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).

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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)