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Australian Institute of Health and Welfare

Board Chair

Hon. Peter Collins, AM, QC

Director

David Kalisch

Any enquiries about or comments on this publication should be directed to:

Communications, Media and Marketing Unit

Australian Institute of Health and Welfare

GPO Box 570

Canberra ACT 2601

Phone: (02) 6244 1032

Email: info@aihw.gov.au

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Contents

Acknowledgments.....	iv
Abbreviations.....	v
Symbols.....	v
Summary	vi
Introduction.....	1
National Indigenous Eye Health Survey	1
Vision loss.....	3
Causes of vision loss	4
Trachoma.....	5
Refractive error.....	8
Cataract.....	9
Diabetes	11
Glaucoma	11
Provision of eye services to Aboriginal and Torres Strait Islander people	13
Further information	16
References	17

Acknowledgments

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Abbreviations

CDNA	Communicable Disease Network Australia
NIEHS	National Indigenous Eye Health Survey
NTEHP	National Trachoma Eye Health Program
WHO	World Health Organization

Symbols

<	less than
>	more than
≥	more than or equal to
..	not applicable
—	zero or rounded to zero

Summary

This paper summarises the findings of the 2008 National Indigenous Eye Health Survey (NIEHS). It reports the overall prevalence of blindness and vision impairment in Aboriginal and Torres Strait Islander children aged 5 to 15 years and adults over the age of 40 years. The paper also presents some data from the National Trachoma Surveillance and Reporting Unit, Medicare, hospital data and case studies.

- Over the age of 40 years, Aboriginal and Torres Strait Islander people have 6 times the rate of blindness of other Australians.
- Aboriginal and Torres Strait Islander children have less poor vision than other Australian children.
- 94% of vision loss in Indigenous Australians is preventable or treatable.
- 35% of Indigenous Australian adults report they have never had an eye examination.

Trachoma was found in one-half of the *Very remote* communities at endemic levels.

- Adults with trachoma scarring and in-turned lashes (trichiasis) are found across the country.
- Australia is the only developed country to still have endemic blinding trachoma.

Refractive error refers to problems with the focusing of light and is a frequent cause of reduced visual acuity.

- Nearly four-fifths (79%) of Aboriginal and Torres Strait Islander adults had self-reported eye problems.
- 83% with self-reported problems had sought care, but of these, 64% reported that their vision problem had not been resolved.

Cataract caused one-third (32%) of blindness in Aboriginal and Torres Strait Islander adults.

- About 65% of people with cataract had been operated on.

Diabetes was reported by more than one-third (37%) of Aboriginal and Torres Strait Islander adults.

- 13% of Indigenous Australians with diabetes had visual impairment.
- But only 20% of those with diabetes had an eye examination in the previous year.

Glaucoma and age-related macular degeneration are still uncommon causes of vision loss in Aboriginal and Torres Strait Islander people.

Existing data sets do not permit the reliable identification of the distribution or the number of eye services provided to Indigenous Australians.

- There appears to be a marked under-resourcing of specialist eye services provided to remote and disadvantaged communities compared with the national average.
- Research suggests that the provision of eye care by Aboriginal Medical Services is associated with better vision outcomes, and that well-coordinated services are more productive, have shorter waiting lists and save money.

Introduction

While the prevalence of reported eye and vision problems are similar among Indigenous and other Australians, the burden of eye disease faced by Aboriginal and Torres Strait Islander people is disproportionate. Indigenous Australians reported having cataracts and either complete or partial blindness at higher rates than non-Indigenous Australians (ABS & AIHW 2008). Factors such as geographical isolation, economic disadvantage, a lack of transport and a lack of access to health services limit the opportunities for prompt identification, management and treatment of eye health problems (OATSIH 2001).

Bilateral visual impairment can affect health related quality of life and independent living (West et al. 2002). It is also found to increase the risk of mortality, earlier nursing home placement, falls, and the use of community support services (Vu et al. 2005; West et al. 1997; Weih et al. 2002; Lamoureux et al. 2004; Ivers et al. 2003; Wang et al. 2003; Wang et al. 1999).

Until recently, there has been limited national data on eye and vision problems for Indigenous people. Hospitalisation rates for diseases of the eye were similar for both Indigenous and non-Indigenous Australians with rates highest for those aged 65 years and over (ABS & AIHW 2008). Eye and vision problems were managed by general practitioners at a rate of 2 per 100 encounters with Indigenous Australians (AIHW 2011).

The 2008 National Aboriginal and Torres Strait Islander Social Survey found that 7% of Indigenous children aged 0–14 years experienced eye or sight problems. More than one-third of the problems reported (37%) were due to difficulty reading or seeing close up (long-sightedness), and 28% were for difficulty seeing far away (short-sightedness). For those with eye or sight problems, 61% wore glasses or contact lenses (ABS 2010).

This paper summarises the findings of the 2008 National Indigenous Eye Health Survey (NIEHS). It was the first national survey of eye health in Aboriginal and Torres Strait Islander people since 1980, when the National Trachoma Eye Health Program (NTEHP) reported rates of blindness in Indigenous Australians that were 10 times as high as in other Australians (Royal Australian College of Ophthalmologists 1980).

The survey provides a comprehensive picture of Indigenous eye health. It reports the overall prevalence of blindness and vision impairment in Aboriginal and Torres Strait Islander children aged 5 to 15 years and adults over the age of 40 years. It also gives specific information about some of the leading causes of vision loss including uncorrected refractive error, cataract, trachoma and diabetic retinopathy.

Additional data about trachoma from the National Trachoma Surveillance and Reporting Unit are also included. Further studies of outreach eye services, using Medicare and hospital data and case studies of outreach services, highlight the shortfall in the provision of eye care services to more remote areas, and the importance of good coordination of services.

National Indigenous Eye Health Survey

The National Indigenous Eye Health survey was conducted in 2008 by the Indigenous Eye Health Unit at the University of Melbourne in collaboration with the Centre for Eye Research Australia and the Vision Cooperative Research Centre. The survey used a multi-stage, random cluster sample to obtain representative national data. The sample sites for the NIEHS were selected using the Australian Indigenous Geographical Classification, and were grouped according to the Accessibility/Remoteness Index of Australia into five categories;

Major cities, Inner regional, Outer regional, Remote and Very remote (Fox et al. 2010). The *Very remote* category was divided into *Very remote coastal* and *Very remote inland*. Within each category, five sample areas were randomly selected to yield 30 geographic areas containing about 300 Indigenous Australians.

At the time of the survey, an informal census was done to establish the size of the eligible population of Indigenous children aged 5 to 15 years and adults aged 40 years and above. Sources included community and local council housing lists, health service and hospital lists, Aboriginal housing or legal aid records, and local informants.

Standardised demographic data were collected, and a standardised eye examination was done on all participants. Primary ethical approval was obtained from the Human Research and Ethics Committee at the Royal Victorian Eye and Ear Hospital, but final clearance was required from 73 entities (Studdert et al. 2010). Overall, 1,694 children aged 5 to 15 years (84% of those eligible) and 1,189 adults aged 40 years and above (72% of those eligible) were examined.

Vision loss

Vision loss refers to both low vision (less than 6/12) and blindness (less than 6/60) (see Box 1). Overall, 1.5% of Indigenous children, aged 5–15 years, had low vision, and 0.2% were blind. Nearly 1 in 10 (9.4%) of adults, aged 40 and over, had low vision and 1.9% were blind (Table 1).

Box 1: Measures of vision acuity

Visual acuity refers to an individual's clearness of vision, typically measured by reading an eye chart of black letters on a white background. Normal vision is expressed as 6/6 vision. The first number represents a test distance of 6 metres from the eye chart. The second number represents the distance that a person with average vision can see certain letters on the eye chart.

So, if a person has 6/12 vision, they need to be 6 metres from the eye chart to read letters that a person with average vision could read from 12 metres away.

It is common to categorise vision worse than 6/60 as either 'perception of light' or 'no perception of light'.

In the imperial measurement of feet and inches, 6 metres becomes 20 feet, and so normal visual acuity would be expressed as 20/20 vision.

Table 1: Prevalence of binocular distant visual acuity, 2008^(a)

Distant visual acuity on presentation	Eligible Indigenous			
	Children (n = 1,694)		Adults (n = 1,189)	
	Number	Per cent	Number	Per cent
Normal vision (visual acuity $\geq$ 6/12)	1,659	97.9 (97.3–98.6)	1,052	88.5 (86.7–90.3)
Bilateral vision loss				
Visual acuity < 6/12 to $\geq$ 6/18	17	1.0 (0.5–1.5)	75	6.3 (4.9–7.7)
Visual acuity < 6/18 to $\geq$ 6/60	8	0.5 (0.2–0.9)	37	3.1 (2.1–4.1)
Visual acuity < 6/60 to > perception of light ^(b)	3	0.2 (0.1–0.5)	19	1.6 (0.9–2.3)
Perception/no perception of light	..	..	3	0.3 (0.1–0.7)
Not recorded	7	0.4 (0.2–0.9)	3	0.3 (0.1–0.7)
Low vision (visual acuity < 6/12 to $\geq$ 6/60)	25	1.5 (0.9–2.1)	112	9.4 (7.8–11.1)
Blindness (visual acuity < 6/60)	3	0.2 (<0.1–0.5)	22	1.9 (1.1–2.6)

(a) Unadjusted.

Note: Figures in brackets represent 95% confidence interval.

Source: NIEHS in Taylor et al 2010c.

When adjusted for differences in age structure and compared with other Australians, Indigenous children had one-fifth the rate of low vision, whereas Indigenous adults had six times the rate of blindness (Table 2).

Table 2: Prevalence of vision loss (per cent)

Vision loss	NIEHS	Other Australians	Relative risk
Low vision			
Children ^(a)	1.40 (1.38–1.44)	6.36 (6.27–6.45) ^(a)	0.2
Adults	14.42 (14.39–14.43)	5.19 (5.17–5.20) ^(b)	2.8
Blindness			
Children	0.18 (0.17–0.18)	0.28 (0.26–0.30)	0.6
Adults	2.79 (2.78–2.81)	0.45 (0.44–0.46) ^(b)	6.2

(a) From data provided by the Sydney Myopia Study (Robaei et al. 2005; Robaei et al. 2006a; Robaei et al. 2006b).

(b) From data synthesised from the Melbourne Visual Impairment Project and the Blue Mountains Eye Study (Taylor et al. 2005).

Notes

1. Age-standardised to the Australian population (ABS 2006).
2. Figures in brackets represent 95% confidence interval.

Source: Taylor et al. 2010c.

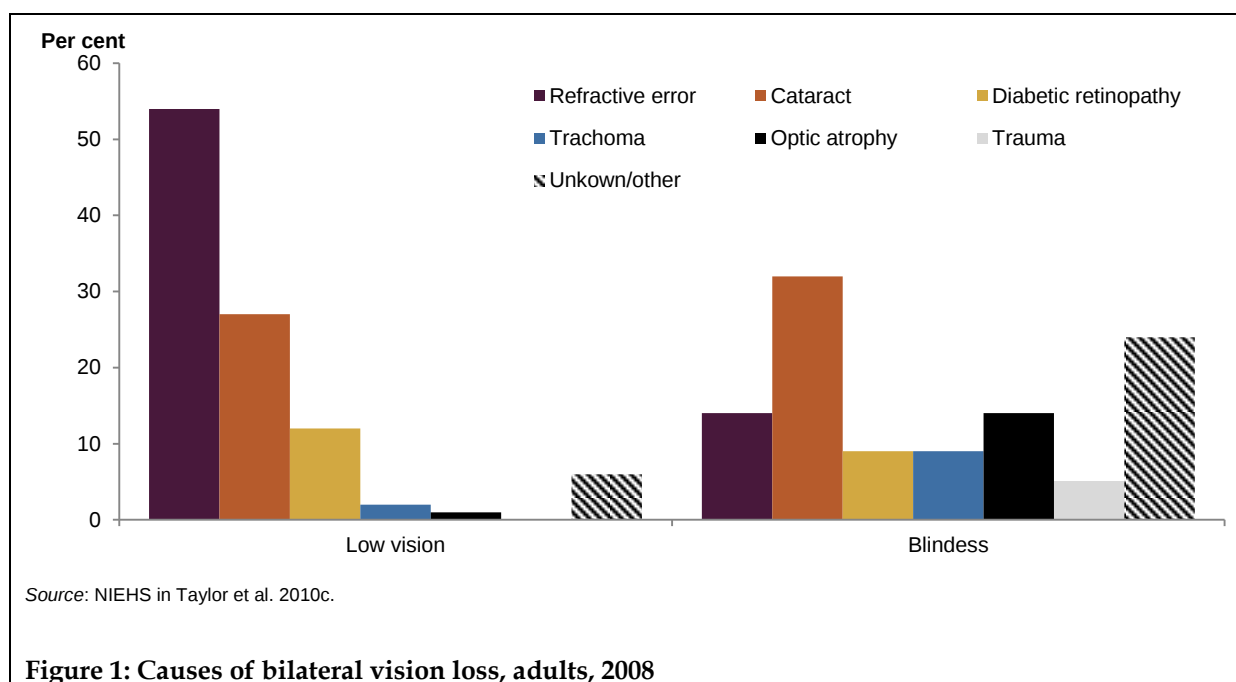
Rates of blindness and low vision did not vary by state or remoteness categories for either children or adults sampled with two exceptions:

- Compared with the children in *Major cities*, children in *Remote*, *Very remote coastal* and *Very remote inland* were significantly less likely to have low vision.
- The adults in Queensland and Western Australia had significantly more low vision than adults in New South Wales (Taylor et al. 2010c).

Causes of vision loss

The most common cause of bilateral blindness in Aboriginal and Torres Strait Islander adults was cataract (32%), and the most common cause of low vision was uncorrected refractive error (54%) (Figure 1). In Indigenous children, uncorrected refractive error was the most important cause of low vision (56%) and blindness (33%).

Refractive error was also the most common cause of all monocular loss vision (47% of low vision in children and 59% in adults), although ocular trauma was the leading cause of blindness in adults (28%) followed by cataract (22%).



In 1980, the NTEHP reported a blindness rate in Aboriginal people aged 40 years and above of 8.2%, 10 times the rate they found in non-Aboriginal people (Royal Australian College of Ophthalmologists 1980). The rate reported by the NTEHP is much higher than the 2.8% found in the NIEHS, although the current rate is still 6 times that of other Australians. Comparing the cause of blindness in Indigenous Australians between 1980 and 2008 showed the following:

- There has been a dramatic reduction in the amount of blindness caused by corneal disease (84% of which was then due to trachoma) from 52% to 9%.
- The prevalence of blindness from cataract decreased somewhat from 40% to 30%.
- The prevalence of blindness due to retinal causes – including diabetes, age-related macular degeneration and other retinal causes – increased from 4% to 9%.

Trachoma

Trachoma is an infectious disease of the eye caused by *Chlamydia trachomatis*. If left untreated, follicles form on the upper eyelids and grow larger until the granulations invade the cornea, eventually causing blindness. Previous research has linked a lack of facial hygiene and unsanitary environments to trachoma, and highlighted the role of water availability and hygiene education in trachoma prevention (Abdou et al. 2010).

The NIEHS showed trachoma is still common in Aboriginal communities, although it has been reported to have disappeared from mainstream Australia a century ago (Taylor 2008). The national prevalence of active trachoma in children was 3.8% (Taylor et al. 2010a). Although isolated cases were found in all regions, half of the *Very remote* communities had endemic trachoma, with more than 5% of children having active trachoma, the rate considered by the World Health Organization (WHO) to define trachoma to be of public health importance. The highest community rate observed by the NIEHS was 23%, and the highest prevalence of active trachoma was found in children aged 5 and 6 years.

Adults with scarring from trachoma (trichiasis) were found across the country, with a national average of 16%, and the highest prevalence in the *Very remote* communities (Table 3). The blinding sequela of trichiasis (in-turned eyelashes) was found predominantly in the *Very remote inland* areas where the prevalence was 5.7% (Table 3).

Table 3: Distribution of trachoma across Australia, 2008

Region	Communities with endemic trachoma	Active trachoma in children(5–15 years)	Scarring in adults	In-turned eyelashes in adults
		Per cent		
Very remote inland	2/5	7.3	40	5.7
Very remote coastal	3/5	7.2	7	0.4
Remote	0/5	1.6	17	0.4
Outer regional	0/5	1.0	13	0.6
Inner regional	0/5	1.1	5	0
Major city	0/5	0.6	5	0
Total	5/30	3.8	16	1.4

Source: NIEHS in Taylor 2009.

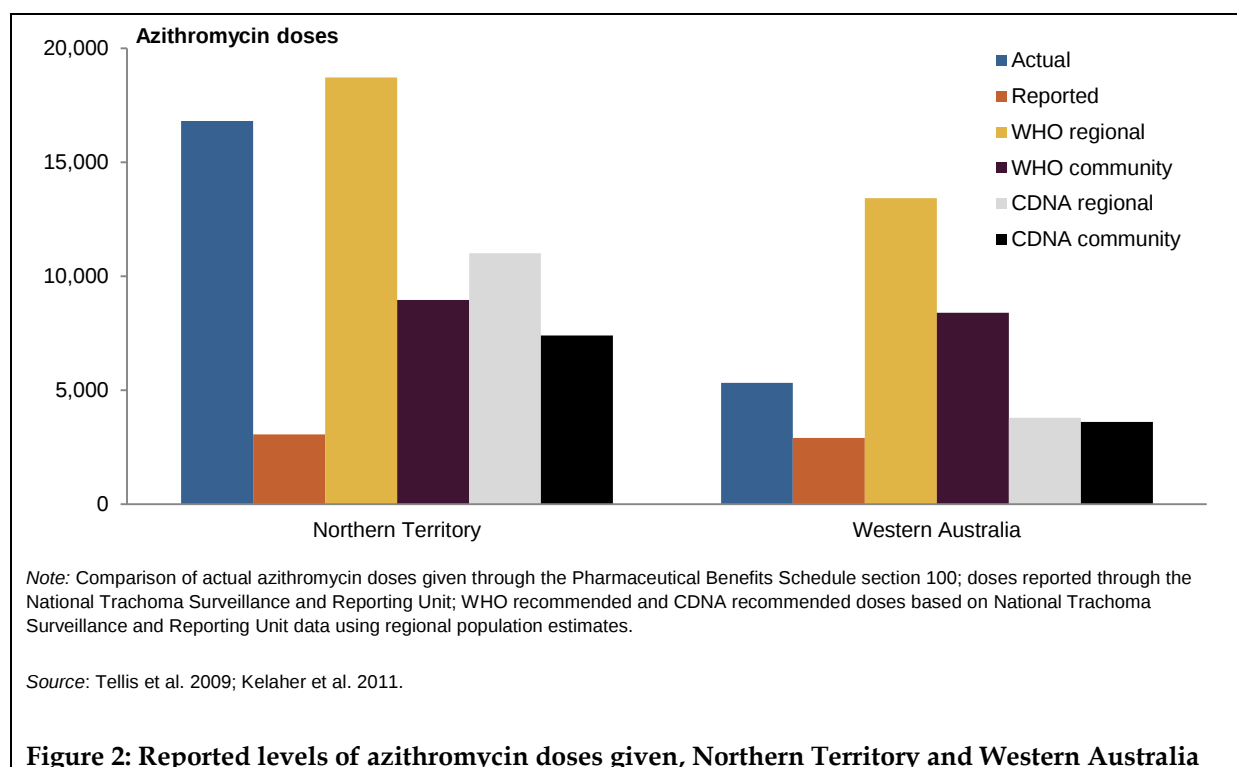
The prevalence of active trachoma in children found by the NIEHS of 3.8% is significantly reduced from the prevalence reported by the NTEHP of 9.5% in 1980. For those over the age of 40 years, the NIEHS reported rates of trachomatous scarring of 16% and in-turned eyelashes of 1.4% compared with rates of 22.5% and 6% reported by the NTEHP. Blindness rates from trachoma were 0.2% compared with 2.5% in the NTEHP. These findings certainly support the notion that endemic trachoma has been less severe in recent years than it was in the 1970s, although it still far exceeds the WHO thresholds in many outback communities.

The National Trachoma Surveillance and Reporting Unit was established in 2006, and reports data collected from jurisdictional programs in the Northern Territory, South Australia and Western Australia. It presents data for children aged 1 to 9 years for 2009, and reported an overall prevalence of active trachoma of 14% in endemic regions. These data are relatively incomplete, as only 57% of the at-risk communities were screened, and in these communities, only 20% of the children were examined (Adams et al. 2010). The WHO recommends the use of the SAFE strategy (surgery, antibiotics, facial cleanliness and environmental improvement) to control trachoma, and this has been endorsed by Communicable Disease Network Australia (CDNA 2006). The components of the SAFE strategy are incompletely implemented, with trichiasis screening and referral available in 67% of communities, antibiotic distribution in 68% of communities and facial cleanliness programs in 58% (Adams et al. 2010).

Data on the supply of azithromycin (an antibiotic) to health services through the Pharmaceutical Benefits Schedule, section 100 was obtained from Medicare Australia (Kelaher et al. 2010). The data from Medicare Australia were compared with the data reported to have been used by the National Trachoma Surveillance and Reporting Unit (Tellis et al. 2009) and the WHO and CDNA guidelines (Kelaher et al. 2011).

The analysis showed that the number of doses recommended using either the WHO or CDNA guidelines, applied at either a regional level or an endemic community level, far exceeded the number of doses that were reported to have been distributed (Figure 2). However, the analysis showed that in the Northern Territory, many times more doses of azithromycin were actually supplied through the Pharmaceutical Benefits Scheme than were

reported to be used for trachoma. This is further evidence that the distribution of azithromycin in trachoma control activities is incomplete.



A 2010 study has shown the effectiveness of a trachoma control program (Lansingh et al.). It successfully promoted facial cleanliness, and documented a dramatic reduction in the proportion of children with dirty faces at 12 months in two Aboriginal communities. The intervention achieved almost complete community coverage with azithromycin treatment. One of the two communities also had a substantial environmental improvement program. However, over a 12-month period, there was no added benefit attributable to the environmental intervention over and above that obtained by the antibiotic distribution and health promotion.

A study in the Katherine region looked at people of all ages in five Indigenous communities, grading them for trachoma and assessing the presence of chlamydial infection using polymerase chain reaction (Michel et al. forthcoming). They also assessed individuals against the WHO simplified grading system (developed to facilitate the assessment of trachoma by non-specialist health professionals) as well as a fine grading based on clinical assessment and photograding. The study showed that in the five communities, 59% of polymerase chain reaction positivity was in the individuals who did not have the WHO grade of trachomatous follicular inflammation, although most of them showed milder signs of disease or lived in houses with children who had active trachoma and/or infection. In addition, 13% of those with polymerase chain reaction positivity were aged over 15 years. Assessment of clinical signs using the finer grading also showed infection in those with clinical signs below the threshold used in the WHO grading system. These findings reinforce the need for sustained interventions to control trachoma such as community-wide distribution of azithromycin, rather than just focused treatment of children with trachomatous follicular inflammation and their household members.

The barriers to the implementation of trachoma control programs were looked at by Wright and others (2010). Important factors included clear government commitment to setting trachoma control as a priority, the requirement for adequate staffing and supervision at the community level, and the need for good community engagement.

The review of the Medicare and hospital separation data for 2007–08 shows that a total of 56 eyelid procedures were performed on Aboriginal and Torres Strait Islander people excluding those in the Northern Territory. In the Northern Territory, 42 procedures were performed (Kelaher et al. 2010). An estimated 900 Indigenous Australians have trichomatous trichiasis.

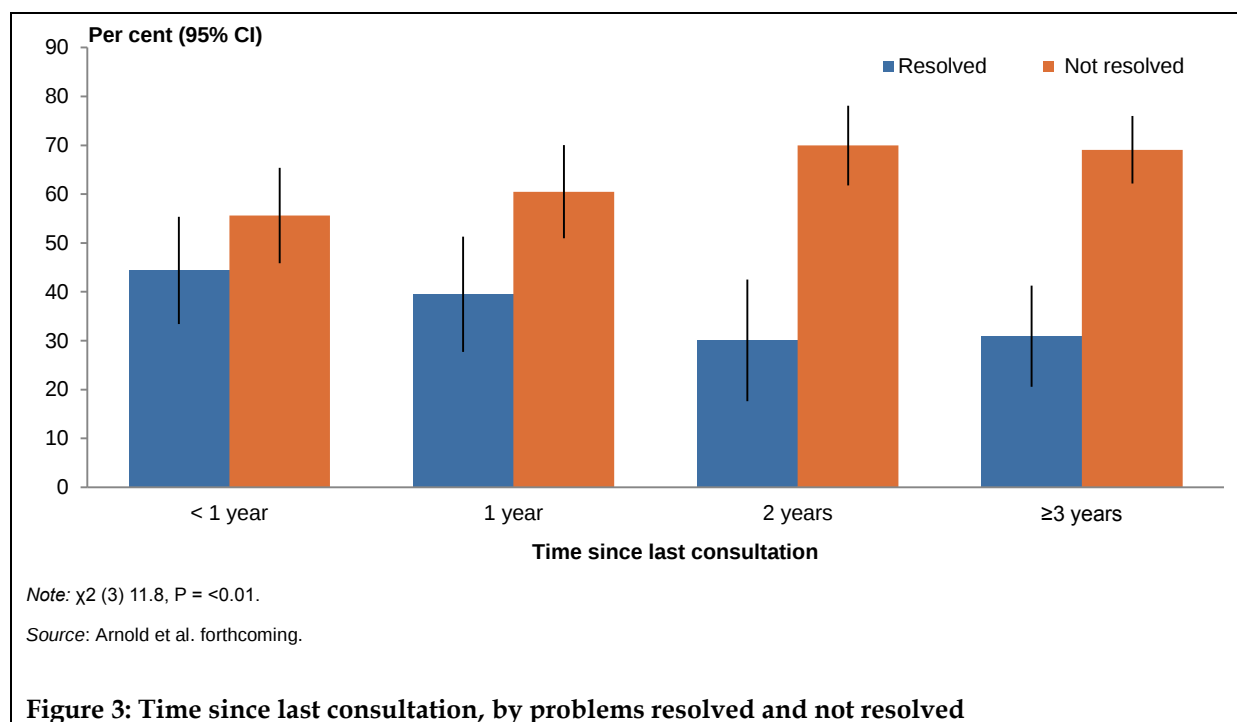
Refractive error

A refractive error is an error in the focusing of light by the eye. It is a frequent reason for reduced visual acuity and includes near-sightedness, far-sightedness and astigmatism.

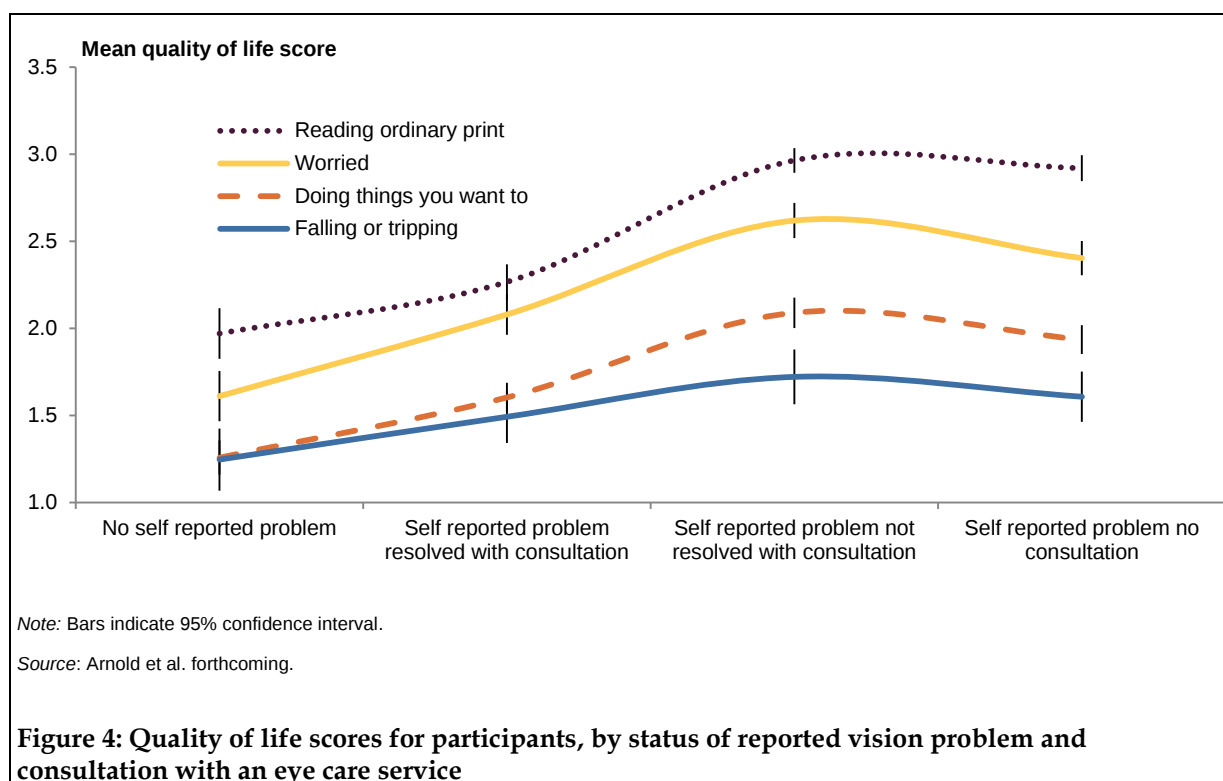
Of the 79% of Aboriginal and Torres Strait Islander adults with self-reported eye problems, 83% of these had sought care. Half (49%) reported seeing an optometrist, 33% a primary health centre, 12% an ophthalmologist, and 6% consulted a hospital service for eye care. Only 23% of those with vision problems or 15% of the total had had an eye examination within the preceding 12 months. For one-third (33%) of participants with vision problems, it had been 3 years or more since their last consultation.

Reasons for not seeking eye care were: not enough time (41%); condition not severe enough (22%); too expensive (17%); not available in area (14%); decided not to seek care (14%); transport/ distance (10%); and waiting time too long (10%).

Among those who had sought eye care for their vision problems, 64% reported that their vision problem had not resolved. This was particularly a problem in those with presbyopia or vision loss. The proportion of those who reported an unresolved vision problem increased as the time since previous examination increased (Figure 3).



Patients with unresolved vision problems had worse quality of life scores. Overall difficulty with reading ordinary size print (under corrected presbyopia) was the highest scoring item (Figure 4).



Vision problems were far less common in children; only 19% reporting having a vision problem, with 58% of these having sought care. Most had seen an optometrist (51%) or a primary health service (37%). All those children who had consulted an eye service (63%) had reported their vision problem had resolved.

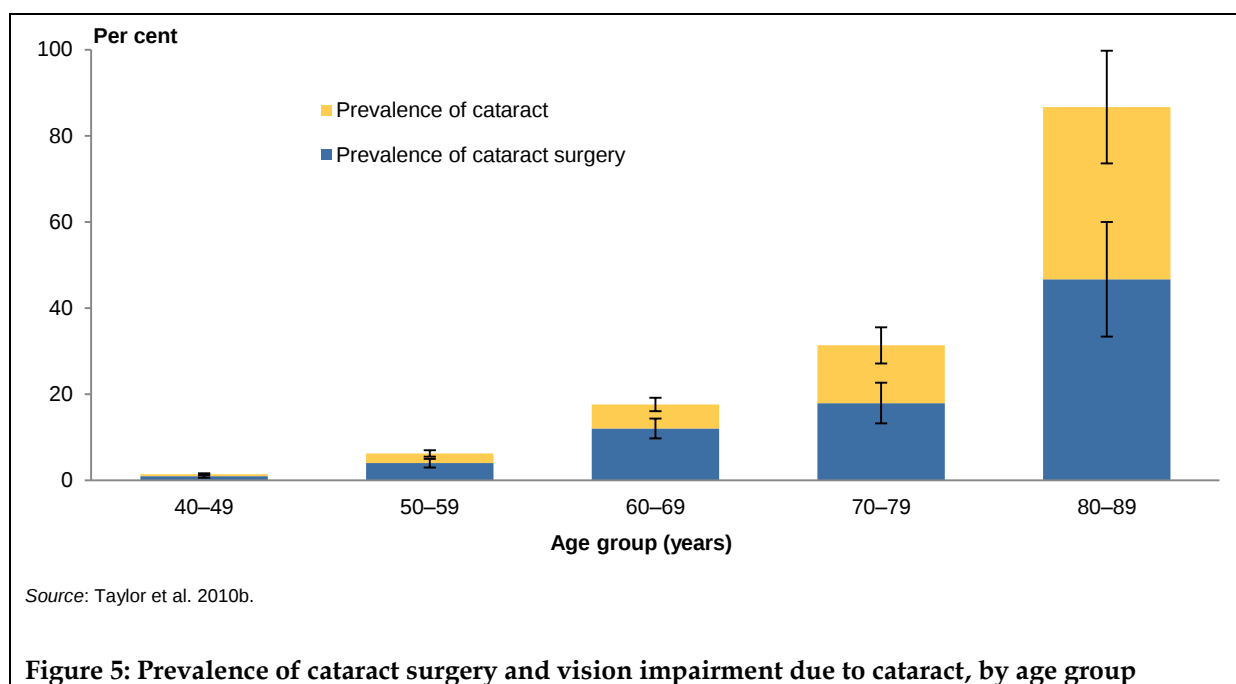
An estimated 21,000 Aboriginal and Torres Strait Islander adults require distance correction and 41,000 require correction for near vision. It seems likely these people would need a new pair of glasses about once every second year.

Cataract

A cataract is a mostly degenerative condition in which the lens of the eye clouds over, obstructing the passage of light to cause vision loss and, potentially, blindness. The main risk factors for the onset of cataract include ageing, exposure to ultraviolet light, injury, diabetes and smoking. Surgery involves replacing the clouded lens with one made from plastic.

Cataract caused some 32% of the blindness and 27% of the low vision loss in Aboriginal and Torres Strait Islander adults. Low vision from cataract occurred in 2.5% of adults, and blindness in another 0.6% (Taylor et al. 2010c). There were no significant regional or state variations in vision loss due to cataract.

Overall, 6.5% of Indigenous adults have had cataract surgery, with no gender or regional variations in the proportion who had surgery, although this increased rapidly with age, as did the prevalence of cataract (Figure 5).



About 65% of people with cataract had been operated on, and this did not vary significantly by region. Of those who had been operated on, 78% could see 6/12 or better. Of operated eyes with vision of less than 6/12, 40% were treatable (uncorrected refractive error or posterior capsular opacification – clouding of part of the lens covering (capsule) that remains after surgery), and 20% had poor vision from diabetic eye disease (retinopathy).

It was estimated that some 3,234 Indigenous adults with vision loss from cataract and 4,320 Indigenous cataract operations a year would be required to match the national cataract surgery rate of 9,500 operations per million people per year (Taylor et al. 2010b).

A history of cataract was found to be unreliable, with 44% of those with a reported history of cataract having vision of 6/12 or better, and 19% of those with vision loss reported to be due to cataract had a cause other than cataract responsible for this. Of those who reported having had cataract surgery, 7% were found not to have had surgery.

Blinding unoperated cataract was a much more important cause of blindness in Indigenous adults (31%) than in other Australians (14%) (Taylor et al. 2005). Age-specific rates suggest that blindness from cataract is about 12 times as high in Indigenous adults as in other Australians (Taylor et al. 2010c). Cataract was also a much more common cause of low vision in Indigenous adults than in other Australians (28% versus 14%) (Taylor et al. 2005).

A study of Medicare and hospital discharge data for 2007–08 gave a national cataract surgery rate of 9,460 (Kelaher et al. 2010). The cataract surgery rate of 3,216 for the Northern Territory was not disaggregated for Indigenous and others. However, for the remaining states and territory, the cataract surgery rate for Indigenous Australians was 2,239 – four times less than the national rate. WHO has recommended that countries in Africa should aim to have at least a cataract surgery rate of 3,000 to eliminate the most severe forms of cataract blindness. An estimated 4,300 cataract operations per year would be required by Indigenous Australians to match mainstream coverage.

Diabetes

Diabetic retinopathy (damage to the blood vessels in the retina) is caused by complications of diabetes which can eventually lead to blindness.

The prevalence of self-reported diabetes in Aboriginal and Torres Strait Islander adults aged over 40 years in the NIEHS was 37% (Goujon et al. 2010). This is 7 times as high as self-reported diabetes in other Australians aged 40 years and over (McCarty et al. 1998). The average age of onset of diabetes in this group was reported to be 44 years and the average duration of disease was 11 years. Only 20% of those with diabetes had had an eye examination in the previous 12 months which is the recommended interval in the National Health and Medical Research Council Guidelines (NHMRC 2008; NHMRC 1997). It is estimated that some 40,000 Indigenous Australians need an annual eye examination to detect diabetic retinopathy.

Overall, 13% of Aboriginal and Torres Strait Islander people with diabetes had visual impairment, with diabetes being the cause of 13% of low vision and 9% of blindness (Taylor et al. 2010c).

Diabetic retinopathy was present in 30% of people with diabetes, and diabetic retinopathy was found in 6.3% of those who did not self-report the diagnosis of diabetes (Xie et al. forthcoming). It is likely that further testing may have revealed diabetes in at least some of these people. About one-third of those with retinopathy (12% of those with diabetes) had severe diabetic retinopathy requiring laser treatment. Overall, only 30% of those who required laser treatment had received at least some laser treatment.

The prevalence of self-reported diabetes in Indigenous Australians has increased dramatically over the past 30 years. In 1980, the NTEHP found a self-reported rate of only 0.3% of diabetes in Aboriginal and Torres Strait Islander adults. Diabetic retinopathy was not listed as a separate cause of blindness, but it was included with all retinal causes that only together totalled 4% of blindness, compared with 9% of blindness caused by diabetes alone in the NIEHS (Royal Australian College of Ophthalmologists 1980). Currently, the rate of diabetes-related blindness in Indigenous Australians is estimated to be more than 14 times as high as that reported by other Australians (Taylor et al. 2010c). However, in those with diabetes, the prevalence of diabetic retinopathy and the proportion requiring laser treatment remains remarkably constant across multiple population groups. A review of the Medicare and hospital discharge data for 2007–08 showed that 165 retinal procedures were performed on Indigenous Australians excluding those in the Northern Territory. This includes all retinal procedures, and does not separately identify laser treatment for diabetic retinopathy. An estimated 4,700 Indigenous Australians with diabetes require laser treatment each year.

Glaucoma

Glaucoma is a condition in which there is elevated pressure within the eye caused by obstruction of the outflow of aqueous humour. The acute form may quickly cause blindness if untreated. The chronic form may progress slowly over a number of years, producing gradual loss of peripheral vision. Glaucoma is a leading cause of blindness worldwide.

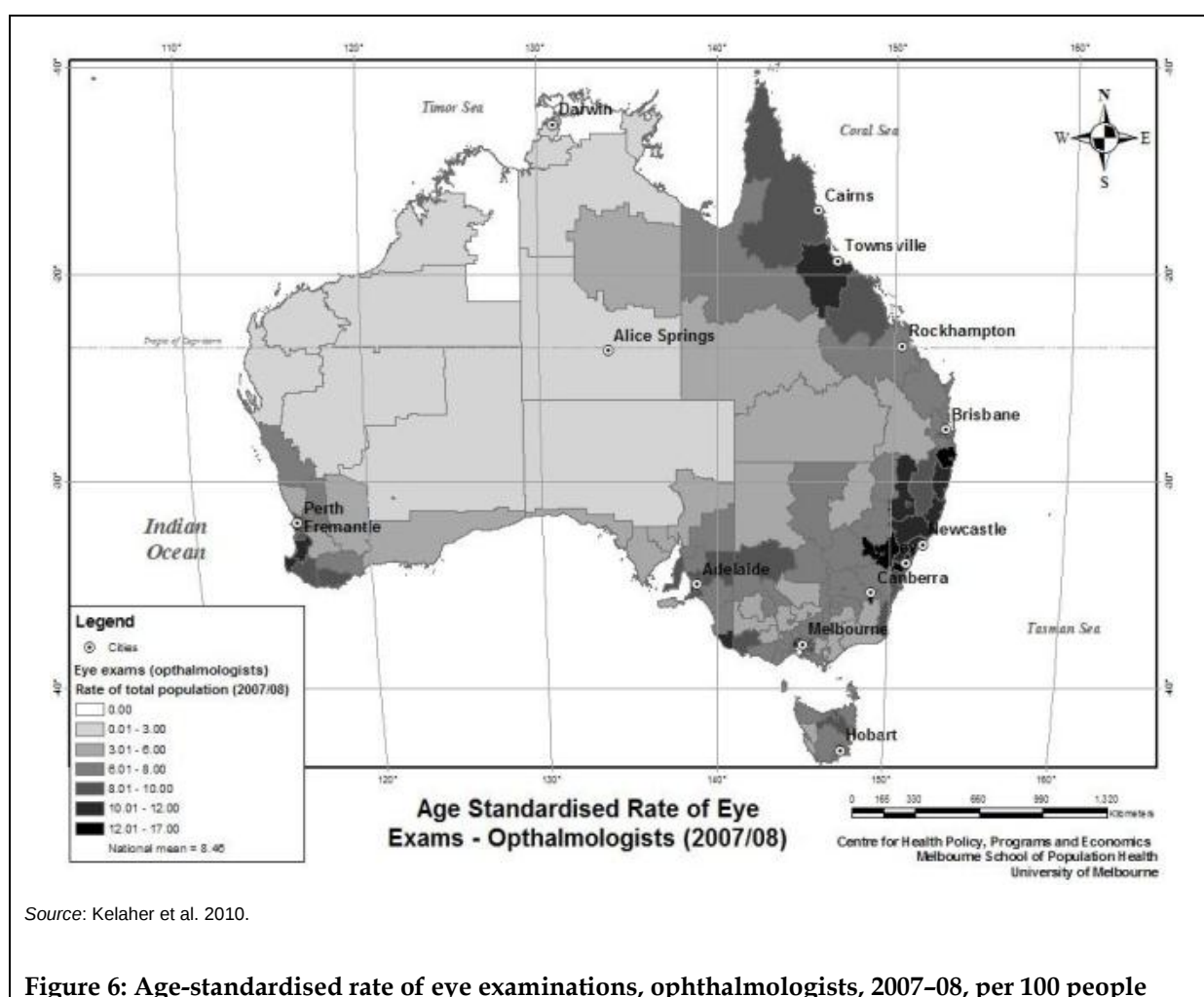
Glaucoma is generally thought to be uncommon among Aboriginal and Torres Strait Islander people in the absence of other ocular complications, although glaucoma is not uncommon following ocular trauma or as a complication of diabetes (Royal Australian College of Ophthalmologists 1980).

The NIEHS found an overall prevalence of glaucoma of 2.2% in Indigenous adults, although no cases of low vision or blindness was solely attributable to glaucoma (Chua et al. forthcoming; Taylor et al. 2010c; Wensor et al. 1998). The overall prevalence of glaucoma in those aged 40 years and over was 1.7% (Wensor et al. 1998), and glaucoma was responsible for 14% of blindness (Taylor et al. 2005).

Provision of eye services to Aboriginal and Torres Strait Islander people

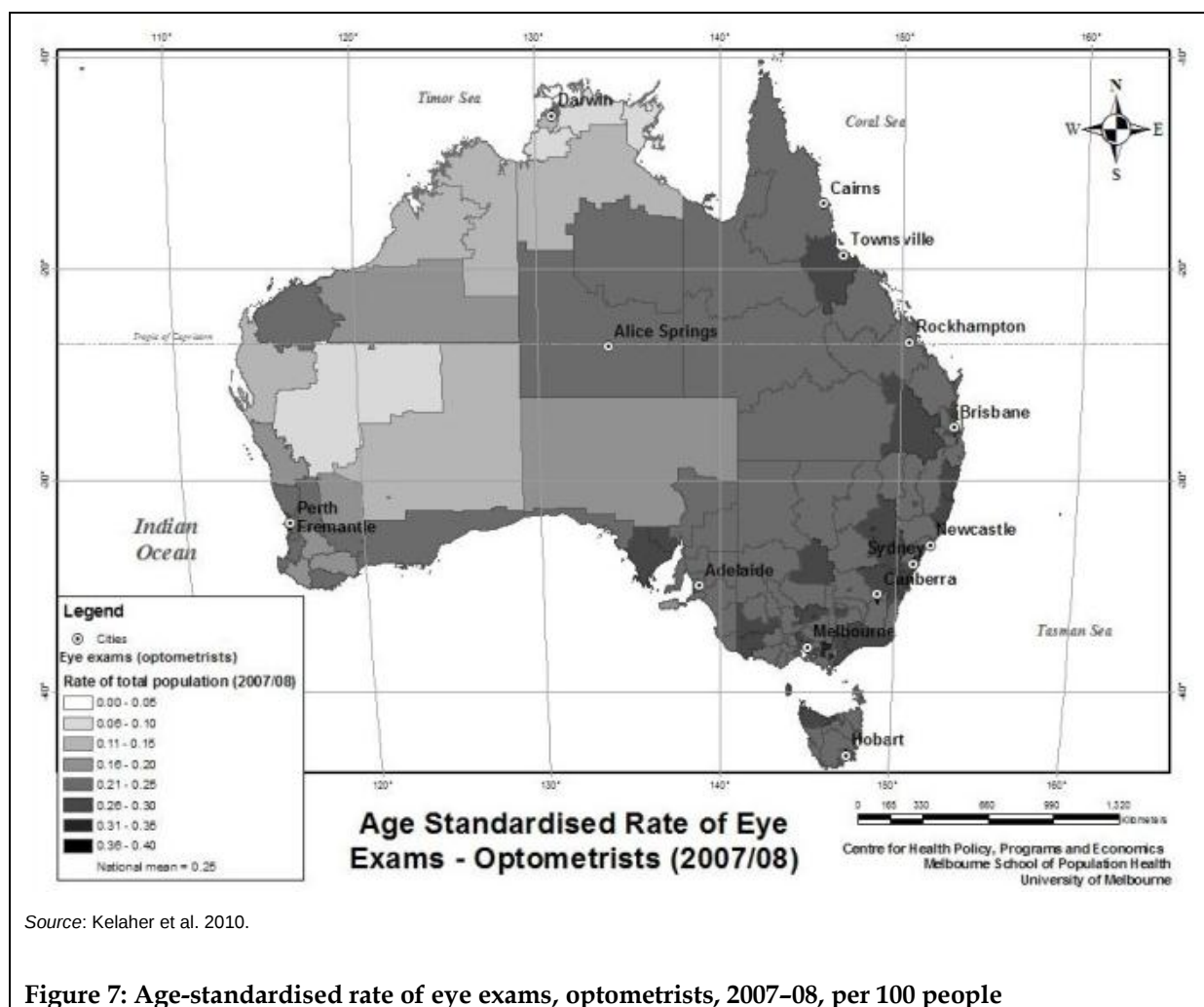
Despite a number of government initiatives to improve Indigenous people's access to eye health services there remain significant inequities in access. Treatment for cataract and trachoma falls below WHO guidelines in some areas with large Indigenous populations (Kelaher et al. 2010). Two key types of eye health professionals are optometrists and ophthalmologists. Optometrists conduct eye and vision examinations, prescribe glasses and lenses and carry out treatment for some eye disorders whereas ophthalmologists generally specialise in treating eye disease with drugs and surgery.

A review of workforce distributions showed it was not possible to determine the geographic distribution of full-time-equivalent ophthalmologists and optometrists across Australia (Kelaher et al. 2010). Nor was it possible to reliably identify eye services provided to Aboriginal and Torres Strait Islander people across the country. There was a wide variation in the age-standardised rate of eye examinations over geographic areas (figures 6 and 7). But when regions were stratified by the proportion of the population that was Indigenous, there was a progressive reduction in the number of ophthalmic examinations, the number of optometric examinations and the total number of eye examinations.



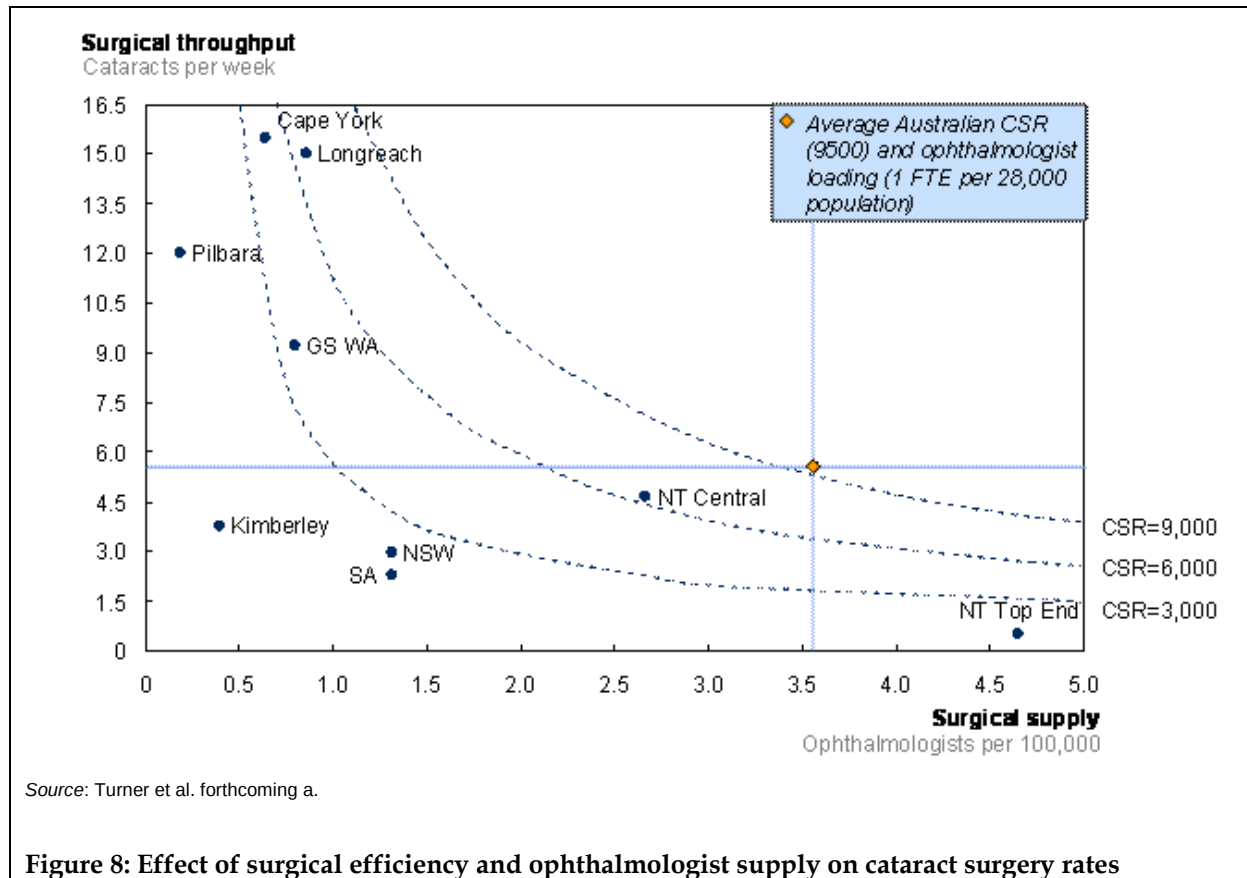
Source: Kelaher et al. 2010.

Figure 6: Age-standardised rate of eye examinations, ophthalmologists, 2007-08, per 100 people



Outreach services for eye health care exist in most states and territories in Australia and provide specialist services to remote and disadvantaged communities. A case study of outreach eye services showed a marked under-resourcing of both ophthalmologists and optometrists in most outreach services compared with the national average coverage (Turner et al. 2009). There was on average 1 ophthalmologist for every 28,000 people and 1 optometrist for every 5,400 people, together equivalent to 1 eye health provider per 4,900 people. In all 10 outreach regions studied the population per eye health provider was at least double the national average and in four regions the figure was more than four or five times the national average.

There was a marked variation in surgical productivity as measured by the cataract surgery rate for the different outreach services (Figure 8). This variation was not solely due to the amount of time ophthalmologists were available (surgical supply), but was also strongly correlated with effective service integration and coordination. Well-coordinated services with better integration of ophthalmology and optometry roles were shown to have a 40% higher clinic throughput, 80% higher cataract surgery rates, waiting times 5 to 6 months shorter for surgery and outpatient appointments, and costs reduced by 15%. Coordination of eye services includes facilitating engagement with the local community, eye professions and health facilities (Turner et al. forthcoming b).



For the more effective delivery of eye care services in outback areas, both an increase in the full-time-equivalent presence of ophthalmologists and optometrists is required, as well as increased coordination between visiting eye teams, local service providers, including Aboriginal Medical Services, and Regional Surgical Centres (Siggins Miller 2010).

The increasing availability of optometric services provided in Aboriginal Medical Services was associated with a reduction in visual impairment, and increased use of glasses (Turner et al. forthcoming c). This effect was not seen with the provision of other optometric services in the community. This reinforces the role of community-controlled organisations in providing appropriate services.

Further information

In addition to the population-based studies referred to above, various service-based reports of Aboriginal eye health have been published recently.

Data collected in remote communities in Central Australia over 3 years by a visiting eye team based in Alice Springs generally confirm the findings of the National Indigenous Eye Health Survey (Landers et al. 2010b; Taylor 2010). The Central Australian study reported on: the relative rarity of myopia, especially in younger people (Landers et al. 2010c); the high prevalence of vision loss due to cataract (Landers et al. 2010d) and diabetic retinopathy (Landers et al. 2010a); and the ongoing occurrence of trichiasis and vision loss from trachoma (Landers et al. 2010e).

Another study from the Eastern Goldfields of Western Australia also reported service-based data collected over 12 years, and emphasised the increasing importance of diabetic retinopathy as a cause of vision loss (Clark et al. 2010).

References

- Adams KS, Burgess JA, Dharmage SC & Taylor HR 2010. Trachoma surveillance annual report, 2009: A report by the National Trachoma Surveillance and Reporting Unit. *Communicable Diseases Intelligence* 34(4).
- Abdou A, Munoz BE, Nassirou B, Kadri B, Moussa F, Baare I et al. 2010. How much is not enough? A community randomised trial of a water and health education programme for trachoma and Ocular C. trachomatis infection in Niger. *Tropical Medicine and International Health* 15:98-104.
- Arnold A-L, Goujon N, Busija L, Keeffe JE & Taylor HR forthcoming. Utilisation of eye care services and vision related quality of life in Indigenous Australians. *Medical Journal of Australia*, submitted.
- ABS & AIHW (Australian Bureau of Statistics & Australian Institute of Health and Welfare) 2008. The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples 2008. AIHW cat. no. AIHW 21. Canberra: ABS.
- ABS 2006. Experimental estimates of Aboriginal and Torres Strait Islander Australians, Jun 2006. ABS cat. no. 3238.0.55.001 Canberra: ABS.
- ABS 2010. The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples, May 2010. ABS cat. no. 4704.0. Canberra: ABS.
- AIHW 2011. The health and welfare of Australia's Aboriginal and Torres Strait Islander people, an overview. Cat. no. IHW 42, Canberra: AIHW.
- Chua BE, Xie J, Arnold A-L, Koukouras I, Keeffe JE & Taylor HR forthcoming. Glaucoma prevalence in Indigenous Australians. *British Journal of Ophthalmology*, 27 November 2010.
- Clark A, Morgan WH, Kain S, Farah H, Armstrong K, Preen D, et al. 2010. Diabetic retinopathy and the major causes of vision loss in Aboriginals from remote Western Australia. *Clinical and Experimental Ophthalmology* 38(5):475-482.
- CDNA (Communicable Disease Network Australia) 2006. Guidelines for the public health management of trachoma in Australia. Canberra: Commonwealth of Australia.
- Fox SS, Arnold A-L, Keeffe JE & Taylor HR 2010. Sampling and recruitment methodology for a National Eye Health Survey of Indigenous Australians. *Australian and New Zealand Journal of Public Health* 34(6):554-562.
- Goujon N, Brown CM, Xie J, Arnold A-L, Dunn RA, Keeffe JE et al. 2010. Self-reported vision and health of Indigenous Australians. *Clinical and Experimental Ophthalmology* 38(8):796-804.
- Ivers RQ, Cumming RG, Mitchell P, et al. 2003. Visual risk factors for hip fracture in older people. *J Am Geriatr Soc*, 51:356-63.
- Kelagher M, Ferdinand A, Ngo S, Tambula N & Taylor HR 2010. Access to eye health services among Indigenous Australians. An area level analysis. Melbourne: Indigenous Eye Health Unit, Melbourne School of Population Health, University of Melbourne.
- Kelagher M, Ferdinand A & Taylor HR 2011. Azithromycin treatment levels inadequate for recommended trachoma control guidelines. *Medical Journal of Australia* 194(2):102.
- Lamoureux EL, Hassell JB, Keeffe JE 2004. The determinants of participation in activities of daily living in people with impaired vision. *Am J Ophthalmol*, 137:265-70.

- Landers J, Henderson T, Abhary S, Craig J 2010a. Prevalence and associations of diabetic retinopathy in Indigenous Australians within central Australia: the Central Australian Ocular Health Study. *Clinical and Experimental Ophthalmology*, 38(4):393–7.
- Landers J, Henderson T, Craig J 2010b. Central Australian Ocular Health Study: design and baseline description of participants. *Clinical and Experimental Ophthalmology* 38(4):375–80.
- Landers J, Henderson T, Craig J 2010c. Prevalence and associations of refractive error in Indigenous Australians within central Australia: the Central Australian Ocular Health Study. *Clinical and Experimental Ophthalmology* 38(4):381–6.
- Landers J, Henderson T, Craig J 2010d. Prevalence and associations of cataract in Indigenous Australians within central Australia: the Central Australian Ocular Health Study. *Clinical and Experimental Ophthalmology* 38(4):387–92.
- Landers J, Henderson T, Craig J 2010e. Prevalence and associations of blinding trachoma in Indigenous Australians within central Australia: the Central Australian Ocular Health Study. *Clinical and Experimental Ophthalmology* 38(4):398–404.
- Lansingh VC, Mukesh BN, Keeffe JE & Taylor HR 2010. Trachoma control in two Central Australian Aboriginal communities: a case study. *International Ophthalmology* 30:367–75.
- McCarty CA, Lloyd-Smith CW, Lee SE, Stanislavsky YL, Livingston PM & Taylor HR 1998. Use of eye care services by people with diabetes: the Melbourne visual impairment project. *British Journal of Ophthalmology* 82:410–4.
- Michel C-EC, Roper KG, Divena MA, Lee HH & Taylor HR forthcoming. Correlation of clinical trachoma and infection in Aboriginal communities. *PLoS Neglected Tropical Diseases*, in press.
- NHMRC (National Health and Medical Research Council) 1997. Working Party on Diabetic Retinopathy. Management of diabetic retinopathy – Clinical Practice Guidelines. Canberra: Australian Government Publishing Service.
- NHMRC 2008. Australian Diabetes Society for the Department of Health and Ageing. Guidelines for the management of diabetic retinopathy. Canberra: Commonwealth of Australia.
- OATSIH (Office for Aboriginal and Torres Strait Islander Health) 2001. Specialist eye health guidelines for use in Aboriginal and Torres Strait Islander populations. Canberra: Commonwealth Department of Health and Aged Care.
- Robaei D, Rose K, Ojaimi E, Kifley A, Huynh S & Mitchell P 2005. Visual acuity and the causes of visual loss in a population-based sample of 6-year-old Australian children. *Ophthalmology* 112:1275–82.
- Robaei D, Huynh SC, Kifley A & Mitchell P 2006a. Correctable and non-correctable visual impairment in a population-based sample of 12-year-old Australian children. *American Journal of Ophthalmology* 142:112–8.
- Robaei D, Kifley A, Rose KA & Mitchell P 2006b. Refractive error and patterns of spectacle use in 12-year-old Australian children. *Ophthalmology* 113:1567–73.
- Royal Australian College of Ophthalmologists 1980. The National Trachoma and Eye Health Program of the Royal Australian College of Ophthalmologists. Sydney: Royal Australian College of Ophthalmologists.
- Siggins Miller 2010. An options paper on the current and future role of the Regional Eye Health Coordinator: A report to the Department of Health and Ageing.

- Studdert DM, Vu TM, Fox SS, Anderson IP, Keeffe JE & Taylor HR 2010. Ethics review of multisite studies: the difficult case of community-based Indigenous health research. *Medical Journal of Australia* 192:275–80.
- Taylor HR 2008. Trachoma: A blinding scourge from the Bronze Age to the twenty-first century. Melbourne: Centre for Eye Research Australia.
- Taylor HR 2009. National Indigenous Eye Health Survey – Minum Barreng (Tracking Eyes). Melbourne: Indigenous Eye Health Unit, Melbourne School of Population Health in collaboration with the Centre for Eye Research Australia and the Vision CRC. Viewed 17 February 2010, <www.iehu.unimelb.edu.au>.
- Taylor HR 2010. Surveys and service: what is going on in the Centre? *Clinical and Experimental Ophthalmology* 38(4):331–2.
- Taylor HR, Keeffe JE, Vu HTV, Wang JJ, Rochtchina E, Pezzullo ML et al. 2005. Vision loss in Australia. *Medical Journal of Australia* 182:565–8.
- Taylor HR, Fox SS, Xie J, Dunn RA, Arnold A-LMR & Keeffe JE 2010a. The prevalence of trachoma in Australia: the National Indigenous Eye Health Survey. *Medical Journal of Australia* 192:248–53.
- Taylor HR, Xie J, Arnold A-L, Goujon N, Dunn RA, Fox S et al. 2010b. Cataract in Indigenous Australians: the National Indigenous Eye Health Survey. *Clinical and Experimental Ophthalmology* 38:1–6.
- Taylor HR, Xie J, Fox SS, Dunn RA, Arnold A-L & Keeffe JE 2010c. The prevalence and causes of vision loss in Indigenous Australians: the National Indigenous Eye Health Survey. *Medical Journal of Australia* 192:312–8.
- Tellis B, Fotis K, Keeffe JE & Taylor HR 2009. Trachoma surveillance annual report, 2008. A report by the National Trachoma Surveillance and Reporting Unit. *Communicable Diseases Intelligence* 33(3):273–90.
- Turner A, Mulholland W & Taylor HR 2009. Outreach eye services in Australia. Melbourne: University of Melbourne.
- Turner AW, Mulholland W & Taylor HR forthcoming a. Funding models for outreach ophthalmology services. *Clinical & Experimental Ophthalmology*, 24 November 2010
- Turner AW, Mulholland WJ & Taylor HR forthcoming b. Coordination of outreach eye services in remote Australia. *Clinical and Experimental Ophthalmology* 24 November 2010 .
- Turner AW, Xie J, Arnold A-L & Taylor HR forthcoming c. Eye health services access and utilization in the National Indigenous Eye Health Survey. *Clinical and Experimental Ophthalmology*, in press.
- Vu HTV, Keeffe JE, McCarty CA, Taylor HR 2005. Impact of unilateral and bilateral vision loss on quality of life. *Br J Ophthalmol*, 89:360–363.
- Wang JJ, Mitchell P, Smith W, et al. 1999. Impact of visual impairment on use of community support services by elderly persons: the Blue Mountains Eye Study. *Invest Ophthalmol Vis Sci*, 40:12–19.
- Wang JJ, Mitchell P, Cumming RG, et al. 2003. Visual impairment and nursing home placement in older Australians: the Blue Mountains Eye Study. *Ophthalmic Epidemiol*, 10:3–13.
- Weih LM, Hassell JB, Keeffe J 2002. Assessment of the impact of vision impairment. *Invest Ophthalmol Vis Sci*, 43:927–35.

- Wensor MD, McCarty CA, Stanislavsky YL, Livingston PM & Taylor HR 1998. The prevalence of glaucoma in the Melbourne Visual Impairment Project. *Ophthalmology* 105:733-9.
- West SK, Munoz B, Rubin GS, et al. 1997. Function and visual impairment in a population-based study of older adults. The SEE project. *Invest Ophthalmol Vis Sci.* 38:72-82.
- West SK, Rubin GS, Broman AT, et al. 2002. How does visual impairment affect performance on tasks of everyday life? The SEE project. *Arch Ophthalmol*, 120(6):774-80.
- Wright HR, Keeffe JE, Taylor HR 2010. Barriers to the implementation of the SAFE strategy to combat hyperendemic trachoma in Australia. *Ophthalmic Epidemiology* 17(6):349-59.
- Xie J, Arnold A, Keeffe J, Goujon N, Dunn RA, Fox S et al. forthcoming. The prevalence of self-reported diabetes and diabetic retinopathy in Indigenous Australians: The National Indigenous Eye Health Survey. *Clinical & Experimental Ophthalmology*, in press.