals. Risk factors include age, diabetes, ocular injury, steroid use, ocular inflammation and ultraviolet exposure. Most importantly, for treatment to be effective we must ensure early detection and diagnosis.

The **Beaver Dam** study from Wisconsin (USA) has shown, not only that cataract is a common age related problem, but that the cumulative incidence rises by a factor of approximately 12 between the ages of 43 and 75 years (Klein et al 1998).

A comparison with the Australian **Melbourne** data indicates that the impact of bilateral cataract on vision impairment rises even more steeply with age. Whereas only 0.5% of 70 year olds were vision impaired as a result of cataract, 12% of those in their 90s were found to be vision impaired as a result of cataract (Weih et al 2000). This represents a 24 times increase.

Results from **Blue Mountains** further highlight that, whereas cataract accounts for 6-10% of bilateral blindness (VA < 6/60) in those aged between 49 to 97 years, it accounts for a staggering 50% of bilateral vision impairment (VA<6/12) (Foran et al 2003). Extrapolating from currently available data, Taylor and Keeffe in a review of world blindness state that “the amount of cataract doubles with each decade of life over the age of 40. By the age of 90 one person in two will have had cataract surgery” (Taylor, Keeffe et al 2001).

Results from **Rotterdam** indicate that cataract can be considered a contributory factor in causes of vision impairment in those with other forms of eye disease. When this is taken into account, cataract is found to be an associate finding in 65% of all cases of vision impairment affecting those 55 years and older (Klaver et al 1998).

Results from the **Copenhagen** study add additional support to this argument in that cataract was found to have been the most common cause of moderate vision impairment (VA<6/12) in those aged 65 to 84 years of age (Buch et al 2004).

The implications of these findings are that in Ireland an estimated 24.4% of those over the age of 85 (n=11530) are likely to have significant cataract and that 1.2% will be severely


vision impaired as a result. Once again, all that is required for detection is a conventional eye test and, thereafter, access to cataract surgery.

Cataract Surgery in the Republic of Ireland

In a published review of changing trends of ophthalmic surgery in the Republic of Ireland, there was an overall increase of 24% in the number of surgical procedures performed between 1994 and 2001 (as shown by the Hospital In-Patient Enquiry data returned from the major acute hospitals to the Economic and Social Research Institute) (Long & O'Brien 2005). In 2001, cataract surgery accounted for 9,020 (82%) of the 11,005 procedures performed.

Data from the private hospital sector was unavailable for inclusion in the review. This could, however, conservatively account for another 5,000 cases per annum given the numbers of people with private health insurance in this country. A conservative estimate of the number of cataract procedures performed in the Republic of Ireland in 2001 would be 14,000. In addition, the survey showed a 49% increase in the number of cataract operations performed between 1994 and 2001 in the public sector hospitals.

With the projected rapid growth in the older population over the next 20 years, it can be predicted that there will be an ever increasing demand on the hospital systems for cataract surgery (Keenan, 2007).



The key messages regarding cataract are that :-

1. Cataracts are common, affecting approximately half of those 65 years and older. Most of us will get cataract as we get older.
2. Cataracts are an associated finding in many other causes of eye disease in the older population.
3. Cataracts can be easily treated. In the early stages of cataract, it may simply involve the replacement of current spectacles but, as it progresses, treatment involves the removal of the lens and the insertion of a small plastic replacement (intraocular lens). Treatment, in the absence of underlying secondary eye disease, is almost always successful and patients often comment on how “clear and bright, the new world seems”.
4. As the population ages, the demand for cataract surgery will increase exponentially.
5. Timely intervention not only improves outcome but reduces the impact of disability as a result of cataracts.

Eyes on the future Ireland

Glaucoma



Normal Vision



Glaucoma

Section 8C – Glaucoma

Unlike many of the other leading causes of vision impairment, glaucoma is essentially symptomless in the early to moderate stages of the disease process. In considering the mechanism of the disease one must now consider the optical instrument in question (eye) as a dynamic soft shell camera, the structure and shape of which is maintained by fluid pressure from within. The fluid (aqueous humour) responsible for maintaining the delicate pressure balance within the eye is also responsible for much of the internal nourishment of the system and is, as a result, continually drained and replenished. When the balance between production and drainage is such that the pressure within any given eye (intraocular pressure) rises to a point that damage is caused at the optic nerve head (the wiring cable), the condition is called glaucoma.

Surprisingly, up to 40% of optic nerve head fibres can be damaged or destroyed in the two leading causes of glaucoma (primary open angle and normal tension glaucoma) before the patient will notice any loss of vision. The process resulting in damage is irreversible. Other causes of glaucoma (acute closed angle and secondary glaucoma), which are associated with both pain and visual symptoms (haloes and blur), are relatively rare by comparison.

In contrast to those conditions which cause a loss of central vision (AMD and Diabetic Maculopathy), glaucoma causes a progressive loss of our peripheral or side vision (visual fields) and a reduction in our ability to see low contrast targets (contrast sensitivity). Diagnosis of the condition involves an assessment of peripheral retinal integrity (visual fields),

intraocular pressures (tonometry) and a detailed assessment of the shape and appearance of the optic nerve head (topography, retinal imaging/photography). Risk factors include age, family history, myopia, ethnicity and the presence of systemic disease including diabetes and cardiovascular diseases.

Findings from the **Beaver Dam** study indicate that the overall prevalence of primary open angle glaucoma in those over the age of 45 years is 2.1%. The figure rises from 0.9% in those aged 43 to 54 to 4.7% in those over the age of 75 years (Klein et al 1992). Results from the **Melbourne study** further highlight that with increased ageing, one person in ten will eventually develop glaucoma (Wensor et al 1998). Furthermore, the prevalence of significant vision impairment resulting from glaucoma has been shown to rise from 0.45% in those aged 60 to 69 years to 1.4% in those 90 years and older (Weih et al 2000).

Similar findings have been reported by the **Blue Mountains** team who, using a combination of factors to diagnose glaucoma, identified an overall adult prevalence rate of 3%. Worryingly half of those found to have this condition which, if untreated will lead to irreversible sight loss, were newly diagnosed through the study (Mitchell et al 1996).

The **Rotterdam study** data also supports these findings and in addition shows that when considering the causes of vision impairment in the elderly, the rise resulting from primary open angle glaucoma is moderately age related (Klaver et al 1998).

With this particular condition, epidemiological data is available from Ireland. Coffey et al, in a large study of 2186 residents (aged 50 years and older) of Roscommon found the age specific

prevalence of primary open angle glaucoma to increase from 0.72% in those aged 50 to 59 years to 3.05% in those 80 years and older (Coffey et al 1993). In the case of glaucoma, detection and early treatment is essential if sight loss is to be prevented. All the recently published long-term studies show clearly that currently available treatments (which lower the eye pressure) are effective at slowing down the rate of visual deterioration. Only when we have lost that battle, does the challenge of providing rehabilitative and low vision support become necessary.

Numerous recent papers clearly demonstrate that the costs of treatment at an early stage are significantly less than treatment of the disease at an advanced stage, thus emphasising the critical importance of screening and detection of early disease by optometrists and eye specialists. (Traverso et al 2005)

▶ The key messages regarding glaucoma are:-

1. Glaucoma is a common condition affecting progressively increasing numbers of older people.
2. Glaucoma is essentially symptomless and causes irreversible sight loss.
3. Detection of glaucoma is dependent on routine eye examinations which can be carried out by your optometrist/opticians.
4. Treatment, by an ophthalmologist particularly if the condition is detected early, works very well and usually involves eye drops alone.

Eyes on the future Ireland



Age Related Macular Degeneration (AMD)



Normal Vision



Age Related Macular Degeneration (AMD)

Section 8D – Age Related Macular Degeneration (AMD)

In considering the camera analogy, we now turn our attention to the light sensitive film (retina) or, more appropriately in the digital age, the electronic plate or micro chip onto which light is focused (transferred) at the back of the camera (eye).

In the case of age related macular degeneration, which affects those 50 years and older, damage is confined to the central part of the film (the macula) on which images of what is of primary interest to the observer are focused, (i.e. those objects on which we have fixed our gaze as opposed to those which are of secondary interest and are positioned in our peripheral fields of vision). The condition is almost always bilateral (affecting both eyes) although the eyes may be affected to different extents and at different times.

The symptoms (distortion and blur) experienced are very disturbing and have a hugely detrimental effect on reading, driving, face recognition and many of the tasks we take for granted when undertaking life's daily activities. The rate of onset of symptoms and the relationship between distortion and blur are largely dependent on whether the condition is wet (characterised by fluid accumulation at the macula) or dry (solid deposits and scar tissue). The wet form is treatable if detected early enough whereas the dry form, which accounts for almost 90% of the condition, is not. (Brown & Regillo 2007)

Patients with either form of the condition often benefit greatly from the provision of low vision aids and rehabilitation/social support services. Risk factors include age, smoking (smokers

are 3-4 times more likely to develop the condition than non-smokers) and a family history of the condition. Risk factors can be reduced through stopping smoking and improving the dietary intake of fish oils and fresh fruit and vegetables rich in Vitamins C and E. Anti-oxidant vitamin supplements may also be important in this respect.

Virtually all studies investigating untreatable causes of vision impairment in the developed world highlight the fact that age related macular degeneration (AMD) ranks top of the list and that its prevalence increases almost exponentially with age. The **Blue Mountains** team have shown that, whereas only a small proportion of individuals in their 50s have this condition, 2 out of every 3 individuals will show signs of it in their 90s and that one in 4 will have lost vision as a result (van Newkirk et al 2000).

The 5 year incidence rates of retinal features considered early precursors of AMD (drusen, retinal pigment abnormalities and exudative macular change) have in addition been shown by the **Beaver Dam** study group to increase by factors of between 8 and 32 when comparing those 43 to 54 years of age with those 74 years and older (Klein et al 1997). Sight impairing age related macular degeneration of both the wet (neovascular) and dry (atrophic) forms have both been shown to demonstrate this marked age specific trend in **Rotterdam** where the percentage of those affected increased from 0.1% (wet) and 0.1% (dry) in the age range 55 to 64 years, to 3.7% (wet) and 7.4% (dry) respectively in those over the age of 85 years (Vingerling et al 1996).

Once again, results from **Melbourne** further confirm this trend in that the prevalence of vision impairment resulting from AMD triples with each decade over the age of 70 (Weih et al 2000).

Copenhagen results illustrate exactly the same trend where AMD has become the major cause of blindness in those 65 to 84 years of age (Buch et al 2004). The **MRC/UK** findings are, once again, consistent with all of the preceding data. In this case, 53% of vision impairment in those aged 75 years and older was a direct result of AMD. Estimates are that 3.7% of those in the population 75 years and older and 14.4% of those 90 years and older are vision impaired due to AMD (Evans et al 2004).

Cumulative figures from a large European study (EUREYE) which pooled data from multiple centres of excellence indicate that age related maculopathy (ARM), which is a risk factor for the development of age related macular degeneration (AMD), was present in 36% of individuals 65 years and older. Age related macular degeneration (AMD), which is the form of the disease associated with severe visual impairment, was present in 3.3% of this large population group. Once again, the prevalence showed a very strong age related increase (Augood et al 2006). The methodology adopted in this population based study is similar to that used in many of the other studies referred to in this report (Augood et al 2004).

Analysis of data held on the Irish Blind register indicates that 44% of all new registrations occurred as a result of age related macular degeneration (Kelliher et al 2006). If, however, one extrapolates from the prevalence figures identified in the studies referred to in this document, the estimated number of those eligible for registration as a result of AMD in Ireland would be almost 7,000. In the case of ARM, early detection through a conventional sight test is important as treatment may be available. Sight loss resulting from AMD can, thereafter, be managed using low vision and rehabilitation strategies.



The key messages regarding AMD are :

1. Age related maculopathy (ARM) is very common in later life.
2. Approximately 10% of those with ARM will develop severe vision impairment as a result of age related macular degeneration (AMD).
3. Early detection of some forms of AMD (wet) can provide access to effective treatment.
4. Rehabilitative support and the provision of optical low vision aids can enhance quality of life and retain and maintain independence for people living with AMD.

Eyes on the future Ireland

Diabetic Eye Disease



Normal Vision



Diabetic Eye Disease

Section 8E – Diabetic Eye Disease

Diabetes is now a common disease which is known to affect approximately one in every 100 adult Europeans. There may, however, be as many again who have the disease and as yet are unaware of it. The condition occurs either because the body lacks insulin or because its ability to utilise it is impaired. Of the two types of diabetes, “insulin dependent (type 1) diabetes” tends to manifest itself in the teens and twenties whereas the most common age of onset of “non-insulin dependent (type 2) diabetes” is in the 50s, 60s and 70s. When considering the impact that diabetes has on the eye, one must remember that it is in fact a “whole body disease” affecting the vascular system.

The principal ocular effect is, however, “retinopathy” which, once again, is synonymous with damage to the film in the camera. The damage inflicted differs from that resulting from either AMD or retinitis pigmentosa in that it can affect both central and peripheral vision. The effect on the individual can include central blur, distortion, field loss and a reduction in both low contrast vision and colour vision. Treatment is available using high powered lasers but this is dependent on early detection and timely intervention. Those affected often find that their spectacle correction needs more regular change than would be expected in non-diabetics.

Of particular note is the fact that, whereas 25% of those affected by diabetes will exhibit signs of retinopathy within 5-10 years of age of onset, this figure rises to 90% by 30 years. Risk factors for sight threatening retinopathy include poorly controlled diabetes, high blood pressure, obesity and high lipid and cholesterol levels (Kohner 2008). Approximately

8-10% of all diabetics suffer potentially sight threatening maculopathy or proliferative retinopathy. This is a fact which is of great importance given the dramatic increase in diabetes in developed countries.

A review of literature from the study centres selected for comparison highlights the fact that eye disease resulting from diabetes is on the increase.


Results from **Blue Mountains** indicate that, of those diagnosed with diabetes at the commencement of the study, 22% developed retinopathy over a 5-year period and, of those with retinopathy, 26% showed significant progression (Cikamatana et al 2007). Figures for the presence of retinopathy in newly diagnosed type 2 diabetes (10.2%) from **Beaver Dam** are lower in comparison (Klein et al 1992). Interestingly, those noted to have an increase in the rate at which diabetic retinopathy progresses were found to have a poorer life survival rate than those from the study sample who had no evidence of eye disease (Knudtson et al 2006).

Regarding vision impairment associated with diabetic eye disease, results from the **MRC/UK** study found that diabetic eye disease accounted for 3.4% of vision loss in those 75 years and older (Evans et al 2004). Results from **Melbourne** were similar in that the prevalence of vision impairment resulting from diabetes was generally lower than that resulting from the other major causes. In those 80 years and older, the age group most likely to have sight loss resulting from diabetic eye disease, the overall prevalence of sight loss of diabetic origin was 0.8% (Weih et al 2000). Results from a population based study in the United Kingdom found that the prevalence of bilateral vision

impairment (VA<6/18) amongst known diabetics was 2.8% (Prasad et al 2001).

A review of the blind register in England and Wales published in 2006 also shows a doubling in the numbers of people registered as legally blind from diabetic retinopathy during the same period (Bunce 2006). The Department of Health in the UK has recognised the importance of this problem and initiated a national screening programme to identify those at risk so that they can be treated at the earliest possible stage.

Data from the Irish blind registration studies indicate that the number of individuals registered as a result of diabetic eye disease have increased by a factor of two between 1996 (147) and 2003 (323) (Kelliher et al 2006). Furthermore, assuming as most studies have found that the prevalence of diabetes amongst adults of Caucasian origin is 2-3%, and that 2-3% of diabetics are vision impaired, it would seem logical to assume that almost 1000 adults aged 45 and older in Ireland suffer unnecessary and treatable vision impairment as a direct result of diabetes. The Health Service Executive, through an Expert Advisory Group, has developed a blueprint for establishing a national screening programme which can build on the North West Diabetic Retinopathy Screening Service to include the rest of the HSE West Region.



The key messages regarding diabetic eye disease are :-

1. Diabetics have a significantly higher risk of sight loss than non-diabetics.
2. Screening programmes are essential to the early detection and treatment of diabetic retinopathy.
3. Poorly controlled diabetes, high blood pressure and poorly controlled cholesterol levels increase risk of eye disease and associated sight loss.
4. Rehabilitation intervention is extremely important to people who lose sight as a direct result of diabetic eye disease because the condition is progressive.

Eyes on the future Ireland

Retinitis Pigmentosa



Normal Vision



Retinitis Pigmentosa

Section 8F – Retinitis Pigmentosa

Retinitis Pigmentosa (RP) is the name given to a group of hereditary retina disorders characterised by progressive damage to photoreceptors (rods) which are predominantly responsible for our peripheral vision. When considering the camera illustration, it is as if the film had been damaged in such a way that the peripheral components of each photograph are incapable of recording an image.

The first symptoms experienced by someone affected by RP concern difficulties getting around in low lighting (night blindness). These symptoms often appear first, shortly after adolescence. As the disease progresses, visual field loss (tunnel vision) and difficulties interpreting low contrast images also become manifest. Most patients with RP retain usable central vision well into older age.

There are 3 modes of inheritance (dominant, recessive and X-linked), the latter form affecting males. The genetics of the disease is, however, much more complex as there are now known to be at least 30 different genes which cause these diseases (Van Soest, 1999). The Humphries Laboratory at Trinity College, Dublin, published the first paper identifying a genetic mutation in RP (Farrar et al 1991). Clinically those with the X-linked and recessive forms of the disease tend to lose vision earlier and are more severely affected than those who have the dominant form of the disease. The condition is, of course, bilateral.

Conventional low vision aids are less useful to the RP patient than to those with macular disease although rehabilitative

assistance and, in particular, mobility training can be invaluable. Electronic magnification aids (CCTVS) which both magnify and enhance contrast can, however, be very useful. Cataracts are a common associated finding in RP and, in some cases the condition can be associated with hearing loss (Ushers Syndrome).

Although little has been published from population based studies on the epidemiology of RP, it is widely recognised that the condition is a very significant cause of vision impairment in younger adults and that those affected progress to irreversible blindness. In Denmark, analysis of registration data reveals a prevalence of 1 in every 3943 individuals, the age specific prevalence rate rising consistently over the first 4 decades of life (Haim 2002). Prevalence figures from the United States (1 in every 4,756) are similar although of note is the fact that year on year incidence of new cases is only 1 in every 16,000 (Bunker et al 1984). Figures from the United Kingdom indicate that the prevalence amongst those aged 45 to 64 years of age is 1 in every 3,195 (Bundey and Crews 1984). As yet unpublished data for Northern Ireland indicates that the prevalence of RP is currently 1 in 3996 (Silvestri G, Personal Communication).

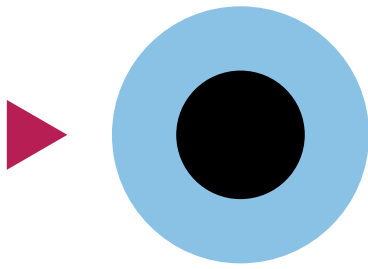
In Ireland, a recent analysis of blind registration data revealed RP as the third major cause of registered vision loss accounting for 7% of those on the register (Kelliher et al 2006).

In this report, based on estimates obtained from other studies, it is likely that 1060 individuals are likely to be affected in Ireland. The extent to which these individuals are vision impaired is determined by the form of the disease and the age of the patient. Most affected individuals being eligible

for blind registration by the age of 30. There are, as yet, no effective cures for RP although much is being done on the molecular nature of the disease, in pursuit of a possible cure. Major advances in gene therapy approaches have recently been reported offering hope for a potential cure (Bainbridge 2008).

▶ The key messages regarding Retinitis Pigmentosa are:

1. Important research on the molecular nature and genetics of RP is being carried out in Ireland.
2. Treatment and prevention are realistic aspirations for people with RP.
3. Important improvements in life quality for people with RP can be achieved through the provision of optical and electronic aids and through rehabilitation.



Section 9 Projected Estimates of Blindness and Vision Impairment in Ireland

The population of Ireland is still relatively young compared with those of other European countries. In the 2006 census 35% of the Irish population was under 25 years while the proportion over 65 years was 12%. This compares with 25% and 17% respectively in Europe. By 2031, it is predicted that approximately 16% of the Irish population will be over 65 years. In absolute terms this will mean more than double the numbers of elderly persons (65 +), from 460,000 in 2006 to just over 1 million in 2031.

A marked increase in the frequency of blindness and vision and impairment with advancing age has been reported across all studies. This has important implications for the provision of services for elderly persons, who are also likely to be compromised by infirmity and co-morbid conditions as they age. It also has significant implications for the increasing burden of care due to increased longevity and the ageing population.

To estimate the numbers of persons likely to have blindness or vision impairment over the next quarter century in Ireland the projected populations for 2016, 2026 and 2036 were sought from the Central Statistics Office. Age-specific rates from the Rotterdam study, used in the computation of current prevalence figures, were applied to the projected populations and expected numbers of persons who are likely to be blind or vision impaired calculated. The results are presented in Tables 4 and 5.

Table 4: Estimated Numbers of Blind Persons in Ireland (WHO Criteria) in 2016, 2026 and 2031

Age Grp	Rate*	2006		2016		2026		2031	
		Pop Irl	Est N	Proj Pop**	Est N	Proj Pop**	Est N	Proj Pop**	Est N
55-64	0.12	407,055	488	521,800	626	652,200	783	736,200	883
65-74	0.17	262,548	446	376,400	640	492,300	837	555,400	944
75-84	0.64	157,350	1,007	197,200	1,262	307,300	1,967	363,700	2,328
85+	3.92	48,028	1,882	75,000	2,940	118,600	4,649	156,600	6,139
		874,981	3,823	1,170,400	5,468	1,570,400	8,235	1,811,900	10,294

* Rates(%) derived from the Rotterdam Eye Study

** Projected Population of Ireland, Central Statistics Office, Dublin

Based on the Rotterdam Study, and using the WHO Criteria, the number of blind persons in Ireland aged 55 years + is set to increase as follows:

- ▶ by 43% (3,800 to 5,500) over the 10 year period, 2006 to 2016
- ▶ by 116% (3,800 to 8,200) over the 20 year period, 2006 to 2026
- ▶ by 170% (3,800 to 10,300) over the 25 year period, 2006 to 2031

Table 5: Estimated Numbers of Visually Impaired Persons in Ireland (WHO Criteria) in 2016, 2026 and 2031

		2006		2016		2026		2031	
Age Grp	Rate*	Pop Irl	Est N	Proj Pop**	Est N	Proj Pop**	Est N	Proj Pop**	Est N
55-64	0.12	407,055	488	521,800	626	652,200	783	736,200	883
65-74	0.37	262,548	971	376,400	1,393	492,300	1,822	555,400	2,055
75-84	2.58	157,350	4,060	197,200	5,088	307,300	7,928	363,700	9,383
85+	11.76	48,028	5,648	75,000	8,820	118,600	13,947	156,600	18,416
		874,981	11,168	1,170,400	15,927	1,570,400	24,480	1,811,900	30,738

* Rates(%) derived from the Rotterdam Eye Study

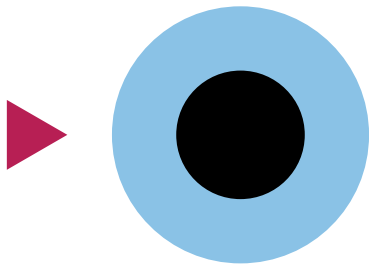
** Projected Population of Ireland, Central Statistics Office, Dublin

Based on the Rotterdam Study, and using the WHO Criteria, the number of visually impaired persons in Ireland aged 55 years + is set to increase as follows:

- ▶ by 45% (11,000 to 16,000) over the 10 year period, 2006 to 2016
- ▶ by 125% (11,000 to 25,000) over the 20 year period, 2006 to 2026
- ▶ by 180% (11,000 to 31,000) over the 25 year period, 2006 to 2031

It must be emphasized that the estimates derived here are based on well-conducted, population-based epidemiological studies of blindness and vision impairment in populations which are ethnically and largely geographically similar to the Irish population. In the absence of national population-based data on eye conditions it is imperative that we use these data to estimate the current prevalence and future burden of blindness and vision impairment in this country. It must be emphasized that the estimates derived are the most conservative possible. They could be significantly greater if data from other studies were used, or the US diagnostic criteria for blindness and vision impairment were applied.

The current estimates and projections of future burden have huge implications for ophthalmology service requirements in Ireland over the next 25 years. It is hoped that they will form the basis of a comprehensive planning process for this sector of the population into the future.



Section 10 Co-Authors and Acknowledgements

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Ms B Gallagher, (NCBI & Queens University, Belfast)

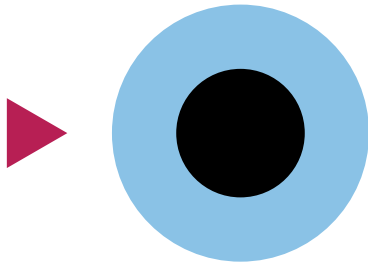
Mr E Dardis, (NCBI)

Dr R Sugrue, (Mater Hospital)

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Section 11 Appendix 1 - Glossary

Prevalence = $\frac{\text{Number of cases or events}}{\text{Total Population at risk}}$

Incidence = $\frac{\text{Number of new cases identified in a given time interval}}{\text{Total Population at risk at the beginning of the specified time interval}}$

Disorder The term used to describe the impact of the disease or disease on the anatomical structure or visual function within the organ or, in the case of vision, a component of the visual pathway.

Impairment The consequence in terms of measurable loss or departure from functional capacity to the bodily organ affected by disorder or disease of an anatomical or physiological function.

Disability The consequence to the patient in terms of the effect of the impairment on the patient's abilities.

Handicap The consequence of the disability in terms of how it affects the patient's ability to interact with society.

Vision Impairment Within the context of this report, the term vision impairment has been used, unless quoted directly from other referenced material, to include both low vision and blindness.

Blindness This term essentially refers to those whose vision is so significantly impaired that they are unlikely to be able to make use of residual vision. There are essentially 3 (WHO) categories of blindness 1: VA<3/60 to 1/60 – 2: VA<1/60 to light perception – 3: No perception of light – A fourth category is, however, included to cover those cases of unrecordable vision.

Low Vision The term low vision essentially describes a degree of vision impairment likely to impact quality of life and yet with which some residual vision is retained. WHO subclassifies low vision into 2 subdivisions.

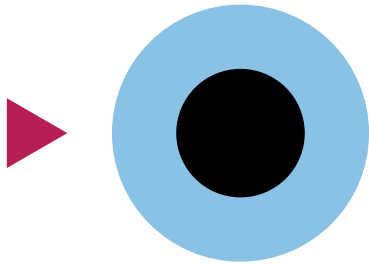
1: VA<6/18 to 6/60

2: VA<6/60 to 3/60

References

WHO ICIHD-2 International Classification of Impairment, Disability and Handicap Geneva WHO 1980

ICHD-2 International Classification of Functioning Disability in Health WHO 2000



Section 12 Appendix 2 - Visual Acuity Conversion Chart

(Acuities selected are those used in the various definitions of blindness and vision impairment in this report)

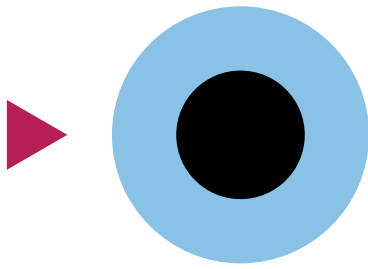
	Snellen (ft*)	Snellen (metric**)	Snellen (decimal***)	LogMAR ****
Normal Vision	20/20	6/6	1.0	0.0
Mild VI	<20/40	<6/12	<0.5	<0.3
Moderate VI	<20/60	<6/18	<0.3	<0.5
Severe VI	<20/200	<6/60	<0.1	<1.0
Profound VI	<20/400	<6/120 (3/60)	<0.05	<1.3

* generally used in the USA

** generally used in the Republic of Ireland and the UK

*** generally used in Europe

**** generally used in clinical trials



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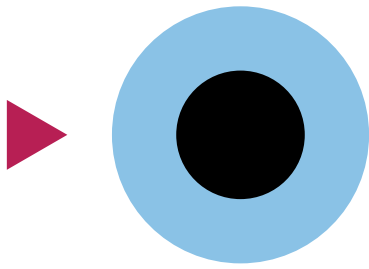
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Section 14

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