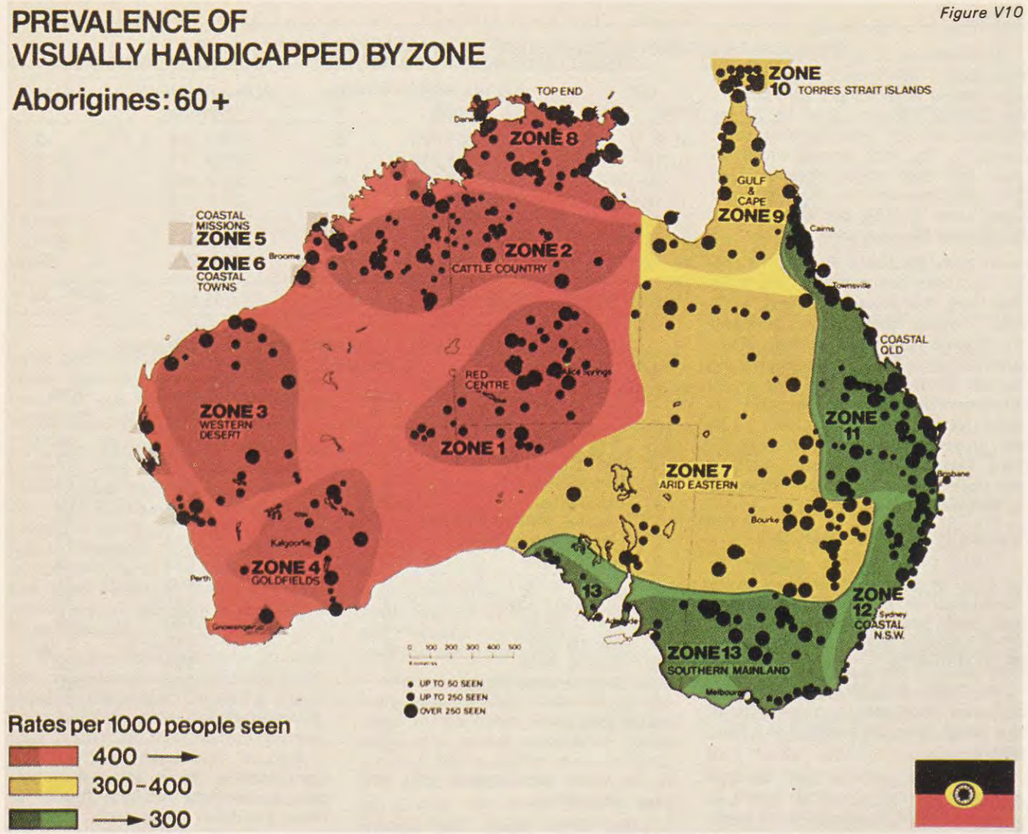
Figure V10



The four zones with the lowest rates of poor vision among the elderly were Zones 7, 11, 12 and 13, with rates ranging from 256 per thousand in the Southern Mainland zone (about one in four) to 323 in every thousand in Arid Eastern zone (about one in every 3). Fig. V.10 shows the geographical distribution of visually handicapped Aborigines aged 60 years or more.

SUMMARY

Throughout rural Australia, **good vision** in both eyes occurs for nearly all the young of both races. For children aged 0-9 years, only 12 in every thousand non-Aborigines and eight in every thousand Aborigines do not have such a high standard of vision. Eleven of every hundred young Aborigines and two of every hundred non-Aborigines have super sight: vision 6/2 or better.

As age advances, good vision is achieved by an increasingly smaller proportion of Aborigines and non-Aborigines. By age 20-29 , Aboriginal good vision rates fell below that for non-Aborigines in the same age group. For elderly Australians, approximately six in every 10 non-Aborigines and only four in every 10 Aborigines have good vision in both eyes.

Many of those without good vision may still have **satisfactory vision**: good vision in one eye. Almost all the young have satisfactory vision: 998 per thousand have satisfactory vision in the 0-9 age group.

In the 10-19 age group, 996 per thousand non-Aborigines have satisfactory vision, compared with 995 per thousand Aborigines in the same age group. The satisfactory vision rates fall for both racial groups with age, but fall more quickly and further for Aborigines. In old age, about eight out of 10 non-Aborigines and six out of 10 Aborigines have satisfactory vision.

Poor vision, that is, vision in one's better eye worse than 6/12 but better than 6/60, occurs for very few young rural Australians. Two in every thousand non-Aborigines under the age of 10, and one in every thousand Aborigines in the same age group are affected. In the 10-19 age group, the rates, though higher, (four per thousand in each racial group), are still low. Poor vision rates increased with age. Of those 60 years and over, 150 of every thousand non-Aborigines and 227 of every thousand Aborigines have poor vision.

Monocular blindness was defined as having one eye which was blind (6/60 or worse) with the other eye having good vision or poor vision (better than 6/60). For Aborigines, 27 in every thousand seen was monocularly blind, while the rate for non-Aborigines was 10 in every thousand. The condition was uncommon in the 0-9 and 10-19 age groups, being 2 and 7 respectively for Aborigines and 3 and 7 respectively for non-Aborigines.

With age the monocular blindness rates increased to reach 122 per thousand non-Aborigines in the 60+ age group and 193 in every thousand Aborigines in the same age group.

Blindness, vision no better than 6/60 in one's better eye, was very uncommon in young rural Australians. Under the age of 20, less than seven in every 10,000 Aborigines seen were blind while less than two in every 10,000 non-Aborigines were.

Blindness rates increased with age, dramatically for Aborigines. At 60 or more, 189 of every thousand Aborigines seen and 46 of every thousand non-Aborigines seen were blind.

A total of 60 blind non-Aborigines were seen, giving a blindness rate of less than two in every thousand. The estimated rate for all non-Aborigines in rural Australia is probably less than four per thousand.

With Aborigines, the blindness rate was 15 per thousand. The program saw 925 blind Aborigines: there may be as many as 1,500 blind Aborigines in rural Australia.

The visually handicapped, that is, those who are pensionably blind or who have poor vision, form a group who do not have good vision in either eye. Persons in this group could not, for example, pass a driving licence test. Overall, nine in every thousand non-Aborigines seen and 38 in every thousand Aborigines seen fell into this group.

The rate increased with age: in each racial group, two in every thousand children under the age of 10 was visually handicapped but by age 60 or more, 166 in every thousand non-Aborigines and 415 in every thousand Aborigines was visually handicapped.

The pattern of vision was the same for non-Aborigines in the different zones of Australia but there was considerable difference between the zones with Aboriginal vision. In all zones it may be said that the pattern of vision for young Aborigines was similar to and, in many cases, better than that for non-Aborigines.

In zones with lower overall rates of good and satisfactory vision and high rates of poor vision, monocular blindness and blindness for Aborigines, the deterioration of vision with age was more marked than in zones where the rates were closer to the non-Aboriginal rates. While good and satisfactory vision rates approached those found for non-Aborigines in some zones, particularly in the eastern and southern regions of Australia, in no zone did they equal them.

Blindness and visual handicaps among Aborigines are acquired with advancing years and occur more frequently in the zones to the centre, the west and the north-west of the continent. A detailed study of Aboriginal eye disease, and its associations zone by zone and age group by age group, is needed to give the basis of Aboriginal blindness.

Figures V11 and 12 show the prevalence of four vision categories for the total sample of Aborigines and non-Aborigines by age.

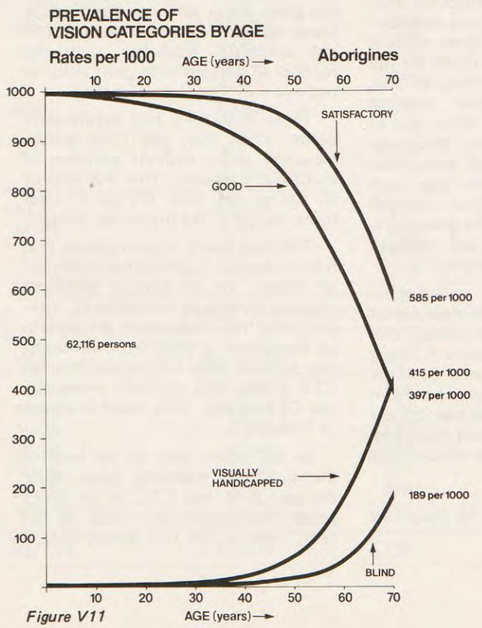


Figure V11

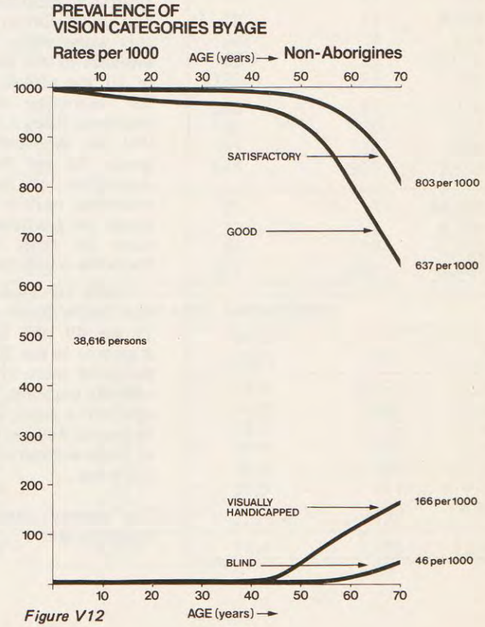


Figure V12

Chapter 7:

Trachoma and Vision

Trachoma and Visual Impairment

Trachoma is important not by its presence per se, but because of association or casual relationship to loss of vision. In this chapter we examine the relationship of trachoma to vision.

Trachoma is a public health problem because it is significantly associated with progressive visual loss and eventual blindness. The more severely a person has trachoma, in any age group, the more likely is that person to have such impairment.

Table TV1 shows the relationship between trachoma and visual impairment in Aborigines examined by the program.

Aborigines with and without cicatricial trachoma have the same trend of worsening vision with increasing age. As Table TV1 and the accompanying graphs show however, the trend for those with evidence of cicatricial trachoma is, especially from mid-adulthood on, to have considerably worse vision than those without evidence of the disease. From the age of 30, the gap also increases so that, for example, Aborigines without trachoma have a good vision rate of 943 per thousand in the 30-39 age group, 38 per thousand more than Aborigines of the same age with trachoma, while in the 60 and over age group, the gap between the good vision rates for those with and without trachoma is 230 per thousand.

While blindness rates among those with and without trachoma are similar to age 49, the rate for those with trachoma in the 50-59 group is 39 per thousand more than found in those without trachoma, and among persons aged 60 or more, the rate was 235 per thousand, 148 per thousand more than in those without evidence of cicatricial trachoma.

The severity categories for cicatricial trachoma are:

CTA (severe)
CTB (less severe)
and **CTC** (least severe).

The relationship between severity and visual loss for different age groups is shown in Table TV2.

Those with CTA were significantly more likely than any other group to have blindness or to be visually handicapped in each of the three age groups and overall. One in every five persons overall with CTA was blind, including more than one in every three people over the age of 60.

CTB also was significantly associated with reduced vision in persons aged 40 to 59 and in persons aged 60 or more. Overall, the blindness rate for persons with CTB was 32 per thousand, more than six times the rate found in persons without cicatricial trachoma, and more than 10 times the rate found in persons with CTC. There was no marked difference in the rates in persons under the age of 40, although the good vision rate was significantly lower than that found in persons without cicatricial trachoma, with the number of persons with good vision in one eye only significantly higher.

Those with CTC had significantly better vision than any other group, including those without evidence of cicatricial trachoma. This was true of all age groups, with the gap in rates being highest in the higher age groups.

This last result might indicate that mild cicatricial trachoma has no impact on vision, or, if any, a beneficial impact. It must be remembered, however, that the evidence of the pattern of prevalence is that, with increasing age, persons with CTC move into the CTB group, and, perhaps eventually the CTA group. This trend is shown in Table TV3.

In the above table 52 per cent of the cicatricial trachoma cases under the age of 40 had CTC; in the 40-59 group, the proportion is only 20 per cent; while in the 60+ group, only 7

TABLE TV1: VISION IN ABORIGINES AND CICATRICIAL TRACHOMA

AGE	Rates per thousand: CICATRICIAL TRACHOMA STATUS	VISUAL STATUS: GOOD	SATISFACTORY	VISUALLY HANDICAPPED	BLIND
0-9	Absent	988	977	3	1
	Present	980	995	5	2
10-19	Absent	981	994	6	1
	Present	978	996	4	1
20-29	Absent	959	991	9	2
	Present	996	994	6	1
30-39	Absent	943	987	13	4
	Present	905	984	16	4
40-49	Absent	895	970	30	12
	Present	820	957	43	12
50-59	Absent	778	900	100	15
	Present	671	863	137	39
60+	Absent	545	707	293	87
	Present	315	522	478	235
ALL AGES	Absent	950	979	21	5
	Present	826	907	93	41

TABLE TV2: VISION IN ABORIGINES AND CICATRICIAL TRACHOMA SEVERITY

AGE	Rates per thousand: CICATRICIAL TRACHOMA STATUS	VISUAL STATUS: GOOD	SATISFACTORY	VISUALLY HANDICAPPED	BLIND	SAMPLE
0-39	Absent	978	994	6	1	29,767
	CTC	974	996	4	1	6,065
	CTB	958	994	6	1	4,936
	CTA	879	963	37	12	562
40-59	Absent	848	942	58	13	3,338
	CTC	857	966	34	5	629
	CTB	771	932	68	19	2,018
	CTA	592	809	191	62	529
60+	Absent	545	707	293	87	1,190
	CTC	610	824	176	60	182
	CTB	386	607	393	158	1,408
	CTA	173	359	641	365	1,076
ALL AGES	Absent	950	979	21	5	34,295
	CTC	954	988	12	3	6,876
	CTB	817	914	86	32	8,362
	CTA	458	625	375	200	2,167

TABLE TV3: CICATRICIAL TRACHOMA BY SEVERITY BY AGE: ABORIGINES

AGE	NO SEEN	CTA	PER CENT	CTB	PER CENT	CTC	PER CENT
0-9	22,536	119	0.5	1,044	4.6	2,076	9.2
10-19	17,505	178	1.0	1,916	10.9	2,948	16.8
20-29	6,573	127	1.9	1,245	18.9	1,149	17.5
30-39	4,568	182	4.0	1,235	27.0	683	15.0
40-49	3,897	269	6.9	1,161	29.8	443	11.3
50-59	2,698	269	10.0	887	32.9	191	7.1
60+	3,923	1,092	27.8	1,425	36.3	183	4.6
TOTAL	61,700	2,236	3.6	8,913	14.4	7,673	12.4

per cent of the cicatricial trachoma cases had CTC.

If the pattern of prevalence found is an indication of the natural history of the disease in individuals, then there would seem strong evidence that CTC progresses with time to CTB.

Thus CTC itself might not impair vision, but, like follicular trachoma might be a base or stepping stone for further pathological changes in which visual impairment does occur.

Figure TV1

PREVALENCE RATES FOR GOOD VISION (6/12 or better) WITH AND WITHOUT CICATRICIAL TRACHOMA BY AGE

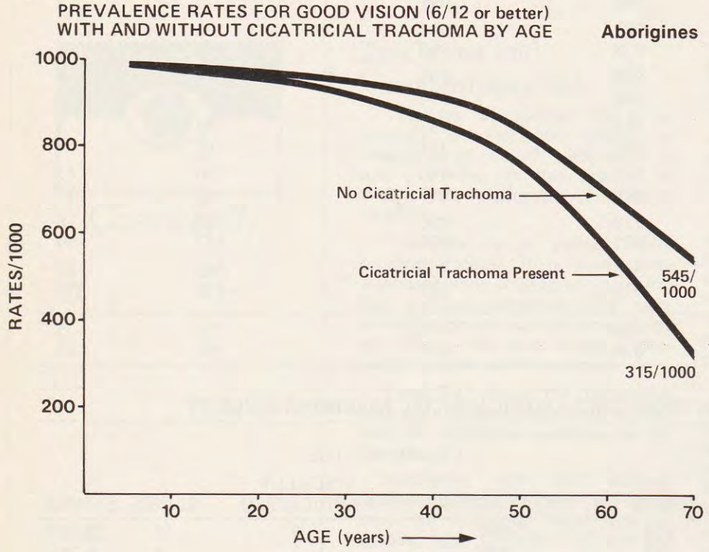
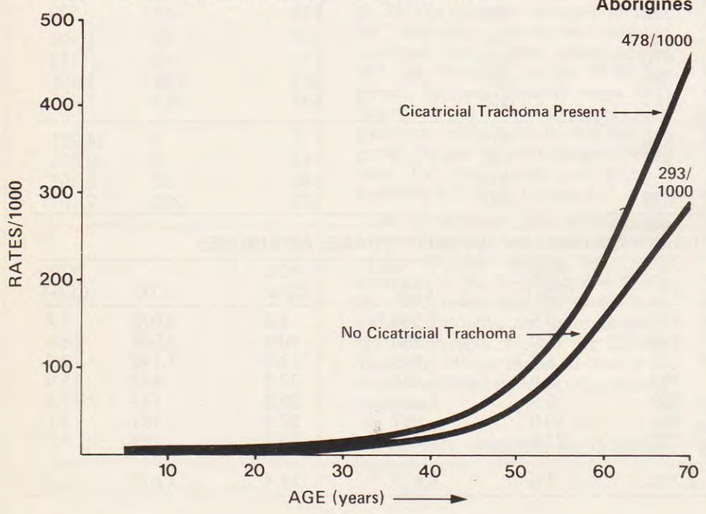


Figure TV2

PREVALENCE RATES FOR VISUALLY HANDICAPPED PERSONS WITH AND WITHOUT CICATRICIAL TRACHOMA



Most of the blindness cases associated with severe trachoma – CTA – came from three zones which can be seen in Table TV4.

These zones also had the highest prevalence rates for trachoma (see Chapter 5, Table T6). The zones were Zone 1 Red Centre, Zone 2 Cattle Country, Zone 3 Western Desert. In these, 747/1076, or 69 per cent, of the over 60-year-old Aborigines had CTA. These 747 persons formed only 747/3840, or 19 per cent, of the total 60+ age group, yet they provided 264/730, or 36 per cent of the Aboriginal blind aged 60+ seen by the program.

From all zones, CTA cases formed 1076/3846, or 28 per cent, of the over-60 population but provided 393/730, or 54 per cent, of the blind persons. In contrast the 1190/3846, or 31 per cent, of the old without signs of cicatricial trachoma provided only 103/730, or 14 per cent, of the elderly blind.

Not only is the blindness rate in these three zones highest in the areas of greatest trachoma prevalence but the proportion of blindness cases associated with severe and very severe cicatricial trachoma is highest in the zones of highest prevalence, next highest in the intermediate zones, and lowest in the zones of lowest prevalence.

How is cicatricial trachoma associated with visual loss? There appear to be two closely connected factors to be taken into account:

1. Some of the signs of cicatricial trachoma, most notably pannus formation but also conjunctival scarring and trichiasis, are directly involved in the development of corneal disease, particularly in corneal scarring. The presence of these signs alone may be a significant pointer to visual loss associated with corneal disease.
2. By causing conjunctival disease and by depriving the eye of the protection given by the conjunctiva, trachoma may assist in the development of other eye disease associated with visual loss.

Before examining the relationship between trachoma and corneal disease, the relationship between some of the signs of cicatricial trachoma and visual impairment will be considered.

Trachoma Pannus and Visual Impairment

As discussed in Chapter Four, one of the signs of trachoma is the development of a pannus, a white or cloudy area at the top cornea usually forming a crescent on the limbus. Pannus was measured according to width. (See Figure TOC 4, Chapter 4).

Pannus was seen to develop with age, as Table TV5 shows. Of children 0-9 seen, 8.1 per cent had a pannus 2mm wide or wider, with the prevalence of the condition steadily increasing with age until, of those over the age of 60 seen, 63.8 per cent were affected.

In this table, a pannus graded as 1, that is less than 2mm, was not considered, because the presence of a pannus of this size, in the absence of other cicatricial trachoma signs, is not regarded as sufficient evidence of trachoma. Thus those recorded as having pannus less than 2mm are counted as having no pannus.

Figure TV3

PREVALENCE RATES FOR BLINDNESS WITH AND WITHOUT CICATRICIAL TRACHOMA

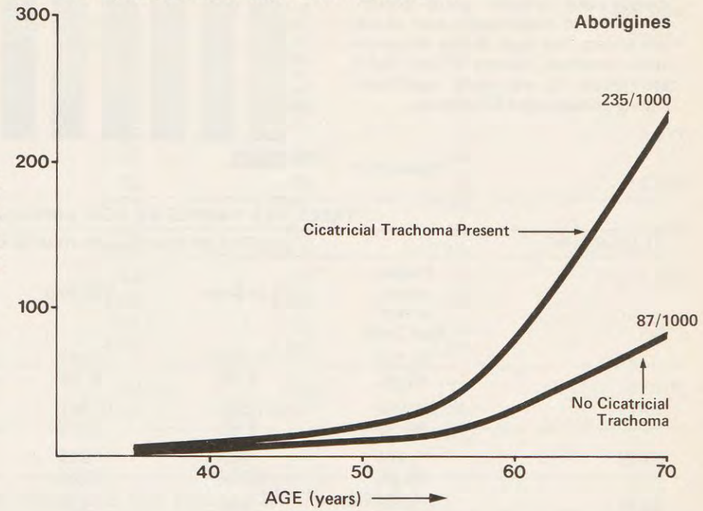


TABLE TV4: TRACHOMA AND BLINDNESS BY ZONE: ABORIGINES 60 AND OVER

ZONES	BLINDNESS (Rates per thousand) NO TRACHOMA	CTC	CTB	CTA	TOTAL
1, 2 & 3: Red Centre, Cattle Country and Western Desert	116	65	149	353	236
4, 5, 6, 7 & 8: Goldfields, Coastal Missions, Coastal Towns, Arid East & Top End NT	82	64	176	415	196
9, 10, 11, 12 & 13: Gulf and Cape, Torres Strait, Coastal Qld, Coastal NSW and Southern Mainland	84	48	257	244	101
ALL ZONES	87	60	158	365	190

It can be seen from Table TV5 that as the prevalence of pannus increases with age, so does the degree of pannus. Only 1 per cent of pannus seen in children aged 0-9 was of 5mm or more, for instance, the proportion was only a little higher in those aged 10-19, only marginally higher again in those aged 20-29, and only a little higher again in those aged 30-39. In those aged 40-49, 2.5 per cent had such a pannus; in the 50-59 age group, 3.8 per cent did, and, in the 60+ group, 9.4 per cent did.

If the trachoma pannus is wide enough to cross the visual axis of the eye, then it can be directly associated with blindness and visual impairment. But, as Table TV6 shows, even pannus less than 5mm – the width usually needed to cross the visual axis – can be associated with visual impairment, whether because of other associated trachoma pathology or because of distortion of the surface of the cornea.

This table, and the Histogram Figure TV4, show a highly significant association between the degree of pannus and reduced visual performance. When considered in each of the age groups, the high degree of association remained, except in the 10-19 age group. It was most significant among persons aged 60 or more.

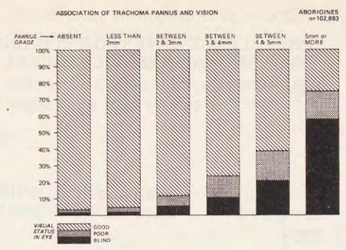


Figure TV 4

Trichiasis and Visual Impairment

Trichiasis (see Figure TOC 6, Chapter 4), was found to be extremely uncommon among the young but was seen to develop with age, being most common in the elderly. Table TV7 shows the pattern of trichiasis found in the worse eye of Aborigines in each of the age groups.

TABLE TV5: PANNUS BY AGE: ABORIGINES

AGE GROUP	WIDTH OF PANNUS IN WORSE EYE					
	Pannus absent or less than 2mm	2 to 3mm	3 to 4mm	4 to 5mm	5+mm	Total
0-9	20,719 91.9%	1,500 6.7%	253 1.1%	55 0.2%	17 0.1%	22,544
10-19	15,504 88.6%	1,538 8.8%	361 2.1%	78 0.4%	24 0.1%	17,505
20-29	5,474 83.2%	833 12.7%	215 3.3%	38 0.5%	13 0.2%	6,573
30-39	3,420 74.9%	840 18.4%	236 5.2%	56 1.2%	16 0.3%	4,568
40-49	2,717 69.7%	768 19.7%	300 7.7%	83 2.1%	30 0.8%	3,898
50-59	1,709 63.3%	604 22.4%	263 9.7%	84 3.1%	38 1.4%	2,698
60 & over	1,812 46.2%	935 23.8%	656 16.7%	321 8.2%	199 5.1%	3,923
ALL AGES	51,355 83.2%	7,018 11.4%	2,284 3.7%	715 1.2%	337 0.5%	61,709

TABLE TV6: TRACHOMA PANNUS AND VISUAL STATUS: ABORIGINES

PANNUS GRADE	VISUAL STATUS IN EYE			
	Good	Poor	Blind	Total
No pannus seen	54,036 96.6%	1,069 1.9%	812 1.5%	55,923
Pannus less than 2mm	27,539 95.0%	901 3.1%	557 1.9%	28,997
Between 2 and 3mm	10,731 88.1%	770 6.3%	685 5.6%	12,186
Between 3 and 4mm	2,999 76.2%	513 13.0%	423 10.7%	3,935
Between 4 and 5mm	686 61.6%	200 18.0%	228 20.5%	1,114
Five mm or more	184 25.3%	123 16.9%	421 57.8%	728
TOTAL EYES	96,175 93.5%	3,576 3.5%	3,132 3.0%	102,883

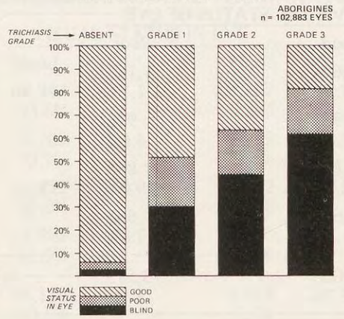
TABLE TV7: TRICHIASIS BY AGE: ABORIGINES

AGE GROUP	TRICHIASIS GRADE				
	Absent	1	2	3	Total Seen
0-9	22,541 99.9%	2 0.1%	1 0%	0 0%	22,544
10-19	17,995 99.8%	16 0.1%	2 0%	2 0%	17,505
20-29	6,551 99.7%	15 0.2%	5 0.1%	2 0%	6,573
30-39	4,519 98.9%	22 0.5%	18 0.4%	9 0.2%	4,568
40-49	3,822 98.1%	36 0.9%	25 0.6%	15 0.4%	3,898
50-59	2,607 96.6%	44 1.6%	25 0.9%	22 0.8%	2,698
60 and over	3,459 88.2%	181 4.6%	157 4.0%	126 3.2%	3,923
TOTAL SEEN	60,940 98.8%	350 0.6%	242 0.4%	177 0.3%	61,709

TABLE TV8: TRICHIASIS AND VISUAL STATUS: ABORIGINES

TRICHIASIS Grade	VISUAL STATUS IN EYE				
	Good		Poor	Blind	Total Seen
Trichiasis absent	95,524 94.0%		3,332 3.3%	2,794 2.7%	101,650
Grade 1	257) 49.6%)		111 21.4%	150) 20.0%)	518
Grade 2	126) 36.7%)	38%	66 19.2%	151) 44.0%)	41% 343
Grade 3	48) 19.0)		49 19.4%	156) 61.7%)	253
TOTAL SEEN	95,955 93.4%		3,558 3.5%	3,251 3.2%	102,754

Figure TV 5



Trichiasis is very closely related to visual impairment, as Table TV8 and Figure TV5 show.

Only 38.6 per cent, 431/1114, of the eyes seen with trichiasis had good vision in the eye with trichiasis, compared with 94 per cent of those without the condition; 457/1114 or 41 per cent of the eyes with trichiasis were blind, compared with 2.7 per cent of those without the condition.

This table is presented for all ages. The association was present, however, in each of the age groups, being most significant among those aged 60 or more, see Figure TV5. It was also significant in each of the 13 zones.

TABLE TV9: TRACHOMA SCARRING BY AGE: ABORIGINES

AGE GROUP	SCARRING STATUS IN WORST EYE				
	Scarring not present	Scarring just present	Scarring obviously present	Scarring grossly present	Total Seen
0-9	20,307 90.1%	1,710 7.6%	453 2.0%	74 0.3%	22,544
10-19	12,894 73.6%	3,401 19.4%	1,085 6.2%	125 0.7%	17,505
20-29	3,739 56.9%	1,954 29.7%	773 11.8%	107 1.6%	6,573
30-39	2,055 45.0%	1,568 34.3%	794 19.7%	151 3.3%	4,568
40-49	1,526 39.1%	1,367 35.1%	766 17.3%	239 6.1%	3,898
50-59	905 33.5%	994 36.8%	571 21.2%	228 8.5%	2,698
60 & over	823 21.0%	1,092 27.8%	1,062 27.1%	946 24.1%	3,923
TOTAL	42,249 68.5%	12,086 19.6%	5,504 8.9%	1,870 3.0%	61,709

Trachoma Scarring and Visual Impairment

As with pannus and trichiasis, the proportion of the Aboriginal population seen with trachoma scarring increased in each age group.

As Table TV9 shows, 9.9 per cent of those under the age of 10 had clinically detectable conjunctival scarring; 26.4 per cent of those aged 10-19 did and by age 60 or more, 79 per cent of those seen did.

The table also shows how the severity of scarring increases with age. In the youngest age group, only 0.3 per cent had gross scarring, while a further 2 per cent had obvious scarring. Both proportions were higher in each succeeding age group until, among Aborigines aged 60 or more, 24.1 per cent of those seen had gross scarring and a further 27.1 per cent had obvious scarring.

The prevalence pattern of scarring suggests that scarring which is initially relatively mild becomes progressively worse with age, while subclinical scarring becomes more apparent as people become older.

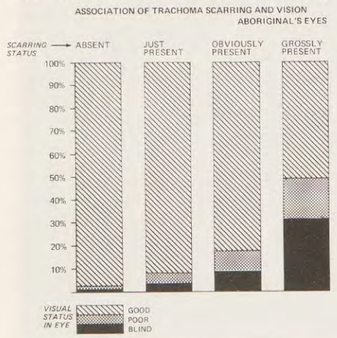
Trachoma scarring may affect vision in a number of ways. Firstly, one effect of scarring is to distort the membrane that sweeps across the eye with each blink, causing irritation and aggravating other corneal changes which are occurring as a result of trachoma. Secondly, an eyelid scarred by trachoma is unable to provide the eye with all the protection – against infection and irritation – that it needs; thus scarring can potentiate other eye infections or make worse other injuries or trauma to the eye. (See Figure TOC 5, Chapter 4).

TABLE TV 10: TRACHOMA SCARRING AND VISUAL STATUS: ABORIGINES

SCARRING STATUS	VISUAL STATUS OF EYE			
	Good	Poor	Blind	Total
Scarring not present	66,694 97.2%	1,167 1.7%	748 1.1%	68,609
Scarring just present	19,952 91.8%	993 4.6%	781 3.6%	21,726
Scarring obviously present	7,821 82.3%	858 9.0%	82 8.7%	9,503
Scarring grossly present	1,621 51.3%	561 17.8%	977 30.9%	3,159
TOTAL EYES SEEN	96,088 93.3%	3,579 3.5%	3,330 3.2%	102,997

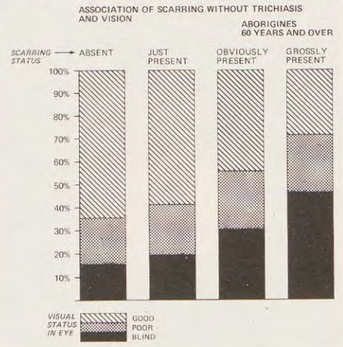
Table TV10 and the accompanying Figure TV6, show a significant relationship between trachoma scarring, and its degree, and reduced visual performance. This was a relationship found among each age group (although one significant only to the p = 0.05 level among 10-19 year old Aborigines) being most significant among persons aged 60 or more. It was significant in every zone, being most significant in the zones of highest trachoma prevalence.

Figure TV 6



Particularly among the elderly gross scarring of the eyelid was frequently accompanied by trichiasis. However, even when cases of gross scarring accompanied by trichiasis are excluded from consideration, a high degree of association between trachoma scarring and reduced visual performance remained, as shown by Table TV11 and Figure TV7, which consider the eyes of Aborigines 60 years and over.

Figure TV 7



Herbert's Pits and Visual Impairment

Herberts pits (see Figure TOC 7, Chapter 4) are regarded as being conclusive evidence of the existence of trachoma, but are generally regarded as having little effect on vision, or the subsequent course of the disease.

There is a significant relationship between the presence of Herberts pits and visual impairment, but it is significant only to the p = 0.025 level. Other cicatricial trachoma signs had probabilities associated with the relationship many times more significant. Table TV12 shows the association.

The association present is found only between Herberts pits and poor vision, there being a mild, but not significant, negative association between Herberts pits and blindness. This might be partly explained by the fact that people with trachoma who were blind may have had corneal pathology (associated with trachoma) which obscured any Herberts pits which had previously been visible.

TABLE TV 11: SCARRING WITHOUT TRICHIASIS AND VISUAL STATUS: ABORIGINES 60 YEARS AND OLDER

SCARRING STATUS	VISUAL STATUS OF EYE			
	Good	Poor	Blind	Total Seen
Scarring Absent	1,095 64.8%	336 19.9%	260 15.4%	1,691
Just present	1,310 58.5%	490 21.9%	439 19.6%	2,239
Obviously present	868 43.9%	508 25.7%	599 30.3%	1,975
Grossly present	279 28.5%	245 25.0%	456 46.5%	980
TOTAL SEEN	3,552 51.6%	1,575 22.9%	1,754 25.5%	6,885

TABLE TV12: HERBERTS PITS AND VISUAL STATUS: ABORIGINES

NUMBER OF HERBERTS PITS	VISUAL STATUS IN EYE			
	Good	Poor	Blind	Total
None	68,244 93.6%	2,367 3.2%	2,268 3.1%	72,879
1 to 3	7,707 93.9%	285 3.5%	213 2.6%	8,205
4 to 7	16,279 93.0%	702 4.0%	521 3.0%	17,502
8 or more	3,922 91.9%	220 5.2%	125 2.9%	4,267
TOTAL EYES	96,152 93.5%	3,574 3.5%	3,127 3.0%	102,853

Cicatricial Trachoma and Corneal Disease

Trachoma and corneal disease are very strongly related, as Table TV13 shows.

The corneal pathology referred to in Table TV13 does not include cases of trachoma pannus, a direct result of trachoma. It can be seen that while 1.8 per cent of the population without cicatricial trachoma have corneal disease, 2.4 per cent of those with mild cicatricial trachoma (CTC) do; 11.2 per cent of those with CTB do, and 36.7 per cent of those with CTA do. This association is highly significant.

The same association also very significant is found in non-Aborigines with cicatricial trachoma, as Table TV14 shows.

As with Aborigines, corneal disease was more prevalent where cicatricial trachoma was more severe. In this group, however, perhaps partly because of small number problems, the prevalence rate for corneal disease in persons with CTA was the same as that found in persons with CTB, while in Aborigines the prevalence of corneal disease in persons with CTA was more than three times that found in persons with CTB.

The major form of corneal pathology found to be associated with trachoma was the development of corneal scars and opacities. The nature of corneal disease and the epidemiological patterns associated with it will be discussed in another chapter. In this chapter, however, the strong association between corneal diesease and cicatricial trachoma needs to be mentioned. Damage to the cornea associated with trachoma provides the bulk of trachomatous blindness and visual loss.

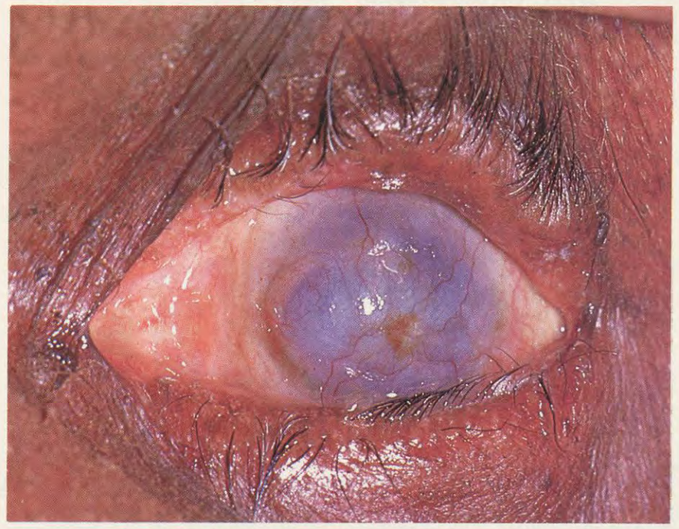


Figure TV 8 "An Aboriginal eye affected by corneal disease, the result being opacification or clouding-over of the cornea."

TABLE TV13: CICATRICIAL TRACHOMA AND CORNEAL DISEASE: ABORIGINES

CICATRICIAL TRACHOMA CATEGORY	CORNEAL DISEASE PRESENT Frequency	PER CENT	CORNEAL DISEASE ABSENT Frequency	PER CENT	TOTAL
Cicatricial trachoma absent	786	1.8	42,100	98.2	42,886
CTC	187	2.4	7,486	97.6	7,673
CTB	994	11.2	7,907	88.8	8,901
CTA	825	36.7	1,425	63.3	2,250
TOTAL	2,792	4.5	58,918	95.5	61,710

TABLE TV14: CICATRICIAL TRACHOMA AND CORNEAL DISEASE: NON-ABORIGINES

CICATRICIAL TRACHOMA CATEGORY	CORNEAL DISEASE PRESENT Frequency	PER CENT	CORNEAL DISEASE ABSENT Frequency	PER CENT	TOTAL
CICATRICIAL trachoma absent	227	0.6	37,835	99.4	38,062
CTC	4	2.9	135	97.1	139
CTB	14	7.7	168	92.3	182
CTA	5	7.7	60	92.3	65
TOTAL	250	0.7	38,198	99.4	38,448

Table TV15 shows the presence and absence of corneal disease and the trachoma status of Aborigines examined by the program who were visually handicapped, that is had vision in their best eye no better than 6/18.

Of the 1,616 Aborigines with both trachoma and visual handicaps, 720, or 44.6 per cent, had corneal disease. The proportion of these was lowest among those who had CTC, the highest in those who had CTA.

The proportion of persons with both trachoma and corneal disease is even higher when the worst of those in the table above are considered: the 644 people who are blind by the new international standard (those with vision no better than 3/60 in their better eye) are considered. Table TV16 shows the pattern found among this group.

More than half those with cicatricial trachoma of any category whose vision was 3/60 or worse had corneal disease. In the CTA group, this proportion was 67 per cent.

This different prevalence of corneal scars according to the various cicatricial trachoma categories is shown by Table TV17.

This table shows a marked relationship between the prevalence of corneal scars and opacities in the different age groups and the category of cicatricial trachoma found. Overall, the prevalence of corneal scars increased in every age group: the more severe the cicatricial trachoma, however, the greater the prevalence of corneal scars. Taking all age groups into consideration, 1.4 per cent of Aborigines without cicatricial trachoma had corneal scars and opacities; 2.1 per cent of those with CTC did; 9 per cent of those with CTB did, and 34.5 per cent of those with CTA did.

A similar pattern is also seen with the keratitis as shown by Table TV18. In the preparation of this table, trachoma pannus, itself closely related

TABLE TV15: VISUALLY HANDICAPPED ABORIGINES: TRACHOMA AND CORNEAL DISEASE

CICATRICIAL TRACHOMA CATEGORY	CORNEAL DISEASE PRESENT Frequency	PER CENT	CORNEAL DISEASE ABSENT Frequency	PER CENT	TOTAL
Cicatricial trachoma absent	89	12.5	625	87.5	714
CTC	8	9.9	73	90.1	81
CTB	233	32.3	489	67.7	722
CTA	479	58.9	334	41.1	813
TOTAL	809	34.7	1,521	65.3	2,330

TABLE TV16: TRACHOMA AND CORNEAL DISEASE AMONG ABORIGINES BLIND BY INTERNATIONAL STANDARD

CICATRICIAL TRACHOMA CATEGORY	CORNEAL DISEASE PRESENT Frequency	PER CENT	CORNEAL DISEASE ABSENT Frequency	PER CENT	TOTAL
Cicatricial trachoma absent	20	19.4	83	80.6	103
CTC	1	12.5	7	87.5	8
CTB	70	37.8	115	62.2	185
CTA	233	67.0	115	33.0	348
TOTAL	324	50.3	320	49.7	644

TABLE TV17: PREVALENCE OF CORNEAL SCARS IN CT CATEGORIES: ABORIGINES

CICATRICIAL TRACHOMA CATEGORY	AGE GROUPS 0–39	40–49	50–59	60 +	TOTAL ALL AGES
NO CT	363/38,280	68/2,024	59/1,351	102/1,223	592/42,878
Per cent	0.9	3.3	4.4	8.3	1.4
CTC	114/6,856	20/443	10/191	15/183	159/7,673
Per cent	1.6	4.5	5.2	8.2	2.1
CTB	268/5,440	138/1,161	121/887	272/1,425	799/8,913
Per cent	4.9	11.9	13.6	19.1	9.0
CTA	87/606	61/269	94/269	529/1,092	771/2,236
Per cent	11.9	22.7	34.9	48.4	34.5
TOTAL	823/51,182	287/3,897	284/2,698	918/3,923	2,321/61,700
Per cent	1.6	7.4	10.5	23.4	3.8

to cicatricial trachoma severity, is not considered.

The association of keratitis with age is not as clear as that observed with corneal scarring, but there is still a marked relationship between the presence of the condition and the severity of cicatricial trachoma. Taking all ages into consideration, one in every thousand people without any evidence of cicatricial trachoma was found to have keratitis; by comparison two in every thousand with CTC did; four in every thousand with CTB did and 16 in every thousand with CTA did.

With pterygia the association between the prevalence of the condition in various age groups and the various severity categories is not as marked as with other conditions. There is, however, a very significant association between trachoma and the condition — an association found in each of the age groups considered.

Phthisis bulbi means, literally, shrivelling of the eyeball while enucleation means the complete loss of the eyeball. The aetiology of these two conditions will be discussed in the next chapter; it is clear, however, from a study of Table TV20 that there is a significant association between these two conditions and cicatricial trachoma and its severity. This association is found in all age groups, and is most associated with CTA. One in every 15 people with CTA has either a shrivelled eyeball or has lost it altogether; in those aged 60 or more, one in every 10 has lost one or both eyes.

As with traumatic cataracts, a proportion of cases of phthisis bulbi and enucleation cases are caused by trauma and injury. Those with trachoma pathology, particularly severe trachoma pathology, appear from the table to be significantly more likely either to suffer the sort of injury likely to lead to enucleation or to lose the eyeball once such an injury is received.

TABLE TV18: PREVALENCE OF KERATITIS IN CT CATEGORIES: ABORIGINES

CICATRICIAL TRACHOMA CATEGORY	AGE GROUPS 0–39	40–49	50–59	60 +	TOTAL ALL AGES
NO CT	46/38,289	4/2,024	4/1,351	3/1,223	57/42,878
Per cent	0.1	0.2	0.3	0.2	0.1
CTC	11/6,856	2/443	0/191	0/183	13/7,673
Per cent	0.2	0.5	0	0	0.2
CTB	18/5,440	1/1,161	8/887	6/1,425	35/8,913
Per cent	0.3	0.3	0.9	0.4	0.4
CTA	10/606	1/269	8/269	17/1,092	36/2,236
Per cent	1.7	0.4	3.0	1.6	1.6
TOTAL	85/51,182	10/3,897	20/2,698	26/3,923	141/61,700
Per cent	0.2	0.3	0.7	0.7	0.2

TABLE TV19: PREVALENCE OF PTERYGIUM IN CT CATEGORIES: ABORIGINES

CICATRICIAL TRACHOMA CATEGORY	AGE GROUPS 0–39	40–49	50–59	60 +	TOTAL ALL AGES
NO CT	332/38,280	192/2,024	143/1,351	140/1,223	807/42,878
Per cent	0.9	9.5	10.6	11.4	1.9
CTC	106/6,856	48/443	33/191	23/183	210/7,673
Per cent	1.5	10.8	17.3	12.6	2.7
CTB	185/5,440	165/1,161	143/887	252/1,425	745/8,913
Per cent	3.4	14.2	16.1	17.7	9.1
CTA	21/606	34/269	34/269	136/1,092	225/2,236
Per cent	3.5	12.6	12.6	12.5	10.1
TOTAL	644/51,182	439/3,897	353/2,698	551/3,923	1,987/61,700
Per cent	1.3	11.3	13.1	14.0	3.2

TABLE TV20: PREVALENCE OF PHTHISIS BULBI AND ENUCLEATIONS IN CT CATEGORIES: ABORIGINES

CICATRICIAL TRACHOMA CATEGORY	AGE GROUPS 0–39	40–49	50–59	60 +	TOTAL ALL AGES
NO CT	36/38,280	7/2,024	8/1,351	15/1,223	66/42,878
Per cent	0.1	0.3	0.6	1.2	0.2
CTC	8/6,856	2/443	0/191	2/183	12/7,673
Per cent	0.1	0.5	0	1.1	0.2
CTB	18/5,440	15/1,161	19/887	63/1,425	115/8,913
Per cent	0.3	1.3	2.1	4.4	1.3
CTA	10/606	11/269	17/269	109/1,092	147/2,236
Per cent	1.7	4.1	6.3	10.0	6.6
TOTAL	72/51,182	35/3,897	44/2,698	189/3,923	340/61,700
Per cent	0.1	0.9	1.6	4.8	0.5

Trachoma and Monocular Blindness

Much of the discussion of trachoma has centred on its effects on both eyes; a person with trachoma pathology in one eye being likely to have similar pathology in his or her other eye. Aborigines with cicatricial trachoma also have significantly more monocular blindness than those without cicatricial trachoma, as Table TV21 shows.

Those with CTC have monocular blindness rates similar to or slightly below those without any signs of cicatricial trachoma in each of the age groups. However, for CTB and CTA in each age group over the 20-29 group, the rate was significantly higher than that found in those with cicatricial trachoma. The CTA rate was significantly higher than that found in those without evidence of cicatricial trachoma.

Thus cicatricial trachoma is not only associated with bilateral visual loss; it seems clearly associated with unilateral visual loss as well. Moreover, a person with monocular blindness at any age appears to have much the same prospect of having good vision in his other eye regardless of whether he or she has trachoma, as Table TV22 shows.

TABLE TV21: CICATRICIAL TRACHOMA AND MONOCULAR BLINDNESS: ABORIGINES

AGE	MONOCULARLY BLIND				
	NO CICATRICIAL TRACHOMA	CICATRICIAL TRACHOMA			
		CTC	CTB	CTA	TOTAL
0–9	33/11,073	8/1,527	4/772	4/81	49/13,453
Per cent	0.3	0.5	0.5	4.9	0.4
10–19	86/12,225	19/2,723	12/1,731	5/178	122/16,857
Per cent	0.7	0.7	0.7	2.8	0.7
20–29	88/4,024	20/1,137	22/1,219	6/123	136/6,503
Per cent	2.2	1.8	1.8	4.9	2.1
30–39	59/2,445	15/678	50/1,214	16/180	140/4,517
Per cent	2.4	2.2	4.1	8.9	3.1
40–49	71/2,006	13/439	75/1,147	31/266	190/3,858
Per cent	3.5	3.0	6.5	11.7	4.8
50–59	102/1,332	10/190	94/871	47/263	253/2,656
Per cent	7.7	5.3	10.8	17.9	9.5
60 +	177/1,190	27/182	289/1,408	269/1,076	762/3,856
Per cent	14.9	14.8	20.5	25.0	19.8
ALL	616/34,295	112/6,876	546/8,362	378/2,167	1,652/51,700
Per cent	1.8	1.6	6.5	17.4	3.2

TABLE TV22: CICATRICIAL TRACHOMA AND MONOCULAR BLINDNESS: STATUS OF OTHER EYE

AGE	CICATRICIAL TRACHOMA ABSENT: PROPORTION WITH GOOD VISION IN OTHER EYE		CICATRICIAL TRACHOMA PRESENT: PROPORTION WITH GOOD VISION IN OTHER EYE		TOTAL PROPORTION WITH GOOD VISION IN OTHER EYE	
		PER CENT		PER CENT		PER CENT
0–9	31/33	94	14/16	88	45/49	92
10–19	76/86	88	34/36	94	110/112	90
20–29	78/88	89	42/48	88	120/136	88
30–39	50/59	85	75/81	93	125/140	89
40–49	64/71	90	101/119	85	165/190	87
50–59	64/102	63	103/151	68	167/253	66
60 +	76/117	43	243/585	42	319/762	42
ALL AGES	439/616	71	612/1036	59	1051/1652	64

The table suggests the potentiating role for trachoma when injury or trauma occurs in the eye: most such injuries are unilateral. When trachoma is present blindness appears a much more likely result of eye injury than when it is not.

Sex Differences

As discussed in the chapter on the prevalence of cicatricial trachoma and shown by Table CT6, there was a trend, almost significant, for females to have higher prevalence of the two most severe cicatricial trachoma categories, with a significantly higher prevalence of CTA in females in each of the age groups from the age of 30 on.

How did this difference demonstrate itself in the vision rates found? Table TV23 shows the pattern found.

In each age group, more females without cicatricial trachoma appear in the better vision groups than males. There is little difference to age 59 other than that a higher proportion of women belong in the good vision category, but the higher levels of monocular good vision among males makes the satisfactory vision rates the same for both sexes.

SUMMARY

Aborigines with trachoma have a significantly greater prospect of reduced vision or blindness, especially in old age, than those without the disease. Of the 918 Aboriginal blind able to be graded for the presence of cicatricial trachoma, 719 or 78 per cent had signs of cicatricial trachoma.

Blindness was much more common in people with the most severe forms of cicatricial trachoma, with one in every five people with such signs being blind, including more than one in every three persons over the age of 60. It was next most closely related to the severe cicatricial trachoma category (CTB): about one in every 31 people having such signs being blind, including more than one in every seven Aborigines over the age of 60. Those with the mildest signs of cicatricial trachoma had blindness rates below that found in those without signs of cicatricial trachoma, but there was strong evidence in the prevalence pattern which showed that this category of cicatricial trachoma (CTC) was a transitional stage leading in later years to more severe pathology and visual loss. Overall, the blindness rate among those without cicatricial trachoma was five per thousand, compared with three per thousand among those with CTC, 32 per thousand among those with CTB and 200 per thousand among those with CTA. In the age group with the highest prevalence of blindness – those aged 60 or more – the blindness rate among those without signs of cicatricial trachoma was only a little more than a third of that found in people with cicatricial trachoma.

There was evidence, however, that trachoma might play a potentiating role with other eye disease capable of impairing vision; by robbing the eye of defence mechanisms, trachoma makes it easier for other conditions to establish themselves and cause loss of vision.

The major association between trachoma and other eye pathology was with corneal pathology: trachoma being associated with most of the corneal pathology seen. Even excluding the prevalence of trachoma pannus, itself significant, corneal pathology was found in 16.8 per cent of the Aboriginal population seen; 10.7 per cent of the Aboriginal population seen had corneal pathology associated with trachoma. In those with the most severe form of cicatricial trachoma, 36.7 per cent had corneal pathology. By comparison, 1.8 per cent of those without signs of cicatricial trachoma had corneal pathology.

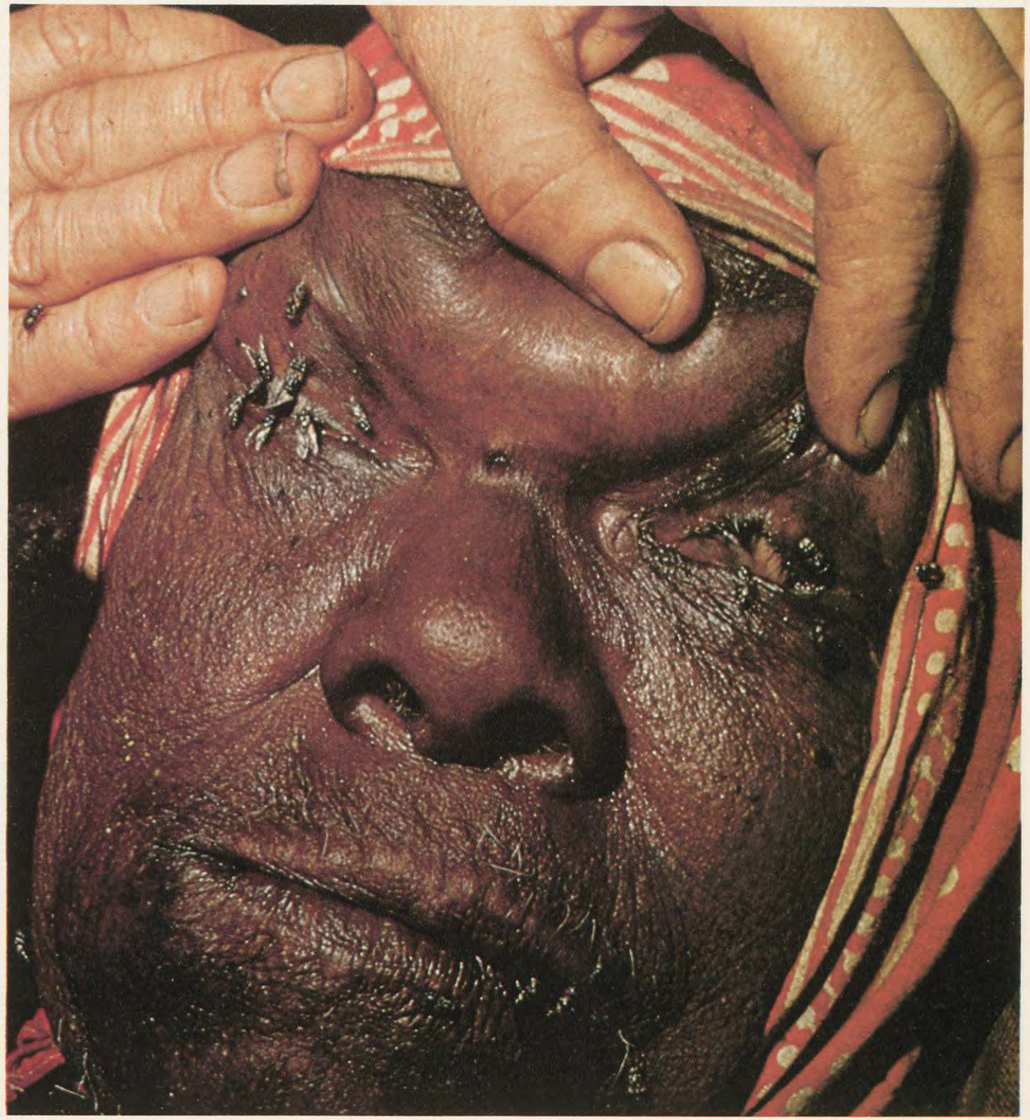
The major form of such corneal pathology was corneal scarring, found in 9.2 per cent of persons with signs of cicatricial trachoma but in only 1.4 per cent of those without such signs. Corneal scarring was seen to be more prevalent with age; but for those showing signs of trachoma, the prevalence of corneal scars was higher in every age group, with a widening gap with each age, than that found among those with trachoma.

The mechanism of trachomatous blindness and reduced vision due to trachoma was thus primarily due to its corneal involvement. More than half the Aboriginal blind had significant corneal disease. Much of this might not have happened but for the presence of trachoma.

TABLE TV23: VISION AND CICATRICIAL TRACHOMA BY SEX: ABORIGINES

AGE	SEX	CT STATUS	VISION GROUPS (rates per thousand) Good	Satisfactory	Handicapped	Blind
0–39	Males	Absent	977	994	6	1
	Females	Absent	978	995	5	1
	Males	Present	959	992	8	2
	Females	Present	966	994	6	1
40–59	Males	Absent	833	942	58	12
	Females	Absent	863	942	58	14
	Males	Present	751	919	81	19
	Females	Present	765	916	84	27
60 +	Males	Absent	499	685	315	101
	Females	Absent	594	730	270	71
	Males	Present	317	547	453	220
	Females	Present	314	499	501	248
ALL AGES	Males	Absent	939	977	23	6
	Females	Absent	954	981	19	4
	Males	Present	820	876	124	39
	Females	Present	831	905	95	43

Figure TV 9 "An Aboriginal woman blinded by trachoma."



Chapter 8:

Visual System Abnormalities in Rural Australia

While examining persons for signs of trachoma, program eye doctors often noted abnormalities of the eye, its surrounding tissue, and its connections with the nervous system. Not all the abnormalities seen were listed, especially early in the program's field activities when clinical field work was less efficiently organised than later. When a person being examined failed to achieve 6/6 vision or better – average vision – a search was made for the cause of the failure and the abnormalities found were listed.

Findings were coded for computer analysis according to the International Code of Eye Disease (International Council of Ophthalmology 1975). The findings were recorded for each eye. Up to five pathologies were able to be recorded; for some this involved the selection of the five most significant abnormalities, because others were also present. The findings presented in this report will be affected by the tendency for abnormalities to be less commonly noted when vision in each eye was 6/6.

Although the recording of abnormalities which are not presently affecting vision may provide information about later loss of vision, and give clues to basic causes of eye abnormalities, the essential logic is the link between visual system abnormalities and visual system function - vision.

It is useful to consider ocular abnormalities in relation to vision, but to precede such a consideration with an overall view of the listed ocular abnormalities and an explanation of some aspects of specific items.

Table VSA 1 shows that a total of 22,173 pathologies or abnormalities were listed in a total of 15,202 of the 100,732 persons considered in this report.

For Aborigines, 16,668 abnormalities were listed in 11,086 people: 82 per cent of Aborigines seen had no abnormalities listed. For non-Aborigines, 5,505 pathologies were seen in 4,116 persons: 89 per cent of non-Aborigines had no abnormalities listed.

TABLE VSA 1: PATHOLOGY DISTRIBUTION

ABORIGINES

Age	Persons with at least one Pathology	Number of Pathologies Found	Persons without Pathology	Total Persons Seen
0–29	2,748	3,355	44,177	46,925
30–39	1,196	1,568	3,394	4,590
40–49	2,246	3,160	1,667	3,913
50–59	1,850	2,827	866	2,716
60+	3,046	5,758	926	3,972
ALL AGES	11,086	16,668	51,030	62,116

NON-ABORIGINES

0–29	2,059	2,511	31,560	33,619
30–39	453	549	1,524	1,977
40–49	566	737	683	1,249
50–59	453	673	414	867
60+	585	1,035	319	904
ALL AGES	4,116	5,505	34,500	38,616
TOTALS	15,202	22,173	85,530	100,732

In Table VSA 2 the category of abnormality found is listed in order of rate per thousand people seen.

Some explanation of this and following pathology tables is necessary, and reference to Figure VSA 1 may be useful for persons unfamiliar with the anatomy of the eye and visual system.

1. **Corneal abnormalities**: of the 18 possible classifications of corneal abnormalities, corneal scars and opacities were the most common. For Aborigines, 3,112 corneal pathologies were listed, of which 65 per cent were corneal scars and opacities, 14 per cent were cases of Labrador Keratopathy (Lab K) – Climatic Droplet Keratopathy (C.D.K.) – 12 per cent were keratitis cases (excluding trachoma pannus), and 5 per cent deposits and pigmentations. For non-Aborigines, 271 corneal pathologies were listed: of these, 49 per cent were scars and opacities, 13 per cent cases of keratitis, 4 per cent degenerations including Lab K, and 23 per cent deposits and pigmentations.

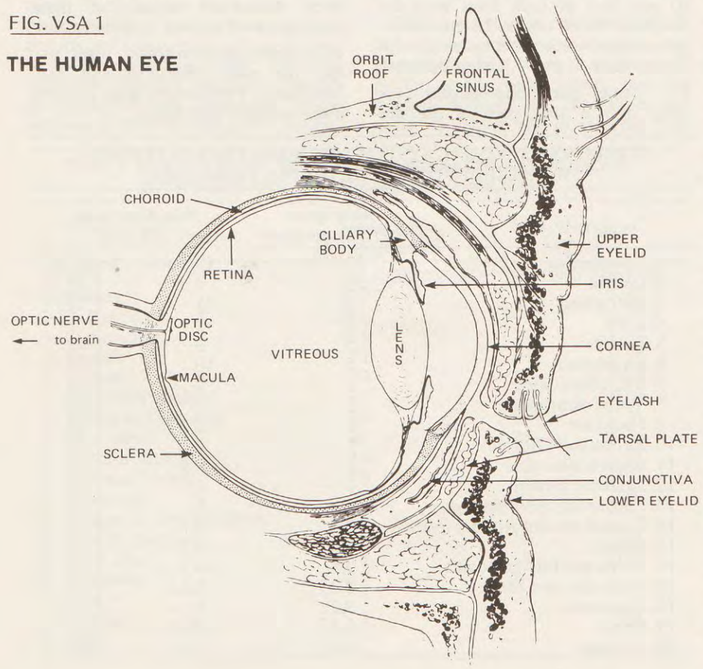
TABLE VSA 2: VISUAL SYSTEM ABNORMALITIES RATES PER THOUSAND

	Aborigines (62,116 persons)	Non-Aborigines (38,616)	
1. Cornea	49/1000	7/1000	(rank 6)
2. Conjunctiva	43	21	(2)
3. Lens	36	8	(5)
4. Refraction	29	39	(1)
5. Eyelids	10	10	(4)
6. Strabismus	9	14	(3)
7. Eyeball	6	2	(13)
8. Iris, ciliary body	5	2	(11)
9. Visual disturbance	4	5	(7)
10. Retina and Choroid	3	3	(8)
11. Lacrimal System	2	1	(14)
12. Congenital Abnormalities	1	2	(10)
13. Neoplasm	1	2	(9)
14. General Disorders	1	1	(15)
15. Optic disc and pathways	1	0.5	(16)
16. Glaucoma	1	2	(12)
17. Sclera	1	0.2	(18)
18. Burns and foreign bodies	0.5	0.5	(17)
19. Orbit	0.2	0.02	(20)
20. Vitreous	0.2	0.2	(19)

2. **Conjunctival abnormalities** (other than signs of trachoma): the most common listed were pterygia, see Figure VSA 17, and acute conjunctivitis. For Aborigines, 2,700 persons had conjunctival abnormalities, of which 74 per cent were pterygia and 11 per cent acute conjunctivitis cases. There were 812 non-Aborigines listed as having conjunctival abnormalities: 50 per cent were pterygia and 20 per cent cases of acute conjunctivitis.

FIG. VSA 1

THE HUMAN EYE



3. **Disorders of the lens**: these included cataract (opacification of the lens), see Figure VSA 18; aphakia (absence of the lens) and subluxation (displacement of the lens). There were 2,312 Aborigines listed as having lens abnormalities: 48 per cent had senile cataract, 7 per cent had pseudoexfoliation of the lens, and 16 per cent had aphakia or subluxation of the lens. Six per cent of the cases involved traumatic cataract. and 7 per cent congenital cataract. Among non-Aborigines, there were 334 persons with lens abnormalities: 58 per cent had senile cataract, 3 per cent had pseudoexfoliation of the lens, 19 per cent had aphakia or subluxation, and 4 per cent had congenital cataract.

4. **Refraction abnormalities (excluding presbyopia)**: 1,813 Aborigines had refractive abnormalities listed: 39 per cent were recorded as having hypermetropia (long sightedness), 31 per cent myopia (short sightedness) and 30 per cent astigmatism. There were 1,509 non-Aborigines listed as having refractive abnormalities: 29 per cent were hypermetropia, 38 per cent myopia and 32 per cent astigmatism.

5. **Eyelid abnormalities** were mostly entropion and blepharitis. There were 652 Aborigines listed in this category: 31 per cent for inflammation blepharitis. There were 385 non-Aborigines listed: 72 per cent had blepharitis.

6. **Strabismus (squint or abnormal alignment of the eyes)**: 558 Aborigines were affected, of whom 61 per cent were divergent and 20 per cent convergent. There were 527 non-Aborigines affected: of these 37 per cent were divergent and 40 per cent convergent.

7. **Eyeball abnormalities:** 377 Aborigines were listed as having eyeball abnormalities: 92 per cent of these involved phthisis bulbi (shrivelling of the eye) or enucleations (complete loss of the eyeball). There were 54 non-Aborigines listed as having eyeball abnormalities: 44 per cent involved phthisis or enucleation.

8. **Iris and ciliary body abnormalities:** 316 Aborigines had these listed, with 54 per cent of cases being traumatic mydriasis. For non-Aborigines, there were 66 listings, of which 41 per cent were for traumatic mydriasis.

9. **Visual disturbances:** 250 Aborigines were listed as having visual disturbances: 72 per cent of these were for amblyopia and 18 per cent for nystagmus. There were 211 non-Aborigines listed: 76 per cent of these cases were for amblyopia and 15 per cent nystagmus.

10. **Retinal and Choroidal abnormalities:** 213 Aborigines were listed in this category: 33 per cent of these for macular degeneration (a retinal abnormality usually in old people and thought to be due to an inherited tendency), 15 per cent for diabetic retinopathy, and 11 per cent for choroidal or retinal scars. Another 14 per cent of these cases involved retinal detachments, and hereditary retinitis pigmentosa accounted for 2 per cent. There were 94 retinal or choroidal abnormalities listed in non-Aborigines: 56 per cent for macular degeneration, 6 per cent for diabetic retinopathy, 19 per cent for retinal detachment and 13 per cent for retinitis pigmentosa.

11. **Lacrimal system:** This system includes the tear-producing gland and the tear drainage passages. There were 106 Aborigines listed as having lacrimal system abnormalities: 38 per cent of these were for epiphora (spilling of tears over the face, watering eye). 30 per cent for chronic infection of the tear-drainage passages, and 17 per cent for blockage of the tear-draining system. See figure VSA 19. There were 30 non-Aborigines listed for lacrimal system abnormalities: 50 per cent for epiphora and 10 per cent for blockage of the tear-drainage system.

12. **Congenital abnormalities:** 80 Aborigines were listed: 35 per cent for congenital cataract and 25 per cent for congenital abnormalities of the iris. There were 68 non-Aborigines listed: 21 per cent for congenital cataract and 35 per cent for congenital abnormalities of the iris.

13. **Neoplasia:** 77 Aborigines were listed: none had malignant neoplasms, 36 per cent had benign tumours of the skin of the eyelids. There were 71 non-Aborigines listed: 3 per cent had malignant neoplasms of the eyelids, and 3 per cent malignant neoplasms of the conjunctiva. The remainder were benign tumours: 27 per cent of the cases listed under this heading were on the skin of the eyelid; 39 per cent on the conjunctiva and 20 per cent being benign intra-ocular tumours.

14. **General disorders:** 74 Aborigines were listed as having general disorders: 80 per cent of such cases were for diabetes. There were 22 non-Aborigines listed under this heading, with 59 per cent of these having diabetes.

15. **Optic disc abnormalities** (the optic disc is that part of the eye where it is joined to the optic nerve.) There were 64 Aborigines listed as having optic disc abnormalities with 62 per cent of cases being of optic atrophy. There were 19 non-Aborigines listed with optic disc abnormalities, with 58 per cent of cases involving optic atrophy.

16. **Glaucoma:** Glaucoma is an eye condition in which the pressure within the eye is increased: it is referred to as primary when it is due to an inherited tendency, or secondary when it occurs in association with or due to eye abnormalities such as injury or infection. There were 57 cases involving Aborigines in this category: 19 per cent were said to be primary (all open angle), 25 per cent were glaucoma suspects, and 53 per cent were for secondary glaucoma. There were 59 non-Aborigines listed: 12 per cent for primary glaucoma, 73 per cent as glaucoma suspects, and 8 per cent for secondary glaucoma.

17. **Scleral abnormalities:** were infrequent for both groups.There were 41 Aborigines listed, 90 per cent as having episcleritis, and six non-Aborigines, 75 per cent as having episcleritis.

18. **Burns and foreign bodies:** these were infrequent in both groups, with 25 Aborigines and 20 non-Aborigines listed. About 60 per cent of these cases involved corneal foreign bodies.

19. **Orbit abnormalities:** were also rare for both Aborigines and non-Aborigines. Twelve Aborigines and one non-Aborigine were listed.

TABLE VSA 3: VISUAL SYSTEM ABNORMALITIES IN PERSONS WITH GOOD VISION – RATES PER THOUSAND

	Aborigines (57,327 persons)	Non-Aborigines (37,459)	
1. Conjunctiva	32/1000	19/1000	(rank 2)
2. Cornea	22	4	(5)
3. Refraction	19	31	(1)
4. Lens	5	2	(7)
5. Eyelids	5	9	(4)
6. Strabismus	5	10	(3)
7. Iris, ciliary body	2	1	(12)
8. Visual disturbance	1	2	(6)
9. Neoplasm	1	2	(8)
10. Retina and Choroid	1	1	(11)
11. General disorders	1	0.5	(16)
12. Lacrimal system	1	1	(13)
13. Congenital abnormalities	1	1	(9)
14. Eyeball abnormalities	0.5	0.5	(14)
15. Sclera	0.5	0.2	(18)
16. Burns and foreign bodies	0.5	0.5	(15)
17. Optic disc and nerve	0.25	0.25	(17)
18. Glaucoma	0.2	1	(10)
19. Orbit	0.1	0.02	(20)
20. Vitreous	0.05	0.1	(19)

20. **Vitreous abnormalities:** were also very rare, with 10 Aborigines and eight non-Aborigines listed.

Table VSA 2 gives an overview of the frequency of abnormalities found. It gives, however, no real information as to the significance of the abnormality in relation to a vision-affecting process. There are certain significant differences in prevalence rates between the two racial groups. Abnormalities more likely to occur on a hereditary basis, for example, refractive disorders, strabismus, glaucoma and retinal abnormalities, were noticeably less prevalent in the Aboriginal group. However, abnormalities more likely to be acquired independently of inheritance, such as corneal, conjuctival and lens abnormalities, were much more frequent in the Aboriginal group.

Table VSA 3 shows the visual system abnormalities found in persons listed as having good vision, that is vision of 6/12 or better in both eyes. This good vision group quite obviously shows the lowest prevalence rates for each abnormality group. The presence of the abnormalities was, at the time of examination, compatible with good vision.

Aborigines in the good vision group had higher rates than non-Aborigines for conjunctival, corneal and iris and ciliary body abnormalities. Non-Aborigines had higher rates for refractive disorders, strabismus, eyelid abnormalities and glaucoma. There were equal rates for congenital, retinal and choroidal and lacrimal system disorders.

TABLE VSA 4: VISUAL SYSTEM ABNORMALITIES IN PERSONS WITH SATISFACTORY VISION – RATES PER THOUSAND

	Aborigines (59,755)	Non-Aborigines (38,266)	
1. Conjunctiva	36/1000	20/1000	(rank 2)
2. Cornea	34	6	(5)
3. Refraction	25	36	(1)
4. Lens	16	5	(7)
5. Strabismus	7	13	(3)
6. Eyelids	7	9	(4)
7. Iris, ciliary body	4	1	(11)
8. Visual disturbances	3	5	(6)
9. Eyeball	3	1	(12)
10. Retina and Choroid	2	2	(9)
11. Neoplasm	1	2	(8)
12. General disorders	1	0.5	(17)
13. Lacrimal system	1	1	(14)
14. Congenital abnormalities	1	2	(10)
15. Optic disc and pathways	1	0.5	(16)
16. Sclera	0.5	0.2	(18)
17. Glaucoma	0.5	1	(13)
18. Burns and foreign bodies	0.5	0.5	(15)
19. Orbit	0.1	0.02	(20)
20. Vitreous	0.1	0.2	(19)

The visual system abnormalities for those listed with satisfactory vision, ie 6/12 vision in one or both eyes, are listed in Table VSA 4.

This table is similar to Table VSA 3 but certain differences are seen. No abnormality rate is less than that seen in the good vision group, but the relative increases and changes in the order of listing are of interest. For Aborigines, the change in rate for corneal abnormalities from 22 per thousand to 34 per thousand and for lens disorders from 5 to 16 per thousand are striking, while there is an increase in refractive disorders from 19 per thousand to 25 per thousand. For non-Aborigines, increases in the rates are less marked although significant for disorders of refraction, strabismus, the cornea and the lens as well as for visual disturbances.

When only low rates of abnormalities are present, small increases in the number of cases can significantly change rates. Such occurrences are more affected by the chances involved in sampling, and trends at these lower prevalence rates are less reliable indicators of genuine change than rises and falls of higher prevalence levels. For example, an increase from one group to another of a rate from 30 per thousand to 36 per thousand, although only an increase of one-sixth, is more likely to be significant than the doubling of a prevalence rate from one to two per thousand.

Table VSA 5 shows the visual system abnormalities found in persons in the poor vision group – those with vision in their best eye no better than 6/18 but better than 6/60.

The most obvious difference between this group and the two preceding groups is the dramatic increase

TABLE VSA 5: VISUAL SYSTEM ABNORMALITIES IN PERSONS WITH POOR VISION – RATES PER THOUSAND

	Aborigines (1,435 persons)	Non-Aborigines (290)	
1. Lens	456/1000	331/1000	(rank 2)
2. Cornea	317	79	(4)
3. Refraction	198	348	(1)
4. Conjunctiva	159	72	(5)
5. Eyelids	72	34	(8)
6. Eyeball	40	17	(11)
7. Iris, ciliary body	32	27	(10)
8. Retina and Choroid	28	93	(3)
9. Strabismus	26	34	(7)
10. Visual disturbances	19	31	(9)
11. Lacrimal system	10	7	(13)
12. Glaucoma	10	37	(6)
13. Congenital abnormalities	9	–	
14. General disorders	8	10	(12)
15. Optic disc	8	3	(14)
16. Neoplasm	4	–	
17. Sclera	3	–	
18. Vitreous	2	3	(15)
19. Orbit	1	–	

in the prevalence rates for most abnormalities. Two considerations need to be taken into account in comparing these rates: firstly the number in the non-Aboriginal poor vision group is small and one or two extra listed abnormalities may substantially increase a prevalence rate; secondly, a pathology category which already had a high prevalence rate in the good and satisfactory groups is less likely to show a greater proportionate increase than a category which was initially low. There is, for example, a nine-fold increase in the prevalence of corneal abnormalities, considerably less than the 20-fold increase in the prevalence rate for glaucoma, but the absolute rate for the latter is still low by comparison with corneal disease.

No cases of burns or foreign bodies were found among Aborigines in the poor vision group, while no cases of neoplasms, congenital abnormalities, burns and foreign bodies, general disorders, or orbit abnormalities were seen in the non-Aborigines in the poor vision group. Even taking into account the small numbers (290) in the non-Aboriginal group, this non-occurrence of pathology groupings in the poor vision groups suggests either that these pathologies were not related to visual function and/or that the presence of abnormalities more clinically significant led to the under-recording of these less relevant pathologies.

It should be noted in relation to this that some ocular pathologies occur with, or because of, other abnormalities. For example, the development of cataract is often associated with changes in the refractive state of the eye so that persons acquiring cataract, other than congenital cataract, are likely to be listed with refractive abnormalities. Similarly persons with corneal or conjunctival abnormalities (particularly, of the latter, pterygium) are more likely to show refractive abnormalities.

Table VSA 5 shows striking prevalence rates for lens, corneal, refractive and conjunctival abnormalities in Aborigines. Most of these do not appear to be hereditary. Among non-Aborigines with poor vision, there were high rates for lens and refractive abnormalities and for retinal and choroidal disorders. In the latter, there may be a significant hereditary component. Retinal and choroidal disorders prevalence rates for non-Aborigines in the poor vision group are 46 times higher than in the satisfactory vision group. There was also a high rate of increase for the glaucoma category, although this started from a smaller prevalence base.

Table VSA 6 shows the prevalence rates for visual system abnormalities among those who were blind – those with vision no better than 6/60 in either eye.

Among both groups, the highest rates are found for lens pathologies.

With Aborigines, corneal abnormalities are next most prevalent. Then with much lower rates were eyeball abnormalities, mostly phthisis, and conjunctival abnormalities.

With non-Aborigines, the next highest prevalence group after lens abnormalities were retinal and choroidal abnormalities. Refractive disorders were next most prevalent; then followed corneal disease.

Comparing the prevalence rates of abnormalities between the poor vision group and the blind group may give some indication of progression and/or limitation in vision-losing pathological processes. (See Figure VSA 2)

Conjunctival abnormalities, including pterygia, occur frequently in both groups – more so for Aborigines – but prevalence rates were lower in the blind group than in the poor vision group.

Of the other major abnormality groups affecting Aborigines, there were lower prevalences among the blind of refractive disorders, strabismus, and retinal and choroidal abnormalities, while of the lesser prevalence abnormality groups, the blind group had lower rates for visual disturbances, congenital abnormalities, neoplasms, scleral abnormalities and vitreous abnormalities. There were lesser prevalences in the non-Aboriginal group than in the poor vision group for refractive disorders, conjunctival abnormalities, glaucoma, eyelid abnormalities and visual disturbances.

This lesser prevalence for the blind suggests that conditions which have a peak prevalence in the poor vision group may not frequently proceed to blindness and/or that progression of other abnormalities may, in causing blindness, lessen the likelihood of the other pathology being recorded. A person blind from cataract for example, is less likely to be listed for a retinal disease that cannot be seen or diagnosed because of the cataract.

Where, however, the prevalence of an abnormality increases from the poor vision to the blind group, the abnormality may be most closely linked with blindness. Among Aborigines, lens, corneal and eyeball abnormalities show large increases in prevalence rates between the two groups. For non-Aborigines, abnormalities of the lens and the retinal and choroidal system show marked increases in prevalence between the two groups, while abnormalities of the iris and ciliary body, though not

TABLE VSA 6: VISUAL SYSTEM ABNORMALITIES IN BLIND GROUP – RATES PER THOUSAND

	Aborigines (925 persons)	Non-Aborigines (60)	
1. Lens	641/1000	516/1000	(rank 1)
2. Cornea	555	83	(4)
3. Eyeball	149	33	(11)
4. Conjunctiva	118	50	(6)
5. Eyelids	87	33	(10)
6. Iris, ciliary body	47	66	(5)
7. Refraction	46	183	(3)
8. Strabismus	24	50	(7)
9. Retina and Choroid	18	250	(2)
10. Optic nerve	17	–	
11. Lacrimal system	16	–	
12. Glaucoma	16	33	(9)
13. Visual disturbances	9	16	(13)
14. General disorders	5	50	(8)
15. Congenital abnormalities	4	16	(14)
16. Neoplasm	3	16	(12)
17. Vitreous	1	–	
18. Sclera	1	–	

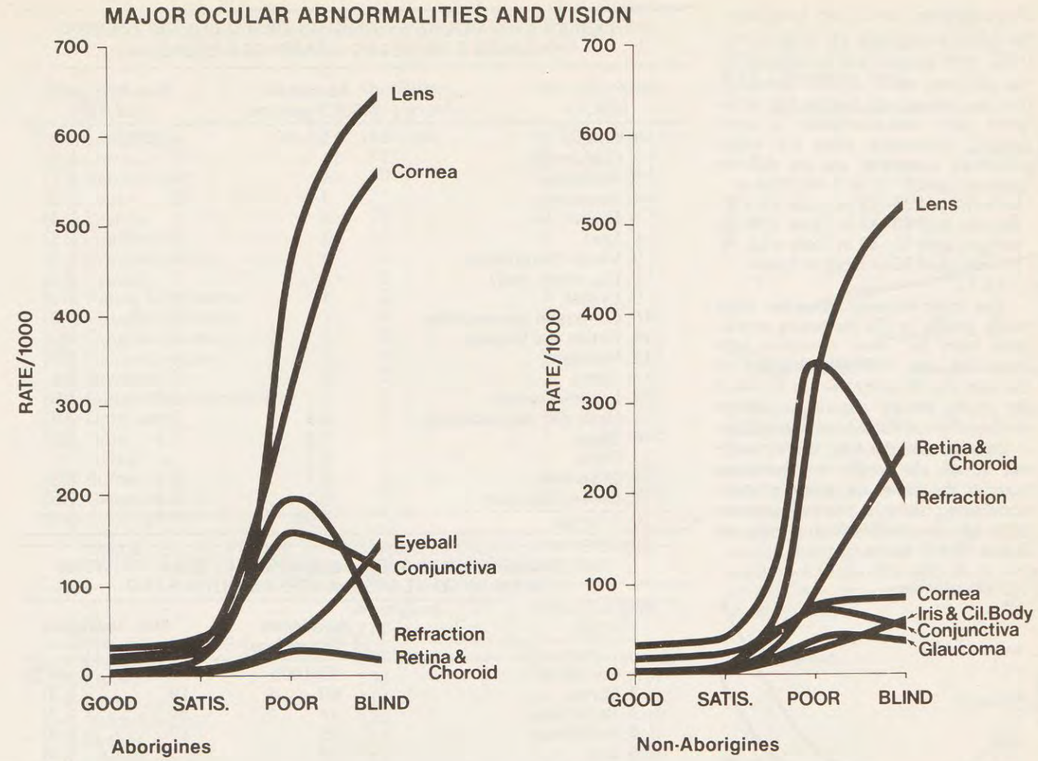


Figure VSA 2

PREVALENCES OF MAJOR OCULAR ABNORMALITIES ACCORDING TO VISION CATEGORIES

reaching high rates, also show a marked increase.

Table VSA 7 shows the prevalence rates for the various categories of visual system abnormalities among persons who were listed as being visually handicapped, that is, who were blind or had poor vision.

Those in this table are those who, by reasonable criteria, can be said not to have good vision. Comparison of the rates for the two race groups shows the significant association of anterior and non-retinal abnormalities with visual handicaps in Aborigines and the emergence of retinal and choroidal abnormalities as well as lens and refractive abnormalities as the major abnormalities associated with visual handicaps among non-Aborigines.

TABLE VSA 7: VISUAL SYSTEM ABNORMALITIES IN VISUALLY HANDICAPPED GROUP – RATES PER THOUSAND

	Aborigines (2,361 persons)	Non-Aborigines (350)	
1. Lens	528/1000	334/1000	(rank 1)
2. Cornea	415	80	(4)
3. Conjunctiva	144	69	(5)
4. Refraction	139	320	(2)
5. Eyeball	83	20	(11)
6. Eyelids	78	34	(9)
7. Iris, ciliary body	38	34	(8)
8. Strabismus	26	37	(7)
9. Retina and Chorid	24	120	(3)
10. Visual disturbances	15	29	(10)
11. Glaucoma	13	37	(6)
12. Lacrimal system	13	6	(13)
13. Optic disc, pathways	11	3	(14)
14. Congenital abnormalities	7	3	(16)
15. General disorders	7	17	(12)
16. Neoplasm	4	3	(17)
17. Sclera	2	–	
18. Vitreous	2	3	(15)
19. Orbit	0.4	–	

Prevalence of Abnormalities by Age

In this section the prevalence of the different visual system abnormalities in various age groups for Aborigines and non-Aborigines is considered. Prevalence rates for listed pathology categories are set out for
persons aged 0–29 in Table VSA 8
persons aged 30–39 in Table VSA 9
persons aged 40–49 in Table VSA 10
persons aged 50–59 in Table VSA 11
persons aged 60 or more in Table VSA 12

The most obvious trend for both racial groups is the increasing prevalence rates for most disorders with increasing age. However, the rate of increase and its extent is not the same for both groups nor is it always similar for different abnormalities.

Disorders of the lens, more prevalent at all age levels in Aborigines than in the same age group of non-Aborigines, show a marked increase with age for both racial groups, as Figure VSA 3 shows.

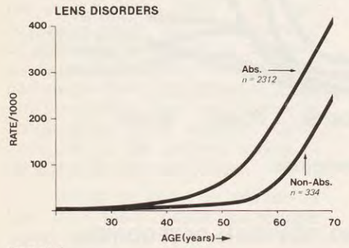


Figure VSA 3
DISORDERS OF THE LENS BY AGE
Aborigines and Non-Aborigines

Corneal abnormalities, also more frequent in any age group for Aborigines than in the same age group for non-Aborigines, show an increase with age for both racial groups, but the increase is more marked with Aborigines, as Figure VSA 4 shows.

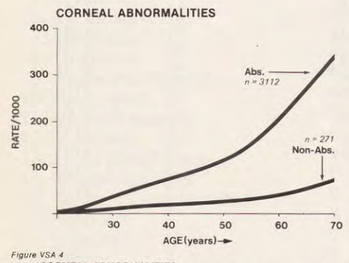


Figure VSA 4
CORNEAL ABNORMALITIES BY AGE
Aborigines and Non-Aborigines

TABLE VSA 8: VISUAL SYSTEM ABNORMALITIES IN PERSONS AGED 0–29 YEARS – RATES PER THOUSAND

	Aborigines (46,925 persons)	Non-Aborigines (33,619)	
1. Cornea	15/1000	3/1000	(rank 6)
2. Conjunctiva	14	10	(3)
3. Refraction	14	26	(1)
4. Strabismus	7	13	(2)
5. Eyelids	4	8	(4)
6. Lens	3	1	(8)
7. Visual disturbances	3	5	(5)
8. Iris, ciliary body	1	1	(11)
9. Eyeball	1	1	(10)
10. Congenital abnormalities	1	2	(7)
11. Retina and Choroid	1	1	(12)
12. Neoplasm	1	1	(9)
13. Sclera	1	0.2	(16)
14. Lacrimal system	1	0.3	(14)
15. Optic disc and pathways	0.3	0.2	(17)
16. Burns	0.3	0.3	(13)
17. Orbit	0.1	–	
18. Glaucoma	0.1	0.2	(15)
19. General disorders	0.1	0.1	(18)
20. Vitreous	0.02	0.02	(19)

TABLE VSA9: VISUAL SYSTEM ABNORMALITIES IN PERSONS AGED 30–39 YEARS – RATES PER THOUSAND

	Aborigines (4,590 persons)	Non-Aborigines (1,977)	
1. Conjunctiva	93/1000	79/1000	(rank 2)
2. Cornea	60	19	(3)
3. Refraction	44	84	(1)
4. Strabismus	15	17	(4)
5. Lens	15	9	(6)
6. Eyelids	12	13	(5)
7. Visual disturbances	8	9	(7)
8. Iris, ciliary body	8	3	(10)
9. Retina and Choroid	7	4	(9)
10. Eyeball	7	–	
11. General disorders	3	–	
12. Lacrimal system	2	3	(13)
13. Optic disc	2	2	(15)
14. Neoplasm	2	4	(8)
15. Glaucoma	2	3	(11)
16. Congenital abnormalities	1	3	(12)
17. Burns	1	3	(14)
18. Orbit	0.4	–	
19. Vitreous	0.4	–	
20. Sclera	0.2	–	

Iris and ciliary body abnormalities, again more frequent in any age group for Aborigines than for non-Aborigines in the same age group, show an increase with age for both racial groups but the rate of increase for each group is about the same, as Figure VSA 5 shows. The most marked increase appears after the age of 55.

Eyeball abnormalities were more common in Aborigines than non-

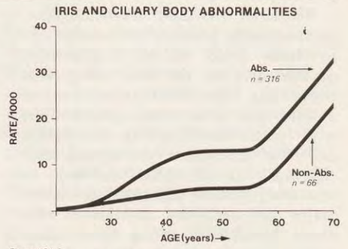


Figure VSA 5
IRIS AND CILIARY BODY ABNORMALITIES BY AGE
Aborigines and Non-Aborigines

TABLE VSA 10: VISUAL SYSTEM ABNORMALITIES IN PERSONS AGED 40–49 YEARS – RATES PER THOUSAND

	Aborigines (3,913 persons)	Non-Aborigines (1,249)	
1. Conjunctiva	135/1000	91/1000	(rank 2)
2. Cornea	93	21	(4)
3. Refraction	80	117	(1)
4. Lens	33	11	(6)
5. Eyelids	20	23	(3)
6. Strabismus	15	15	(5)
7. Iris, ciliary body	13	5	(12)
8. Eyeball	12	6	(11)
9. Retina and Choroid	8	8	(7)
10. Visual disturbances	8	8	(8)
11. General disorders	5	2	(15)
12. Lacrimal system	3	1	(16)
13. Neoplasm	2	7	(9)
14. Congenital abnormalities	2	1	(18)
15. Optic disc	2	2	(13)
16. Orbit	1	1	(17)
17. Sclera	1	–	
18. Burns	0.5	1	(19)
19. Glaucoma	0.2	7	(10)

TABLE VSA 11: VISUAL SYSTEM ABNORMALITIES IN PERSONS AGED 50–59 YEARS – RATES PER THOUSAND

	Aborigines (2,716 persons)	Non-Aborigines (867)	
1. Conjunctiva	155/1000	121/1000	(rank 2)
2. Cornea	150	33	(3)
3. Lens	114	24	(4)
4. Refraction	110	163	(1)
5. Eyelids	25	24	(5)
6. Eyeball	17	12	(9)
7. Retina and Choroid	13	13	(8)
8. Iris and ciliary body	13	5	(14)
9. Strabismus	11	14	(7)
10. General disorders	7	7	(13)
11. Visual disturbances	6	12	(10)
12. Optic disc	5	2	(15)
13. Glaucoma	3	14	(6)
14. Neoplasm	2	12	(11)
15. Congenital abnormalities	1	1	(18)
16. Vitreous	1	–	
17. Lacrimal system	1	9	(12)
18. Burns	1	2	(16)
19. Sclera	1	1	(17)
20. Orbit	0.3	–	

Aborigines in all age groups. For Aborigines there was a dramatic rate of increase with age, but among non-Aborigines there was a lessening rate of increase from the 50–60 age group on, as Figure VSA 6 shows.

There was only a slight increase in retinal and choroidal abnormalities with age among Aborigines, but among non-Aborigines there was marked increase with age among those in the 50–59 age group and older. In the 60-years and over age group, the non-

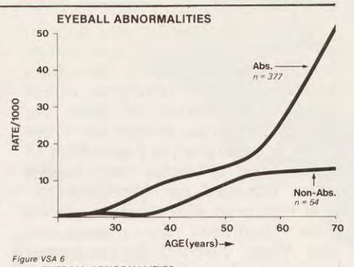


Figure VSA 6
EYEBALL ABNORMALITIES BY AGE
Aborigines and Non-Aborigines

Aboriginal prevalence for retinal and choroidal disorders was about three times the Aboriginal rate. Figure VSA 7 shows the trend.

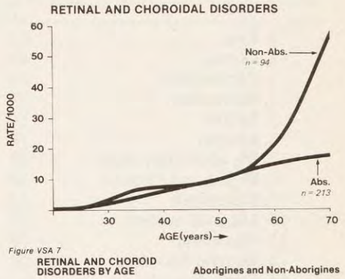


Figure VSA 7
RETINAL AND CHOROID DISORDERS BY AGE
Aborigines and Non-Aborigines

Among both racial groups the glaucoma prevalence rates were very low in the younger age groups, increasing markedly with age in non-Aborigines to reach 27 per thousand among non-Aborigines aged 60 or more, but increasing only slowly among Aborigines to reach a peak prevalence in persons aged 60 or more of nine per thousand. Figure VSA 8 shows the trend.

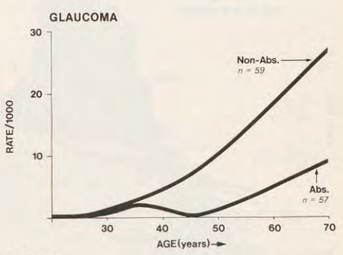


Figure VSA 8
GLAUCOMA BY AGE
Aborigines and Non-Aborigines

Aborigines had higher prevalence rates for conjunctival disorders than non-Aborigines in each age group. Rates increased with age, but lessened in older age, as Figure VSA 9 shows.

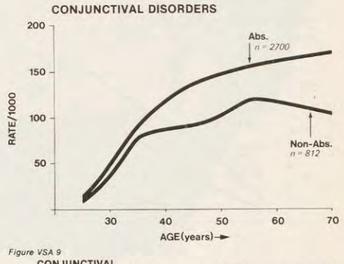


Figure VSA 9
CONJUNCTIVAL ABNORMALITIES BY AGE
Aborigines and Non-Aborigines

TABLE VSA 12: VISUAL SYSTEM ABNORMALITIES IN PERSONS AGED 60+ YEARS – RATES PER THOUSAND

	Aborigines (3,972 persons)	Non-Aborigines (904)	
1. Lens	409/1000	246/1000	(rank 1)
2. Cornea	341	75	(4)
3. Conjunctiva	171	115	(3)
4. Refraction	89	189	(2)
5. Eyelids	66	51	(6)
6. Eyeball	52	13	(11)
7. Iris and ciliary body	33	23	(8)
8. Retina and Choroid	17	57	(5)
9. Strabismus	12	15	(9)
10. Lacrimal system	12	6	(15)
11. Glaucoma	9	27	(7)
12. General disorders	5	10	(12)
13. Optic disc	5	7	(14)
14. Neoplasm	5	8	(13)
15. Visual disturbances	4	14	(10)
16. Congenital abnormalities	3	2	(17)
17. Sclera	1	1	(18)
18. Vitreous	1	6	(16)
19. Orbit	0.2	–	
20. Burns	0.2	–	

The prevalence of eyelid disorders, shown in Figure VSA 10, increased with age in both racial groups at approximately the same rate.

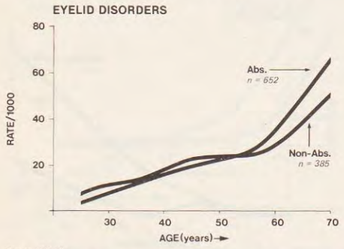


Figure VSA 10
EYELID DISORDERS BY AGE
Aborigines and Non-Aborigines

Non-Aborigines showed higher prevalences of refractive disorders in all age groups than Aborigines in the same age group. Among non-Aborigines there was a marked increase in prevalence with age, but in Aborigines the prevalence rose until age 55 and fell in the 60 + age group. Figure VSA 11 shows the trend.

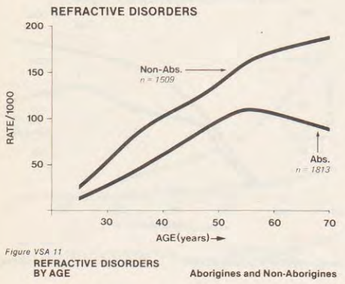


Figure VSA 11
REFRACTIVE DISORDERS BY AGE
Aborigines and Non-Aborigines

There was no marked age trend for strabismus generally for either Aborigines or non-Aborigines, the latter having higher prevalence rates than Aborigines in all but one age group, where the rate was the same, as Figure VSA 12 shows.

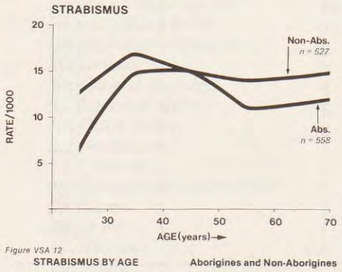


Figure VSA 12
STRABISMUS BY AGE
Aborigines and Non-Aborigines

General disorders, mostly diabetes and hypertension, were more commonly seen with increasing age in both Aborigines and non-Aborigines, except that the prevalence fell from the 50–59 age group to the 60 + age group in Aborigines, as Figure VSA 13 shows. The difference may suggest either increased non-Aboriginal survival compared with Aborigines when these conditions are present, or that these disorders have emerged more recently, relatively sparing the very old.

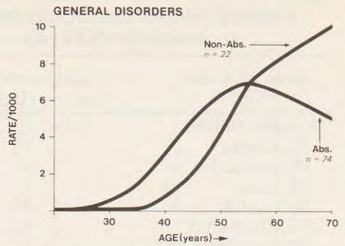


Figure VSA 13
GENERAL DISORDERS BY AGE
Aborigines and Non-Aborigines

There was a marked increase in the prevalence of visual disturbances with increasing age in non-Aborigines, as Figure VSA 14 shows. In Aborigines, however, a rise in prevalence to middle age was followed by a decline in old age.

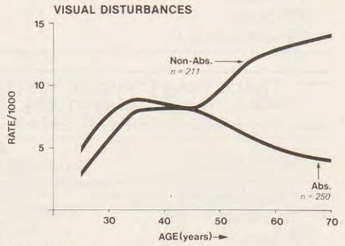


Figure VSA 14
VISUAL DISTURBANCES BY AGE
Aborigines and Non-Aborigines

There were low prevalences of lacrimal disturbances in both Aborigines and non-Aborigines, but, as Figure VSA 15 shows, there was a significant increase in prevalence for the very old.

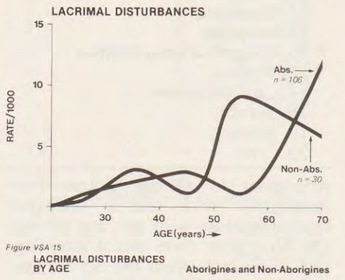


Figure VSA 15
LACRIMAL DISTURBANCES BY AGE
Aborigines and Non-Aborigines

Prevalence by Zone

Because of the different age structure of different zones, with different prevalence rates found in particular age groups, comparison of zonal rates must involve standardisation for age for each of the major pathologies being discussed.

The rates presented below involve standardising the rate found in each zone in each of the age groups in decades according to Australian Bureau of Census data on the age distribution of non-Aborigines. Especially with conditions which are heavily age dependent, this may produce rates in Aborigines which exceed the actual recorded prevalence rates, since a smaller proportion of the Aboriginal population is elderly. Such a standardisation is necessary, however, so that Aboriginal and non-Aboriginal rates can be compared.

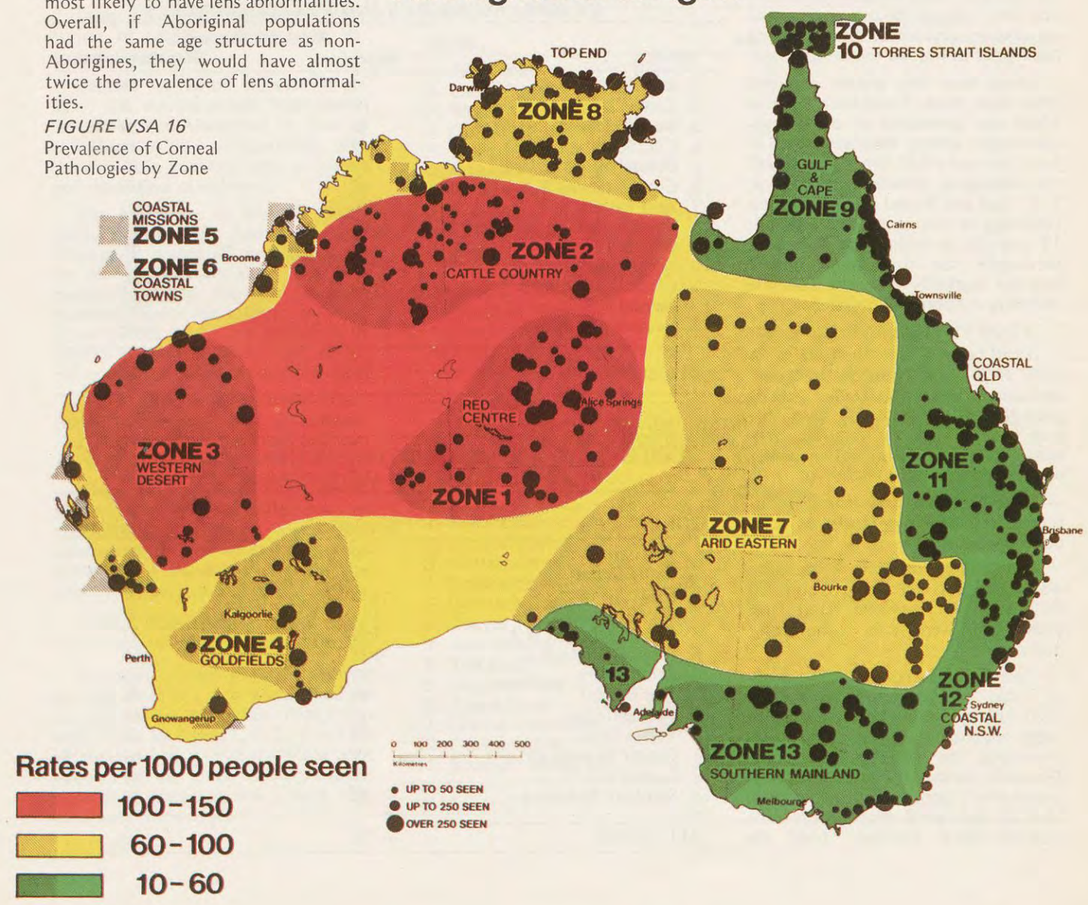
Table VSA 13 shows the standardised prevalence of lens abnormalities among Aborigines and non-Aborigines according to zone.

The prevalence data for non-Aborigines is less reliable when taken by zone because of small number problems with the old, the group most likely to have lens abnormalities. Overall, if Aboriginal populations had the same age structure as non-Aborigines, they would have almost twice the prevalence of lens abnormalities.

TABLE VSA 13: AGE-ADJUSTED LENS ABNORMALITIES BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand Aborigines	Non-Aborigines
1. Red Centre	75	27
2. Cattle Country	76	42
3. Western Desert	84	22
4. Goldfields	86	19
5. Coastal Missions W.A.	76	30
6. Coastal Towns W.A.	93	41
7. Arid Eastern	71	38
8. Top End N.T.	83	33
9. Gulf and Cape	68	58
10. Torres Strait	81	55
11. Coastal Queensland	55	42
12. Coastal N.S.W.	57	44
13. Southern Mainland	50	27
ALL ZONES	73	38

FIGURE VSA 16
Prevalence of Corneal Pathologies by Zone



The prevalence of lens abnormalities for Aborigines in Zone 6, Zone 4, Zone 3, Zone 8 and Zone 10, on an age-adjusted basis, was more than 80 per thousand.

In Zone 2, Zone 5, Zone 1 and Zone 7 the prevalence rate was higher than 70 per thousand.

The lowest prevalence zone was Zone 13, with an age-adjusted prevalence of 50 per thousand. This was still significantly higher than the overall age-adjusted non-Aboriginal rate.

Table VSA 14 shows the distribution of corneal pathologies by zone.

The overall prevalence of corneal abnormalities among Aborigines was 4.4 times that found in non-Aborigines when age-adjusted rates are compared.

Considerably the highest prevalences were found in Zones 1, 2 and 3, the rates in these three zones lifting the average rates to such an extent that only one of the other zones had prevalences of corneal disease among Aborigines as high as the average rate.

There were two groups of zones other than these. These were those in which the prevalence of corneal abnormalities among Aborigines was at least two-and-a-half times the overall non-Aboriginal prevalence: Zones 4, 5, 6, 7, 8 and 9; and the other group consisting of four zones: Zones 10, 11, 12 and 13, in which the Aboriginal prevalence rate for corneal disease was not markedly different from the overall non-Aboriginal prevalence.

Figure VSA 16 shows this trend.

It can be seen that this figure is the same as that for cicatricial trachoma prevalence among Australian Aborigines (Figure 6, Chapter 5, page 46), even though trachoma pathology was excluded from consideration when preparing the figure.

Table VSA 15 shows the distribution of refractive pathologies by zone on an age-adjusted basis.

The figures for Zone 1 could be discounted for both race groups; at this stage of screening refractive pathologies were only occasionally noted.

Overall, non-Aborigines had higher rates for refractive pathologies than Aborigines; the eastern zones had rates approaching or in some cases exceeding the non-Aboriginal rate. Generally it may be said that those zones which contain a higher proportion of Aboriginal people with some non-Aboriginal ancestors have the highest overall prevalence rates for refractive disorders. Zones where most Aboriginal people have no non-Aboriginal ancestors show lower prevalence rates for refractive disorders, especially in the first two decades of life.

Conjunctival disorders, mainly pterygia, affected 20 per cent more Aborigines than non-Aborigines, on an age-adjusted basis. The major reason for this appeared to be very high rates in four Aboriginal zones: Zone 3, 4, 5 and 6. In each of these the overall Aboriginal prevalence of conjunctival disorders was about twice the non-Aboriginal rate. See Table VSA 16.

Pterygia (see Figure VSA 17) in particular are believed to be strongly related to climatic factors, particularly ultra-violet radiation exposure. This association is explored more closely in Chapter 12.

Table VSA 17 shows the distribution of iris and ciliary body abnormalities by zone.

Because of small number problems, the comparatively high prevalences for non-Aborigines in Zone 5 and Zone 9 are not significant, and there is little variation seen in overall non-Aboriginal prevalences.

The prevalence of iris and ciliary body disorders was fairly low, with Aborigines having 80 per cent more on an age-adjusted basis, but still having less than one case in every hundred. There was a trend for these abnormalities to be less prevalent in Aborigines in the eastern and southern zones, especially among the aged.

Table VSA 18 shows the distribution of strabismus, on an age-adjusted basis, by zone for Aborigines and non-Aborigines.

Aborigines suffered from about two-thirds as much strabismus as non-Aborigines, although overall prevalences were low for both groups. Little zonal variations not explainable by sample size were seen.

TABLE VSA 19 shows the distribution of eyeball abnormalities by zone.

Although overall prevalence rates are low, there is a clear zonal trend to be observed for Aborigines. High rates were found in Zones 1, 2, 3, 4 and 6, all areas of high overall trachoma prevalence. In the areas where the prevalence of trachoma was lowest, the rates were the lowest.

TABLE VSA 14: AGE-ADJUSTED CORNEAL PATHOLOGIES BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand Aborigines	Non-Aborigines
1. Red Centre	142	20
2. Cattle Country	136	26
3. Western Desert	118	6
4. Goldfields	77	11
5. Coastal Missions W.A.	75	27
6. Coastal Towns W.A.	74	12
7. Arid Eastern	72	34
8. Top End NT	95	19
9. Gulf and Cape	56	26
10. Torres Strait	28	5
11. Coastal Queensland	29	15
12. Coastal NSW	17	18
13. Southern Mainland	36	10
ALL ZONES	88	20

TABLE VSA 15: AGE-ADJUSTED REFRACTIVE ABNORMALITIES BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand Aborigines	Non-Aborigines
1. Red Centre	3	13
2. Cattle Country	17	3
3. Western Desert	26	129
4. Goldfields	49	97
5. Coastal Missions W.A.	47	70
6. Coastal Towns W.A.	45	103
7. Arid Eastern	75	90
8. Top End NT	13	76
9. Gulf and Cape	35	84
10. Torres Strait	54	59
11. Coastal Queensland	100	91
12. Coastal N.S.W.	73	106
13. Southern Mainland	148	140
ALL ZONES	51	86

TABLE VSA 16: AGE-ADJUSTED CONJUNCTIVAL ABNORMALITIES BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand Aborigines	Non-Aborigines
1. Red Centre	52	24
2. Cattle Country	94	66
3. Western Desert	126	60
4. Goldfields	111	57
5. Coastal Missions W.A.	134	97
6. Coastal Towns W.A.	123	66
7. Arid Eastern	85	72
8. Top End NT	48	48
9. Gulf and Cape	61	48
10. Torres Strait	64	50
11. Coastal Queensland	67	62
12. Coastal N.S.W.	33	37
13. Southern Mainland	58	38
ALL ZONES	74	59

TABLE VSA 17: AGE-ADJUSTED IRIS AND CILIARY BODY DISORDERS BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand Aborigines	Non-Aborigines
1. Red Centre	8	0
2. Cattle Country	18	8
3. Western Desert	11	4
4. Goldfields	18	3
5. Coastal Missions W.A.	10	30
6. Coastal Towns W.A.	11	0.3
7. Arid Eastern	13	4
8. Top End N.T.	13	5
9. Gulf and Cape	8	10
10. Torres Strait	2	3
11. Coastal Queensland	7	5
12. Coastal N.S.W.	3	0
13. Southern Mainland	3	9
ALL ZONES	9	5

TABLE VSA 18: AGE-ADJUSTED STRABISMUS PREVALENCE BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand Aborigines	Non-Aborigines
1. Red Centre	6	8
2. Cattle Country	13	18
3. Western Desert	9	16
4. Goldfields	12	10
5. Coastal Missions W.A.	5	16
6. Coastal Town W.A.	18	18
7. Arid Eastern	16	20
8. Top End	9	16
9. Gulf and Cape	11	14
10. Torres Strait	8	12
11. Coastal Queensland	9	10
12. Coastal N.S.W.	8	7
13. Southern Mainland	16	27
ALL ZONES	11	17

TABLE VSA 19: AGE ADJUSTED EYEBALL ABNORMALITIES BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand Aborigines	Non-Aborigines
1. Red Centre	22	4
2. Cattle Country	21	0
3. Western Desert	11	0
4. Goldfields	16	3
5. Coastal Missions W.A.	7	0
6. Coastal Towns W.A.	11	0.1
7. Arid Eastern	5	3
8. Top End	8	4
9. Gulf and Cape	8	0
10. Torres Strait	3	0
11. Coastal Queensland	3	2
12. Coastal N.S.W.	2	1
13. Southern Mainland	5	5
ALL ZONES	11	2

With small number problems, little significant inter-zonal variation was seen with non-Aborigines, with overall prevalence of the condition about one-fifth the Aboriginal prevalence.

Table VSA 20 shows the prevalence of eyelid abnormalities by zone on an age-adjusted basis for Aborigines. Rates for non-Aborigines, other than an overall rate, have not been calculated, although both groups share the same overall prevalence rate of 17 per thousand.

For Aborigines, there was wide variation between the zones, with the highest prevalences being found in the northern and western zones, and the lowest in the southern, eastern zones.

Retinal and choroidal disorders by zone for Aborigines and non-Aborigines are shown in Table VSA 21.

A clear trend is evident from the table. Retinal and choroidal disorders among Aborigines are uncommon in all zones but particularly so in those zones where most Aboriginal people have no non-Aboriginal ancestors. In zones where a substantial proportion of the Aboriginal people have some non-Aboriginal ancestors, prevalence rates approach or exceed the overall non-Aboriginal rate.

TABLE VSA 22 gives the distribution of visual disturbances by zone.

No clear pattern can be seen for Aborigines. With both Aborigines and non-Aborigines, prevalence rates for visual disorders were low, although Aboriginal prevalence rates, on an age-adjusted basis, were half that found in non-Aborigines.

The zonal information, and the results for standardising Aboriginal and non-Aboriginal populations, is summarised in Table VSA 23.

A clear overall trend was apparent. For visual system abnormalities in which overall Aboriginal prevalence was higher than that found for non-Aborigines, rates were considerably higher in the northern and western zones and tended to approach non-Aboriginal rates in the eastern and southern zones. The basis of almost all these visual system abnormalities was environmental factors, ranging from exposure to global or ultra-violet irradiation to social and hygiene factors; most of these visual system abnormalities are not hereditarily determined.

TABLE VSA 20: AGE-ADJUSTED EYELID ABNORMALITIES BY ZONE: ABORIGINES

ZONE	Rates per thousand
1. Red Centre	23
2. Cattle Country	46
3. Western Desert	31
4. Goldfields	30
5. Coastal Missions W.A.	12
6. Coastal Towns W.A.	15
7. Arid Eastern	15
8. Top End N.T.	13
9. Gulf and Cape	7
10. Torres Strait	3
11. Coastal Queensland	10
12. Coastal N.S.W.	2
13. Southern Mainland	12
ALL ZONES	17

TABLE VSA 21: AGE-ADJUSTED RETINAL AND CHOROIDAL DISORDERS BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand	
	Aborigines	Non-Aborigines
1. Red Centre	4	5
2. Cattle Country	3	5
3. Western Desert	5	0
4. Goldfields	6	5
5. Coastal Missions W.A.	6	0
6. Coastal Towns W.A.	2	8
7. Arid Eastern	11	13
8. Top End N.T.	2	11
9. Gulf and Cape	4	3
10. Torres Strait	9	14
11. Coastal Queensland	13	11
12. Coastal N.S.W.	8	36
13. Southern Mainland	5	7
ALL ZONES	6	11

TABLE VSA 22: AGE-ADJUSTED VISUAL DISTURBANCES BY ZONE: ABORIGINES AND NON-ABORIGINES

ZONE	Rates per thousand	
	Aborigines	Non-Aborigines
1. Red Centre	3	8
2. Cattle Country	5	10
3. Western Desert	5	13
4. Goldfields	10	7
5. Coastal Missions W.A.	6	8
6. Coastal Towns W.A.	9	10
7. Arid Eastern	7	11
8. Top End N.T.	2	10
9. Gulf and Cape	4	2
10. Torres Strait	3	4
11. Coastal Queensland	5	7
12. Coastal N.S.W.	3	1
13. Southern Mainland	8	4
ALL ZONES	5	9

On the other hand, most of the visual system abnormalities in which prevalence rates for non-Aborigines exceeded those for Aborigines were primarily determined by hereditary factors. The zones with the highest Aboriginal rates for the environmentally mediated abnormalities tended to have the lowest rates for the hereditary abnormalities, while the zones with the lowest rates for the environmentally mediated abnormalities tended to have the highest rates for the hereditarily mediated abnormalities. The latter were zones in which a substantial proportion of the Aboriginal population had some non-Aboriginal ancestors, while the former comprised areas where most of the Aboriginal population had no non-Aboriginal ancestors. This suggests that the genes for determining such disorders may be absent or less prevalent in Aborigines than in non-Aborigines.

It is to be emphasised that the standardised, age-adjusted, prevalence rates given in Tables VSA 13 to VSA 23 do not give true prevalence rates for these visual system abnormalities in Aborigines. The age structure of Aborigines is significantly different from that of non-Aborigines, with many fewer older people proportionately in the population. Thus, using non-Aboriginal population figures to standardise prevalence rates will, especially with conditions which occur with ageing, over-state the true prevalence of such conditions in Aborigines. The effect of standardisation is, however, to permit direct comparison with prevalence rates in the non-Aboriginal population and to do this some standardisation must take place. Standardised rates permit an assessment of the true overburden or underburden of the relevant abnormalities.

Thus the prevalence of cataracts in non-Aborigines might be higher than the non-standardised prevalence rates for Aborigines. There are, however, 2.5 times as many non-Aborigines over the age of 60 on a proportionate basis, the 60+ age group providing almost all the cataract pathology, and thus no direct comparison, except age group by age group, can be made. In fact, Aborigines over the age of 60 have a prevalence rate for cataract of 410 per thousand, compared with the non-Aboriginal prevalence rate of 247 per thousand. Standardising permits a comparison which takes into account the age structure differences to give a true picture of comparative prevalence.

TABLE VSA 23: AGE-ADJUSTED PREVALENCE RATES FOR COMMON VISUAL SYSTEM ABNORMALITIES: ABORIGINES AND NON-ABORIGINES

Abnormality	Rates per thousand	
	Aborigines	Non-Aborigines
Lens	73	38
Corneal	88	20
Refractive	51	86
Conjunctival	74	59
Iris and ciliary body	9	5
Strabismus	11	17
Eyeball	11	2
Eyelids	17	17
Retinal and Choroidal	6	11
Visual disturbances	5	9

The standardisation was made, on statistical advice, on the basis of the age structure of the non-Aboriginal population. Table VSA 24 shows the prevalence of three of the most common visual system abnormalities discussed standardised for the Aboriginal age structure. The non-Aboriginal rate is also standardised for the same age structure.

Some explanatory notes and comments on some of the pathology groups insofar as they affect rural Australians, are necessary. Climatic, environmental and trachoma associations of some of the pathology groups are dealt with elsewhere in this report.

TABLE VSA 24: COMPARATIVE PREVALENCES OF THREE VISUAL SYSTEM ABNORMALITIES: ABORIGINES AND NON-ABORIGINES (STANDARDISED FOR ABORIGINAL AGE STRUCTURE)

Condition	Rates per thousand	
	Aborigines	Non-Aborigines
Lens abnormalities	34	17
Corneal abnormalities	50	12
Refractive abnormalities	33	60

Firstly **Refractive Disorders.** These are more prevalent for non-Aboriginal people of all age groups. Aborigines are less likely to be myopic than non-Aborigines. When myopia occurs in Aborigines it is often in association with early cataract. Extreme myopia with atrophy of the posterior retina and choroid was not recorded whereas such a condition is a well-recognised cause of defective vision in non-Aboriginal groups. Hypermetropia is the commonest Aboriginal refractive error. This condition of long-sightedness does not induce vision difficulties in the young and does not impede visual function for close work for adults in the high ambient light typical of daylight hours in central Australia.

However, if close visual tasks are to be performed in artificial light after sundown, Aboriginal hypermetropia becomes a vision-limiting factor because it causes premature presbyopia. Related to this factor of high light intensity for most daytime visual tasks are some characteristics of visual function common in Aborigines. Aborigines and non-Aborigines (although we have not listed all cases) in the high sunlight areas have convergence (the ability to direct each eye upon a close object) and accommodation (the ability to alter the focus of the eye's lens system so as to focus on a close object) both much reduced compared to indoor workers in the less bright parts of Australia. This phenomenon appears to be due to the fact that bright light induces a small pupil size that makes accommodation unnecessary with subsequent weakening by non-use of the muscles of accommodation. Rural Australians of both races usually require spectacles for close work in artificial light earlier than urban Australians and such spectacles usually need to be of greater strength.

The human refractive state, apart from changes occurring with cataracts, is known to be determined genetically and no basis for acquired change due to visual tasks performed has been verified. The relative paucity of myopia and the excess of hypermetropia in Aborigines appears to be genetically determined.[1]

1. see Taylor, H.R., Thesis: Vision of Australian Aborigines. Melbourne University, 1978.

Strabismus (non alignment of both eyes on the object of visual attention, or squint) is less common for Aboriginal children than for non-Aborigines. The most common form of strabismus in non-Aboriginal children is convergent squint – "cross eyes". As age advances convergent squints often change to become divergent. The basis for childhood convergent squint is thought to be two-fold: firstly it occurs when one eye has poorer vision than the other. The causes of this poor vision may be many but the most common is an inherited refractive error more common in non-Aboriginal than Aboriginal children; secondly convergent squint in children occurs because the child, eager to examine objects at close range, uses much of his readily available focussing power-accommodation which is rigidly linked unit for unit with convergence. Thus over-accommodation leads to over-convergence or crossed eyes. Most children are long-sighted – hypermetropic – but can readily overcome this condition because they have many times the focussing power of adults – if a child is more long-sighted than average for his age the extra focussing power he needs to use to see clearly close objects may induce over-convergence and in some cases "cross eyes". The amount of convergence that each child accomplishes for each unit of focussing power used is fixed for each individual and may be genetically determined. If the amount of convergence for each unit of focussing power is higher than average, over-convergence or "cross eyes" may occur with close vision. Aboriginal children have less amounts of convergence per unit of focussing power than do Caucasian children. Although this phenomenon is probably genetic it may include some adaption to high-light environments.

If a squint develops early in life and is constant rather than intermittent and there is an uncorrected refractive error in one eye, then **amblyopia** or "blunt sight" in the defective eye may develop and persist through life. Amblyopia rates are lower in Aboriginal children because they have a lesser tendency, through inheritance, for strabismus.

If sight in an eye is lost or greatly reduced in late childhood or adulthood it is not unusual for the poorer-sighted eye to diverge. Such a divergent squint is the most common form of strabismus among Aboriginal people.

For all ages for Aborigines we found divergent strabismus occurred at a rate of 5 per thousand while for convergent squint it was 2 per thousand. For non-Aborigines the rate was 5 per thousand for both convergent and divergent squint. Amblyopia rates in the sample were 4.1 per thousand for non-Aborigines and 2.9 per thousand for Aborigines.

The program's findings for **disorders of the lens** are worthy of comment. The most common form of cataract in Aborigines is opacification of the back of the lens (see Figure VSA 18) – posterior subcapsular cataract. Because of the dark colour of the Aboriginal iris and the adverse lighting conditions found in field work, it is easy for the novice to over-diagnose cataract in Aborigines. Congenital cataract occurs in Aborigines with no non-Aboriginal ancestry. Rates for congenital cataract for all the Aboriginal people seen was 0.4 per thousand and for non-Aborigines 0.3 per thousand. Dislocation or subluxation of the lens occurs when the ring of supporting fibres that holds the lens in place is disturbed. This dislocation sometimes occurs due to an inherited defect when it is associated with other abnormalities including tall stature and a tendency to have long fingers or arachnodactyly (spider fingers). This inherited defect was found in quite a number of Aboriginal people. In one small town, 21 Aboriginal persons with this condition were seen. All however had some amount of non-Aboriginal ancestry.

The lens can be dislocated due to forceful rupture of its supporting fibres such as occurs when the eye is affected by blunt trauma. This situation often accompanied by traumatic cataract and traumatic inaction of the pupil was a frequent finding in the Aboriginal sample. The predilection for Aboriginal lenses to dislocate has technical inference for surgeons removing Aboriginal cataracts. These will be mentioned elsewhere.

Pseudoexfoliation of the lens capsule, or PXF, was encountered much more frequently in Aboriginal people with a rate of 3.4 per thousand overall found compared with 0.2 per thousand overall for non-Aborigines. This prevalence of PXF has already been reported, and it will be referred to when glaucoma is described.

No certain evidence of destructive inflammation consequent upon hypermaturity of cataract was noted.

Retinal and Choroidal Abnormalities affected 3 per thousand of both racial groups in our sample but it affected 18 per thousand blind Aborigines. In non-Aborigines, macular degeneration, a condition of failure of central vision due to age-associated changes in the central retina, is one of the major causes of blindness. It is virtually untreatable and appears to be heritable. It is diagnosed by the appearance of the retina as seen with the opthalmoscope. Ophthalmoscopic appearances correlate poorly with the vision achieved by the eye in early stages of the disease and there are other conditions (some due to trauma) that may resemble it. Of the total Aboriginal retinal and choroidal pathology listed, macular degeneration occurred 71 times, accounting for 33 per cent of total retinal and choroidal pathology. For non-Aborigines it occurred 53 times, accounting for 56 per cent of non-Aboriginal retinal and choroidal pathology. Retinal scars, usually due to trauma and similar in appearance to macular degeneration, were listed 24 times in Aborigines – 11 per cent of retinal and choroidal pathology. For non-Aborigines retinal scars were listed four times, 4 per cent of retinal and choroidal listings. For Aborigines the prevalence of chorio – retinal abnormalities was greater in the poor vision group than in the blind group, with 28 per thousand compared with 18 per thousand affected. For non-Aborigines, however, the prevalence rate in the poor vision groups was 93 per thousand and in the blind group 250 per thousand. Aborigines when compared with non-Aborigines appear to be relatively spared from macular degeneration. Two of the examiners (F.C.H. and H.R.T.) cannot recall an unequivocal case of macular degeneration in an Aboriginal without non-Aboriginal ancestors.

Hereditary retinal dystrophies, such as retinitis pigmentosa, were listed in Aborigines five times and in non-Aborigines seven times. Cases of retinitis pigmentosa have been found in Aborigines who have no non-Aboriginal ancestors.

Retinal detachment was found 29 times (0.4 per thousand) for Aborigines and 10 times (0.2 per thousand) for non-Aborigines in the sample. Four, or 14 per cent, of the Aboriginal detachments compared with four, or 40 per cent, of the non-Aboriginal detachments recorded as rhegmatogenous.

Diabetic retinopathy was listed 32 times for Aborigines setting an overall prevalence of 0.5 per thousand and three times (0.7 per thousand) for non-Aborigines. Diabetes mellitis, the general illness, was listed 59 times (0.94 per thousand) for Aborigines and 13 times (0.33 per thousand) for non-Aborigines in the sample. Our field program did not attempt significant general diabetes screening and the above trends may or may not be significant. Juvenile onset diabetes with new blood vessels appearing on the optic disc was seen in one 14-year-old Aboriginal girl.

Glaucoma refers to conditions of the eye associated with an abnormal increase in the pressure within the eye. To maintain good optical function the normal eye requires a higher pressure than that of other organs because the relationship between different parts of the eye must remain constant within quite fine limits, otherwise poor vision occurs. The pressure producing and regulating system of the eye has several important factors and some of these appear to be inherited. Diseases and injury by disrupting the eye can cause increase in eye pressure - called secondary glaucoma. Glaucoma can be present at birth and only one such case was listed, occurring in an Aboriginal. For the major form of glaucoma an increased eye pressure is present for some years before loss of vision occurs – during this period a person with a raised eye pressure is a glaucoma suspect. There were 43 non-Aborigines listed as suspects, providing 73 per cent of the non-Aboriginal glaucoma listings. For Aborigines there were 14 such listings or 25 per cent of the total glaucoma listings. Although whole population eye pressure measurements in Aborigines were not attempted, measurements when done, for example, in all persons with PXF, impressed with the low levels recorded. If glaucoma suspects are excluded from the glaucoma listings, Aboriginal glaucoma listings may be tabulated as follows:

Primary open angle glaucoma 11
Secondary glaucoma 32
and non-Aboriginal glaucoma cases
Primary open angle glaucoma 7
Secondary glaucoma 10

Thus 34 per cent of the listed Aboriginal glaucoma was primary compared with 70 per cent of non-Aboriginal glaucoma. One examiner (F.C.H.) in spite of a substantial background in glaucoma epidemiology and in spite of examining more Aborigines than any other examiner, did not find one certain case of primary open angle or primary closed angle glaucoma in Aborigines. Several times persons presented as though with primary glaucoma, but the diagnosis was not sustained after investigation.

PXF is a condition that is frequently associated with both cataract and glaucoma in Caucasians. It is relatively more common in Aborigines: 3.5 per thousand compared with 0.2 per thousand non-Aborigines. Yet only two of the 217 Aborigines with this condition had an ocular pressure abnormally elevated, and of these only one had visual loss.

Aborigines when compared with non-Aborigines appear to be remarkedly spared from primary glaucoma.

The **lacrimal** system consists of the lacrimal glands which produce tears which move down and over the eye with movements of the eyelids and are then sucked by the lacrimal pump from the surface of the front of the eye nearest the nose through small tubes – canaliculi – into the tear sac draining into the nose by way of the tear duct. The most common abnormalities of this system are deficient production of tears and obstruction to the normal drainage of tears (see Figure VSA 19). Tear deficiency resulting in dry eyes is not uncommon in non-Aboriginal Australians although in the program's non-Aboriginal sample there were only five cases listed (a rate of 0.1 per thousand). For Aborigines there were also five cases listed giving a rate of 0.08 per thousand. Advanced trachoma, by causing scarring of the conjunctiva – the layer from or through which tears pass – is in some parts of the world associated with tear deficiency or dry eyes. Yet for the Australian Aboriginal sample, with substantial numbers of persons with advanced trachoma scarring, dry eyes were encountered very infrequently. In fact a very common complaint of many old Aborigines with advanced trachoma is that of excess watering of the eyes: it was not unusual to find Aboriginal persons with grossly scarred conjunctival surfaces pouring out tears quite profusely. The drainage of tears is critically affected by the arrangement of parts of the eyelids and other structures at the nasal side of the eyeball (inner canthus). Unless the tear canaliculi touch the globe or dip into the normal pool of tears that forms at the inner canthus the tears will not drain into the tear sac. Many adult Aborigines have a gross enlargement of the caruncle (the small knob of tissue in the wedge of the inner canthus) that is not seen in non-Aborigines. This hypertrophy of the caruncle may dislocate the normal tear draining system causing tears to flow over the eyelids and down the face. The cause of the overgrowth is unknown.

Chronic infection of the tear sac occurred more frequently in Aborigines, especially the elderly and in the trachoma zones, with 32 cases (0.5 per thousand) compared with three cases in non-Aborigines (0.08 per thousand). This infection attributed to trachoma and other causes may block tear drainage into the nose from the tear sac. There were 50, or 0.08 per thousand, Aborigines, and 10, or 0.1 per thousand, non-Aborigines, listed with obstructed tear ducts. Epiphora or spilling of tears down the face may be due to excess tear formation or poor tear drainage or both. For Aborigines 58, or 0.6 per thousand, were listed with epiphora and for non-Aborigines 15, or 0.4 per thousand, were so listed.

Visual system abnormalities associated with blindness in the sample warrants a more detailed analysis.

There were 985 persons whose vision was not better than 6/60 in both eyes or their better eye. Of these 925 were Aborigines and 60 were non-Aborigines.

Many of these suffered multiple visual system abnormalities as can be deduced from Table VSA 6 but an attempt was made to ascribe the major cause of blindness for each person from the records. These medical opinions are tabulated in Table VSA 25. There are certain defects that limit

the accuracy of such tabulations. For instance, if a person has vision of such a poor standard as to be classified blind, and the front of his eye (cornea) is sufficiently opaque to account for his poor standard of vision, then such an opacity may limit the visualisation of cataract also present and itself sufficient to cause blindness. Similarly, cataract sufficient to cause blindness may prevent recognition of retinal disease sufficient to cause blindness.

The proportions found for non-Aborigines is similar to that found in the United Kingdom by A. Sorsby in 1966.

Corneal disease was the cause of blindness in 461 of the 925 Aboriginal blind. In 386 of these cases, trachoma was considered to be the major contributing factor: thus trachoma was the major contributing factor in six of every seven cases of blindness due to corneal disease in Aborigines.

Lens abnormalities, mostly cataracts but also damage occurring as a result of surgery or of dislocation of the lens, was the cause of blindness of 363 or 39 per cent of the Aboriginal blind seen by the program. This gives an overall rate for lens blindness of six per thousand.

Retinal, choroidal and optic disc abnormalities were the cause of 56 cases of Aboriginal blindness, six per cent of the Aboriginal blind seen. Many of these persons had other than the age-dependent heritable macular degenerations that account for the largest proportion of non-Aboriginal retinal blindness.

TABLE VSA 25: CAUSES OF BLINDNESS IN RURAL AUSTRALIA

RACE	CONDITION	NUMBER OF PERSONS BLIND	RATE/ 1000	PER CENT OF BLIND
ABORIGINAL	Corneal disease	461	7	50
	Lens abnormalities	363	6	39
	Retinal, Choroidal or optic disc	56	1	6
	Cause not known	26	0.5	3
	Multiple causes	13	0.2	1
	Glaucoma	6	0.1	1
	TOTAL	925	15	100
NON-ABORIGINAL				
	Corneal disease	4	0.1	7
	Lens abnormalities	14	0.4	23
	Retinal, choroidal or optic disc	31	0.8	52
	Cause not known	3	0.1	5
	Multiple causes	5	0.1	8
	Glaucoma	3	0.1	5
	TOTAL	60	1.6	100

There were 26 Aborigines for whom a cause of blindness was not attributed. Most were very old and not able to be fully examined so as to precisely attribute the cause of blindness.

There were 13 people blind from multiple causes, and six from glaucoma. In four of the latter, the glaucoma was secondary to injury or inflammation.

There were 60 blind non-Aborigines seen. Four of these, or seven per cent, were blind because of corneal disease - two with trachoma as the basic cause of their blindness.

Lens abnormalities were the cause of 14 cases of blindness, with retinal, choroidal and optic disc and pathway abnormalities, the cause of 31 cases, 52 per cent of the non-Aboriginal blind. The bulk of the latter were cases of macular degeneration.

No definite cause was able to be attributed to three cases, while multiple causes accounted for eight cases. Glaucoma caused blindness in three persons.

The age structure of blindness among Aborigines is shown in Table VSA 26.

For the non-Aboriginal blind, the age structure was as shown in Table VSA 27.

TABLE VSA 26: AGE STRUCTURE OF ABORIGINAL BLINDNESS

CONDITION	0–9	10–19	20–29	30–39	40–49	50–59	60+	TOTAL
Corneal disease	1	3	1	4	17	35	400	416
Lens abnormalities	3	4	2	4	10	27	313	363
Retina, Choroid, optic disc	3	5	4	8	14	7	15	56
Multiple causes	1	2	2	1	3	1	3	13
Cause not known	2	3	1	0	2	4	14	26
Glaucoma	0	0	0	0	0	1	5	6
TOTAL	10	17	10	17	46	75	750	925

TABLE VSA 27: AGE STRUCTURE OF NON-ABORIGINAL BLIND

CONDITION	0–9	10–19	20–29	30–39	40–49	50–59	60+	TOTAL
Corneal disease	0	0	0	0	0	1	3	4
Lens abnormalities	0	0	0	0	0	0	14	14
Retina, Choroid, optic disc	2	2	2	0	2	4	19	31
Cause not known	0	1	0	0	0	0	2	3
Multiple causes	0	1	1	1	0	0	2	5
Glaucoma	0	0	0	0	0	1	2	3
TOTAL	2	4	3	1	2	6	42	60

A comparison of the causes of blindness in Aboriginal and non-Aboriginal rural Australians is of interest. It was the experience of the fieldwork of eye-doctors working with the program that most of the non-Aboriginal blind had had previous and usually adequate investigation, care and attention for their ocular condition. In some cases, of course, earlier or a different type of medical intervention might have been able to prevent the person going blind. Such a matter is mostly one of argument and opinion, but that the non-Aboriginal blind had had mostly multiple-skilled eye examinations was a matter of fact.

Very few of the non-Aboriginal blind could have been prevented from proceeding to blindness even with the knowledge of "hindsight". In this regard it appears reasonable to consider the non-Aboriginal blindness rate as that which is acceptable given the present status of blindness-preventing technology: eye hygiene, eye surgery, and drug therapy.

In this light it is useful to analyse Aboriginal blindness.

Corneal disease is the major form of blindness for Aborigines. It is mostly non-heritable, acquired late in life, and is related to a hygiene status that is capable of being changed. It is amenable to preventative and in some cases curative intervention, such as anti-trachoma measures. Most of this intervention has already occurred in the non-Aboriginal population, among whom, assuming that the prevalence rate found in the non-Aboriginal sample is the true non-Aboriginal prevalence, there is a prevalence rate for blinding corneal disease of 0.1 per thousand or one per 10,000 persons.

That the non-Aboriginal rate is as high as one in 10,000 is itself open to doubt. Blinding corneal disease among non-Aborigines was confined to persons over the age of 50, an age group most likely to be selected rather than being a true sample.

Making allowances for different age rates, only 16 Aborigines would be blind from corneal disease were the Aboriginal rate for corneal disease the same as that found for non-Aborigines. Thus, 445 Aborigines were blind from corneal disease who would not have been blind had Aborigines suffered blinding corneal disease at the same rate as rural non-Aboriginal Australians.

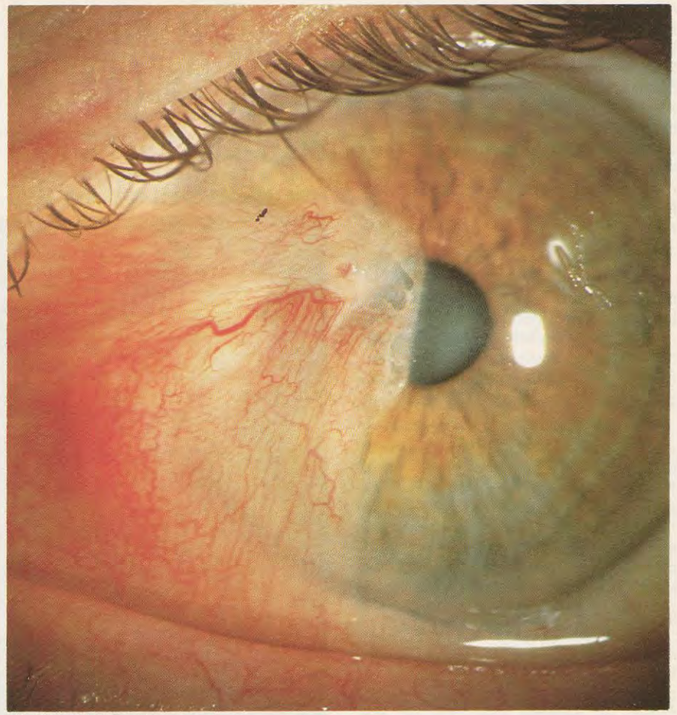


Figure VSA 17 Pterygia

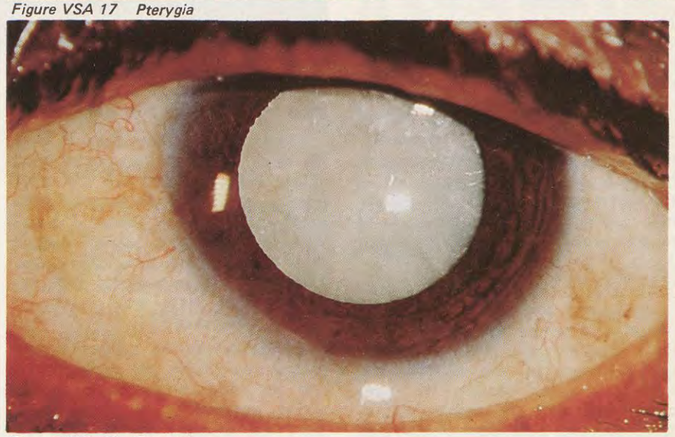


Figure VSA 18 Cataract

Lens abnormalities, mostly cataract, caused blindness for 14, or four in every 10,000 non-Aborigines. This cataractous form of blindness is mostly non-heritable and relievable if adequate surgical services can be delivered. The four per 10,000 figure represents failure of delivery of either preventative or curative medical services.

For Aborigines, 363, or six per thousand, were blind from cataract. Making allowances for different age

rates, only 61 Aborigines would have been blind from lens abnormalities were the Aboriginal rate for blinding lens abnormalities the same for Aborigines and non-Aborigines. So for Aborigines, failure of delivery of either cataract prevention or relieving services resulted in more than 302 persons being blind from lens disorders over and above those that would have been so blind were the prevalence rates for Aborigines the same as for non-Aborigines.

For the other major causes of blindness, prevalence rates are similar for both racial groups. However, as described elsewhere, there is more non-tractable, genetically determined, blinding retinal disease in non-Aborigines than Aborigines.

For all causes of blindness then, 445 Aborigines blind from corneal disease and 302 Aborigines blind from lens disorders – a total of 747 persons, 80 per cent of the Aboriginal blind seen – may be considered as being blind because of a failure to deliver to Aborigines those services used by non-Aboriginal rural Australians.

These 747 people are for Australia part of the national "overburden of avoidable blindness", a phrase coined by Professor Barrie Jones in devising the aim of the International Agency for the Prevention of Blindness: "The elimination of the overburden of avoidable blindness".

Making a projection on the epidemiological pattern seen – assuming that the sample of Aborigines seen by the program was a random one – the overburden of avoidable blindness among rural Aboriginal Australians probably amounts to about 1,175 of about 1,460 cases of Aboriginal blindness.

The same analysis can be made of other abnormalities of vision, if it is assumed that the abnormalities discussed in this chapter are the contributing factors to poor vision, and that the non-Aboriginal rates represent a standard of unavoidable impairment.

Taking and comparing age rates, and assuming the non-Aboriginal rates as the unavoidable base of visual impairment, an analysis of Table V 6 in Chapter Six would suggest that 902 Aborigines in the sample would have poor vision. In fact, 1,436 have poor vision, giving an avoidable excess of poor vision of 534 persons.

Projecting on the epidemiological pattern seen, and projecting a total population of rural Aborigines of 127,000, probably 2,800 rural Aborigines have poor vision compared with a total of about 1,500 which would be expected were rural Aborigines to have the same poor vision rates as non-Aboriginal rural Australians. The avoidable level of Aboriginal poor vision is thus about 1,300.

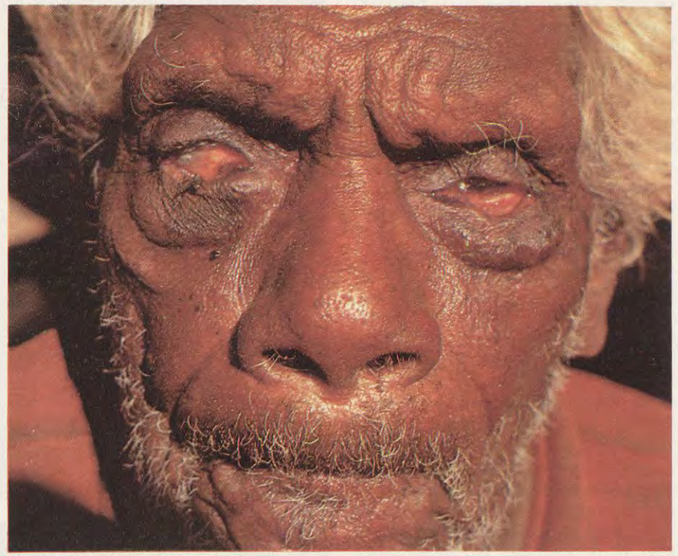


Figure VSA 19 Lacrimal disturbance

Similarly, were Aborigines to have the same pattern of monocular good vision only (one good eye, the other poor vision or blind) as non-Aborigines, an analysis of Tables V 2 and V 4 in Chapter Six would suggest that there would be 1,893 rural Aborigines with monocular good vision. In fact there were 2,448, an avoidable excess of 555.

Projecting on the epidemiological pattern shown by the zonal trends and the program's estimate of the actual populations in those areas, there are probably about 5,200 rural Aborigines with monocular good vision, 1,300 more than the 3,900 which would be expected were Aboriginal monocular good vision rates the same as the non-Aboriginal rate. This 1,300 represents the avoidable level of uniocular visual loss associated with good vision in the other eye.

In the program's sample there were 1,836 Aborigines who had avoidable visual loss: 747 would have been spared blindness, 534 poor vision, and 555 visual loss in one eye had Aboriginal rates of visual loss been the same as the non-Aboriginal rate. This represents almost three per cent of the Aboriginal sample seen.

Projecting on the epidemiological pattern of visual loss, and on the program's estimates of the rural Aboriginal population, it appears that about 3,775 rural Aborigines may suffer from avoidable visual loss: 1,175 being avoidably blind, 1,300 having avoidable poor vision, and 1,300 having avoidable visual loss in one eye. This also represents about 3 per cent of the rural Aboriginal population. This 3 per cent represents the level of avoidable visual loss among rural Aboriginal Australians.

What this means is that three in every hundred rural Aboriginal Australians have some loss of vision that might reasonably be attributable to lack of services and/or facilities that are currently being used by non-Aboriginal Australians.

The nature of the services and the facilities necessary to eliminate this avoidable visual loss, and methods of securing the use of such services and facilities, were rightly the concern of the program.

Chapter 9:

Some Infections in Rural Australia:

Ear, Nasal, Respiratory and Skin Disease

The trachoma-screening program provided an ideal opportunity to assess the prevalence of some other health problems known to affect rural Australian communities.

An important problem, of particular concern to Aborigines, is the high prevalence of respiratory disease in many communities. Among the forms of respiratory disease known to be very prevalent are otitis media (middle-ear inflammation); chronic nasal discharges; colds (severe and mild); acute and chronic brochitis and pneumonia; all, however, are believed to form part of a general chronic respiratory infection syndrome, of a form known to be common among under-privileged groups the world over.

The program decided to perform two examinations which would give some indication of the general level of respiratory disease, as well as show the prevalence of two specific respiratory infections or conditions: middle-ear infection and nasal discharge. Both can be measured by examinations which could be performed quickly with criteria able to be easily standardised.

Ear Disease

In grading for the presence of middle-ear disease, program examiners –all doctors and most ophthalmologists –made one of nine findings for each ear examined. These were:

0 = a normal tympanum or ear drum was observed
1 = a scarred or healed eardrum, when no diagnosis of otitis media could be made
2 = a dry tympanic perforation was observed
3 = a wet, or suppurating, perforation was observed
4 = wax in the ear obscured a view of the drum
5 = a red drum was observed
6 = 'glue' ear was observed
7 = myringotomy tubes were present
8 = a foreign body was present in the ear canal.

Three of these findings, numbers 2, 3 and 6, were used as evidence of otitis media.

With the type of otitis media seen most commonly by program examiners, a common sequence of events occurs.

The middle-ear cavity becomes infected by organisms which gain access to it from the tube which connects it to the back of the throat (the Eustachian tube). The tube is closed off with swelling caused by inflammation and cannot drain the inflammatory fluid being produced in the middle ear. The ear drum may then perforate and the inflammatory fluid drains through the perforation (hole) in the ear drum into the outer canal and then on to the skin.

If the inflammation persists, the ear may continue to drain pus. Over a long period, especially with repeated attacks of otitis media, there is likely to be permanent damage to the ear drum and the hearing bones (auditory ossicles), and impairment of hearing.

Occasionally, the middle ear may become filled with non-purulent fluid which does not drain through a perforated drum or the Eustachian tube. This is referred to as 'glue ear'.

A person with evidence of glue ear or of a perforated ear drum still discharging fluid or with a dry hole in the drum was considered by the program to have otitis media.

A person with a red drum *may* be considered to have early signs of otitis media. Although other studies have included such a finding as evidence of otitis media, the program did not. This was because there appeared to be more observer variation possible in the diagnosis of a red drum (as discussed later, this appeared to be a factor in unusually high findings in two areas of Australia).

Also observed were healed or scarred eardrums, in which a perforation had been closed by scar tissue. This was considered evidence of past otitis media.

In a small number of cases, the

presence of myringotomy tubes – drainage tubes inserted surgically into the ear drum to drain fluid or pus – was noted. As with scarring, the presence of such tubes was an indicator of past ear problems; it was also, however, a measure of the level of surgical intervention presently occurring.

In some cases foreign bodies were noted in the ear canal. Mostly these consisted of impacted flies. They were usually indicated to local health authorities for syringing, or syringed out by program staff on the spot. Some persons had wax in their ear canals, preventing a view of the drum.

All persons were examined with a hand-held auriscope, either immediately before or immediately after the examination for signs of trachoma. Other examinations, such as audiometry, were not generally performed, although all persons with evidence of otitis media or other ear pathology requring treatment were identified to local health personnel for follow-up.

Observer Variation

No assessment of observer variation was made, and the results presented are not adjusted for any such variation. As with the trachoma examinations, about 55 per cent were performed by one of three examiners, with a further 18 per cent performed by one of another three examiners. Each of these persons – all medical practitioners – spent long periods in the field with the program's screening teams and were very familiar with the program's grading standards. About a quarter of the examinations were performed by medical practitioners who joined program field teams for several weeks at a time.

All observers were given instructions in otoscopy and had the signs demonstrated in an effort to achieve some standardisation of grading. As noted earlier, and as discussed further, there appeared to be a discrepancy in the number of red drums observed by one particular observer in two areas of Eastern Australia.

The findings made by this observer for red ear drums were consistently higher than those reported by other observers in the same area and make the overall prevalence of the condition in those zones higher than those found anywhere else. With this exception, however, there was no apparent significant variation between observers noted by the program.

The Findings

The records of 97,986 persons were considered, of whom 60,273 were Aborigines and 37,713 were non-Aborigines. Each had findings made for both ears. No one with an incomplete record of otoscopic findings is included in this discussion.

TABLE RD 1: OTITIS MEDIA BY AGE: ABORIGINES

AGE	NUMBER EXAMINED	NUMBER WITH BILATERAL OTITIS MEDIA	%	NUMBER WITH OTITIS MEDIA IN ONE EAR	%	TOTAL WITH OTITIS MEDIA IN ONE OR BOTH EARS	%
0 & 1	2,219	150	6.8	213	9.6	363	16.4
2 & 3	3,176	254	8.0	376	11.8	630	19.8
4 & 5	4,811	282	5.9	583	12.1	865	18.0
6 & 7	6,086	331	5.4	641	10.5	972	16.0
8 & 9	5,696	281	4.9	541	9.5	822	14.4
10 & 11	5,341	188	3.5	504	9.4	692	13.0
12 & 13	4,509	154	3.4	318	7.0	472	10.5
14 & 15	3,543	104	2.9	270	7.6	374	10.6
16 & 17	2,174	71	3.3	151	6.9	222	10.2
18 & 19	1,669	27	1.6	123	7.4	150	9.0
20–29	6,449	129	2.0	358	5.5	487	7.6
30–39	4,482	62	1.4	193	4.3	255	5.7
40–49	3,793	33	0.9	126	3.3	159	4.2
50–59	2,607	14	0.5	61	2.3	75	2.9
60 +	3,718	25	0.7	86	2.3	111	3.0
ALL AGES	60,273	2,105	3.5	4,544	7.5	6,649	11.0

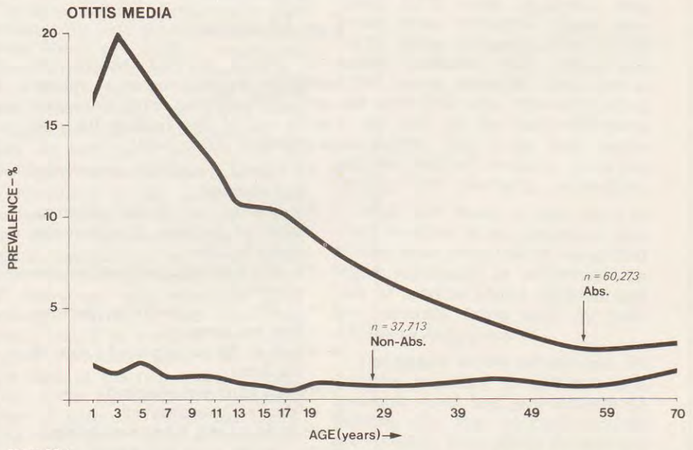


Figure RD 1
OTITIS MEDIA BY AGE
Aborigines and Non-Aborigines

Otitis Media

(Wet or dry perforations and/or glue ear)

For all age groups, 6,649 Aborigines had these findings in one or both ears, compared with 405 non-Aborigines (as seen in Table RD 4). This gives a rate of 11 per cent for Aborigines seen and 1.1 per cent for non-Aborigines seen. Aborigines thus had 10 times as much otitis media as non-Aborigines.

The prevalence of otitis media in age groups for Aborigines is shown in Table RD 1.

In Aborigines the peak age prevalence for otitis media was two and three, with 19.8 per cent, or nearly one in every five children affected. (See Figure RD 1)

The prevalence fell slowly with all age groups until the 18 and 19 group, with more than one in every 10 persons affected. It continued to fall until, in the 60 year and over age group, the prevalence of otitis media was 3 per cent. Overall, nearly one in every nine persons examined had at least one affected ear.

Overall, 3.5 per cent of those seen had otitis media in both ears. As with the prevalence rates for otitis media in one or both ears, the peak prevalence was found among children aged two or three, with 8 per cent affected. The prevalence was higher than one per cent in all age groups up to age 40, though tending to fall with age fairly steadily. Among persons aged 60 or more, the prevalence of bilateral otitis media was 0.7 per cent.

A further 7.5 per cent had otitis media in one ear only. The peak prevalence was found in children aged four and five, though the prevalence, at 12.1 per cent, was not significantly different from the prevalence of 11.8 per cent in children aged two and three.

Table RD 2 shows the conditions which made up the diagnosis of otitis media.

It can be seen that the glue ear prevalence is initially about 7.6 per cent of the ears with otitis media among children aged 0–9. It rises (to an extent significant only to p=0.1) in adolescents, and falls in adults, to a statistically significant extent ($p < 0.001$).

Wet perforations form 11 in every 20 cases of otitis media in Aboriginal children seen by the program, significantly more than the proportion found among adolescents, where it is about four in every 10.

Dry perforations appear to become more common with increasing age, with adolescents having significantly more than children ($p < 0.001$) and adults having significantly more than adolescents ($p < 0.001$).

The prevalence of otitis media for Aborigines in three age groups for each of the zones of Australia can be seen in Table RD 3.

Considerably the worst zones were Zones 1 and 3, the Red Centre and the Western Desert. Here more than three in every 10 Aboriginal children seen had otitis media, while the rate among adolescents in Zone 1, at 24.3 per cent, exceeded the rate found among children in all zones except Zone 1 and Zone 3. In both zones the rates among adults were also high, with at least one in every 20 persons affected.

In the next three zones, Zones 4, 12 and 2, the Goldfields WA, Coastal NSW and the Cattle Country of the Northern Territory, more than one in every five children had otitis media in one or both ears. In the second of these, Zone 12, the prevalence found among adolescents, at 18 per cent, was almost as high, although in all three zones the prevalence was higher than one in every eight. In Coastal NSW the prevalence of otitis media in adults was the highest of any of the zones, at 7.7 per cent. However, the prevalence in Zone 2, the Cattle Country, was the

TABLE RD 2: CONDITION OF ABORIGINAL EARS WITH OTITIS MEDIA

This table refers to ears and not persons

CONDITION	AGE 0–9		AGE 10–19		AGE 20 +		Total	
Glue ear	377	7.6%	215	8.8%	50	3.7%	642	7.3%
Wet perforation	2,810	56.8%	946	38.5%	507	37.6%	4,263	48.7%
Dry perforation	1,763	35.6%	1,293	52.7%	793	58.7%	3,849	44.0%
TOTAL	4,950		2,454		1,350		8,754	

TABLE RD 3 – PREVALENCE OF OTITIS MEDIA BY ZONES: ABORIGINES

ZONE	CHILDREN AGE 0–9 FREQUENCY	%	ADOLESCENTS AGE 10–19 FREQUENCY	%	ADULTS AGE 20 + FREQUENCY	%
1: Red Centre	952/2,901	32.7	477/1,965	24.3	195/2,886	6.8
3: Western Desert	239/755	31.7	65/494	13.2	48/967	5.0
4: Goldfields WA	147/638	23.0	56/439	12.8	19/641	2.7
12: Coastal NSW	240/1,089	22.0	168/934	18.0	62/803	7.7
2: Cattle Country	375/1,779	21.0	153/1,077	14.2	113/2,483	4.5
8: Top End NT	482/2,481	19.4	283/1,920	14.7	198/2,745	7.2
5: Coastal Missions WA	81/483	16.8	33/348	9.5	15/544	2.8
9: Gulf and Cape QLD	191/1,244	15.4	82/897	9.1	52/1,382	3.8
6: Coastal Towns WA	145/1,320	11.0	77/1,119	6.9	58/1,027	5.6
7: Arid East	364/3,796	9.6	214/2,981	7.2	120/2,786	4.3
11: Coastal Queensland	293/3,504	8.4	177/3,194	5.5	88/2,696	3.3
13: Southern Mainland	87/1,163	7.5	86/1,053	8.2	77/1,116	6.9
10: Torres Strait	56/790	7.1	38/789	4.8	34/871	3.9
ALL ZONES	3,652/21,943	16.6	1,909/17,210	11.1	1,079/20,947	5.1

lowest found, at 2.7 per cent.

In Zone 8, the Top End NT; Zone 5, the Coastal Missions WA; Zone 9, the Gulf and Cape Country, and Zone 6, Coastal Towns WA, the prevalence ranged from one to two in every 10 children seen. The prevalence in Zone 8, at 19.4 per cent, was almost enough to place it into the previous group, making the prevalence for ear disease in the Northern Territory considerably worse than all other areas.

Among adolescents in Zones 8, 5, 9 and 6, the prevalence of otitis media ranged from 14.7 per cent in the Top End to 6.9 per cent in Coastal Towns WA. Among adults, the prevalence ranged from 7.2 per cent in the Top End to 3.8 per cent in the Gulf and Cape Country.

In the remaining four zones, Zone 7, Arid East, Zone 11, Coastal Queensland, Zone 13, Southern Mainland and Zone 10, the Torres Strait Islands, prevalence in children ranged from 9.6 per cent in Zone 7 to 7.1 per cent in Zone 10, between one and two in every 20 seen.

In Zone 13 the rate among adolescents, at 8.2 per cent, was higher than that found among children at 7.5 per cent. This difference was not, however, statistically significant. The range varied among these four zones from 8.2 per cent among adolescents in Zone 13 to 4.8 per cent in Zone 10, the Torres Straits. Among adults in these four zones, the rate ranged from 6.9 per cent in the Southern Mainland to 3.3 per cent in Coastal Queensland.

There were marked differences between the pattern of otitis media found in Aborigines and non-Aborigines although the same tendency for it to be mainly a disease of children was seen. The prevalences were, however, considerably lower in every age group seen, as Table RD 4 and Figure RD 1 show.

The highest prevalence was found in children under the age of two with 2 per cent having otitis media in one or both ears. With slight, not significant fluctuations, the rate gradually fell, so that in the 10 and 11 age group, 1.2 per cent seen were affected, with no other group between the age of 12 and 40 having a prevalence as high as 1 per cent. There was an increase, not statistically significant, to 1.1 per cent among persons aged 40-49; then a fall, again not significant, in the 50-59 group; and an increase to 1.5 per cent in persons aged 60 years or more.

This prevalence (in the 60+ group) was not statistically significantly higher than in the 50-59 age group. The overall prevalence of otitis media in adolescents (persons aged between 10 and 19 years) was no higher, at 0.9 per cent, than that found among adults (those 20 or more).

These results show that a finding of otitis media is a finding unusual at any age in non-Aborigines, but is especially unusual from the age of 12 on. This contrasts to Aborigines, among whom the finding is common in children and adolescents, and even, by comparison with non-Aborigines, in adults. There was no Aboriginal age group in which the prevalence of otitis media was lower than the highest prevalence age group of non-Aborigines, 2 per cent.

Overall, 59 children had otitis media in both ears, a rate of two in every thousand non-Aborigines seen. In no age group was the prevalence significantly higher than this. Not only did non-Aborigines have significantly lower prevalence of otitis media, but the composition of conditions which made up the diagnosis was significantly different, as Table RD 5 shows.

While glue ear provided only 7.3 per cent of the cases of otitis media seen among Aborigines, it provided 36.4 per cent of those among non-Aborigines.

The trend for wet perforations to provide an increasing proportion of otitis media cases from childhood to adulthood was the opposite to the trend found in Aborigines. There were no significant differences between any of the age rates, however.

As with Aborigines, dry perforations became more common with increasing age, with adult non-Aborigines having a significantly greater proportion of the otitis media cases than non-Aboriginal adolescents.

The marked differences in glue ear proportion suggest that the nature and/or course of otitis media encountered by Aborigines, particularly children, is significantly different from that encountered by non-Aborigines.

There were significant differences in prevalence patterns in different areas of Australia as Table RD 6 shows.

The highest prevalence of otitis media encountered among children was in the Coastal NSW zone, with one in every 17 seen having otitis media.

Two other zones, Zone 1, the Red Centre, and Zone 4, Goldfields WA, had prevalences significantly higher than the average of 1.3 per cent. All these zones had prevalence more than twice that encountered overall.

Only two zones, Zone 8 and Zone 9 had prevalences significantly lower than average. The highest prevalence found among non-Aboriginal children was lower than the lowest prevalence found in any zone for Aboriginal children. The lowest zone prevalence found among non-Aboriginal children (0.6 per cent in Zone 8) was one-tenth the prevalence in the lowest zone for Aboriginal children, c.f. Tables RD 3 and 6.

TABLE RD 4 – PREVALENCE OF OTITIS MEDIA BY AGE: NON-ABORIGINES

AGE	NUMBER EXAMINED	NUMBER WITH BILATERAL OTITIS MEDIA	PER CENT	NUMBER WITH OTITIS MEDIA IN ONE EAR	PER CENT	TOTAL WITH OTITIS MEDIA IN ONE OR BOTH EARS	PER CENT
0 & 1	297	0	0	6	2.0	6	2.0
2 & 3	534	1	0.2	6	1.1	7	1.3
4 & 5	2,765	9	0.3	35	1.3	44	1.6
6 & 7	5,904	8	0.1	55	0.9	63	1.1
8 & 9	5,942	8	0.1	71	1.2	79	1.3
10 & 11	5,633	9	0.2	56	1.0	65	1.2
12 & 13	4,964	6	0.1	36	0.7	42	0.8
14 & 15	3,317	8	0.2	18	0.5	26	0.8
16 & 17	917	1	0.1	3	0.3	4	0.4
18 & 19	226	1	0.4	1	0.4	2	0.9
20–29	2,354	2	0.1	18	0.8	20	0.8
30–39	1,934	1	0.1	14	0.7	15	0.8
40–49	1,220	3	0.2	10	0.8	13	1.1
50–59	836	0	0	6	0.7	6	0.7
60 +	870	2	0.2	11	1.3	13	1.5
ALL AGES	37,713	59	0.2	346	0.9	405	1.1

TABLE RD 5: CONDITION OF NON-ABORIGINAL EARS WITH OTITIS MEDIA

This table refers to ears and not persons

CONDITION	AGE 0–9	%	AGE 10–19	%	AGE 20 +	%	TOTAL	%
Glue ear	100	44.4	62	37.8	7	9.3	169	36.4
Wet perforation	55	24.4	50	30.4	26	34.7	131	28.4
Dry perforation	70	31.1	52	31.7	42	56.0	164	35.3
TOTAL	225		164		75		464	

TABLE RD 6 – PREVALENCE OF OTITIS MEDIA BY ZONES: NON-ABORIGINES

ZONE	CHILDREN AGE 0–9 Frequency	%	ADOLESCENTS AGE 10–19 Frequency	%	ADULTS AGE 20 + Frequency	%
12: Coastal NSW	23/404	5.7	15/632	2.4	2/138	1.4
1: Red Centre	9/267	3.4	6/132	4.5	2/438	0.5
4: Goldfields	42/1,309	3.2	14/644	2.2	1/367	0.3
3: Western Desert	5/219	2.3	3/88	3.4	0/213	–
2: Cattle Country	11/572	1.9	2/245	0.8	8/538	1.5
6: Coastal Towns WA	20/1,450	1.4	17/1,570	1.1	8/476	1.7
5: Coastal Missions	4/284	1.4	2/143	1.4	1/131	0.8
13: Southern Mainland	11/973	1.1	4/753	0.5	4/336	1.2
10: Torres Strait	1/102	1.0	0/50	–	3/177	1.7
7: Arid East	33/4,122	0.8	33/4,514	0.7	13/1,562	0.8
11: Coastal QLD	25/3,316	0.8	28/4,385	0.6	9/1,038	0.9
9: Gulf & Cape	3/475	0.6	2/357	0.6	5/329	1.5
8: Top End NT	12/1,960	0.6	13/1,543	0.8	11/1,478	0.7
ALL ZONES	199/15,453	1.3	139/15,057	0.9	67/7,221	0.9

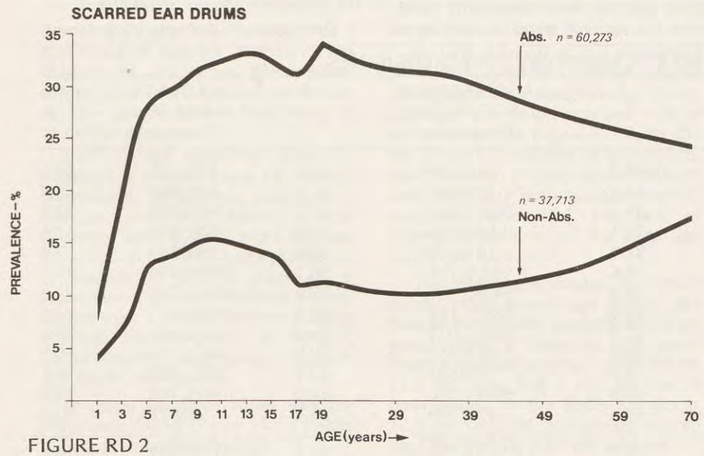


FIGURE RD 2
TYMPANIC SCARRING BY AGE
Aborigines and Non-Aborigines

Scarring of the Ear Drum

Of the 60,273 Aborigines examined, 17,564 or 29.1 per cent, had a scar on one or both eardrums. Of these, 7,500, or 12.4 per cent, had both ear drums scarred. By comparison, 5,096 of the 37,713 non-Aborigines examined, or 13.5 per cent, had a scarred ear drum, with 1,953, or 5.2 per cent, having scars on both drums.

Although the difference between the Aboriginal and non-Aboriginal prevalence is not as great as with otitis media, it is obvious with scarring that different patterns exist. See Figure RD 2.

The age prevalence pattern for scarring in Aborigines is shown in Table RD 7.