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Original Article

Self-reported vision and health of indigenous Australians

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Abstract

Purpose: To describe the self-reported vision, history of eye disease and general health of indigenous Australian participants in the National Indigenous Eye Health Survey.

Methods: Using a multistage cluster sampling methodology, 30 geographic areas, stratified by remoteness, were selected to provide a representative population of indigenous Australians aged 5–15 years and 40 years and over. Before an eye examination, participants completed a questionnaire about their eye health and eye care facilities consulted, satisfaction with their vision and general health.

Results: A total of 1694 indigenous children (49.2% female, mean age 9.5 ± 2.9 years) and 1189 adults (61.0% female, mean age 53.1 ± 9.7 years) participated. Three-quarters of adults (259/342) and 88.4% of children (129/146) wore the right distance glasses. Adults from remote areas were less likely to have refractive error ($P = 0.002$) as well as males versus females ($P = 0.02$). Similar results were found for children. Adults wearing appropriate distance glasses were as satisfied with their vision as people with normal vision who did not need glasses ($P = 0.6$). Both groups were more satisfied with their distance vision than people with poor presenting vision ($P = 0.007$). Self-report of cataract, diabetic retinopathy, glaucoma and age-related macular degeneration did not match with clinical findings ($P < 0.001$). Over 37% of adults (417/1187) and 1.3% of children (22/1691) reported having diabetes.

Conclusion: The National Indigenous Eye Health Survey provided information to guide future planning of eye health prevention strategies for indigenous Australians. Findings indicate the importance of correcting refractive error to improve quality of life. Prevention messages should be renewed in appropriate sociocultural formats.

Key words: diabetes, eye health, indigenous Australian, population survey, prevention, refractive error, sun protection, vision.

Introduction

The National Indigenous Eye Health Survey (NIEHS) was undertaken to fill a 30-year gap in population-based information about eye health in the Australian indigenous population[1] and to provide an evidence base for the future development of eye care services. Although strategies were implemented to address the high rates of vision problems previously identified,[2,3] the dramatic increase in diabetic eye disease among indigenous Australians[4] and the ongoing presence of trachoma in at least some parts of the country[5] highlight the need for more current information.

Two recent population-based studies, The Melbourne Visual Impairment[6] and The Blue Mountains Eye Study[7] provided rich data about eye health and

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vision impairment (VI) in the mainstream Australian population. The National Aboriginal and Torres Strait Islander Health Survey, of more than 10 000 indigenous people in 2004–2005 found that about one in six people reported being hypermetropic and about one in ten people were myopic.[8] Although subsidized spectacles schemes exist to increase access of indigenous people to glasses,[2] there are little data regarding the use of corrective lenses among this population.

This article describes the sociodemographic characteristics, self-reported vision, the use of spectacles and satisfaction with vision of the NIEHS participants. Personal and family history of eye disease and general health are examined. It also described smoking habits, a risk factor for both age-related macular degeneration (AMD) and cataract. Sun protection, a protective factor for cataract, was measured as well.

Methods

Data from the 2006 National Census were used to delineate geographic areas that included approximately 300 indigenous people (range 200–400).[9] The sample sites were selected using the Australian Indigenous Geographic Classification into five strata: major city, inner regional, outer regional, remote and very remote. For this study, the very remote stratum was further divided into coastal and inland by the presence of a coastal boundary. This gave six strata. Within each stratum, indigenous areas were ranked by descending indigenous population and sampled proportional to size to give five sample areas in each thus giving 30 sites.

The recruitment strategies used varied to suit local communities, and have been described elsewhere (S Fox *et al*., under review, 2010).

Eligible participants were children aged 5–15 years and adults aged 40 years and over who self-identified as indigenous (Aboriginal and/or Torres Strait Islander) and resided in the survey site during the week data were collected.

The process to obtain ethical clearance for the survey has been previously described in detail.[10] The research was conducted in accordance with the tenets of the Declaration of Helsinki as revised in 2000. Initial ethical approval was obtained from the Human Research Committee of the Royal Victorian Eye and Ear Hospital (Melbourne, Victoria).

In November 2007, a pilot survey was conducted in a northern New South Wales (NSW) town. A total of 135 indigenous Australians of all ages were recruited. As a result of feedback received from the pilot study participants and other stakeholders (including Aboriginal health workers), the questionnaire was further modified to increase its relevancy for indigenous Australians. Test–retest reliability testing demonstrated acceptable stability.

Questionnaires

Participants were asked to complete a questionnaire before a vision examination using an E chart, visual field testing, trachoma grading and retinal photography. Standardized adult and child questionnaires were adapted from an assessment used in The Vision Initiative.[11] The adult questionnaire contained sociodemographic items: gender, age, language spoken at home and education. Items in the self-perceived eye health section included: history of vision problems, eye health services utilized, satisfaction with distance and near vision, use of corrective lenses, and personal and family history of four eye diseases (cataract, diabetic retinopathy, AMD and glaucoma). The question on current satisfaction with vision provided a measure of each participant's perceived adequacy of their vision. Combining self-perception and objective measure of vision gives indications of people's knowledge and awareness of eye health. Also, it reflects the capacity of eye care to meet people's needs. Four questions adapted from the Impact of Vision Impairment questionnaire were used to assess vision-related quality of life.[12] Questions on general health were chosen to elicit information on health indicators known to be associated with eye health: self-reported diabetes, smoking and sun protection (sunglasses and hat). Personal history of stroke was asked for vision examination purposes. The children's questionnaire consisted of demographic data (gender, age, language spoken at home), history of vision problems, services utilized, the use of distance vision corrective lenses, sun protection and self-reported diabetes. Figures 1 and 2 present the integral adult and children questionnaires.

Analysis

Data were entered into a database using Access Software (Microsoft Corporation, Redmond, WA, USA) and were analysed with STATA 10.0 (STATA Corporation, College Station, TX, USA). Differences in responses were examined using χ^2 Pearson's tests for categorical data (Fisher test for stratified samples less than $n = 5$), and Anova or Kruskal–Wallis for continuous data. Victoria ($n = 33$ children and $n = 29$ adults) and Tasmania ($n = 32$ and $n = 43$, respectively) were excluded from state-stratified analysis due to the small sample sizes. A P-value of less than 0.05 was considered significant. VI was defined as presenting visual acuity less than 6/12 in the better eye.

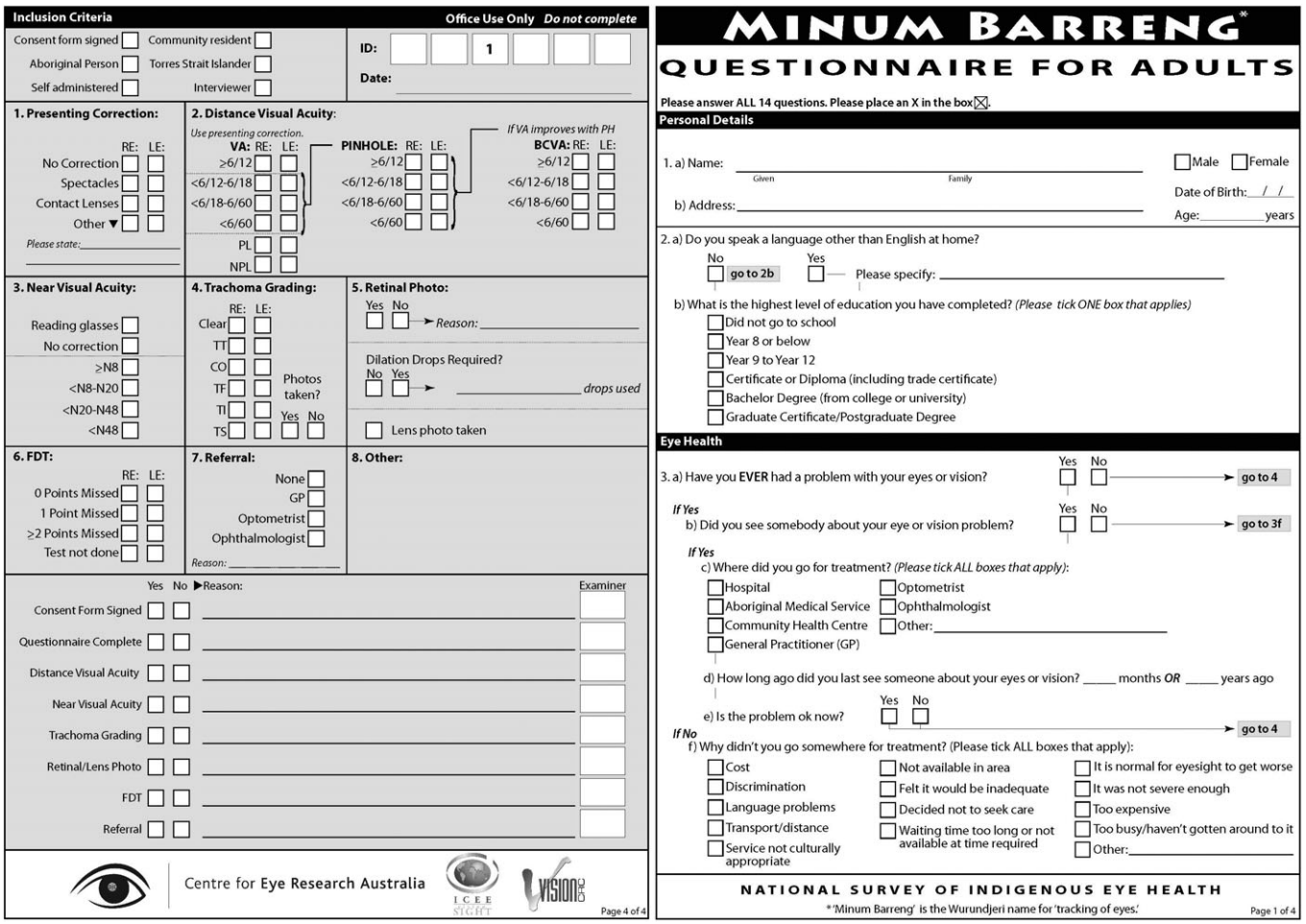

Figure 1. National Indigenous Eye Health Survey adult questionnaire form.

Results

A total of 2883 eligible indigenous people from the 30 sites were interviewed during 2008: 1694 children (84.4% of expected population identified by local authorities) and 1189 adults (71.8% of the expected population).

Sociodemographic characteristics

Of the 1694 children, 49.2% were female (834), with a mean ± standard deviation (SD) age of 9.5 ± 2.9 years. Among the adult participants, 60.8% were female (723/1189) and the mean ± SD age was 53.1 ± 9.7 years.

One-third of children (572/1686) and 41% of adults (487/1185) spoke another language than English at home. Consistent with census data,[8] the proportion of participants speaking only English at home decreased from urban (>90%) to very remote areas (<50%; $\chi^2(4) = 833$, $P < 0.001$). In NSW, 4% of participants spoke another language than English at home (20/523). In contrast, more than 95% of participants from the Northern Territory (NT) did so (423/442; $\chi^2(4) = 941$, $P < 0.001$).

Although 7% of adults had not attended school (80/1167), two-thirds reported having attended secondary school beyond Year 8 (717/1167). The level of education attained increased from very remote to urban areas ($\chi^2(5) = 42$, $P < 0.001$; Fig. 3). A positive correlation existed between speaking English at home and education level ($\chi^2(4) = 68$, $P < 0.001$).

Self-perceived vision and utilization of corrective lenses

Almost 60% of adults were satisfied with their distance vision, whether they normally wore distance vision glasses/lenses (183/307) or not (495/881). Over 65% of people wearing reading glasses were satisfied with their near vision (471/724). People who lived in more remote areas were more satisfied with their vision, irrespective of whether they wore glasses or not ($\chi^2(4) = 32$, $P < 0.001$).

Combining self-reported wearing of distance glasses and visual acuity examination with a

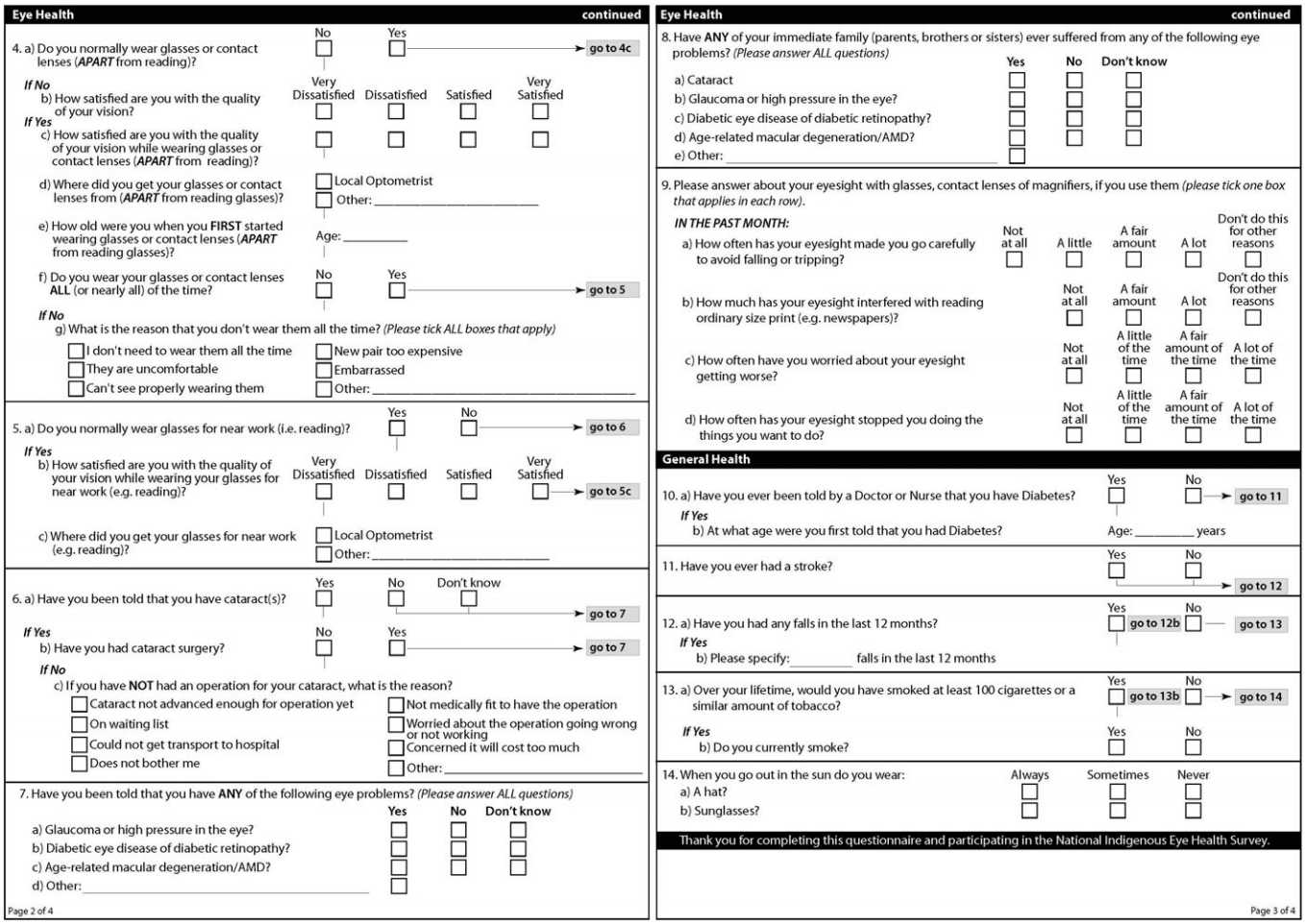

Figure 1. Continued.

pinhole, the prevalence of refractive error (RE) was 28.9% in adults (342/1185) and 8.7% in children (146/1686). Note that due to the examination procedures, our study did not specifically separate myopia and hypermetropia. In both groups, females were more likely to have RE than males (31.4% *vs.* 25.1% in adults, $\chi^2(1) = 6$, $P = 0.02$; and 10.5% *vs.* 6.9% in children, $\chi^2(1) = 7$, $P = 0.008$).

Moreover, the prevalence of RE increased significantly with ageing in female children whereas it did not in male children (Table 1).

Among those with RE, 80.4 % of adults wore the right correction (259/342) and 88.4% of children. The remaining people with RE were: undercorrected (8.2% of adults [28/342] and 2.7% of children [4/146]); non-corrected (i.e. not wearing glasses; 10.2% of adults [35/342] and 7.5% of children [11/146]); or living with VI not due to RE and wearing distance glasses (5.8% of adults [20/342] and 1.4% of children [2/146]).

In adults, the prevalence of RE varied significantly between regions, from 22.6% in very remote inland (47/208) regions to 42.0% in major cities (47/112; $\chi^2(5) = 16$, $P = 0.008$). No difference was found between regions and correction of RE (Fig. 4). Similar results were found for children ($\chi^2(5) = 17$, $P = 0.005$; Fig. 5).

Adults who had normal presenting distance visual acuity with their RE corrected with glasses were as satisfied with their distance vision (155/259, 59.9%), as those with normal vision who did not need glasses (461/795, 58.0%; $\chi^2(1) = 0.3$, $P = 0.6$). In comparison, those with poor presenting vision, whether from undercorrected RE (15/28, 53.6%), uncorrected RE (14/35, 40.0%) or from other causes (33/71, 46.5%), were significantly less satisfied with their vision ($\chi^2(1) = 7$, $P = 0.007$). These three last groups reported comparable satisfaction with distance vision ($\chi^2(2) = 1$, $P = 0.56$).

Seventy per cent of the adult participants (214/306) and 21.6% of children (29/134) reported wearing their glasses all the time. The most common reason for not wearing recommended distance glasses was the absence of a perceived need to wear

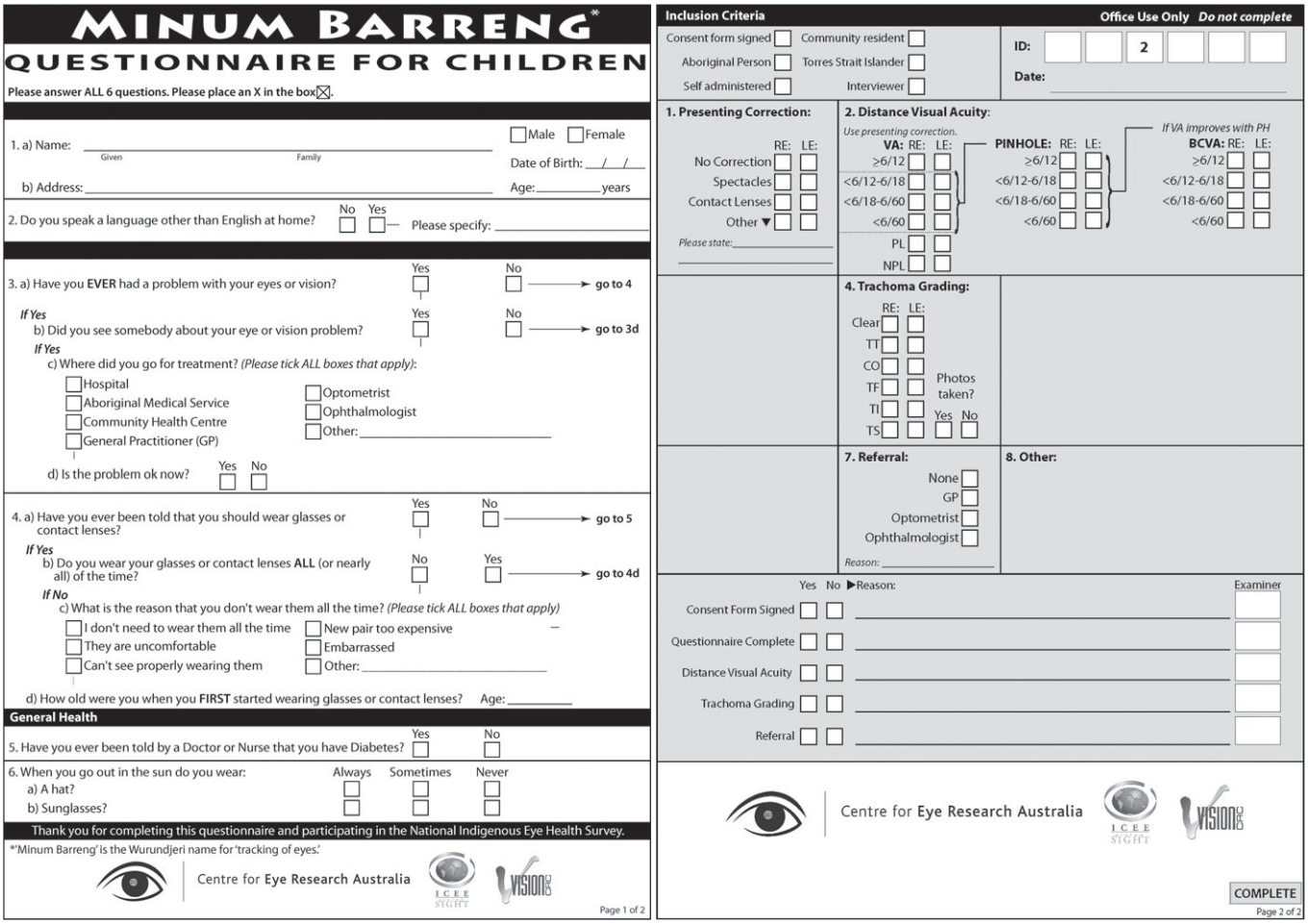

Figure 2. National Indigenous Eye Health Survey children questionnaire form.

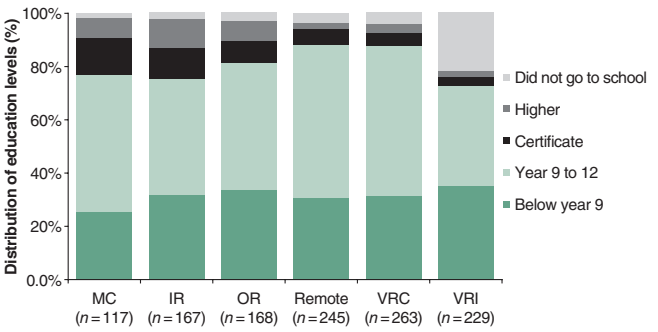

Figure 3. Education level of adults by region among National Indigenous Eye Health Survey adult participants ($n = 1167$). MC, major cities; IR, inner regional; OR, outer regional; VRC, very remote coastal; VRI, very remote inland.

them all the time (62.0% of adults [57/92] and 42.7% of children [42/103]). Embarrassment and discomfort were other important factors mentioned by children (13/103, 12.6% for both categories).

Sixty-one per cent of adults reported wearing reading glasses (725/1186). In major cities and regional areas, higher rates in the use of near vision glasses were reported (>65%) compared with remote and very remote areas (<60%; $\chi^2(5) = 16$, $P = 0.006$).

Table 1. Distribution of children with refractive error (combining corrected, undercorrected and uncorrected) by gender and age groups among the NIEHS child participants ($n = 1686$)

Age groups (years)	Female *n* (%)*	Male *n* (%)**
5–7 years	6/241 (2.5)	10/258 (3.9)
8–10 years	23/267 (8.6)	22/282 (7.8)
11–13 years	33/219 (15.1)	20/239 (8.4)
14–15 years	25/102 (24.5)	7/78 (9.0)
Total***	87/829 (10.5)	59/857 (6.9)

*$\chi^2(3) = 44$, $P < 0.001$; **$\chi^2(3) = 5$, $P = 0.15$; ***$\chi^2(1) = 7$, $P = 0.008$. NIEHS, National Indigenous Eye Health Survey.

History of eye disease

More than 21% of adults (258/1186) reported having at least one of the four following conditions:

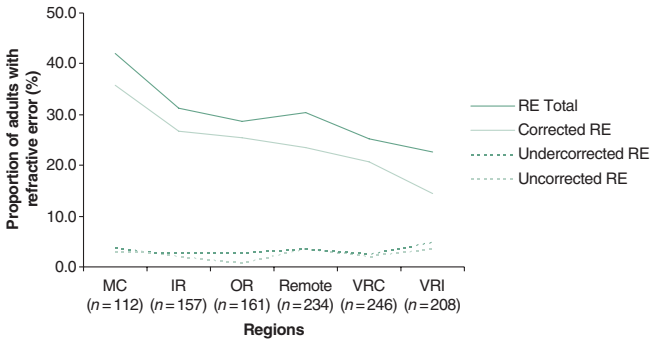

Figure 4. Distribution of adults with refractive error (corrected, undercorrected and uncorrected combined and disaggregated) by region among National Indigenous Eye Health Survey adult participants ($n = 1118$).

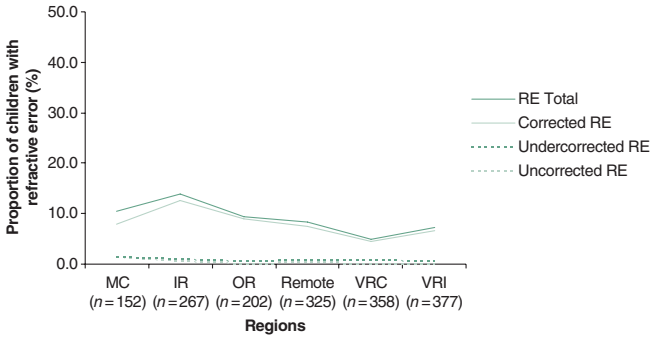

Figure 5. Distribution of children with refractive error (corrected, undercorrected and uncorrected combined and disaggregated) by region among National Indigenous Eye Health Survey child participants ($n = 1681$).

cataract (12.2%), diabetic retinopathy (9.5%), glaucoma (3.6%) and/or AMD (2.0%). This self-report only matched partly with the examination findings: more than half of the people who self-reported cataract (75/145) and diabetic retinopathy (55/102), and more than 85% of people who self-reported glaucoma (29/34) and AMD (21/23) were not diagnosed with the respective diseases in the current survey ($P < 0.001$, respectively). Inversely, 12 people out of 20 (60.0%) diagnosed with VI due to diabetic retinopathy did not report to be affected by the disease.

More than one-third (411/1185, 37.4%) of adults reported a family history of eye disease being either cataract (24.8%), diabetic retinopathy (17.1%), glaucoma (6.2%) and/or AMD (5.3%). A higher proportion of adults in urban and regional areas reported a family history compared with those living in remote and very remote settings ($\chi^2(1) = 46$, $P < 0.001$). Although there were no gender differences found in personal history of eye disease, fewer males than females reported a family history of cataract ($\chi^2(1) = 12$, $P < 0.001$) and diabetic retinopathy ($\chi^2(1) = 5$, $P = 0.03$; Table 2).

General health

Diabetes

Over 37% of adults reported having diabetes (417/1187) with no difference by gender. The median age at diagnosis of diabetes was 43 years (interquartile range = 37–50) and the average ± SD duration was 11 ± 9.3 years. Diabetes was reported by 1.3% of children (22/1691).

Tobacco use

Almost half of the adult population were current smokers (548/1189, 46.1%). Fewer women from very remote inland regions (42/142, 29.6%) were current smokers than from urban regions (142/294, 48.3%; $\chi^2(3) = 19$, $P < 0.001$).

Stroke

Almost 7% of adults reported a history of stroke (81/1186). This varied significantly among regions and peaked in remote areas (31/245, 12.7%; $\chi^2(5) = 19$, $P = 0.002$). There was no consistent trend in reported stroke with age (Table 3). The age-adjusted prevalence for the indigenous population was 7.23% (95% confidence interval: 7.21–7.25%). Overall, stroke was more common among men (41/466, 8.8%) than women (40/720, 5.6%; $\chi^2(1) = 5$, $P = 0.03$).

Sun protection

Over twenty per cent of children (366/1692, 21.6%) and adults (288/1181, 24.3%) reported never wearing sunglasses or a hat when in the sun (Table 4). Sun protection behaviours significantly differed among regions in both groups. In urban and regional areas, fewer people failed to protect their eyes in the sun in comparison with remote and very remote areas (children: 17.9% *vs.* 23.8%, $\chi^2(2) = 9$, $P = 0.01$; adults: 19.2% *vs.* 27.5%, $\chi^2(2) = 11$, $P = 0.003$). More participants in the NT failed to wear sun protection (101/244 children [41.4%] and 76/198 adults [38.4%]) compared with their counterparts in NSW (30/277 children [10.8%], $\chi^2(8) = 101$, $P < 0.001$; and 39/247 adults [15.8%], $\chi^2(8) = 71$, $P < 0.001$).

Discussion

The NIEHS has provided a better understanding of eye health and eye care utilization among

Table 2. Self-reported personal and familial medical history of cataract, diabetic retinopathy, glaucoma, and/or AMD among NIEHS adult participants, by gender (n = 1188, 466 male and 722 female)

Eye disease	Personal history			Family history		
	Male *n* (%)	Female *n* (%)	χ^2(1 df)/*P*-value	Male *n* (%)	Female *n* (%)	χ^2(1 df)/*P*-value
Cataract	55 (11.8)	90 (12.5)	0.1/0.7	90 (19.4)	204 (28.3)	12.2/<0.001
Diabetic retinopathy	49 (10.5)	64 (8.9)	0.9/0.3	65 (14.0)	137 (19.0)	5.0/0.03
Glaucoma	18 (3.8)	25 (3.5)	0.1/0.7	21 (4.5)	52 (7.2)	3.6/0.06
AMD	12 (2.6)	12 (1.7)	1.2/0.3	22 (4.8)	40 (5.6)	0.4/0.5
Any eye disease	107 (23.0)	151 (20.9)	0.7/0.4	130 (28.0)	281 (39.0)	15.3/<0.001

AMD, age-related macular degeneration; NIEHS, National Indigenous Eye Health Survey.

Table 3. Self-reported history of stroke among NIEHS adult participants, by gender and 5-year age group (n = 1186)

Gender	Age groups (years) *n* (%)							
	40–44	45–49	50–54	55–59	60–64	65–69	70–79	80+
Male (466)*	5 (4.9)	9 (8.1)	12 (12.8)	5 (7.9)	3 (7.3)	4 (11.4)	2 (10.0)	1 (20.0)
Female (n = 720)**	2 (1.3)	12 (8.0)	7 (5.0)	7 (6.8)	2 (2.6)	7 (15.2)	2 (4.8)	1 (10.0)
Total (n = 1186)	7 (2.8)	21 (8.4)	19 (8.1)	12 (7.2)	5 (4.3)	11 (13.6)	4 (6.0)	2 (13.3)

χ^2(7 df)/*P*-value: *5.0/0.7, **17.2/0.02. NIEHS, National Indigenous Eye Health Survey.

Table 4. Self-reported protection when going in the sun (hat and sunglasses) among NIEHS adult and child participants, by gender (n = 2873)

	Children (n = 1692)*		Adults (n = 1181)**	
	Male *n* (%)	Female *n* (%)	Male *n* (%)	Female *n* (%)
Never	166 (19.3)	200 (24.0)	68 (14.6)	220 (30.6)
Sometimes	674 (78.5)	619 (74.3)	316 (68.3)	440 (61.3)
Always	19 (2.2)	14 (1.7)	79 (17.1)	58 (8.1)
Total	859 (100.0)	833 (100.0)	463 (100.0)	718 (100.0)

*χ^2(2 df) = 51, P < 0.001; **χ^2(2 df) = 5.9, P = 0.053. NIEHS, National Indigenous Eye Health Survey.

indigenous Australians. Remarkably, the survey included 30 sites equally distributed across six remoteness regions, giving a representative sample of the indigenous population. Participation rates were good for adults (1189/1655, 71.4%) and very good for children (1694/2007, 84.4%). Furthermore, the gender and age distribution of adults, by remoteness region and secondary level education was consistent with the 2006 National Census.[8] A low proportion of NT participants (<5%) spoke only English at home. This may have lead to some misunderstanding of the questions, although local interpreters were used.

The prevalence of RE is known to vary considerably between ethnic groups and countries.[13] As with previous studies,[14] we found the overall prevalence of RE was low in both indigenous children and adults (<10% and <30%, respectively) compared with other ethnic groups. For example, myopia was reported to affect 12.8% of children aged of 12 years in the Sydney Myopia Study[15] and up to 77.5% of 15-year-old girls in Southern China.[16] RE was reported in 54.0% of mainstream Australian adults aged 40 and above.[17] Myopia was diagnosed in 34.6% of adults from rural India and up to 38.7% of Singaporean adults with Chinese background.[18]

Females were more likely to have RE. This gender difference has been already described in surveys conducted among people with different genetic backgrounds, either as a trend[13,19] or a real difference.[20] From a sample of 448 children aged of 12.7 years (range 11.1–14.4 years), the Sydney Myopia Study reported mainstream Australian girls were more likely to wear glasses (22.4% *vs.* 15.4% of boys, P = 0.002).[15]

The strong correlation between urban regions and higher rates of RE in the adult population could be explained partly by the acquisition of the European genes that predispose to myopia and partly by a changing lifestyle with children spending less time outdoors. Moreover, the proportion of people with the adapted correction does not vary across regions, suggesting that the access to spectacles is similar across regions.

People with poor presenting vision were more dissatisfied with their vision than those with normal presenting vision. Those who had the appropriate spectacles to restore their vision to normal were as satisfied with their vision as those who had normal vision without glasses. This shows the importance of correcting RE on indigenous adults.

In this study, only one-fifth of the children who had been prescribed glasses wore them appropriately. This should lead to messages on the necessity of wearing distance glasses all the time and acceptance of children with glasses in the community.

We showed that people overreported their history of eye diseases, although every effort was made to clarify any source of confusion, for example, high pressure in the eye was mentioned along with glaucoma in the questionnaire. Conversely, people were diagnosed with low vision due to eye diseases during this survey and were not aware of it. These findings raise questions about the adequacy of previous prevention messages, and the necessity of developing socially and culturally adapted information about health related to vision.

In this study, the proportion of indigenous people who reported a history of stroke was higher than the mainstream population. Based on self-reports from the 2007–2008 National Health Survey, the proportion of people who had cerebrovascular disease ranged from 0.6% for 45- to 54-year-olds to 8.0% for those over 75 years.[8] This concerning prevalence of stroke in the Australian indigenous population reflects the wide presence of risks factors leading to cardiovascular diseases such as diabetes and smoking. These figures are consistent with recent concerning reports about the health of indigenous people throughout the world.[21]

In contrast to expectations that children living in warmer climates, such as Queensland and NT would be more likely to use sun protection than children living in other states,[22] this study found that sun protection was less common in children from the NT than other states. SunSmart primary schools programmes were only established in NSW and NT in 2008, unlike other states that have been operating since 1993 (Cancer Council Victoria, National SunSmart Schools and Early Childhood Program. Melbourne, Victoria, pers. comm., 2009). As the school participation rate in SunSmart programmes varies significantly between states (from 17% to 86%) and general sun protection measures used differ between individual schools,[23] it is difficult to determine how much these policies influence child behaviour. However, optimal sun-protective behaviour (wearing both hat and sunglasses) was reported by only 2% of the children. There may be avenues to address sun protection, during school time at least. It is unclear whether indigenous sun-protective behaviours have changed. However, improved ocular protection against ultraviolet-B could significantly delay the need for cataract surgery and reduce health care expenditure.[24] The use of sun protection was less common among women than men in the study. Additional research may be valuable to understand this gender difference; and sun prevention programmes should be designed to address this issue.

The NIEHS provided information to guide future planning and provision of eye health prevention programmes for indigenous Australians. The study showed that the proper correction of RE is important to improve the satisfaction with vision and hence improve quality of life. This re-emphasizes the importance of providing adequate and accessible refractive services. Eye health knowledge should be improved in communities and preventive messages should be renewed in the appropriate format to the sociocultural context.

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References

1. Royal Australian College of Ophthalmologists. *The National Trachoma and Eye Health Program of the Royal Australian College of Ophthalmologists*. Sydney: Royal Australian College of Ophthalmologists, 1980.
2. Taylor V, Ewald D, Liddle H *et al*. *Review of the Implementation of the National Aboriginal and Torres Strait Islander Eye Health Program*. Canberra: Centre for Remote Health and Commonwealth of Australia, 2003.
3. Taylor H. *Eye Health in Aboriginal and Torres Strait Islander Communities. Report of a review commissioned by the Commonwealth Minister for Health and Family Services, the Hon Dr Michael Wooldridge*. Canberra: Commonwealth of Australia, 1997.
4. 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; **331**: 26–33.
5. Tellis B, Keeffe J, Taylor H. Trachoma surveillance annual report, 2007: a report by the National Trachoma

Surveillance and Reporting Unit. *Commun Dis Intell* 2007; **324**: 388–99.
6. VanNewkirk M, Weih L, McCarty C *et al*. Cause-specific prevalence of bilateral visual impairment in Victoria, Australia: the visual impairment project. *Ophthalmology* 2001; **1085**: 960–6.
7. Attebo K, Mitchell P, Smith W. Visual acuity and the causes of visual loss in Australia. The Blue Mountains Eye Study. *Ophthalmology* 1996; **1033**: 357–64.
8. Australian Bureau of Statistics. National Health Survey. Summary of results, 2007–2008 (Reissue): Cat no 43640 [Online]. 2009 [cited 2009 21 Sep]. Available from: http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/9FD6625F3294CA36CA25761C0019DDC5/$File/43640_2007-2008%20(reissue).pdf
9. Australian Bureau of Statistics. Experimental Estimates of Aboriginal and Torres Strait Islander Australians, Jun 2006: Cat no 3238.0.55.001 [Data table online]. 2006 [cited 2009 28 Jan]. Available from: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3238.0.55.001Jun%202006?OpenDocument
10. Taylor H, Fox S. Ethical hurdles in Indigenous research. *Aust NZ J Public Health* 2008; **325**: 489–90.
11. Ferraro J, Mazzoni L, Keeffe J *et al*. Evaluation of an eye health program: The Vision Initiative. *Ophthalmic Epidemiol* 2006; **132**: 137–5.
12. Hassel JB, Weigh LM, Keeffe JE. A measure of handicap for low vision rehabilitation: the impact of vision impairment profile. *Clin Experiment Ophthalmol* 2000; **28**; 156–61.
13. Gilbert CE, Ellwein LB. Prevalence and causes of functional low vision in school-age children: results from standardized population surveys in Asia, Africa, and Latin America. *Invest Ophthalmol Vis Sci* 2008; **493**: 877–81.
14. Taylor HR. Racial variations in vision. *Am J Epidemiol* 1981; **1131**: 62–80.
15. Robaei D, Kifley A, Rose K *et al*. Refractive error and patterns of spectacle use in 12-year-old Australian children. *Ophthalmology* 2006; **1139**: 1567–73.
16. He M, Zeng J, Liu Y *et al*. Refractive error and visual impairment in urban children in southern china. *Invest Ophthalmol Vis Sci* 2004; **453**: 793–9.
17. Wensor M, McCarty C, Taylor H. Prevalence and risk factors of myopia in Victoria, Australia. *Arch Ophthalmol* 1999; **117**: 658–63.
18. Wong TY, Foster PJ, Hee J *et al*. Prevalence and risk factors for refractive errors in adult Chinese in Singapore. *Invest Ophthalmol Vis Sci* 2000; **419**: 2486–94.
19. Krishnaiah S, Srinivas M, Khanna RC *et al*. Prevalence and risk factors for refractive errors in the South Indian adult population: the andhra pradesh eye disease study. *Clin Ophthalmol* 2009; **3**: 17–27.
20. Goh PP, Abqariyah Y, Pokharel GP *et al*. Refractive error and visual impairment in school-age children in Gombak District, Malaysia. *Ophthalmology* 2005; **1124**: 678–85.
21. Gracey M, King M. Indigenous health part 1: determinants and disease patterns. *Lancet* 2009; **4**: 65–75.
22. ABS. *Australian Social Trends, 1997: Health Status: Protecting the Health of Our Children*. (Catalogue no. 4102.0). Canberra: ABS, 1997.
23. Girgis A, Sanson-Fisher R, Tripodi D *et al*. Evaluation of interventions to improve solar protection in primary schools. *Health Educ Q* 1993; **20**: 275–87.
24. Dolin P, Johnson G. Solar ultraviolet radiation and ocular disease: a review of the epidemiological and experimental evidence. *Ophthalmic Epidemiol* 1994; **1**: 155–64.