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Original Article

Eye health service access and utilization in the National Indigenous Eye Health Survey

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Abstract

Background: To determine access to and utilization of eye health services for indigenous Australians.

Design: A national, stratified, random cluster sample was drawn from 30 communities across Australia that each included about 300 indigenous people.

Participants: A total of 1189 indigenous adults aged 40 and above were examined, representing 79% of the target population.

Methods: Eye health services data including nature and availability of facilities and workforce supply were collected for comparison with eye health prevalence data. The data were collected in 2008.

Main Outcome Measures: Low vision prevalence and coverage rate for distance refractive correction.

Results: The full-time equivalent availability of an optometrist working in an Aboriginal Medical Service was significantly associated with both a decrease in the prevalence of low vision ($t = -2.41$, $P = 0.02$) and an increase in the coverage rate for distance refractive correction ($t = 2.99$, $P = 0.006$). These associations were not replicated when comparing availability of private or hospital-based optometry in each community. Regional eye health coordinators appeared to provide an improved utilization of Aboriginal Health Services and therefore improved access to Aboriginal medical service optometry.

Conclusions: Eye health services for indigenous Australians need to be provided in culturally appropriate facilities with clear links to the indigenous community to optimize access to care and reduce the prevalence of vision impairment. The adequate provision of accessible eye care services is an important component in 'closing the gap' in vision loss for indigenous Australians.

Key words: eye, research, survey.

Introduction

The National Indigenous Eye Health Survey (NIEHS) was carried out in 2008 to provide baseline evidence to help plan and prioritise the effective delivery of eye care to indigenous Australians.[1] The survey was designed to assess the prevalence and main causes of vision impairment, as well as the utilization of eye care services. The last comprehensive nationwide data on the prevalence and causes of vision impairment in indigenous Australian communities were collected in the 1970s during the National Trachoma and Eye Health Program.[2] Since then, there have been intermittent reports investigating specific problems such as trachoma or the increase in diabetic eye disease.[3–7] There have been several national efforts to improve the delivery of eye care to indigenous people.[8,9] These have been supplemented by the

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ongoing efforts of individual practitioners and medical services. However, in the last 30 years, there have been no further national data on the status of indigenous eye health. A current evaluation of the availability and accessibility of eye health services in relation to eye disease prevalence is needed to plan and prioritise effective eye care service delivery.

Methods

The sampling methods used for the NIEHS have been described in detail elsewhere.[10] Data from the June 2006 national census were used to delineate geographic areas that included approximately 300 indigenous people.

Essentially, indigenous areas were grouped into six strata based on the Australian Accessibility and Remoteness Index (ARIA): Major City, Inner Regional, Outer Regional, Remote and Very Remote. For the purpose of this study, the Very Remote stratum was subdivided into Very Remote Coastal and Very Remote Inland. Within each ARIA, five sample areas or communities were randomly selected (proportional to size) using census data to identify geographic areas containing approximately 300 indigenous people. This provided a total of 30 sample areas.

The process for obtaining ethical clearance for the NIEHS has been described in detail elsewhere.[11] Primary ethical approval was obtained from the Human Research Ethics Committee of the Royal Victorian Eye and Ear Hospital. However, separate formal ethical approval was required and was obtained from multiple national and regional ethical committees. The research was conducted in accordance with the tenets of the Declaration of Helsinki as revised in 2000. Written, informed consent was obtained for all participants prior to examination.

A standardized questionnaire was used to collect data on demographics, general health, eye health and health service utilization.[10] A standardized eye examination including presenting distance and near visual acuity using an E chart. Pinhole testing and refraction were performed if the presenting acuity was less than 6/12. Fundus photographs of each eye were taken with a non-mydriatic retinal camera.

A survey form was designed and completed by visiting team members by interviewing local health service providers including nurses, optometrists, ophthalmologists and Aboriginal Health Workers. The availability of eye health professionals at each site was measured as a proportion of full-time equivalence (FTE). The availability of optometry services based within Aboriginal medical services (AMS) or Aboriginal community controlled healthcare organizations was also determined and termed 'AMS optometrist' in this paper. The presence of regional eye health coordinators (REHC) was recorded. The availability of facilities for eye surgery at each site was determined. The time spent travelling, the distance and mode of transport for both surgery and laser treatment were also recorded. The proportion of patients actually receiving prescribed glasses was estimated by local providers.

Data analysis

Data were entered into an electronic database using Access 2000 (Microsoft Corp. Redmond, WA, USA). Data were checked for missing values and where possible, missing data were followed up. All statistical analysis was performed using STATA version 11.0 (Stata Corporation, College Station, TX, USA).

Vision impairment refers to all those with vision of less than 6/12. Refractive error was determined as the cause of vision impairment when a person with vision impairment could see 6/12 or better with either the pinhole test or after refraction. Cataract surgery coverage was determined by calculating the number of patients who had undergone cataract surgery as a proportion of all patients who either had received surgery or required an operation. Similarly, diabetic laser coverage was calculated as the number of patients who had received any retinal laser treatment for diabetic eye disease as a proportion of all those with previous treatment or requiring retinal laser for diabetic retinopathy.

Results

A total of 1189 adults over the age of 40 years were examined at 30 sites. This represents 79% of the target population. Prevalence of vision impairment and blindness and the identified causes have been reported previously.[1] Rates of vision impairment, refractive error, refractive correction, cataract surgery and diabetic laser treatment coverage for States and remoteness regions are presented in Table 1.

Workforce

Optometry services were available at all of the sites (Table 2). The availability of optometrists decreased with increasing remoteness of the site with all the 'Major City' and 'Regional' sites having at least one full-time equivalent (FTE) optometry service. All of the 'Very Remote' regions had a visiting optometry service. However, seven out of ten 'Very Remote' communities had an optometrist present less than 1 week per year (0.028 FTE).

Ophthalmology services were not available at four sites (Table 2). Two of these were in 'Very Remote'

Table 1. Rates of vision impairment <6/12 (excl. blindness), refractive error, refractive correction, cataract surgery and diabetic laser treatment coverage in indigenous adults age 40 and above by state and remoteness regions

	Distance vision (%)			Near vision (%)		Surgery coverage (%)	
	Presenting vision impairment	Refractive error	Have distance glasses	Difficulty near with vision (<N8)	Have reading glasses	Cataract surgery	Diabetic laser
States (*n*)							
NSW (247)	5.7	4.1	24	43	74	57	25%
NT (198)	9.1	6.1	3.0	40	49	58	25
Qld (259)	11.6	6.2	22	22	68	69	43
SA (129)	9.3	6.2	13	42	65	78	23
Tas. (43)	4.7	4.7	30	14	83	0	0
Vic. (29)	6.9	3.5	21	31	33	100	50
WA (284)	12.0	4.9	9.9	55	60	61	48
Regions							
Major city (117)	7.7	6.0	32	48	75	57	50
Inner regional (167)	7.8	4.2	22	36	67	75	46
Outer regional (168)	6.6	3.0	14	41	70	60	27
Remote (245)	10.2	6.5	16	31	64	67	36
Very remote coastal (263)	9.5	4.2	11	42	59	66	38
Very remote inland (229)	12.7	7.4	8.70	42	50	63	33
Total	9.4	5.3	16	39	63	65	37

Table 2. Summary of workforce availability

	Optometry FTE mean	Ophthalmology FTE mean	AMS optometry FTE
State			
NSW	2.52	1.81	0.08
NT	0.17	0.01	0.02
Qld	0.26	1.84	0.01
SA	1.20	0.08	0.02
Tas.	1.00	0.00	0.00
Vic.	3.00	1.85	0.00
WA	1.50	0.77	0.00
Regions			
Major city	2.46	2.60	0.06
Inner regional	2.71	1.68	0.05
Outer regional	2.17	0.43	0.01
Remote	0.67	0.07	0.01
Very remote coastal	0.06	0.00	0.01
Very remote inland	0.02	0.01	0.01

AMS, Aboriginal medical service; FTE, full-time equivalent.

Table 3. REHC presence compared with eye services aimed specifically for indigenous people

	AMS Optometry	AMS Ophthalmology
REHC present	11	8
REHC absent	8	2

Fisher's exact = 0.414. REHC, regional eye health coordinators.

locations. One 'Inner Regional' site without an ophthalmology service had a service located approximately 1 h away. Another 'Remote' site without any ophthalmic service was within an hour of a capital city.

Fifteen of the survey sites had a REHC present (Table 3), and of these sites eight also had AMS ophthalmology and 11 had AMS optometry services. In contrast, of the 15 sites without a REHC, only 2 had AMS ophthalmology, and 8 had AMS optometry clinics.

Questionnaires were assessed to determine whether patients had seen an optometrist within the last 5 years. When optometry services were available for less than 1 week per year (0.028 FTE), then participants were significantly less likely to have visited an optometrist when compared with regions where there is at least one FTE optometrist OR 0.37 (95% CI: 0.2–0.7).

Refractive error

When the overall optometry FTE was compared with the prevalence of low vision and the coverage with distance glasses no significant associations were seen ($t = -1.54$, $P = 0.13$ and $t = 1.97$, $P = 0.06$,

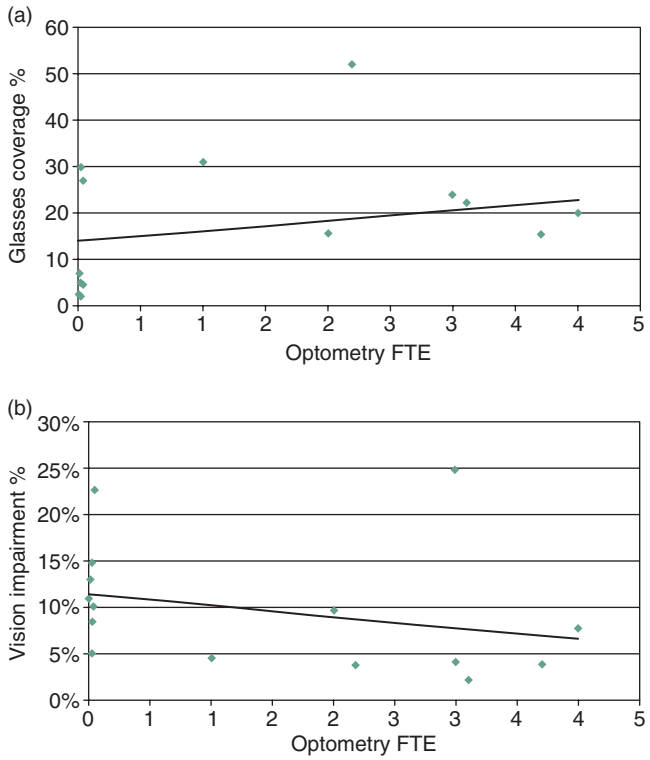

Figure 1. Distance glasses coverage (%) and vision impairment (%) associated with optometry supply (FTE, full-time equivalence) ($P = 0.06$ and 0.13, respectively).

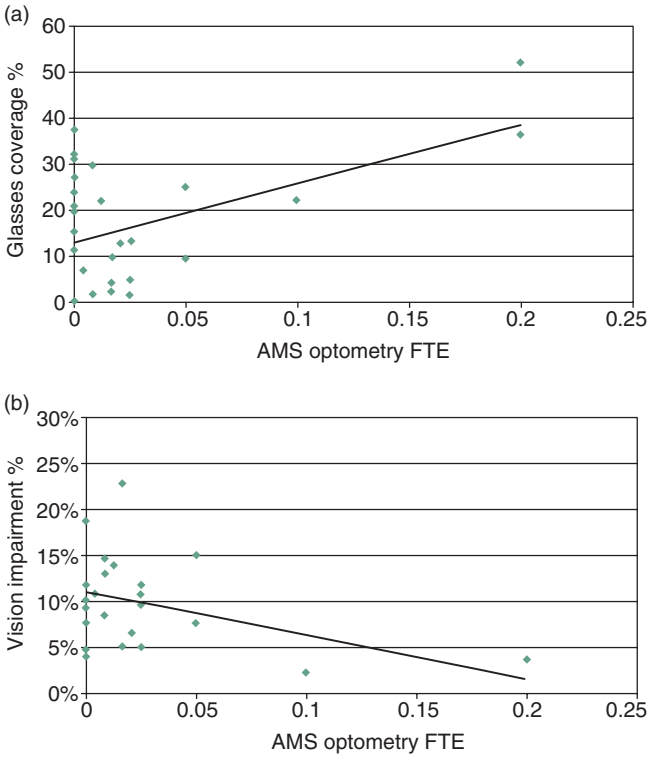

Figure 2. Distance glasses coverage (%) and vision impairment prevalence (%) associated with the AMS optometry supply ($P = 0.006$ and 0.02, respectively). AMS, Aboriginal medical services; FTE, full-time equivalence.

respectively) (Fig. 1). In contrast, when the AMS Optometry FTE (hosted within Aboriginal health services) at each site was compared there were significant decreases in the prevalence of low vision ($t = -2.41$, $P = 0.02$) and significant increases in the coverage rate for distance refractive correction ($t = 2.99$, $P = 0.006$) with increasing availability of an AMS optometry service (Fig. 2).

As expected, there was a significant variation with the urban/regional areas having more optometry and ophthalmology visits when compared with the very remote regions ($P = 0.008$).

Uncorrected refractive error caused 54% of the low vision and 14% of blindness in surveyed participants. Only 20% of adults normally wore glasses for distance compared with 56% in mainstream.[1] For those patients where refractive correction was prescribed, eight sites reported that 'few' of the prescribed glasses were actually purchased. The remaining 22 sites reported 'all or most' glasses being purchased. There was a variation in region remoteness for the eight sites that reported 'few' glasses being purchased, although four of these sites were in Queensland.

Diabetic coverage

Coverage for diabetic laser treatment was assessed for each remoteness area and plotted against average time and distance to where the laser was available. Some states provided air transport for access to laser treatment (Northern Territory and Queensland) whereas others did not (Western Australia) meaning the distance and time variables were not strictly comparable. There were trends towards better treatment coverage where services were more accessible with shorter distances and times to treatment; however, these differences were not significant (Fig. 3). In South Australia and some sites in Queensland, the laser equipment was taken to the communities for clinic visits. Whereas in Western Australia, there were five of eight sites that had more than 3 h of travelling time to receive laser treatment, with an average of 5.8 h (range 3–10 h). Times and distances to laser treatment tended to increase with increasing remoteness of sites (Table 4).

Cataract surgery

Cataract surgical services were located within the community in 17% ($n = 5$) of the surveyed sites. For another 17% ($n = 5$) of sites patients were required to fly for cataract surgery. In Western Australia there was no air travel offered to patients at surveyed sites, and three of eight communities had to travel

distances of >450 km to receive cataract surgery. No linear relationship was found between prevalence of vision loss in adults and time spent travelling to surgery ($r^2 = 0.075$). Surgical waiting times varied and did demonstrate patterns relating to state or remoteness. There were 12 sites where surgery was performed within 6 months. For many of the most remote regions the waiting time was dependent upon the date of the next ophthalmology team visit. Five sites (from Western Australia, Northern Territory and Queensland) had waiting times longer than 1 year. These included 'Outer Regional', 'Remote' and 'Very Remote' regions.

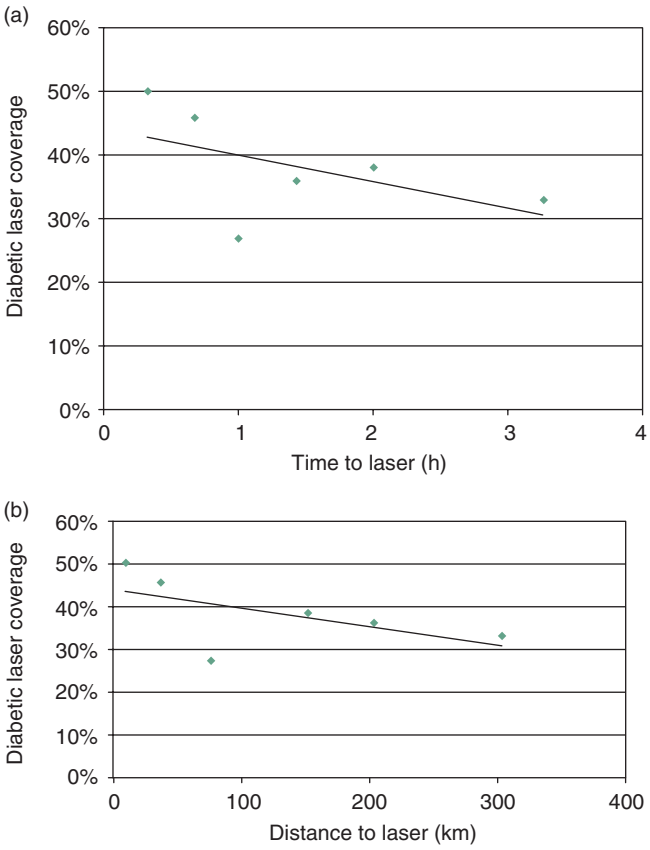

Figure 3. Grouped data for diabetic laser coverage *versus* distance and time to laser facilites.

Discussion

This study shows that the provision of eye-care services within Aboriginal health services results in better vision. It also draws attention to the wide range in accessibility and nature of eye-care services available to Aboriginal and Torres Strait Islander people across the country.

Survey sites providing AMS optometry services (hosted within Aboriginal Health Services) had a reduced prevalence of visual impairment and provided a higher coverage for distance spectacle correction than communities where services were provided in private or state facilities. This supports the notion that access to services for indigenous people is improved if their care is delivered within culturally appropriate facilities.

The presence of a REHC in a community was associated with more AMS-based optometry and ophthalmology services focused on the indigenous population. The REHC may act as a community liaison person providing an important link between the Aboriginal community and the visiting eye services. The coordination roles and costs of these services were not assessed in this study and warrant further evaluation. However, it is apparent that regional coordinators play an important role in

Table 4. Distance and times to cataract surgery and laser facilities grouped according to state and remoteness area

	Surgery				Laser			
	Mean time (h)	Mean distance (km)	<1 h (%)	>4 h (%)	Mean time (h)	Mean distance (km)	<1 h (%)	>4 h (%)
State								
NSW	0.42	21.86	100	0	0.42	21.86	100	0
NT	1.16	282.25	50	0	0.79	252.75	75	0
Qld	0.86	91.83	83	17	0.8	60.67	83	17
SA	2.50	200.00	50	50	0.00	0.00	100	0
Tas.	0.5	38	100	0	0.5	38	100	0
Vic.	0.25	12	100	0	0.75	52.5	50	0
WA	3.21	220.5	50	38	3.83	280.5	38	50
Region								
Major city	0.33	10	100	0	0.33	10	100	0
Inner regional	0.48	21.4	10	0	0.68	37.6	80	0
Outer regional	1	76.2	80	20	1	76.2	80	20
Remote	1.43	188.2	60	20	1.43	204.2	60	20
Very remote coastal	2.06	189.2	60	20	2	151.8	60	20
Very remote inland	3.57	326.8	40	40	3.26	303.2	60	40

linking their community with visiting eye-care services and improving eye care.

Despite comprehensive prevalence data in the NIEHS, there were only a relatively small number of patients in each community that limits the power to compare less common variables such as coverage rates for cataract surgery and laser treatment for diabetic eye disease. This also limits the ability to make comparisons between accessibility to surgical or laser services in individual communities. However, for diabetic laser coverage compared with distance and time to laser facilities, there were trends indicating that accessibility is associated with reduced coverage.

Both prescription and ready-made glasses need to be readily available in most indigenous communities. Although all sites had at least some access to optometry services, in seven out of 30 sites these optometry services were present for less than 1 week per year. In these settings, systems for the payment and delivery of prescription glasses need evaluation to ensure that there are no unnecessary barriers to obtaining the appropriate refractive correction. Different low-cost spectacle schemes exist in each state and territory with complex associated paperwork and eligibility criteria that can act as impediments to accessible refractive correction.[12]

Australian outreach eye services need further evaluation to ensure accessibility and equity between the states and remoteness zones. The adequate provision of accessible eye care services is an important component in 'closing the gap' in vision loss for indigenous Australians. These services need to be provided in culturally appropriate facilities with clear links to the indigenous community to optimize access to care and reduce the prevalence of vision impairment.

References

1. Taylor HR, Fox SS, Xie J, Dunn RA, Arnold A-L, Keeffe JE. The prevalence of trachoma in Australia: the National Indigenous Eye Health Survey. *Med J Aust* 2010; **192**: 248–53.
2. Royal Australian College of Ophthalmologists. *The National Trachoma and Eye Health Program of the Royal Australian College of Ophthalmologists*. Sydney: RACO, 1980.
3. Stocks NP, Hiller JE, Newland H, McGilchrist CA. Trends in the prevalence of trachoma, South Australia, 1976 to 1990. *Aust N Z J Public Health* 1996; **20**: 375–81.
4. Mak DB, O'Neill LM, Herceg A, McFarlane H. Prevalence and control of trachoma in Australia, 1997–2004. *Commun Dis Intell* 2006; **30**: 236–47.
5. Jaross N, Ryan P, Newland H. Prevalence of diabetic retinopathy in an Aboriginal Australian population: results from the Katherine Region Diabetic Retinopathy Study (KRDRS). Report no. 1. *Clin Experiment Ophthalmol* 2003; **31**: 32–9.
6. Jaross N, Ryan P, Newland H. Incidence and progression of diabetic retinopathy in an Aboriginal Australian population: results from the Katherine Region Diabetic Retinopathy Study (KRDRS). Report no. 2. *Clin Experiment Ophthalmol* 2005; **33**: 26–33.
7. Lansingh VC, Weih LM, Keeffe JE, Taylor HR. Assessment of trachoma prevalence in a mobile population in Central Australia. *Ophthalmic Epidemiol* 2001; **8**: 97–108.
8. Taylor V, Ewald D, Liddle H, Warchiver I. *Review of the Implementation of the National Aboriginal and Torres Strait Islander Eye Health Program*. Canberra: Commonwealth of Australia, 2004.
9. Taylor HR. *Eye Health in Aboriginal and Torres Strait Islander Communities*. Canberra: Commonwealth of Australia, 1997.
10. Fox SS, Arnold A-L, Keeffe JE, Taylor HR. Sampling and recruitment methodology for a National Eye Health Survey of Indigenous Australians. *Aust N Z J Public Health* 2010; **34**: 554–62.
11. Studdert DM, Vu TM, Fox SS, Anderson IP, Keeffe JE, Taylor HR. Ethics review of multisite studies: the difficult case of community based Indigenous health research. *Med J Aust* 2010; **192**: 275–80.
12. Turner AW, Mulholland W, Taylor HR. Outreach Services in Australia, 2009. Available from: http://www.iehu.unimelb.edu.au/outreach_eye_services_in_australia_reports