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Original Article

Eye disease and care at hospital clinics in Cook Islands, Fiji, Samoa and Tonga

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Abstract

Purpose: To obtain eye disease and care data to assist with service planning in Cook Islands, Fiji, Samoa and Tonga.

Methods: A hospital-based rapid assessment including interviews and examination of clinical records.

Results: An overview of equipment, staff and services was attained. Visual impairment was associated with increasing age but not gender of clinic attendees. Cataract was the most common cause of low vision and blindness. A substantial proportion of visually significant cataract, particularly that causing low vision but not blindness, was not offered treatment. The vision outcome of cataract surgery in Fiji was less successful than elsewhere. Only Samoa achieved the World Health Organization suggested outcomes. Refractive error was a significant cause of low vision, but poorly treated. Diabetic retinopathy was a substantial contributor to visual impairment at all locations except the Cook Islands, but not all was treated with laser. Trauma/corneal opacity was an important cause of blindness in Cook Islands and Tonga. Pterygium-induced low vision and glaucoma blindness were diagnosed most frequently in Samoa.

Discussion: This methodology enabled quick and cost-efficient collection of data about hospital eye services, the conditions diagnosed and treated, and the outcome of treatment. It could easily be repeated by local clinicians to measure the impact of service planning and implementation. In the four countries audited, the management of, and intervention outcomes for, cataract, refractive error, diabetic retinopathy and trauma need attention.

Key words: cataract, Cook Islands, Fiji, refractive error, Samoa, Tonga.

Introduction

Until recently, the contribution uncorrected refractive error makes to the amount of poor vision globally was not appreciated. Today it is recognized as a leading cause of vision impairment.[1] The world's blind predominantly live in the low resource countries of Asia and Africa, mostly in rural areas with few or underutilized eye care facilities.[2–4] Cataract is the most common cause of blindness.[5]

To address the increasing prevalence of worldwide vision impairment and blindness, *Vision* 2020: *The Right to Sight* [6] was officially launched in 1999. In 2003 and 2006, the World Health Assembly adopted resolutions regarding the *Elimination of Avoidable Blindness*.[7,8] These called on member nations to develop and implement *Vision* 2020 national eye care plans. These plans outline an integrated approach to the elimination of avoidable blindness and vision impairment caused by identified local priority afflictions – generally, cataract and uncorrected refractive error, along with trachoma, childhood blindness, onchoceriasis, glaucoma and/or diabetic retinopathy where they are prevalent and impairing. There have been some successes.[9]

Typically, the small island nations of the western Pacific region have struggling economies with meagre health budgets. Access to eye care is frequently difficult because small populations are spread across many island groups,

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The International Centre for Eyecare Education distributes and receives financial benefit from the sale of readymade spectacles in developing countries. However, the authors, who are no longer employees of this organization, have no personal pecuniary interest in the manufacture, distribution or sale of spectacles. None of the authors has any pecuniary interest in any other product mentioned or in the outcome of this study.

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Table 1. Characterization of Cook Islands, Central Division of Fiji, Samoa and Tonga

	Cook Islands	Central Division Fiji	Samoa	Tonga
Population (*n*)†	21 388	297 607	176 908	114 689
Number of inhabited islands (*n*)†	15	1	4	36
Proportion of population in urban centre (%)‡	72	52	22	34
Health expenditure per capita (international dollar)§	425	220	209	300
Health expenditure as proportion of GDP (%)§	3.8	3.7	5.4	6.5

†http://www.cia.gov/cia/publications/factbook/index.html. ‡http://www.unicef.org/infobycountry/index.html. §The World Health Report 2006: Working together for health. World Health Organization. Geneva, 2006.

separated by vast distances. Ophthalmic human and other resources are scant. Where indigenous eye care programs exist, they are mostly anchored in capital cities and larger towns, leaving rural populations largely without services. As for low resource countries elsewhere, the elimination of avoidable blindness is problematic in this region.

With the exception of a 2005 blindness and vision impairment prevalence study in Papua New Guinea,[10] recent eye health and vision data from the low resource countries of the western Pacific are lacking.[11–14] However, from what is available, cataract and diabetic retinopathy were reportedly among the most common causes of vision loss in Fiji, Cook Islands and Tonga.[11,13,14] Anecdotal evidence suggests that cataract remains the most common cause of blindness in these countries and elsewhere in the region. Given that diabetes is an increasing problem,[15,16] particularly in Polynesia, so too is retinopathy likely to be.[17,18] Also, the new awareness of uncorrected refractive error has increased its recognition.[1,19] As in Papua New Guinea,[10] it is likely to be an important cause of vision impairment across the region. The contribution ocular trauma makes to vision loss may also be significant,[20] but remains unquantified.

As some of the island nations of the western Pacific contemplate developing their own *Vision* 2020 national eye care plans, cataract and uncorrected refractive error (including presbyopia) will almost certainly be nominated as priority targets. In Polynesia, diabetic retinopathy is likely to be added, as may trauma. Strategies for the management of cataract[21] and uncorrected refractive error[19] are available or considered attainable. However, those for the screening, diagnosis and treatment of diabetic retinopathy present a significantly more complex challenge.[22] Although initial assessment and intervention, pathways of referral, and definitive treatment of ocular trauma can be relatively easily accomplished within a developing country medical system,[23] prevention requires a wider and more difficult community and legislative approach.

There is a need for information on which to base the planning processes in these countries. However, considerable resources are required to rigorously assess the prevalence and causes of blindness and vision impairment, describe health services, audit infrastructure, evaluate service workload and document disease interventions and their outcomes. In the absence of these resources, and recognizing that hospital-based services are but one component of a multitiered system providing comprehensive eye care, and that there are significant barriers to accessing these services,[24] a hospital-based rapid assessment methodology was devised to provide a snapshot of eye disease and care.

This paper reports the findings from four Pacific nations: Cook Islands, Fiji, Samoa and Tonga (Table 1).

METHOD

Two- or three-day visits were made to the eye clinics at the national public hospitals in each of Cook Islands, Samoa, Fiji and Tonga. Information about personnel, infrastructure and service delivery was collected by informal interview of clinical and administrative staff. Examination of clinical records was undertaken.

Considering the populations of the four countries as a whole, and based on an estimate of blindness prevalence in the clinic population of 5.0 ± 2.0% at the 5% level of significance, it was determined that 450 records of patients older than 15 years of age should be systematically sampled from each clinic for one calendar year. The total number of consultations in each clinic for the year (being October 2001 to September 2002 for Samoa, and January to December 2002 for the other countries) was then used to calculate which records would be sampled in each clinic. For example, with 3655 consultations in the Tongan hospital, every eighth card was sampled to obtain distribution of the 450 records throughout the year. The patient register book at each clinic, into which every consultation had been written, was used to identify which patient record cards were required. Each record card was then retrieved from the clinic archive.

A preliminary assessment was made of the record card to ensure age, gender and presenting visual acuities were all documented and legible. If any of these details were not present or were illegible, or the patient was under 16 years of age, or the date for which the record was chosen was not that of the first visit of that patient during that year, the record was discarded and that of the subsequent patient in the register book was selected.

Age, gender, presenting visual acuities and clinician examiner of each patient were entered into a specifically designed database. Any eye noted to be visually impaired at presentation (visual acuity worse than 6/18) had the cause of that

Table 2. Characterization of eye care services in Cook Islands, Central Division of Fiji, Samoa and Tonga (2002)

	Cook Islands	Central Division Fiji	Samoa	Tonga
Permanent eye clinics (*n*)	0	1	1	1
Permanent eye doctors (*n*)	0	4	1	1
Mid-level workers (nurses/technicians) (*n*)	0	6	2	2
Primary eye care nurses (*n*)	1	10	0	0
Visiting teams per year (*n*)	1	2	3	5
Outreach trips per year (*n*)	1	40	1	4
Functioning hospital-based equipment				
Cataract				
A-scan and keratometer	No	A-scan	No	A-scan
Operating microscope	Yes	Yes	Yes	Yes
Surgical instruments	No	Yes	Yes	Yes
Phacoemulsification machine	No	No	No	Yes
YAG laser	No	Yes	No	Yes
Refractive error				
Refraction equipment	No	Yes	Yes	Yes
Diabetic retinopathy				
Retinal laser	No	Yes	Yes	Yes
Glaucoma				
Perimetry	No	No	No	No

impairment, as determined by the attending clinician, any intervention received and the post-intervention vision, if documented, also entered into the database.

In some cases of vision impairment, the examining doctor had not nominated a specific cause. For these eyes, in the absence of any other findings, uncorrected refractive error was considered to be that cause if the acuity had improved to better than 6/18 with pinhole. Other causes, including corneal opacity and cataract, required documentation of findings of sufficient magnitude to explain the level of vision loss. Where multiple ocular conditions were recorded but a single cause had not been declared, for the purposes of this study, the attributed cause entered in the database was the condition most easily treated if each of the contributing conditions were individually treatable to a vision of 6/18 or better. So, for example, when uncorrected refractive error and lens opacity coexisted, refractive error, with its easier and less expensive treatment, was nominated as the cause. Where treatment of a condition present would not result in 6/18 or better acuity, it was determined to be the cause rather than any coincident or associated conditions amenable to treatment. So, for example, coincident retinal detachment and cataract, without a history of trauma, would be categorized as 'retina/age-related macula degeneration'.

Analysis of data concerning vision impairing cataract and diabetic retinopathy was undertaken by eye, regardless of whether or not the fellow eye was vision impaired. Although monocular vision impairment due to refractive error was considered for analysis by eye, patients with this were not included in the analysis of refractive error by person. Only where vision impairing refractive error was present in one eye and the fellow eye was also vision impaired by refractive error or some other cause, was analysis done by person.

Statistical analysis used the chi-squared test with significance at $P \leq 0.05$, and odds ratio with 95% confidence intervals (95% CI).

Results

As a result of interview, an overview was formed of the capacity of the eye service associated with the audited hospital (Table 2). In all jurisdictions, outpatient attendance and offered treatments and inpatient cataract surgery were provided without charge.

Only 256 record cards of patients who received eye care in 2002 could be located at the hospital in Cook Islands. All these available records were reviewed. Consequently, this sample was not randomly selected, and some data were missing (Table 3). The study methodology was followed for the other three hospitals, with 380, 421 and 457 records being sampled by the time the selection process reached the end of the study period. For the adult populations, those aged 45 years and older are more likely to use the hospital services, which considering both clinic attendance and cataract surgery, appear to be reasonably gender equitable.

In each location, attendee vision impairment was associated with increasing age (Table 4). Compared with those under 65 years, attendees 65 years and older were 3.7 (95% CI: 1.6–8.8), 6.2 (95% CI: 3.7–10.5), 3.8 (95% CI: 2.3–6.1) and 4.2 (95% CI: 2.4–7.3) times as likely to be vision impaired in the Cook Islands, Fiji, Samoa and Tonga, respectively. There was no significant gender difference associated with low vision or blindness.

With the exception of low vision at the Cook Island and Tongan hospitals, cataract was the most common cause of both low vision and blindness (Table 5). Refractive error and cataract accounted for 90.0%, 63.2%, 55.9% and 72.7% of

Table 3. Clinical record audit for hospitals in Cook Islands, Central Division of Fiji, Samoa and Tonga: summary of patient characteristics

	Cook Islands			Central Division Fiji			Samoa			Tonga		
Hospital audited	Rarotonga Hospital, Rarotonga			Colonial War Memorial Hospital, Suva, Vitu Levu			Tupua Tamases Meaole Hospital, Apia, Upolu			Nuku'alofa Hospital, Tongatopu		
Outpatient attendances during the study period[†] (*n*)	796			~19 000			4009			3655		
Clinical records sampled (*n*)	256			421			380			457		
Proportion of clinical records sampled belonging to female attendees (%)	55.9			49.4			52.7			49.7		
Proportion of cataract surgery performed on female patients (%)	48.5			55.6			51.9			60.0		
Age distribution of sample (years)	16–44	45–64	65+	16–44	45–64	65+	16–44	45–64	65+	16–44	45–64	65+
(*n*)	62	117	72	169	162	90	72	150	158	164	162	131
(%)	(24.2)[‡]	(46.7)[‡]	(28.1)[‡]	(40.1)	(38.5)	(21.4)	(18.9)	(39.5)	(41.6)	(35.9)	(35.4)	(28.7)

[†]January to December 2002 for all hospitals, except Samoa (October 2001 to September 2002). [‡]5 records (2%) were missing age data.

Table 4. Clinical record audit for hospitals in Cook Islands, Central Division of Fiji, Samoa and Tonga: vision status by age group for patients attending

Patients attending	Vision status (better eye per person)											
	Cook Islands			Central Division Fiji			Samoa			Tonga		
	Not vision impaired[†]	Low vision[‡]	Blind[§]	Not vision impaired	Low vision	Blind	Not vision impaired	Low vision	Blind	Not vision impaired	Low vision	Blind
Age (years)												
16–44 (*n* [%])	57 (91.9)	3 (4.8)	2 (3.2)	156 (92.3)	10 (5.9)	3 (1.8)	65 (90.3)	6 (8.3)	1 (1.4)	160 (97.6)	3 (1.8)	1 (0.6)
45–64 (*n* [%])	112 (95.7)	5 (4.3)	0	134 (82.7)	23 (14.2)	5 (3.1)	123 (82.0)	16 (10.7)	11 (7.3)	140 (86.4)	14 (8.6)	8 (4.9)
≥65 (*n* [%])	59 (81.9)	10 (13.9)	3 (4.2)	48 (53.3)	28 (31.1)	14 (15.6)	94 (59.5)	35 (22.2)	29 (18.4)	96 (73.3)	24 (18.3)	11 (8.4)
unknown (*n* [%])	4 (80.0)	1 (20.0)	0	0	0	0	0	0	0	0	0	0
Total (*n* [%])	232 (90.6)	19 (7.4)	5 (2.0)	338 (80.3)	61 (14.5)	22 (5.2)	282 (74.2)	57 (15.0)	41 (10.8)	396 (86.7)	41 (9.0)	20 (4.4)

[†]presenting vision 6/18 or better. [‡]presenting vision 6/120 or better, but worse than 6/18. [§]presenting vision worse than 6/120.

Table 5. Clinical record audit for hospitals in Cook Islands, Central Division of Fiji, Samoa and Tonga: causes of low vision (6/120 or better, but less than 6/18) and blindness (worse than 6/120) for eyes presenting with acuity less than 6/18

Cause	Cook Islands		Central Division Fiji		Samoa		Tonga	
	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)
Cataract	23 (46.0)	22 (56.4)	38 (35.8)	58 (57.4)	45 (35.4)	93 (61.6)	34 (30.9)	50 (45.5)
Refractive error	22 (44.0)	5 (12.8)	29 (27.4)	6 (5.9)	26 (20.5)	5 (3.3)	46 (41.8)	1 (0.9)
Diabetic retinopathy	1 (2.0)	1 (2.6)	23 (21.7)	4 (4.0)	17 (13.4)	12 (7.9)	10 (9.1)	23 (20.9)
Trauma/corneal opacity	3 (6.0)	9 (23.1)	3 (2.8)	10 (9.9)	3 (2.4)	11 (7.3)	5 (4.5)	20 (18.2)
Pterygium	0	0	6 (5.7)	0	21 (16.5)	4 (2.6)	2 (1.8)	3 (2.7)
Glaucoma	0	0	1 (0.9)	3 (3.0)	1 (0.8)	13 (8.6)	1 (0.9)	2 (1.8)
Retina/age-related macula degeneration	0	2 (5.1)	0	5 (5.0)	8 (6.3)	8 (5.3)	5 (4.5)	4 (3.6)
Infection/inflammation	1 (2.0)	0	4 (3.8)	2 (2.0)	3 (2.4)	0	3 (2.7)	6 (5.5)
Childhood blindness	0	0	1 (0.9)	2 (2.0)	0	0	0	0
Poor cataract surgery outcome	0	0	0	5 (5.0)	2 (1.6)	4 (2.6)	2 (1.8)	1 (0.9)
Posterior capsule opacity	0	0	1 (0.9)	6 (5.9)	1 (0.8)	1 (0.7)	2 (1.8)	0
Total	50	39	106	101	127	151	110	110

Table 6. Clinical record audit for hospitals in Cook Islands, Central Division of Fiji, Samoa and Tonga: treatment of eyes with low vision (6/120 or better, but less than 6/18) and blindness (worse than 6/120) caused by cataract

Treatment	Cook Islands		Central Division Fiji		Samoa		Tonga	
	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)
Surgery undertaken	13 (56.5)	20 (90.9)	9 (23.7)	45 (77.6)	29 (64.4)	77 (82.8)	19 (55.9)	41 (82.0)
Surgery booked but not as yet undertaken by local surgeon	0	0	1 (2.6)	5 (8.6)	3 (6.7)	6 (6.5)	0	0
Referred to expatriate visiting surgeon but surgery not yet undertaken	0	1 (4.5)	0	0	0	4 (4.3)	4 (11.8)	5 (10.0)
Referred overseas for surgery	0	1 (4.5)	0	0	0	0	0	0
No treatment	10 (43.3)	0	28 (73.7)	8 (13.8)	13 (28.8)	6 (6.5)	11 (32.4)	4 (8.0)
Total	23	22	38	58	45	93	34	50

low vision and 69.2%, 63.3%, 64.9% and 46.4% of blindness in the Cook Islands, Fiji, Samoa and Tonga clinics, respectively. Diabetic retinopathy was a substantial contributor to visual impairment at all locations except the Cook Islands. Trauma/corneal opacity was an important cause of blindness in Cook Islands and Tonga. Pterygium-induced low vision and glaucoma blindness were diagnosed most frequently in Samoa.

A substantial proportion of visually significant cataract, particularly that causing low vision but not blindness, was not offered treatment (Table 6). This was, in part, likely determined by the functionally satisfactory visual acuity of the fellow eye. Of the blinding cataract offered treatment, 90.9%, 90.0%, 88.5% and 89.1% in the Cook Islands, Fiji, Samoa and Tonga hospitals, respectively, had undergone surgery at the time of audit (at least 5 months after the period to which the reviewed clinical notes pertained).

The vision outcome of cataract surgery in Fiji was less successful than elsewhere (Tables 5 and 7). Only Samoa (Table 7) achieved the World Health Organization suggested outcomes.[25] However, it should be noted that, when present, the Cook Island visual acuities were generally only recorded in the first few postoperative days.

Overall, 70.8% of eyes undergoing cataract surgery were, unaided, no longer vision impaired, but 5.5% were blind. There was no difference between local and visiting surgeons in terms of the patients who were blind postoperatively, and those who had low vision before surgery but who were no longer vision impaired at follow up ($P = 0.858$ and $P = 0.188$, respectively).

Spectacles were not dispensed at the hospital clinics in Cook Islands, Fiji, or Tonga. Samoa had donated recycled spectacles available, but dispensed these to only 16.7% of those with refractive error (Table 8). At all locations, many patients were given a spectacle prescription to take elsewhere. It is unknown how many of these were dispensed. More than 50% of those diagnosed with refractive error in Tonga were not offered any treatment. The refractive errors of two Fijian aphakic patients were treated with secondary intraocular lens implants.

Eyes already blinded by diabetic retinopathy may not warrant retinal photocoagulation (Table 9). However, eyes

Table 7. Clinical record audit for hospitals in Cook Islands, Central Division of Fiji, Samoa and Tonga: vision outcome, at last recorded clinic visit or at discharge, for eyes operated for cataract

Postoperative visual acuity (unaided)	Cook Islands *n* (%)	Central Division Fiji *n* (%)	Samoa *n* (%)	Tonga *n* (%)	Total *n* (%)
6/18 and better	22 (66.7)	26 (48.1)	95 (89.6)	36 (60.0)	179 (70.8)
6/120 or better, but less than 6/18 (low vision)	3 (9.1)	19 (35.2)	9 (8.5)	16 (26.7)	47 (18.6)
Worse than 6/120 (blind)	0	9 (16.7)	1 (1.0)	4 (6.7)	14 (5.5)
No postoperative visual acuity recorded	8 (24.2)	0	1 (1.0)	4 (6.7)	13 (5.1)
Total	33	54	106	60	253

Table 8. Clinical record audit for hospitals in Cook Islands, Central Division of Fiji, Samoa and Tonga: treatment for people with vision impairment (less than 6/18†) caused by refractive error

Treatment	Cook Islands *n* (%)	Central Division, Fiji *n* (%)	Samoa *n* (%)	Tonga *n* (%)
Spectacles dispensed	0	0	2 (16.7)	0
Spectacle prescription given	10 (100)	11 (78.6)	8 (66.7)	9 (39.1)
Referred overseas for spectacles	0	1 (7.1)	1 (8.3)	1 (4.3)
Treated with secondary anterior chamber intraocular lens implantation	0	2 (14.3)	0	0
No treatment	0	0	1 (8.3)	13 (56.5)
Total	10	14	12	23

†Patients with monocular vision impairment due to refractive error are not included. Only patients with vision impairing refractive error in one eye in whom the fellow eye was also vision impaired by refractive error or some other cause are reported.

Table 9. Clinical record audit for hospitals in Cook Islands, Central Division of Fiji, Samoa and Tonga: treatment of eyes with low vision (6/120 or better, but less than 6/18) and blindness (worse than 6/120) caused by diabetic retinopathy

Treatment	Cook Islands		Central Division, Fiji		Samoa		Tonga	
	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)	Low vision *n* (%)	Blindness *n* (%)
Retinal photocoagulation undertaken	0	0	9 (39.1)	4 (100)	11 (64.7)	2 (16.7)	4 (40.0)	5 (21.7)
Referred overseas for retinal photocoagulation	1 (100)	1 (100)	0	0	1 (5.9)	1 (8.3)	0	0
No treatment	0	0	14 (60.8)	0	5 (29.4)	9 (75.0)	6 (60.0)	18 (78.3)
Total	1	1	23	4	17	12	10	23

with low vision attributed to diabetic retinopathy were not universally offered laser treatment in Fiji, Samoa and Tonga.

Discussion

Poor information management and record keeping were significant impediments to this rapid assessment methodology. It was not uncommon for interviewed senior staff to be unaware of the details of the services they participated in and supervised. This was least evident concerning clinical equipment and most obvious with regards to the activities of visiting expatriate teams. The missing patient records in the Cook Islands and poorly completed records in all jurisdictions are typical of eye care in developing countries.[26–29] Improvement in record keeping and service and clinical monitoring would not only strengthen this study's methodology, but likely improve patient care and service planning and delivery. Attention should be given to this in any *Vision* 2020 plan devised.

The current study is hospital based. It does not include information on the people who were unable or unwilling to attend to the clinics. A recent survey conducted in villages within 4 h by bus transport from Fiji's Central Division Colonial War Memorial Hospital, found fatalistic attitudes, rural residence and being female were barriers to use of hospital eye care services, but that lack of awareness of the services was not.[24] There is an imperative for health-care planning to include community education and service extension closer to those in need. Affirmative action targeting women may also be required. Although clinic attendance and cataract surgery would appear to be gender equitable, given that being female is a barrier to use[24] and that women may have a greater burden of disease,[30] this may not be the case.

There is marked disparity in levels of eye service staffing across the four countries. Although *Vision* 2020 makes human resource recommendations,[6] these need to be modified according to the realities of such variables as total population and geography. It may be that, for example, Cook Islands will not be able to sustain a resident ophthalmologist and full complement of ancillary staff, but always rely on a visiting service supported by a few well-trained local eye nurses.

To meet *Vision* 2020 aims of reducing avoidable visual impairment, treatment of cataract and refractive error need to be the top priorities in all four countries. With the possible exception of Cook Islands, although this may be spurious because of missing records, the management of diabetic retinopathy also needs to be prioritized. Cook Islands and Tonga may also target trauma/corneal opacity, perhaps with increased primary eye care capacity. Samoa may need to pay attention to pterygium and glaucoma. A limitation of the study methodology is that it retrospectively relies on the diagnostic skills of clinic practitioners. That pterygium was documented as a significant cause of impaired vision in Samoa but not elsewhere may be a product of uneven skill or interpretation. However, that glaucoma was a more frequently attributed cause of blindness, the diagnosis of which perimetry is not required, in Fiji and particularly Samoa, may reflect ethnicity differences. It would seem prudent to make the confirmation or otherwise of the presence and morbidity of glaucoma in the whole or a subgroup of the population a planning priority. This would have significant service implications.

The clearance rates of cataract for which surgery was planned may suggest that current services are managing this problem well. However, a *Vision* 2020 plan that increases case finding and improves service accessibility will also need to increase surgical capacity. Initiatives, including setting standards, monitoring and training, to improve surgery vision outcomes, particularly in Fiji, should also be incorporated.[25,28,29,31–34]

The treatment of refractive error is perhaps the simplest and potentially most cost-efficient form of eye care. It has been proposed that if a population has blindness due to refractive error, as was the case in these four countries, then eye care services to that population are inadequate.[19] The treatment of refractive error does not end with the issuing of a spectacle prescription. Only the Samoan hospital dispensed spectacles, although to a minority. In all locations, patients were expected to get spectacles from private suppliers. Anecdotally, these sources were too expensive. Most prescriptions were probably not dispensed. So, despite seeking help for poor distance vision, most attendees were probably left unimproved and perhaps dissatisfied. Additionally, although not specifically addressed in this study, there is the problem of treating presbyopia. Based on an estimation of 60% of those 40 years and older being presbyopic,[35] approximately 160 000 people in these four countries would benefit from having near-vision spectacles. Strategies to ensure appropriate dispensing of affordable, cosmetically acceptable, optically functional, physically robust spectacles should be developed,[36–38] as has occurred in Cook Islands since this audit was completed.

The diagnosis and management of diabetes and its complications are vexing problems. The confirmation of diabetic retinopathy as a priority eye condition in the region means more effort needs to be directed to lessen its impact on vision. As occurred in this study, services that leave untreated vision impairing retinopathy are not adequately dealing with the problem. Models of diagnosis and treatment as occur at Lautoka Hospital, in Fiji's Western Division, need to be examined and promulgated.

The methodology used in this audit was designed to quickly and cost-efficiently gather data that might give a snapshot of eye care services, particularly relating to hospital use, common diseases diagnosed and treated, and treatment outcomes. Despite its limitations, it successfully furnished some of the information required to undertake *Vision* 2020 service planning. In the future, it could easily be repeated by local clinicians to track the impact of today's planning.

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