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bulletin 27

Vision problems among older Australians

Summary

1. Visual impairment is an important health issue facing the present and future generations of older Australians because it can affect physical, functional, emotional and social wellbeing, and reduce quality of life.
2. The main aim of this bulletin is to present the most reliable, robust and up-to-date estimates of the prevalence major vision problems among older Australians. The prevalence of vision problems among Aboriginal and Torres Strait Islander peoples is also reported. These estimates are important for use in planning prevention and treatment interventions. The bulletin also presents estimates from the range of Australian data sources available and reports on a number of data quality issues.
3. The term 'older Australians' is used in this bulletin to describe people aged 55 or more. This is the age when there is a significant increase in the prevalence of a number of chronic conditions including vision impairment.
4. About 444,400 Australians aged 55 or more are visually impaired, which represents 9.4% of the 4.7 million Australians in that age group (Table 1). The major eye diseases that cause visual impairment

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in Australia are age-related macular degeneration (AMD), cataract, glaucoma and diabetic retinopathy. Together with uncorrected refractive error (URE), they contribute to over 90% of visual impairment among older Australians.

Table 1: Prevalence of visual impairment by primary cause in Australians aged 55 or more, 2004

	Number	Rate (%)	
Visual impairment	444,400	9.4	
Visual impairment by primary cause		*Distribution (%)*	*Distribution (%) excl. URE*
Cataract	73,000	16	40
Age-related macular degeneration	51,500	12	28
Glaucoma	14,100	3	8
Diabetic retinopathy	7,400	2	4
Other	36,000	8	20
Uncorrected refractive error (URE)	262,400	59	
Total	**444,400**	**100.0**	**100.0**

Notes

1. The primary cause of visual impairment was determined where 2 or more disorders were present.
2. Visual impairment was defined as visual acuity < 6/12 (see glossary). It included blindness.
3. URE can be corrected by eyewear and includes presbyopia, hyperopia, myopia and astigmatism.

Source: Based on data from MVIP and BMES (see Box 1).

5. Cataract is the primary cause of 40% of cases of visual impairment in older Australians and AMD the primary cause of 28%, if refractive error is excluded (Table 1).
6. About 56,100 (1.2%) older Australians are blind, and age-related macular degeneration, glaucoma and cataract are the most common causes (Table 2).

Table 2: Prevalence of blindness by primary cause in Australians aged 55 or more, 2004

	Number	Rate (%)
Blindness	56,100	1.2
Blindness by primary cause		*Distribution (%)*
Cataract	6,600	12
Age-related macular degeneration	28,300	50
Glaucoma	9,200	16
Other	12,000	21
Total	**56,100**	**100.0**

Notes

1. The primary cause of blindness was determined where 2 or more disorders were present.
2. Blindness was defined as visual acuity < 6/60.

Source: Based on data from MVIP and BMES (see Box 1).

7. Of the eye diseases that cause visual impairment, cataract is the most prevalent in the population followed by age-related macular degeneration, diabetic retinopathy and glaucoma (Table 3).
8. Nevertheless, a substantial number of older Australians (about 491,900) have early age-related maculopathy, which usually carries no symptoms, and are at risk of developing age-related macular degeneration and, consequently, visual impairment (Table 3).

Table 3: Most prevalent eye diseases in Australians aged 55 or more, 2004

Eye diseases	Rate (%)	Number
Age-related macular degeneration	3.1	147,000
Early age-related maculopathy	*10.4*	*491,900*
Total age-related maculopathy	*13.5*	*638,900*
Cataract	31.0	1,460,400
Glaucoma	2.3	109,300
Diabetic retinopathy	2.8	133,900

Source: Based on analysis of clinical data from various data sources (see 'Overview of data sources').

9. Presbyopia, an age-related vision disorder that is generally considered a natural part of ageing, affects the sight of 1.3 million older Australians (based on self-report). It contributes to the prevalence of refractive error in this population.
10. Visual impairment and its causes are strongly related to age. Prevalence rates for both visual impairment and blindness are markedly greater among older age groups as are rates of major sight-threatening eye conditions (see Figure 2). With the ageing of the population, the number of older people with vision problems will increase over future decades, if prevalence rates remain constant.
11. The limited data on vision problems among Aboriginal and Torres Strait Islander peoples suggest that diabetic retinopathy and trichiasis (in some communities) are important vision-threatening conditions for older Indigenous Australians. There are no authoritative data for the prevalence of cataract, AMD and glaucoma among older Indigenous Australians.
12. Although there are sufficient data on which to plan interventions, there is a need for an effective and efficient monitoring system for vision problems that uses standard methods and indicators. The system would need to take into account the particular needs for data about the eye health of Indigenous Australians.

Introduction

Impact of vision problems

Visual impairment and blindness are common problems in older Australians and the number of older people affected is likely to increase as the population ages. Visual impairment can diminish the health and wellbeing of older people in many ways, for example by affecting their mobility and contributing to their risk of falls and injury. Their ability to perform everyday activities such as reading or watching television can be affected, as can their ability to drive and to interact socially. Visual impairment

can significantly reduce quality of life and contribute to depression in older people. Preventing and treating visual impairment can increase the prospect of enjoying life as a healthy, productive older person.

Main causes

Although some vision problems of older Australians start early in life, such as retinitis pigmentosa, their prevalence is small compared with vision problems associated with ageing towards the end of life. Among older Australians, the leading causes of visual impairment and blindness are age-related eye disorders such as cataract, age-related macular degeneration, glaucoma and diabetic retinopathy. Presbyopia, an age-related eye disorder, is a significant cause of visual impairment (but not blindness) that can be corrected by eyewear. The number of Australians affected by these five age-related conditions is likely to increase markedly in the next three decades as the population ages.

Purpose of this bulletin

The main aim of this bulletin is to provide up-to-date estimates of the prevalence of major vision problems among older Australians, where 'vision problems' refers to visual impairment and blindness and their causes. Various prevalence estimates have been reported, depending on the definitions and methods applying to the source data. This bulletin discusses these data sources and identifies a range of data quality issues. As well as national prevalence estimates based on the best data available, the bulletin also provides estimates for Aboriginal and Torres Strait Islander peoples where data are available.

This bulletin is one of a series undertaken by the Australian Institute of Health and Welfare, with support from the Australian Government Department of Health and Ageing, to help assess the health and wellbeing of the older population. This is consistent with the Australian Government's National Strategy for an Ageing Australia, which advocates that information, research and health care infrastructure should be available to support the healthy ageing of the Australian population. The bulletin is the first to use important Australian and international data sources on vision problems.

Content

The bulletin provides prevalence estimates of common sight-threatening eye conditions in Australians aged 55 or more. To do this it uses pooled data from international studies that include two Australian studies, data from those Australian population-based studies, and other national data sources. Age-specific data are generally provided from 40 years in order to provide a broader age context. As background, the bulletin provides a brief description of each condition and its risk factors and treatment. Data are also provided for vision problems among Aboriginal and Torres Strait Islander peoples. Comment is also made about data quality and availability.

Overview of data sources

The main Australian data sources available for monitoring the prevalence of vision problems in older people are studies that include an eye examination, sample surveys that collect self-reported information, and data collected for administrative purposes. These

three approaches use different methods and definitions which lead to different estimates of prevalence. The main strengths and weaknesses of each approach are discussed below.

Results have recently become available from analyses of pooled data from population-based clinical studies conducted in Australia, the United States and Europe. The two Australian studies included in the pooled analysis represent a substantial contribution to the study results. The results of the pooled analysis have been used in this bulletin to provide estimates for Australia, and the benefits of using these data are discussed.

Data sources for estimating the prevalence of the eye health of Aboriginal and Torres Strait Islander peoples are also discussed.

Studies that include an eye examination

The Melbourne Visual Impairment Project (MVIP) and the Blue Mountains Eye Study (BMES) included an ophthalmological examination to assess eye conditions that included age-related macular degeneration, cataract, glaucoma and refractive error. The Australian Diabetes, Obesity and Lifestyle Study (AusDiab) examined the prevalence of diabetic retinopathy (Box 1).

Box 1: Australian studies that include an eye examination

The Melbourne Visual Impairment Project (MVIP) 1992–1996

The MVIP, conducted by the Centre for Eye Research Australia, is a population-based study of the prevalence and causes of vision problems. Respondents consisted of 5,147 randomly selected individuals aged 40 and over from Melbourne and rural Victoria, including residents of households and nursing homes, and represented 86% of eligible people (Weih et al. 2000).

The Blue Mountains Eye Study (BMES) 1992–1994

The BMES is a population-based study of the prevalence and causes of vision problems. Respondents consisted of 3,654 non-institutionalised residents aged 49 and over living in two adjoining urban postcode areas in the Blue Mountains area, west of Sydney, and represented 88% of eligible people (Mitchell et al. 1995).

The Australian Diabetes, Obesity and Lifestyle Study (AusDiab) 1999–2000

The AusDiab is a population-based national study conducted by the International Diabetes Institute in 1999–2000. It provides information on the prevalence of diabetes and obesity, and on related conditions and lifestyle in Australia. It included 11,247 participants aged 25 and over in 42 randomly selected areas from six states and the Northern Territory. The response rate was 55% in households that participated. The identification of diabetes was based on an oral glucose tolerance test (Tapp et al. 2003).

Population-based clinical studies have an advantage over self-report surveys for estimating the prevalence of eye disorders because they are able to detect conditions that are not yet diagnosed or of which the respondent is not yet aware. Hence prevalence estimates from population-based clinical studies include people who do not know that they have a particular condition, unlike self-report surveys. Also, clinical data are not subject to reporting biases unlike data from self-report surveys. Population-based clinical studies often vary in methods and definitions, however, and often have limited capacity

to be nationally representative because costs limit their size. This is true of the MVIP and BMES, which differed in methods and definitions and had limited geographical coverage, particularly the BMES (Box 1).

Some of the disadvantages associated with population-based clinical studies can be overcome by combining data from similar studies where differences in methods and definitions can be reconciled. Combined data from the MVIP and BMES have been used in this bulletin to provide prevalence estimates of Australians who are visually impaired, disaggregated by cause of that impairment (Access Economics 2004).

Importantly, data from these two Australian studies, which both achieved response rates well over 80%, have contributed significantly to international meta-analyses of the prevalence of major causes of visual impairment. These analyses aimed to determine the prevalence of eye conditions more accurately by pooling findings from similar large population-based studies conducted internationally over the past two decades.[1] This makes best use of the sparse data available. Pooling data from the Australian studies with international data improves the accuracy of estimates by increasing sample numbers and allowing the use of modelling techniques to produce the best statistical estimates. Care was taken to ensure that there were no systematic biases between studies, and data were harmonised to take into account differences in methods and definitions. The Australian studies made a substantial contribution to the meta-analyses, and the age-specific prevalence rates that were derived from the pooled data apply equally well to Australia. The results of these meta-analyses have been used in this bulletin for cataract, age-related macular degeneration and glaucoma.

The pooled estimates for diabetic retinopathy have not been used because the estimates relate only to people who reported that they had diabetes, and do not take into account diabetic retinopathy among the significant proportion of people with undiagnosed diabetes. Instead, this bulletin uses an Australian data source, AusDiab (see Box 1), which included an oral glucose tolerance test to determine diabetes and glucose status, and an ophthalmological examination to estimate the prevalence of diabetic retinopathy. Retinopathy was assessed among those with diabetes, impaired fasting glucose, and impaired glucose tolerance and in a random sample of those with normal glucose tolerance. About 50% of eligible households participated in the household interview and 55% of eligible adults in these households took part in the clinical examination. An initial analysis of non-response bias concluded that the effect on survey estimates in general would be negligible (Dunstan et al. 2002).

Surveys that collect self-report information

Important features of the sample surveys conducted by the Australian Bureau of Statistics (ABS) are their national geographical coverage and relatively large sample size and high response rates, traditionally around 92% (Box 2). However, the ABS National Health Surveys (NHS) did not sample people in residential care, who represent a significant proportion of the older population e.g. over 25% of people aged 85 or more (AIHW 2002a).

1 In addition to the MVIP and BMES, the meta-analyses also included data from the Beaver Dam Eye Study, Wisconsin, US; Baltimore Eye Survey, Maryland, US; Salisbury Eye Evaluation Project, Maryland, US; and the Rotterdam Study, the Netherlands.

The information collected by ABS surveys is essentially 'as reported' by respondents. The 2001 NHS asked a suite of questions relating to eyesight including 'What (other) sight problems do you have?' Responses were coded to 'Totally blind in both eyes', 'Totally blind in one eye only', 'Partially blind in both eyes', 'Partially blind in one eye only', 'Glaucoma', 'Cataract', 'Trachoma', 'Lazy eye/Strabismus', 'Other (specify)' and 'Don't know'. Information about self-reported medical conditions (including sight problems) was not medically verified and was not necessarily based on a medical diagnosis.

Box 2: ABS sample surveys

National Health Survey (NHS) 2001 and 1995

The NHSs were designed to obtain national information on the health status of Australians, use of health services and facilities, health-related aspects of people's lifestyle, and demographic and socio-economic characteristics. Each survey included a sample of private dwellings such as houses, flats and townhouses across Australia. Non-private dwellings such as nursing homes, hostels and hospitals were not included in the surveys. The 2001 survey collected information from approximately 26,900 respondents across all age groups between February and November 2001, of which about 8,800 were aged 45 or more. The 1995 survey collected information from 57,600 respondents between January 1995 and January 1996, of which about 16,600 were aged 45 or more.

National Survey of Disability, Ageing and Carers (NSDAC) 2003 and 1998

The NSDACs provide information from Australian people with a disability about their health status, and their need for and receipt of assistance. Data were also collected from carers of people with disability about the type of care they provide and the effect that the caring role has on them. The survey included people in all age groups in both private dwellings such as houses and flats, non-private dwellings such as hotels and motels, and cared accommodation such as hospitals, nursing homes and hostels. The 2003 survey collected information between 23 June and 1 November 2003 from approximately 36,200 respondents from about 14,300 private dwellings and non-private dwellings, and approximately 5,100 respondents from about 600 cared accommodations. The 1998 survey collected information from approximately 37,600 respondents from about 14,600 private dwellings and non-private dwellings, and approximately 5,700 respondents from about 600 cared accommodations, from 16 March to 29 May 1998.

With respect to vision problems in general, respondents in the early (symptomless) stages of a condition may not know they have a condition and this would lead to underestimation compared with an ophthalmologic examination. Respondents may also not know the precise medical nature of their vision problem and respond as 'Don't know' which would also lead to underestimation. On the other hand, respondents may report having a condition such as cataract even though it has been successfully treated, which would lead to overestimation.

The 1998 and 2003 National Survey of Disability, Ageing and Carers (NSDAC) collect information from people in households and in cared accommodation about the main conditions associated with their activity restrictions, including vision impairment and glaucoma (AIHW 2004). These surveys are specifically designed to collect information

about disability in the population. While screening questions are used to identify people with a disability, all people aged 60 years or over are questioned about their need for assistance with various daily activities.

These ABS surveys did not collect data on major eye diseases including age-related macular degeneration or diabetic retinopathy, two leading causes of visual impairment and blindness among older Australians. Prevalence estimates for visual impairment from the NHS and NDSAC surveys are provided in the appendix (Table A1). The appendix also includes prevalence estimates for cataract and glaucoma from the NHSs (Tables A2 and A4).

Administrative data

Centrelink collects data about people who receive income support. Data are collected about blindness but not about visual impairment or eye conditions. When determining permanent blindness for the purposes of the disability support pension or the age pension, Centrelink applies the guidelines in Box 3.

Box 3: Some definitions of blindness and visual impairment used in Australia

Ophthalmologic examination

The Melbourne Visual Impairment Project (MVIP) used an ophthalmologic examination and defined visual impairment as visual acuity of < 6/12 (see Glossary) and/or homonymous hemianopia or worse (Weih et al. 2000). The Blue Mountain Eye Study (BMES) defined visual impairment as visual acuity of < 6/12 in the better eye (Wang et al. 2000). A recent analysis of combined data from MVIP and BMES defined visual impairment as visual acuity of < 6/12 and blindness as < 6/60 (Access Economics 2004).

Self-report surveys

The 2001 and 1995 National Health Surveys (NHS) collected self-reported data on blindness and other vision disturbances. They defined blindness as a long-term sight problem that has lasted or is expected to last for 6 months or more. 'Blindness' included either total blindness in both or one eye, or partial blindness in both or one eye that cannot be corrected by spectacles. The category 'visual disturbances' included conditions and symptoms of vision problems that could not be categorised as 'blindness', such as difficulty reading or vision that was blurred, double, cloudy or hazy. Self-report measurement was also used in the 2003 and 1998 National Surveys of Disability, Ageing and Carers (NSDAC), which defined blindness as total loss of sight and visual impairment as partial loss of sight, not corrected by spectacles.

Administrative collection

Centrelink uses the term 'legal blindness' to define vision loss when determining eligibility for special benefits and services from government. Legal blindness is defined as:

- *visual acuity after correction by suitable lenses of less than 6/60 in both eyes, or*
- *constriction to within 10 degrees of fixation in the better eye irrespective of corrected visual acuity, or*
- *a combination of visual defects resulting in the same degree of visual impairment as that occurring in the above points (FaCS 2002).*

Data sources for Aboriginal and Torres Strait Islander peoples

There are few data sources that relate to vision problems among Indigenous Australians. Self-reported data on the prevalence of blindness and visual impairment, and the prevalence of cataract, are available from the NHS 2001. The only other data available are from studies that were conducted in particular regions or communities and included an eye examination. Recent estimates of the prevalence of diabetic retinopathy among Indigenous Australians are available from two studies in the Katherine region and a non-random study in the Pilbara region (Jaross et al. 2003, Diamond et al. 1998). Data on the prevalence of trachoma are available from studies in some areas of Western Australia, South Australia and the Northern Territory (Ewald et al. 2003; Mak & Plant 2001). There are no eye examination data available on the eye health of Indigenous Australians who live in urban and rural settings.

Choice of primary data sources

In principle, data sources that include an eye examination are preferred to data sources that collect only self-report data because of the objective nature of the former and the reporting biases inherent in the latter. Estimates based on pooled data from population-based clinical studies that satisfy strict inclusion criteria are statistically more accurate than estimates based on each study individually. This is particularly relevant to estimating prevalence rates for the older populations where populations and sample sizes are traditionally smaller. However, pooling of data is possible only where differences in methods and definitions between studies can be satisfactorily reconciled.

The data sources selected as providing the best prevalence estimates for Australia are shown in Table 4, and the particular choice is explained in each section. Prevalence estimates from other important Australian data sources are given in the appendix (Tables A1 to A5).

Table 4: Primary data source for each section

Section	Primary data source
Blindness and visual impairment	Combined clinical data from MVIP and BMES
Eye disorders	
Age-related macular degeneration	Pooled analysis of clinical data from 3 US, 1 European and 2 Australian studies (MVIP and BMES)
Cataract	Pooled analysis of clinical data from 2 US, 1 European and 2 Australian studies (MVIP and BMES)
Glaucoma	Pooled analysis of clinical data from 2 US, 1 European and 2 Australian studies (MVIP and BMES)
Diabetic retinopathy	Australian Diabetes, Obesity and Lifestyle Study (clinical data)
Refractive error (presbyopia)	ABS National Health Surveys (self-reported data)
Trichiasis and trachoma (Aboriginal and Torres Strait Islander peoples)	Ad hoc regional studies (clinical data)

Vision problems among older Australians

Visual impairment and blindness

The condition

There have been various definitions of the terms 'visual impairment' and 'blindness' used in Australia, and population surveys have used different approaches to data collection, either ophthalmologic examination or self-report methods (Box 3).

This variation in definition and methods needs to be taken into account when interpreting estimates of the prevalence of vision impairment in older Australians. According to clinical data sources used in this bulletin, which date from the early 1990s, visual impairment refers to a visual acuity of < 6/12 and blindness to a visual acuity of < 6/60. Low vision refers to visual impairment excluding blindness (ICO 2002). Visual impairment includes low vision as well as blindness.

These definitions differ from the current WHO definitions (WHO 2004) which define low vision as visual acuity of less than 6/18, but equal to or better than 3/60, or corresponding visual field loss to less than 20 degrees, in the better eye with best possible correction. Blindness is defined as visual acuity of less than 3/60, or corresponding visual field loss to less than 10 degrees, in the better eye with best possible correction. Like the Australian definitions, visual impairment includes low vision and blindness.

The prevalence of visual impairment and blindness

Based on combined data from the MVIP and BMES, it is estimated that 444,400 older Australians aged 55 or more have visual impairment, which represents 9.4% of the 4.7 million Australians in that age group (Table 5). The estimated number of cases of blindness in 2004 is 56,100 (1.2%), and 388,300 people (8.2%) have low vision. There is a strong association between visual impairment and advancing age.

Other Australian data

In June 2003, Centrelink records included 17,668 recipients (0.8%) aged 55 or more who were receiving a disability support pension or age pension and classified as 'legally blind'. Since blindness from uncorrected refractive error is relatively uncommon in Australia, this suggests that around 40,000 Australians aged 55 or more who satisfy the criteria for 'legal blindness' do not receive a disability support or age pension.[2]

A comparison of separate estimates of the prevalence of visual impairment from the MVIP, BMES and other Australian studies are shown in Table A1 (see appendix). The differences between the MVIP and BMES estimates are due, at least in part, to differences in methods including age groups studied, definitions and coverage. Prevalence rates for each study were strongly age-related.

Definitions and coverage also varied between the studies using self-reported data. The 1995 NHS and the 2003 and 1998 NSDACs only included eye conditions that could not be corrected by spectacles. The 2001 NHS included all eye conditions whether or not they could be corrected by spectacles. The NHSs excluded people in non-private dwellings, and the NSDACs included people in institutional settings.

2 People who are legally blind are exempt from income or assets testing for the disability support pension and the age pension.

Table 5: Prevalence estimates of blindness[a] and visual impairment[b] for Australia, 2004

	Rate (%)			Number[c]		
Age (years)	Blindness	Low vision[d]	Visual impairment	Blindness	Low vision[d]	Visual impairment
40–49	n.a.	0.6	0.6	n.a.	18,900	18,900
50–59	0.1	2.2	2.3	2,200	56,600	58,700
60–69	0.3	4.4	4.7	4,800	72,200	77,000
70–79	0.7	10.5	11.1	7,800	123,100	130,900
80–89	4.1	24.6	28.7	23,800	142,400	166,200
90+	17.8	22.5	40.3	18,700	23,700	42,400
Total	**0.9**	**4.5**	**5.5**	**57,300**	**436,800**	**494,100**
Total 55+	**1.2**	**8.2**	**9.4**	**56,100**	**388,300**	**444,400**

n.a. Not available. Prevalence cannot be reliably estimated from combined data from the MVIP and BMES.

(a) Blindness is defined as visual acuity < 6/60.

(b) Visual impairment is defined as visual acuity < 6/12, and includes blindness.

(c) Estimated for the Australian population at 30 June 2004.

(d) Low vision is defined as visual impairment but not blindness.

Source: Based on combined data from MVIP and BMES.

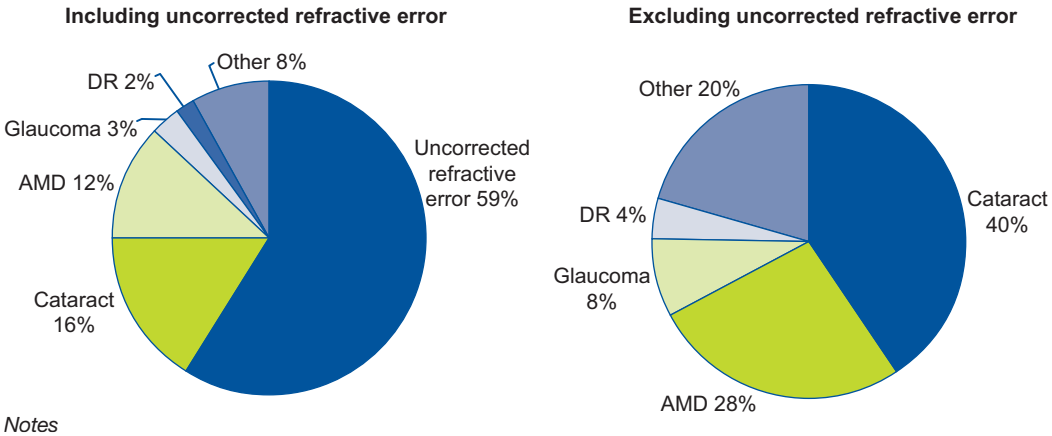
Causes of visual impairment and blindness

The best data for estimating the prevalence of visual impairment by cause are combined estimates from the MVIP and BMES. The combined data set reconciles, as far as possible, differences in methods and definitions and provides estimates of greater accuracy than either study individually. The combined Australian data are preferred to pooled estimates from the US meta-analysis, which may be influenced by differences in access to eye care and treatment patterns in the countries concerned, i.e. Australia, the United States and the Netherlands.

Based on the combined Australian data, the major eye diseases that cause visual impairment among Australians aged 55 or more are cataract, age-related macular degeneration (AMD), glaucoma and diabetic retinopathy (DR). Together with uncorrected refractive error, they contribute to over 90% of visual impairment in this age group (Figure 1). If refractive error, which can be corrected by eyewear, is excluded as a cause of visual impairment, cataract is the primary cause of 40% of cases of vision loss in older Australians and AMD the primary cause of 28%.

The leading causes of blindness among Australians aged 55 or more are AMD (50%), glaucoma (16%) and cataract (12%).

Figure 1: Visual impairment classified by primary cause, Australians aged 55 or more



Notes

1. The data are shown both including and excluding uncorrected refractive error, which can be corrected by eyewear.
2. The primary cause of visual impairment was determined where 2 or more disorders were present.

Source: Based on combined data from MVIP and BMES.

Aboriginal and Torres Strait Islander peoples

Based on self-report, the estimated prevalence rate of total or partial loss of vision is 4% among Indigenous Australians and 3% among other Australians. Rates for Indigenous men and women are the same. The estimated prevalence rate for Indigenous Australians aged 55 or more is 6%, the same as for other Australians (ABS 2002).

Eye and vision problems are reported less frequently by Indigenous Australians (46%) than by other Australians (51%), a pattern that is consistent across age groups. Within the Indigenous population, those living in non-remote areas are more likely to report eye and eyesight problems (49%) than those living in remote areas (38%) (ABS 2002). It has been speculated that, since Indigenous Australians living in remote areas have limited access to specialist eye services, they may be less likely to report eye and vision problems, or to be diagnosed with such problems (ABS & AIHW 2003).

Cataract

The condition and its symptoms

A cataract is a clouding of the eye's naturally clear lens. When the lens becomes opaque, the amount of light that passes through it is reduced and scattered, and the image cannot be correctly focused on the retina at the back of the eye. Subsequently the vision becomes poor, as if looking through a frosty window. The eyes may also be more sensitive to glare and light, and colours may seem faded or yellowed. Monocular double vision may also occur.

Cataracts are mainly of three types: nuclear cataract, which occurs in the centre of the lens; cortical cataract, which radiates from the outside of the lens to the centre; and subcapsular, which starts from the back of the lens (McCarty et al. 1999).

Risk factors

Cataracts are largely related to the ageing process. Other factors are long-term exposure to sunlight and cigarette smoking. Other possible causes include heavy alcohol consumption, medical conditions such as diabetes, eye injury, and use of drugs such as steroids (oral, topical or inhalational) (University of Melbourne 2003; National Eye Institute 2002; McCarty et al. 1999).

Treatment

When symptoms begin to appear, spectacles such as glasses, strong bifocals, magnifying glasses or other visual aids may be used to improve vision for a while. When the condition becomes serious enough to affect daily life, a surgical procedure becomes necessary to restore vision. The operation is a simple and effective procedure that removes the cloudy lens and replaces it with a clear, permanent intra-ocular lens (University of Melbourne 2003).

Prevalence

The prevalence of cataracts in Australia has been estimated from the pooled data from US, European and Australian population-based clinical studies (Congdon et al. 2004). The data contributed by the two Australian studies were very similar to those from the other three studies that also contributed data. Although it is possible that differences in environmental, treatment and behavioural factors may produce differences in the prevalence of cataract between countries, the similarity of the rates across studies was taken by the study authors to indicate that pooling was appropriate and that the estimates were likely to be reliable.

It is estimated that, in 2004, untreated cataract affects almost 1.5 million Australians aged 55 or more, which represents 31% of that age group (Table 6). Age-specific rates for cataract increase with age and are well over 70% for people aged 80 or more. Generally, prevalence rates are higher among women than among men.

Table 6: Prevalence estimates of cataract[a] for Australia, 2004

	Rate (%)			Number[b]		
Age (years)	Men	Women	Persons	Men	Women	Persons
40–49	2.8	1.9	2.3	41,400	28,500	69,900
50–54	4.9	5.0	5.0	32,300	33,300	65,600
55–59	8.2	9.4	8.8	49,800	56,200	106,000
60–64	13.8	16.9	15.3	63,200	75,900	139,000
65–69	22.4	27.7	25.1	82,500	104,600	187,200
70–74	33.9	41.0	37.6	101,700	133,600	235,300
75–79	47.2	54.7	51.3	116,300	165,000	281,300
80+	71.3	76.6	74.7	178,100	333,500	511,600
Total	**15.2**	**20.0**	**17.7**	**665,400**	**930,500**	**1,595,900**
Total 55+	**26.5**	**34.9**	**31.0**	**591,700**	**868,700**	**1,460,400**

(a) Significant lens opacity was defined as the presence of 1 or more of the following in either eye: posterior subcapsular cataract of 1 mm or more, cortical cataract occupying 25% or more of the lens visible through a dilated pupil, or nuclear cataract ≥ the penultimate grade in the classification system used.

(b) Estimated for the Australian population at 30 June 2004.

Source: Derived from Congdon et al. 2004.

Prevalence rates were also estimated for pseudophakia/aphakia, which is indicative of surgical removal. Pseudophakia is the presence of an intraocular lens after cataract extraction and aphakia is the absence of the natural lens of the eye (usually resulting from the removal of cataracts). Based on the pooled data, in 2004 there were 429,600 Australians aged 55 or more who had had cataract surgery, which represents 9.1% of that age group (Table 7).

Table 7: Prevalence estimates of cataract surgery[a] for Australia, 2004

	Rate (%)			Number[b]		
Age (years)	**Men**	**Women**	**Persons**	**Men**	**Women**	**Persons**
40–49	0.8	0.5	0.6	11,800	7,500	19,300
50–54	1.2	0.8	1.0	7,900	5,300	13,200
55–59	1.9	1.4	1.7	11,500	8,400	19,900
60–64	3.1	2.5	2.8	14,200	11,200	25,400
65–69	5.2	4.6	4.9	19,200	17,400	36,500
70–74	8.5	8.2	8.3	25,500	26,700	52,200
75–79	13.6	14.0	13.8	33,500	42,200	75,700
80+	29.6	33.5	32.1	73,900	145,800	219,800
Total	**4.5**	**5.7**	**5.1**	**197,600**	**264,600**	**462,200**
Total 55+	**8.0**	**10.1**	**9.1**	**177,900**	**251,800**	**429,600**

(a) Pseudophakia/aphakia.

(b) Estimated for the Australian population at 30 June 2004.

Source: Derived from Congdon et al. 2004.

Australian data

Based on the 2001 NHS self-report data, it is estimated that, in 2004, cataract affected 403,900 Australians aged 55 or more, which represents 8.6% of that age group (Table A2). Prevalence rates rose with age for both men and women. Women appear to be more susceptible to the condition than men, with 10.4% of women of this age group reporting that they 'had cataracts' at the time of interview compared with 6.3% of men (age-standardised to the Australian population at 30 June 2001).

Thus, although the prevalence estimates based on self-report show the same increase with age and higher rates for women than men, their much lower level compared with the pooled clinical data suggests that the net effect of self-report biases is to produce an underestimate of cataract prevalence.

Results published from Australian population-based clinical studies (MVIP and BMES) are based on different methods and definitions and do not provide a comparable estimate of cataract prevalence.

Aboriginal and Torres Strait Islander peoples

There are no data on the prevalence of cataract for Indigenous Australians based on ophthalmic examination. The prevalence of cataract based on self-report is 3% among Indigenous Australians, compared with 2% among other Australians (ABS 2002).

It is reported more commonly among Indigenous men (5%) than women (2%). The prevalence rate for Indigenous Australians aged 55 or more is 11% which, although higher than for other Australians (8%), is subject to a high relative standard error (ABS 2002).

Age-related macular degeneration

The condition and its symptoms

Age-related macular degeneration (AMD) is a progressive condition affecting the central part (macula) of the retina. The macula is the area at the back of the eye that provides fine vision for daily tasks such as reading and recognising faces. The early stage of the disease is sometimes referred to as age-related maculopathy (ARM). In this stage, vision is unaffected and people may be unaware that they have the condition. People with ARM are at higher risk of AMD but do not necessarily progress to AMD. If the disease progresses to AMD, irreversible loss of central vision occurs, usually in both eyes. People with advanced AMD often maintain sufficient peripheral vision to be able to move around independently, but they are legally blind and their capacity to undertake normal daily activities is limited.

AMD is classified as either dry (geographic atrophy) or wet (neovascular). Dry AMD is more common and is often associated with yellow deposits (drusen) under the retina. Wet AMD is less common, resulting from abnormal blood vessels forming and leaking into the macula. Vision loss tends to be gradual for those with the dry form, but is often sudden for those with the wet form and vision loss may be severe. Although people with AMD are less likely to have the wet form, it is more likely to lead to blindness than the dry form.

Risk factors

AMD is strongly related to advancing age and family history, and the most important known preventable risk factor is smoking (Mitchell et al. 2002, Evans et al. 2005). The evidence for other possible factors, including dietary related factors, is less well established (van Leeuwen et al. 2003; Evans & Henshaw 2004).

Treatment

There is no cure for AMD but treatment may delay or halt its progress. Laser therapies can help reduce the short-term risk of advancing vision loss in selected cases of wet AMD. There is some evidence that, in people with particular indications of AMD, taking a supplement of antioxidants and certain minerals may delay progression of the disease but further research is needed (AREDS Research Group 2001; Richer et al. 2004).

Prevalence

Estimates of the prevalence rate of AMD in Australia can be derived from the pooled results from three continents, in which Australian studies represented two of the six studies analysed (Friedman et al. 2004a). Each study used a standard photographic grading system for determining the prevalence of AMD and early AMD and the analysis

used definitions of wet and dry AMD as specified by the International ARM Study Group.

Applying the pooled age- and sex-specific rates to the Australian population estimates for 2004 produces an AMD prevalence rate of 3.1% (147,000) for the population aged 55 or more (Table 8). Rates were similar between men and women and increased markedly for men and women over 80.

Table 8: Prevalence estimates of age-related macular degeneration[a] for Australia, 2004

	Rate (%)			Number[b]		
Age (years)	**Men**	**Women**	**Persons**	**Men**	**Women**	**Persons**
40–49	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
50–54	0.34	0.20	0.27	2,200	1,300	3,600
55–59	0.41	0.22	0.32	2,500	1,300	3,800
60–64	0.63	0.35	0.49	2,900	1,600	4,500
65–69	1.08	0.70	0.89	4,000	2,600	6,600
70–74	1.98	1.52	1.74	5,900	5,000	10,900
75–79	3.97	3.44	3.68	9,800	10,400	20,200
80+	11.90	16.39	14.75	29,700	71,400	101,100
Total	**1.97**	**2.97**	**2.49**	**57,000**	**93,500**	**150,600**
Total 55+	**2.46**	**3.71**	**3.12**	**54,800**	**92,200**	**147,000**

n.a. Not available.

(a) Age-related macular degeneration was defined as the presence of geographic atrophy or neovascular age-related macular degeneration in either eye.

(b) Estimated for the Australian population at 30 June 2004.

Source: Derived from Freidman et al. 2004a.

These estimates are for AMD, also called late-stage ARM, which is responsible for loss in visual acuity. The prevalence of early ARM (the pre-symptomatic stage) was defined in the pooled study by large drusen (≥ 125 μm) in either or both eyes. On this basis, 491,900 Australians aged 55 or more (10.4%) have early ARM defined by large drusen in at least one eye and are at risk of developing AMD (Table 9). Large drusen are associated with an almost 6% risk of developing AMD over 5 years in the involved eye (Friedman et al. 2004a).

Thus 638,900 Australians aged 55 or more have either the early (491,900) or late (147,000) stage of ARM (Tables 8 and 9). The number of people aged 40 or more with early or late ARM is 720,900.

Australian data

Prevalence estimates from the two Australian studies (Table A3) were lower than the estimates from pooled analysis. Rates were higher in women than men in both Australian studies and were clearly age-related (Table A3).

There are no data on the prevalence of AMD among Indigenous Australians.

Table 9: Prevalence estimates of early age-related maculopathy[a] for Australia, 2004

	Rate (%)			Number[b]		
Age (years)	Men	Women	Persons	Men	Women	Persons
40–49	1.56	1.41	1.48	23,100	21,100	44,200
50–54	2.65	2.52	2.58	17,500	16,800	34,200
55–59	3.77	3.70	3.74	22,900	22,100	45,000
60–64	5.32	5.39	5.35	24,300	24,200	48,500
65–69	7.48	7.81	7.65	27,600	29,500	57,100
70–74	10.40	11.17	10.80	31,200	36,400	67,600
75–79	14.30	15.73	15.09	35,200	47,400	82,700
80+	25.62	29.16	27.87	64,000	126,900	191,000
Total	**5.63**	**6.98**	**6.32**	**245,800**	**324,500**	**570,300**
Total 55+	**9.20**	**11.52**	**10.43**	**205,300**	**286,600**	**491,900**

(a) Early age-related maculopathy was defined as at least 1 druse 125 µm or larger in diameter present in either or both eyes.

(b) Estimated for the Australian population at 30 June 2004.

Source: Derived from Freidman et al. 2004a.

Glaucoma

The condition and its symptoms

Glaucoma is a disease involving damage to the optic nerve and subsequent vision loss or blindness. The condition is often associated with increased intraocular pressure (IOP) resulting from either malfunction or malformation of the eye's drainage system (Weinreb & Khaw 2004). However, the disorder can also occur with normal or even below-normal eye pressure.

Most cases of glaucoma are open-angle glaucoma (OAG), also called chronic glaucoma. OAG usually begins with a loss of peripheral vision, which is often unnoticeable. As permanent nerve damage occurs, symptoms become obvious. Tunnel vision may develop, and only objects that are straight ahead can be seen. Other signs include headache, blurred vision, light sensitivity or haloes around lights. Primary closed-angle glaucoma is less common and usually occurs in an acute form, which presents with the sudden onset of symptoms such as decreased vision, extreme eye pain, headache, nausea and vomiting, and glare and light sensitivity.

Risk factors

The development of glaucoma is associated with advancing age (although it can occur at any stage of life), a family history of glaucoma, and ethnicity (Weinreb & Khaw 2004). Other factors that have been associated with increased risk include IOP, hypertension, cardiovascular disease and extreme short-sightedness.

Treatment

In many cases medical treatment, laser treatment or surgery can slow or halt the progress of glaucoma but any vision loss cannot be restored.

Prevalence

The best available estimates for glaucoma prevalence are those from the pooled analysis of data (Friedman et al. 2004b). The pooled analysis included the data from the two Australian population-based clinical studies and from three similar studies conducted in the United States and Europe. Although there is no single standard for defining glaucoma in population-based research, all five studies in the pooled analysis based their definition on both visual field and photographically obtained optic nerve head data, and the results were similar across studies. Prevalence rates in the pooled analysis are for open-angle glaucoma.

Applying the pooled age- and sex-specific rates to the Australian population estimates for 2004 produced a glaucoma rate of 2.3% (109,300) for the population aged 55 or more (Table 10). There was no statistically significant difference in prevalence rates between men and women, and rates increased with age.

Table 10: Prevalence estimates of glaucoma[a] for Australia, 2004

	Rate (%)			Number[b]		
Age (years)	Men	Women	Persons	Men	Women	Persons
40–49	0.36	0.83	0.60	5,300	12,400	17,800
50–54	0.61	0.89	0.75	4,000	5,900	9,900
55–59	0.85	1.02	0.93	5,200	6,100	11,300
60–64	1.18	1.23	1.20	5,400	5,500	10,900
65–69	1.64	1.58	1.61	6,000	6,000	12,000
70–74	2.27	2.16	2.21	6,800	7,000	13,800
75–79	3.14	3.12	3.13	7,700	9,400	17,100
80+	5.58	6.94	6.44	13,900	30,200	44,200
Total	**1.25**	**1.78**	**1.52**	**54,400**	**82,600**	**137,000**
Total 55+	**2.02**	**2.58**	**2.32**	**45,100**	**64,200**	**109,300**

(a) Glaucoma indicates primary open-angle glaucoma.

(b) Estimated for the Australian population at 30 June 2004.

Source: Derived from Friedman et al. 2004b.

Australian data

Data from the two Australian population-based clinical studies alone suggest a prevalence rate for OAG of around 3% of the population aged 55 or more (Table A4). This is slightly higher than the pooled rate because the three non-Australian studies in the pooled analysis had slightly lower prevalence rates in the older age groups.

Population-based clinical studies of glaucoma are preferred to surveys that collect self-report data, because the former have consistently found that about half those with

glaucoma are unaware they have the condition. However, the Australian estimates based on self-report are of the same magnitude or greater as those based on clinical examination (Table A4). This is perhaps unexpected, given that both Australian population-based clinical studies also reported that about half of people with glaucoma were unaware that they had the condition (Mitchell et al. 1996; Wensor et al. 1998). Although the clinical studies measured OAG and self-report referred to glaucoma generally, this difference in scope is unlikely to be an explanation for the possibly unexpected results, because OAG is by far the most common form of glaucoma.

There are no authoritative data on the prevalence of glaucoma among Indigenous Australians.

Diabetic retinopathy

The condition and its symptoms

Diabetes impairs the body's ability to use glucose for energy and results in high blood glucose levels. Over a period of years, this will damage small blood vessels in the body, among other effects, and often cause complications. Diabetic retinopathy (DR) is a common diabetes complication that affects the small blood vessels of the retina (see Glossary). It remains one of the leading causes of vision loss despite the availability of effective treatment (Tapp et al. 2003).

In the early stages, known as non-proliferative DR, the blood vessels of the retina can develop small swellings in the walls (microaneurysms), can bleed, and can leak fluid. This stage is not usually associated with visual impairment and there are no symptoms. However, if this process affects the macula, fluid can accumulate (macular oedema) and, unless treated, loss of central vision occurs. In proliferative DR (which usually occurs only in people who have had diabetes for many years) abnormal blood vessels grow on the surface of the retina, and without treatment these can bleed, causing cloudy vision or blindness. Abnormal fibrous tissue may also develop, leading to retinal detachment and severe vision loss.

Risk factors

Everyone with diabetes is at risk of developing DR. People with diabetes who are most at risk include those who have had diabetes for many years, those whose diabetes is poorly controlled, those with kidney damage, and those with high blood pressure or high blood cholesterol (NHMRC 1997).

Treatment

DR is symptomless in its early phases but can be treated successfully by laser surgery if identified early. People who have diabetes need to have an eye examination at least every two years if no retinopathy is present, and more frequently if retinopathy is found. Laser treatment can be used to prevent severe vision loss and blindness in advanced DR (NHMRC 1997).

Prevalence

The best data source for estimating the prevalence of DR in Australia is AusDiab because of its coverage and its inclusion of clinical data. The study was a population-based Australia-wide survey of diabetes prevalence and determined DR by retinal photography among people identified as having diabetes (either on the basis of self-report diabetes medication or by an oral glucose tolerance test). This enabled DR rates to be determined for all people with diabetes, both previously diagnosed and undiagnosed. AusDiab has better geographical coverage than the BMES and MVIP and identified a large number of people with diabetes on which to calculate rates of DR.

Results of the meta-analysis for DR have not been used as a basis for Australian estimates of prevalence because the estimates relate to people who reported that they had diabetes. The estimates do not take into account DR among the significant proportion of people who do not know they have diabetes, among whom DR prevalence is usually lower (Kempen et al. 2004).

Based on AusDiab data, it is estimated that 133,900 Australians aged 55 or more have DR. For this age group this represents 2.8% of people and 16.6% of people with diabetes (Table 11). The prevalence of DR was greater in the older age groups.

Table 11: Prevalence estimates of diabetic retinopathy[a] for Australia, 2004

	Diabetes[b]	Diabetic retinopathy		
Age (years)	% population	% Diabetes	% population	Number[c]
25–34	0.3	16.7	0.1	1,400
35–44	2.4	14.5	0.3	10,500
45–54	6.2	11.1	0.7	19,000
55–64	13.1	13.3	1.7	36,900
65–74	17.9	18.5	3.3	45,500
75+	23.0	18.2	4.2	51,600
Total	**7.9**	**15.6**	**1.2**	**164,900**
Total 55+	**17.1**	**16.6**	**2.8**	**133,900**

(a) The level of retinopathy was defined according to a simplified version of the Wisconsin grading system, using retinal photographs.

(b) Diabetes was diagnosed on the basis of fasting plasma glucose of ≥ 7.0 mmol/L, 2-h plasma glucose of ≥ 11.1 mmol/L, or current treatment with insulin or oral hypoglycaemic medication.

(c) Estimated for the Australian population at 30 June 2004.

Source: Derived from Tapp et al. 2003, Dunstan et al. 2002 and AusDiab 1999–2000 data supplied by the International Diabetes Institute.

Other Australian data

Published results from AusDiab for Australians aged 25 or more reported that the prevalence of DR was similar in men and women (Tapp et al. 2003). Also, DR (any form) occurred in 22% of those with known type 2 diabetes and in 6% of those who had not previously been diagnosed. The prevalence of proliferative retinopathy was 2.1% in those with known type 2 diabetes and there were no cases identified among those whose diabetes had not been previously diagnosed (Tapp et al. 2003).

Aboriginal and Torres Strait Islander peoples

The prevalence of diabetes (based on self-report by people aged 15 and over) is significantly higher among Indigenous Australians (11%) than other Australians (3%) (ABS 2002). Further, rates are higher for Indigenous Australians in remote areas (16%) than non-remote areas (9%). Individual studies indicate that the prevalence of type 2 diabetes may be much higher in some communities (OATSIH 2001; AIHW 2002b).

There are few recent statistically sound estimates of the prevalence of DR among Indigenous Australians.[3] Two studies conducted in the Katherine region in the Northern Territory in 1993 and 1996 reported prevalence rates of 18% and 21% respectively for DR among Indigenous Australians with diabetes (Jaross et al. 2003). A non-random study in the Pilbara region in Western Australia estimated the prevalence to be 23% (Diamond et al. 1998). In each study the average age was 48–49 years. The studies are not designed to allow ready comparison with rates for other Australians taking age into account. However, these crude rates are on a par with rates among non-Indigenous Australians with diabetes and, since the prevalence rate of diabetes is higher among Indigenous Australians, the data suggest that the rate of DR in Indigenous Australians is also higher.

Presbyopia

Presbyopia is an age-related loss of the focusing power of the lens that results in difficulty seeing objects close up. It is generally considered to be a refractive error, an optical defect that results in light not being properly focused on the eye's retina. The most common eye conditions affecting refraction apart from presbyopia are hyperopia (long-sightedness), myopia (short-sightedness) and astigmatism (uneven focus). Almost all refractive error can be corrected by spectacles or contact lenses, and some by laser surgery.

Although short-sightedness and many cases of long-sightedness are not specifically age-related, the problems are common conditions in later life. Long-sightedness, short-sightedness and presbyopia were included among the five most common long-term medical conditions reported by people aged 55 or more in the most recent National Health Survey (Table 12).

Table 12: Main long-term medical conditions reported by people aged 55 or more, 2001

55–64 years	%	65–74 years	%	75 years or more	%
Long-sightedness	55	Long-sightedness	48	Arthritis	52
Short-sightedness	34	Arthritis	45	Long-sightedness	43
Arthritis	33	Hypertension	38	Deafness	42
Back problems	32	Short-sightedness	32	Hypertension	42
Hypertension	26	Presbyopia	31	Presbyopia	37

Note: Refractive error was defined by self-report as a long-term condition which has lasted or is expected to last for 6 months or more, regardless of whether or not it could be corrected by spectacles.

Source: ABS 2002.

3 AusDiab, which was the data source used to estimate DR prevalence among non-Indigenous Australians, was not designed to provide reliable estimates for Indigenous Australians.

Vision problems among older Australians

This rest of this section focuses on presbyopia since it is specifically caused by an age-related process.

The condition and its symptoms

Presbyopia is a condition in which the natural lens of the eye loses its flexibility so that focusing on close objects becomes difficult. It develops over a number of years and usually becomes noticeable during middle age, beginning in the 40s. The signs of presbyopia include tendency to hold reading materials at arm's length, blurred vision at normal reading distance, and fatigue, eyestrain or headache when performing close work.

Risk factors

Presbyopia is generally believed to be part of the natural process of ageing, unlike eye diseases such as cataract, age-related macular degeneration, glaucoma and diabetic retinopathy. Several factors have been associated with early onset of presbyopia including trauma or ocular disease which causes damage to the lens or its surrounding muscles, conditions such as diabetes, and use of drugs such as alcohol, anti-depressants and antihistamines. Greater exposure to ultraviolet radiation and a hotter climate may also increase the rate of progression of the condition (Pierscionek & Weale 1996).

Treatment

The most common treatment for presbyopia is prescription eyewear, e.g. reading glasses, bifocal glasses or progressive addition lenses (multifocal glasses). Contact lenses may also be used.

Prevalence

Estimates of the prevalence of presbyopia have been based on self-reported data collected by the 1995 and 2001 NHSs (Table 13). These surveys had national coverage, large samples and high response rates. The estimates relate to people who identified presbyopia as a sight problem they had. Because the estimates are based on self-report, people who did not identify presbyopia as a sight problem are not included, even though presbyopia is generally considered to be a natural part of the ageing process. Therefore, estimates of the prevalence of presbyopia based on self-report are likely to be significant underestimates and are perhaps best considered as estimates of symptomatic presbyopia.

Based on the most recent NHS, presbyopia affects 1,317,000 older Australians (aged 55 or more), which represents 27.9% of that age group (Table 13). The survey found that there was a clear increase in the prevalence rate with age, from 15.3% of those aged 45-49 to 40.1% of those aged 80 or more, with men and women having similar patterns.

The prevalence rate of presbyopia among Australians aged 55 or more changed little between 1995 and 2001—the difference being within sampling error.

Estimates are not available from the MVIP or BMES, nor from the pooled analysis for refractive errors which related to hyperopia and myopia only.

Table 13: Prevalence estimates of presbyopia for Australia, 1995, 2001 and 2004

NHS 1995[a]		NHS 2001[a]	
Age (years)	**Rate (%)**	**Age (years)**	**Rate (%)**
45–49	11.8	45–49	15.3
50–54	16.9	50–54	20.1
55–59	18.5	55–59	18.8
60–64	24.4	60–64	22.1
65–69	30.5	65–69	29.2
70–74	33.4	70–74	33.8
75–79	39.3	75–79	33.9
80+	44.2	80+	40.1
Total	**23.8**	**Total**	**23.8**
	Estimates for ages 55 or more[b]		
Year	**1995**		**2001**
Number	1,094,700		1,201,400
Rate (%)	29.9		28.2
	Estimates for ages 55 or more[c], 2004		
Number	1,399,400		1,317,200
Rate (%)	29.7		27.9

(a) Presbyopia was defined by self-report as a long-term condition that has lasted or is expected to last for 6 months or more and that can be corrected or partially corrected by glasses or contact lenses.

(b) Estimated for the Australian population at 30 June 1995 and 2001 respectively.

(c) Estimated for the Australian population at 30 June 2004.

Source: AIHW analysis of ABS 1995 and 2001 National Health Surveys confidentialised unit record files.

Trichiasis and trachoma

The condition and its symptoms

Trichiasis is a sight-threatening complication of trachoma which affects mainly older Aboriginal and Torres Strait Islander peoples in some regions. In people with the condition, the lid margin and eyelashes turn inwards, and the rubbing of the eyelashes on the cornea leads to corneal damage and blindness in later life.

Trachoma itself is a chronic conjunctivitis caused by repeated episodes of infection with the bacteria *Chlamydia trachomatis*. It is an acute inflammatory condition which is evident first in childhood and, if untreated, can lead to scarring of the tissues of the eyelid over time.

Risk factors

High prevalence rates of trachoma have been associated with poor environmental health conditions, inadequate hygiene, crowding, low socioeconomic status and an arid environment (Ewald et al. 2003, Taylor et al. 2003).

Treatment

Treatment of trachoma is usually by antibiotics. Surgery may be used for trichiasis and may have to be repeated after some years (Taylor et al. 2003).

Prevalence

Prevalence data for trichiasis are few. A 1998 study of trichiasis among Aboriginal people aged 50 years or more in the Kimberley region found an overall prevalence rate of 2.8%. The rate was 11.0% in the Halls Creek Shire, which is also the highest area of trachoma prevalence in the Kimberley (Mak & Plant 2001).

A study of trachoma in a large, remote Central Australian Aboriginal community during 1998–2000 found the prevalence of trachoma among children aged less than 13 was 40% at baseline and changed little over the following 21 months (Ewald et al. 2003).

Although there is evidence of high prevalence rates of trachoma in some areas of Western Australia, South Australia and the Northern Territory, there are no data available for New South Wales, Victoria, Queensland and Tasmania (Taylor et al. 2003).

Main findings and discussion

This bulletin has shown that visual impairment and its causes are highly prevalent among older Australians and are strongly age-related. They have a significant effect on many aspects of living.

Main findings

The information presented in this bulletin represents the most robust and up-to-date estimates available of the prevalence of visual impairment and its causes in Australia in 2004. Estimates show that 9.4% (444,400) of Australians aged 55 or more have some degree of visual impairment, much of which is caused by uncorrected refractive error and the eye diseases cataract and AMD. Blindness occurs in 1.2% (56,100) of older Australians and is most commonly caused by AMD, glaucoma and cataract.

Of the main causes of visual impairment:

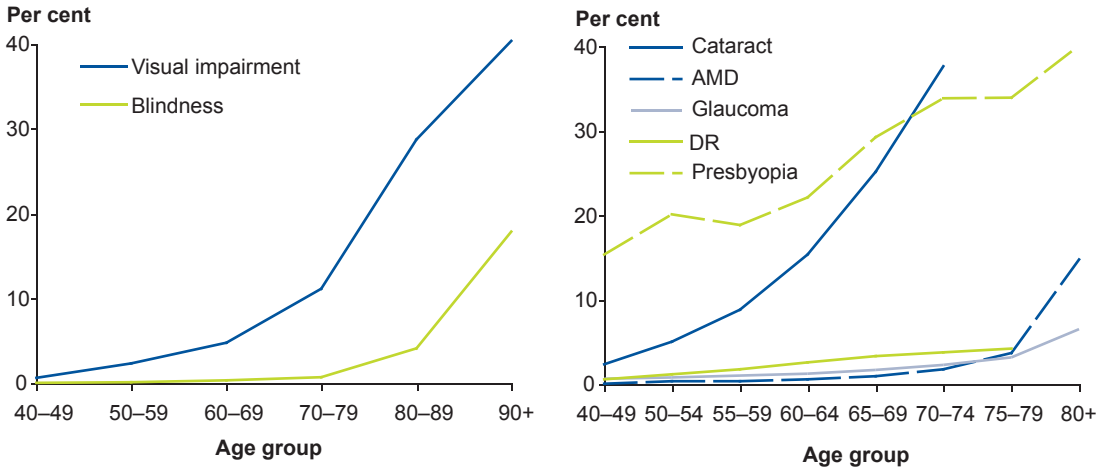
- Cataract is present in 31% (1.46 million) of older Australians. It accounts for 40% of cases of visual impairment (excluding uncorrected refractive error) and 12% of cases of blindness in this age group. About 9.1% (430,000) of Australians aged 55 or more have indications of cataract surgery.
- AMD (late stage ARM), which is usually associated with severe vision loss, affects 3.1% (147,000) of older Australians. A further 10.4% (491,900) have early ARM, which is often asymptomatic. In total, ARM is present in 13.5% (638,900) of older Australians. AMD accounts for 28% of cases of visual impairment and 50% of cases of blindness in older Australians. Its prevalence increases sharply after 70 years of age.
- Glaucoma is present in 2.3% (109,300) of older Australians and accounts for 8% of cases of visual impairment and 16% of cases of blindness.
- DR is present in 2.8% (133,900) of older Australians and accounts for 4% of cases of visual impairment.

- Presbyopia is generally considered to be a natural part of the ageing process and can be corrected by eyewear. Based on self-report, it affects the vision of 27.9% (1.32 million) of older Australians.

The ageing factor

Ageing is the major contributing factor to visual impairment and blindness. Prevalence rates are greater among successive age groups and rates of major vision-threatening conditions are also strongly age-related (Figure 2). Unless these rates fall markedly, the number of older people with vision problems will increase over future decades as the population ages.

Figure 2: Prevalence rates of visual impairment and its causes by age



Some vision problems among older Australians are acquired early in life (e.g. congenital eye disorders, retinitis pigmentosa and eye trauma) but at a population level their prevalence is small compared with vision problems associated with ageing towards the end of life.

The impact of vision problems

Visual impairment is an important health issue facing present and future generations of older Australians. It can markedly reduce quality of life by affecting physical, functional, emotional and social wellbeing. Reduced ability to perform activities of daily living leads to decreased independence and is often accompanied by isolation, depression and poorer social relationships. The ability to participate in the workforce can also be affected. Visual impairment is also strongly associated with falls and hip fractures (College of Optometrists & British Geriatrics Society 2003).

Since prevalence rates are strongly age-related and Australia has an ageing population, the number of people with visual impairment might be expected to increase nationally which will have significant economic implications and affect the provision of health and welfare services.

Vision problems among older Australians

Data issues

The pooled analyses of relevant international studies that included the two Australian population-based clinical studies can be used to derive acceptable prevalence estimates for most of the major eye conditions affecting older Australians. These estimates are more robust and accurate than would have applied if only the Australian studies had been used.

The overview in this bulletin of Australian data sources for vision problems has highlighted a number of data quality issues, data gaps and deficiencies, and a lack of data standards. In particular:

- There have been no agreed standard national definitions of indicators or key concepts.
- There have been no authoritative, systematic or ongoing monitoring and reporting of visual impairment and its causes.
- Population surveys have used different approaches and methods of data collection. Limited geographical coverage leads to uncertainty about their capacity, independently, to produce nationally representative estimates.
- Coverage has varied, e.g. people in institutions, who represent a significant proportion of the population in older age groups, are often excluded.
- There are sample size and reliability issues regarding estimates for the older age groups.

These factors have resulted in variation in estimates of prevalence between data sources, less reliable estimates in older age groups, and a lack of reliable data on which to assess trends.

Data gaps exist for age-related macular degeneration and for diabetic retinopathy for which the only national data source of prevalence is AusDiab.

Aboriginal and Torres Strait Islander peoples

There are limited data available on the eye health of Aboriginal and Torres Strait Islander peoples. There are no estimates of cataract prevalence based on ophthalmic examination and the data based on self-report is inconclusive. Reliable prevalence estimates are also lacking for AMD and glaucoma. Diabetic retinopathy is likely to be an important vision-threatening condition among Indigenous Australians because of the high rate of type 2 diabetes in some communities. The prevalence of trachoma is very high among the children of some Indigenous communities and its sequel, trichiasis, is relatively high among older Indigenous Australians in some areas. There are few recent data on the prevalence of trachoma, or of trichiasis among older Indigenous Australians. There are no eye examination data on the eye health on Indigenous people living in urban and rural settings.

Conclusion

The ageing of the Australian population will increase the number of people with vision problems, even if rates of visual impairment remain constant. Although there are

sufficient data on the magnitude and causes of visual impairment on which to plan interventions, there is no monitoring system in place to assess the impact of those interventions. Any national approach for improving eye health will need to take into account the lack of regular, reliable and comparable objective data for monitoring vision problems based on standard definitions, and the particular need for regular data on the eye health of Aboriginal and Torres Strait Islander peoples.

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Appendix: Statistical tables

Table A1: Prevalence of visual impairment in Australian studies (clinical and self-report data)

BMES 1992–1994[a]		MVIP 1992–1996[b]		NHS 1995[c] & 2001[d]			NSDAC 1998[e] & 2003[e]		
Age (years)	Rate (%)	Age (years)	Rate (%)	Age (years)	Rate (%) 1995	Rate (%) 2001	Age (years)	Rate (%) 1998	Rate (%) 2003
		40–49	0.6	45–49	1.3	2.8	45–49	0.9	1.0
49–59	0.6	50–59	1.6	50–54	1.4	3.6	50–54	1.0	1.1
				55–59	1.9	3.8	55–59	1.6	1.5
60–69	1.1	60–69	4.1	60–64	2.6	4.5	60–64	2.2	1.7
				65–69	2.6	5.7	65–69	3.2	2.4
70–79	5.4	70–79	8.6	70–74	3.4	6.2	70–74	4.9	4.1
				75–79	4.5	8.1	75–79	10.3	6.3
80+	26.3	80–89	27.3	80+	6.0	11.1	80–84	14.2	10.1
		90+	41.8				85+	25.9	17.4
Total	**4.6**		**7.1**		**2.5**	**4.9**		**4.0**	**3.1**
				Estimates for ages 55 or more[f]					
Year	**1993**		**1994**		**1995**	**2001**		**1998**	**2003**
Number	182,600		283,400		118,000	261,700		231,000	193,600
Rate (%)	5.2		7.9		3.2	6.1		5.9	4.3
				Estimates for ages 55 or more[g], 2004					
Number	269,000		390,300		153,000	288,100		282,500	202,900
Rate (%)	5.7		8.3		3.2	6.1		6.0	4.3

(a) Visual impairment was defined as visual acuity of 6/12 or worse in the better eye.

(b) Visual impairment was defined as visual acuity of 6/12 or worse, and/or homonymous hemianopia or worse.

(c) Vision loss was defined by self-report as blindness and other vision disturbances which cannot be corrected by spectacles, and is a long-term sight problem which has lasted or is expected to last for 6 months or more.

(d) Vision loss was defined by self-report as blindness and other vision disturbances regardless of whether it cannot be corrected by spectacles, and is a long-term sight problem which has lasted or is expected to last for 6 months or more.

(e) Vision loss was defined by self-report as total or partial loss of sight, which cannot be corrected by spectacles.

(f) Estimated for the Australian population at 30 June 1993, 1994, 1995, 1998 and 2001 respectively.

(g) Estimated for the Australian population at 30 June 2004.

Sources: AIHW analysis of 1995 and 2001 National Health Surveys confidentialised unit record files; AIHW analysis of 1998 and 2003 National Survey of Disability, Ageing and Carers confidentialised unit record files; Wang et al. 2000; Weih et al. 2000.

Table A2: Prevalence of cataract[a] in Australian studies (self-report data)

NHS 1995		NHS 2001	
Age (years)	**Rate (%)**	**Age (years)**	**Rate (%)**
45–49	0.4	45–49	0.5
50–54	0.5	50–54	0.6
55–59	1.9	55–59	2.1
60–64	2.8	60–64	4.0
65–69	6.4	65–69	5.8
70–74	9.0	70–74	10.1
75–79	14.5	75–79	14.2
80+	20.8	80+	23.0
Total	**4.9**	**Total**	**5.2**
	Estimates for ages 55 or more[b], 2004		
Number	375,500		403,900
Rate (%)	8.0		8.6

(a) Cataract was defined by self-report as a long-term condition that has lasted or is expected to last for 6 months or more, and cannot be corrected by spectacles.

(b) Estimated for the Australian population at 30 June 2004.

Source: AIHW analysis of ABS 1995 and 2001 National Health Surveys confidentialised unit record files.

Table A3: Prevalence of AMD[a] in Australian studies (clinical data)

BMES 1992–1994			MVIP 1992–1996		
	Rate (%)			**Rate (%)**	
Age (years)	**Men**	**Women**	**Age (years)**	**Men**	**Women**
49–54	0.0	0.0	40–49	0.0	0.0
55–64	0.0	0.3	50–59	0.0	0.0
65–74	0.6	0.9	60–69	0.6	0.2
75–84	4.3	6.1	70–79	1.9	1.6
85+	12.5	21.8	80–89	2.0	7.0
			90+	58.6	20.0
Total	**1.3**	**2.4**	**Total**	**0.6**	**0.8**
			Estimates for ages 55 or more[b], 2004		
Number	33,100	86,500		36,600	52,100
Rate (%)	1.5	3.5		1.6	2.1

(a) AMD was diagnosed using fundus photographic grading following an eye examination. The estimates for AMD prevalence do not include early age-related maculopathy, which is the pre-symptomatic stage of AMD.

(b) Estimated for the Australian population at 30 June 2004.

Sources: Mitchell et al. 1995; VanNewkirk et al. 2000.

Table A4: Prevalence of glaucoma in Australian studies (clinical and self-report data)

BMES 1992–1994[a]		MVIP 1992–1996[a]		NHS 1995[b]		NHS 2001[b]	
Age (years)	**Rate (%)**	**Age (years)**	**Rate (%)**	**Age (years)**	**Rate (%)**	**Age (years)**	**Rate (%)**
		40–49	0.1	45–49	0.5	45–49	0.4
50–59	0.2	50–59	0.6	50–54	1.0	50–54	1.0
				55–59	1.2	55–59	2.2
60–69	1.1	60–69	1.9	60–64	1.7	60–64	1.9
				65–69	3.7	65–69	3.4
70–79	4.3	70–79	5.2	70–74	3.9	70–74	4.7
				75–79	5.4	75–79	5.5
80+	8.2	80–89	5.5	80+	4.2	80+	6.6
		90+	11.8				
Total	**2.4**		**1.7**		**2.2**		**2.5**
			Estimates for ages 55 or more[c], 2004				
Number	127,300		144,000		140,300		173,700
Rate (%)	2.7		3.1		3.0		3.7

(a) Glaucoma (primary open-angle glaucoma) was defined by eye examination. Incomplete eye examinations were excluded.

(b) Glaucoma was defined by self-report as a long-term sight problem which had lasted or is expected to last for 6 months or more.

(c) Estimated for the Australian population at 30 June 2004.

Sources: ABS 1995 and 2001 National Health Surveys confidentialised unit record files; Mitchell et al. 1996; Wensor et al. 1998.

Table A5: Prevalence of diabetic retinopathy in Australian studies (clinical data)

Study		BMES 1992–1994	MVIP 1992–1996	AusDiab 2000
Description		Urban area, W of Sydney Population-based sample of 3,650 people aged 49 or more	Victoria State Population-based sample of 4,740 people aged 40 or more	National Population-based sample of 11,250 people aged 25 or more
Diabetes prevalence[a] (per cent)		7% Based on self-report and fasting glucose	5.1% Based on self-report	7.4% Based on self-report and OGTT[b]
DR (as per cent of people with diabetes)		32.4%	29.1%	15.3%
DR (as per cent of study population)		2.3%	1.5%	1.1%
		Estimates for ages 55 or more[c], 2004		
Number	**Diabetes**	. .	. .	805,900
	DR	. .	. .	133,900
Rate %	**Diabetes**	. .	. .	17.1
	DR	. .	. .	2.8

. . Not applicable.

(a) Diabetes types 1 and 2.

(b) Oral glucose tolerance test.

(c) Estimated for the Australian population at 30 June 2004.

Sources: Dunstan et al 2002; Tapp et al 2003; McKay et al. 2000; Mitchell et al. 1998.

Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
AMD	age-related macular degeneration
AREDS	Age-Related Eye Disease Study
ARM	age-related maculopathy
AusDiab	Australian Diabetes, Obesity and Lifestyle Study
BMES	Blue Mountain Eye Study
DoHA	Australian Government Department of Health and Ageing
DR	diabetic retinopathy
ICO	International Council of Ophthalmology
IDI	International Diabetes Institute
IOP	intraocular pressure
MVIP	Melbourne Visual Impairment Project
NHMRC	National Health and Medical Research Council
NHS	National Health Survey
NSDAC	National Survey of Disability, Ageing and Carers
OAG	open-angle glaucoma
OATSIH	Office for Aboriginal and Torres Strait Islander Health

Glossary

anterior chamber	The space in the eye that is behind the cornea and in front of the iris, which is filled with a clear, watery fluid known as aqueous humour.
aphakia	Absence of the lens of the eye; the state of the eye after a cataract has been removed.
aqueous humour	A clear, watery fluid normally present in the front and rear chambers of the eye that nourishes the lens and the cornea.
astigmatism	Irregular curvature of cornea or lens resulting in a distorted image because light rays are not focused on a single point on the retina.
central vision	The ability to see objects in space without moving the head or eyes; corresponds to an area within 30 degrees of the fixation point.
cornea	The clear curved structure that constitutes the front of the eyes; a refractive surface through which light first enters the eye.
focus	The point at which light rays meet after passing through the cornea and lens; in normal eyes this point is on the fovea of the retina.
fovea	A small depression in the macula of the retina that provides the clearest vision.
homonymous hemianopia	Partial blindness which affects the same part of the visual field of each eye.
hyperopia	See *long-sightedness*.
iris	Coloured circular membrane in front of the lens which controls the size of the opening at its centre (pupils) thereby regulating the amount of light entering the eye.
lens	The transparent crystalline body situated behind the pupil of the eye.
long-sightedness (hyperopia)	A refractive error where distant objects are seen more clearly than near objects; the focal point of light rays is behind the retina.
long-term condition	A condition that has lasted or is expected to last for 6 months or more.
meta-analysis	The process of synthesising research results by using statistical methods to combine results from separate but related studies.
macula	An area at the centre of the retina that surrounds the fovea and is responsible for best central vision.
myopia	See *short-sightedness*.

optic nerve	Special nerve of sight beginning in the retina as the optic disk, which carries messages from the retina to the brain, resulting in visual images.
oral glucose tolerance test	Measures the body's ability to use glucose — a blood glucose measurement is taken after a period of fasting and additional measurements are taken after consuming a set amount of glucose.
peripheral vision	The ability to see objects outside the direct line of vision.
posterior chamber	The space in the eye that is behind the iris and in front of the lens, which is filled with a clear, watery fluid known as aqueous humour.
prevalence	Total number of cases of a problem or disease in the population at a given time.
pseudophakia	Presence of an intraocular lens after cataract extraction.
retina	Innermost layer of the eye containing light-sensitive nerve cells and fibres connecting with the brain through the optic nerve.
short-sightedness (myopia)	A refractive error of the eye where near objects are seen more clearly than distant objects; the image of more distant objects is formed in front of the retina and cannot be seen distinctly.
tunnel vision	A constriction of the visual field as though one is looking through a tunnel.
type 2 diabetes	A chronic condition marked by high levels of glucose in the blood and which mostly arises in middle age or older. It is caused by a relative insufficiency of insulin (a hormone released by the pancreas that helps to metabolise glucose) or resistance to its action.
visual acuity	Measurement of the ability of the eye to perceive the shape of objects in the direct line of vision and to distinguish detail; generally determined by finding the smallest symbol on an eye chart that can be recognised at a given distance. Visual acuity of 6/12 describes reduced acuity because it is the ability to see only at 6 metres objects that the normal eye can see at 12 metres. Visual acuity of 6/60 describes the ability to see objects only at 6 metres what the normal eye can see at 60 metres. Normal vision is 6/6.
visual field	The entire expanse of space visible at a given instant without moving the head or eyes.

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