Outreach Eye Services in Australia

THE UNIVERSITY OF MELBOURNE

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ABBREVIATIONS

AHW	Aboriginal Health Worker
ALO	Aboriginal Liaison Officer
AMS	Aboriginal Medical Service
ATSI	Aboriginal and Torres Strait Islander
DoHA	Department of Health and Ageing
FFS	Fee for Service
FHF	The Fred Hollow's Foundation
FTE	Full Time Equivalent
ICEE	International Centre for Eye Care Education
MSOAP	Medical Specialist Outreach Assistance Programme
OATSIH	Office of Aboriginal and Torres Strait Islander Health
OES	Outback Eye Service
Ophthal	Ophthalmologist
Optom	Optometrist
POWH	Prince of Wales Hospital
RANZCO	Royal Australian and New Zealand College of Ophthalmology
REHC	Regional Eye Health Coordinator
RRP	Rural Retention Programme
VOS	Visiting Optometric Scheme

EXECUTIVE SUMMARY

This report provides a cross-sectional review of outreach eye health services in Australia and the main drivers of performance and descriptions of funding models based on evidence collected in early 2009. Service outcomes and costs per attendance vary significantly depending on the funding model, co-ordination between eye care professions, proportion of Indigenous patients and continuity of leadership provided by visiting consultants.

- **There is significant variability in service levels (clinical throughput and supply) and funding arrangements across outreach eye services in Australia**
  - Ophthalmology service levels per population are not consistent across regions and are up to 19 times below the national average. There are up to 40 fold variations in the ratio between ophthalmology and optometry services
  - More efficient services conduct over 15 cataract operations and 145 clinic attendances per ophthalmology week, compared with 1 operation and 13 clinic attendances per week reported by others
  - Funding sources and funding levels vary widely across locations and States and are complex to navigate
  - Regions with a majority of Indigenous patients have higher costs per attendance
- **The main drivers of good services are a funding model that provides appropriate incentives and effective coordination of services**
  - Fee-for-service funding rewards ophthalmologist efficiency more than sessional rates and is associated with higher clinical throughput, lower costs per attendance and shorter waiting times. However, sessional rates act as a safety net for poor turnout or slow clinics in isolated regions
  - Service integration (especially good communication between optometrists and ophthalmologists) is associated with reduced waiting times and has little bearing on overall cost
- Better services see more patients, perform more surgery and have shorter waiting times for both clinic consultations and surgery
- State and Federal Governments should consider alternative options for funding and coordination that incentivise performance appropriately and are transparent and sustainable. Adaptability to regional constraints will be necessary

BACKGROUND

Outreach services for eye health care exist in most states and territories in Australia. The rich history of John Flynn, Ida Mann and Fred Hollows among others has left an indelible mark on the attitude of generations of ophthalmologists and optometrists to provide services to remote and disadvantaged communities.

From the available evidence, it is generally accepted that outreach visits are an important and appropriate part of delivering efficient, equitable and effective eye health services.[1] A population-based observational study showed specialist outreach visits to remote disadvantaged Indigenous communities in Australia improved access to specialists without increasing elective referrals or demands for hospital inpatient services.[2]

Unlike in most specialties, in eye healthcare there are two groups of primary health care providers. Both general practitioners and optometrists provide screening and treatment of eye conditions and may channel referrals to ophthalmologists. In addition, optometrists may work synergistically with visiting ophthalmologists to effectively screen patients requiring secondary care. The coordination of ophthalmology and optometry in providing outreach services to remote areas has been very successful in some jurisdictions although, efficient coordination appears to be lacking in others.

Given the geographic and population diversity across Australia's remote areas, it is not surprising that there is considerable variation in how the services operate across the country. This is accentuated by the fact that most health care planning is usually done by State governments whereas Indigenous health care has often been planned and coordinated by Commonwealth departments through community controlled health organizations. The combination of resources from State and Commonwealth governments has lead to a complex funding relationship. In addition, certain non-government organizations have acted as advocates for disadvantaged remote communities and therefore private, corporate and charitable funding have also contributed.

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[1] Gruen RL, Weeramanthri TS, Knight SS, Bailie, RS. Specialist outreach clinics in primary care and rural hospital settings. *Cochrane Database of Systematic Reviews* 2003, Issue 4. Art. No:CD003798. DOI:10/1002/145651858.CD003798.pub2.

[2] Gruen RL, Bailie RS, Wang Z, Heard S, O'Rouke IC. Specialist outreach to isolated and disadvantaged communities: a population-based study. *Lancet* 2006; **368:**130-138.

SURVEY OUTLINE

Between January and April 2009, nine selected outreach ophthalmology services were visited (Appendix 1) . Selection of these services was partly related to timing of visiting ophthalmologists and partly designed to reflect services with different funding models in diverse settings e.g. different states, territories, coastal, inland, rural, remote, very remote, mainly Indigenous population or mainly non-Indigenous (figure 1).

Key stake-holders from differing backgrounds identified as information rich sources were selected. Interviewees included nurses, clinic clerical staff, Aboriginal health workers (AHW), hospital administrators, optometrists, ophthalmologists, eye service managers and regional eye health coordinators (REHC) (Appendix 3). One-on-one semi-structured interviews were conducted within the context of the participant's work environment. Narrative summaries of qualitative and quantitative information obtained from interviews were collated for each region.

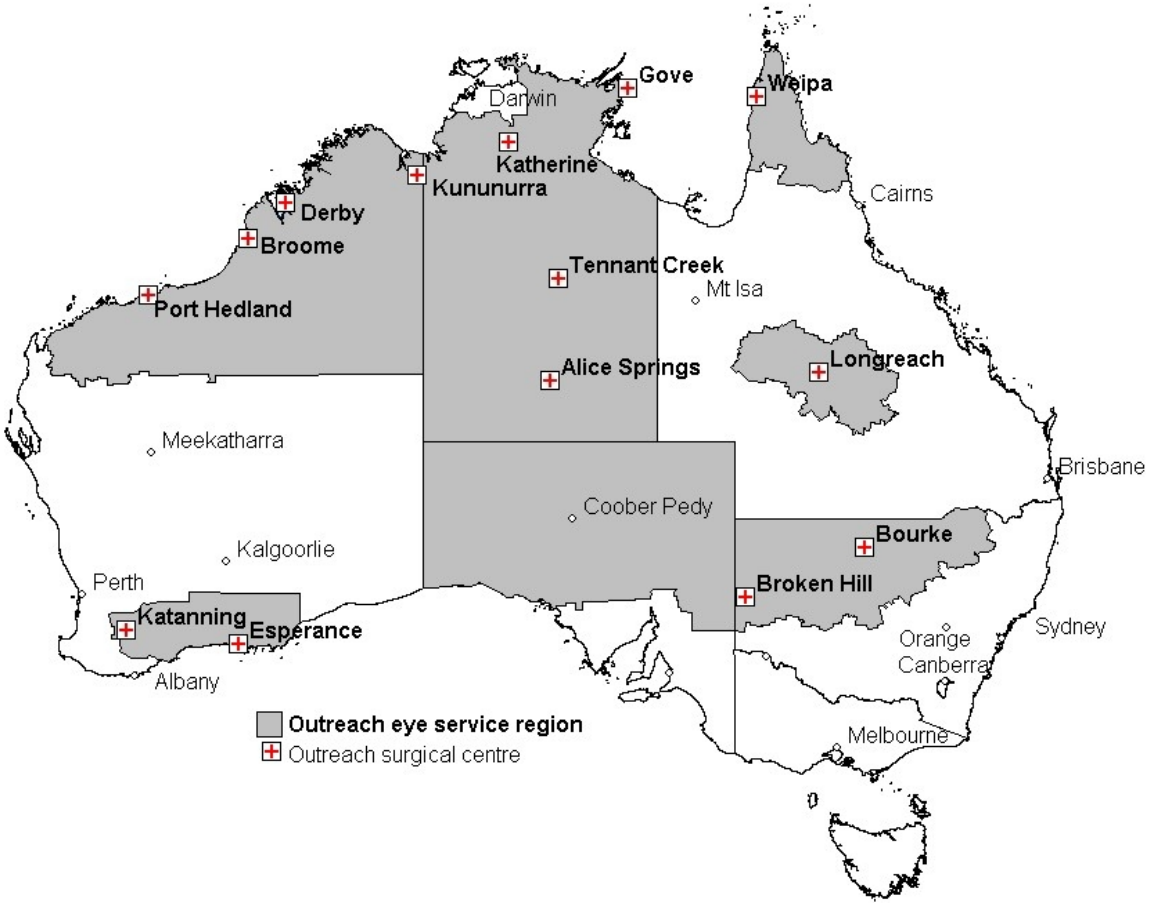


Figure 1. Map showing outreach eye services and surgical centres included in survey.

WORKFORCE

Population per ophthalmologist ratios are above the national average in all regions except the NT Top End and up to 19 times higher in the Pilbara.

The NT has equal proportions of optometry and ophthalmology but in other regions there is up to a 40 fold difference.

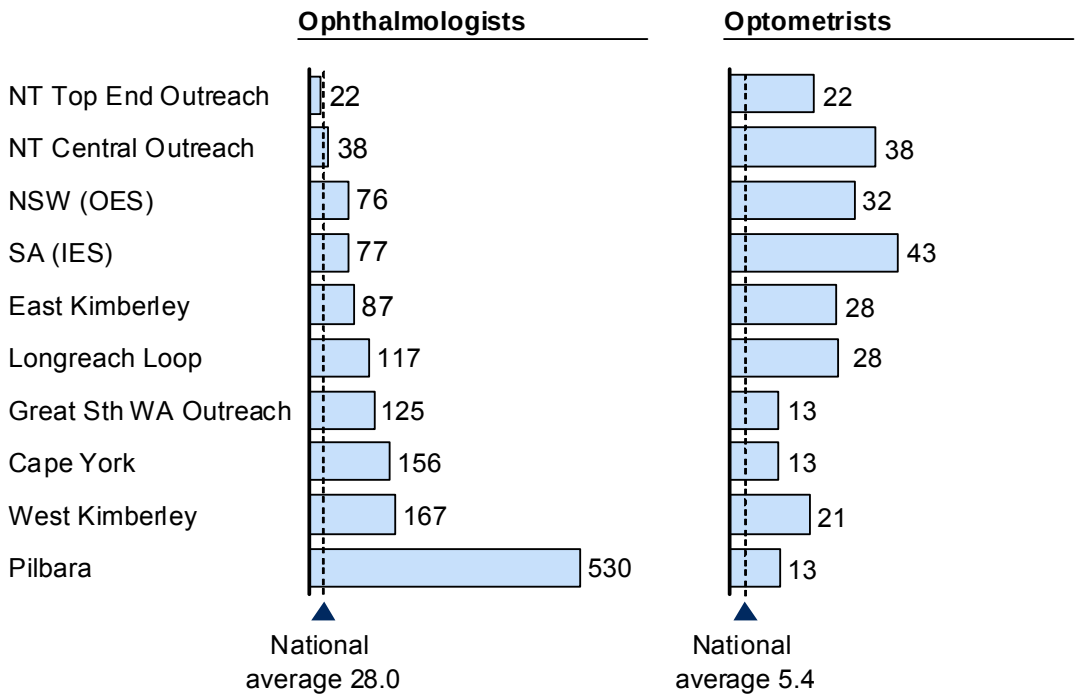


Figure 2. Workforce availability. Population ('000s) per eye care professional.

On average there are 28,000 people per ophthalmologist in Australia and 5,435 people per optometrist. In all outreach regions, the number of people served by one full time equivalent ophthalmologist was higher than the national average (figure 2). The greatest difference was the Pilbara which was 19 times higher. Most outreach services had visiting ophthalmologists who individually spend between 1-7 weeks servicing the region. The NT Top End had a public consultant post dedicated to outreach services. The number of people served by optometrists also varied considerably across the regions.

Lower population/ophthalmologist may be appropriate in regions that:

- are sparsely populated with difficult access
- have populations that need more time per consultation with language and cultural barriers to Western health care
- have a higher than average prevalence of eye disease

Higher population/ophthalmologist may be appropriate in regions:

- with age/workforce confounders e.g. young population, fly-in/fly-out mining related population who are able to seek eye care services on visits to city centres
- with a high number of optometrists and good service integration with visiting ophthalmologists

Optometry and ophthalmology availability data was combined to calculate the number of people per full time equivalent eye care provider (figure 3). This demonstrated less variability between the regions than data for the separate professions.

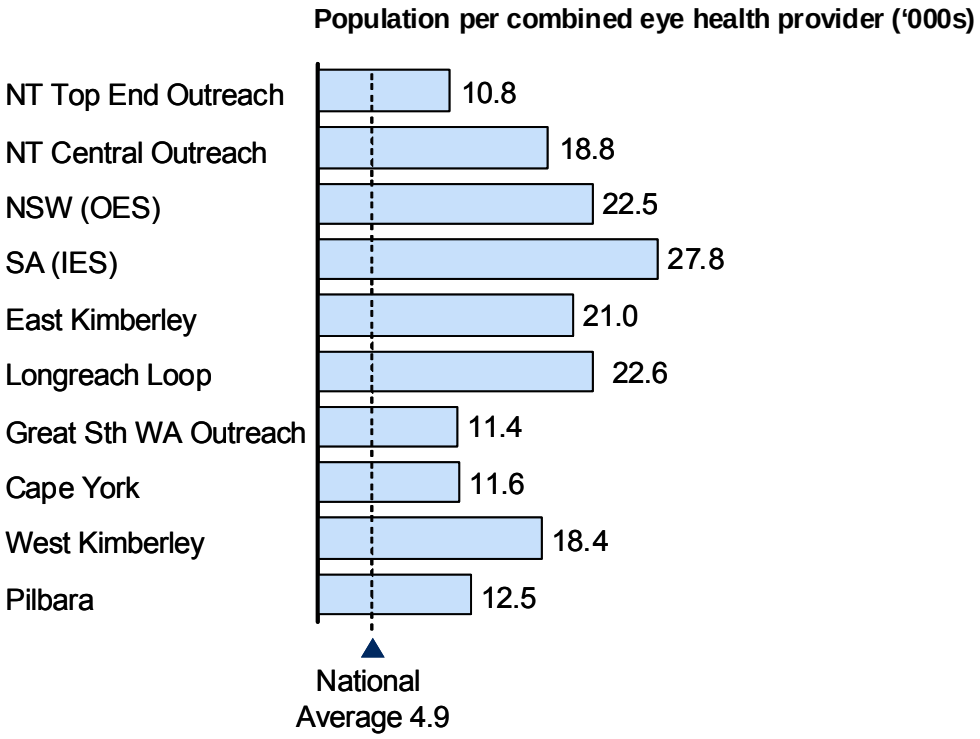


Figure 3. Number of people ('000s) per combined eye health provider.

There were essentially similar numbers of optometrists and ophthalmologists in the NT (figure 2) which suggests a potentially inefficient division of professional services between

primary and secondary eye care. There was up to a 40 fold variation in the ratio of optometry to ophthalmology full time equivalents (table 1).

Region	Ophthalmologist: Optometrist
NT Central Outreach	1:1
Cape York	1:12
NSW (OES)	1:2
Longreach loop	1:4
Great Southern WA Outreach	1:10
NT Top End Outreach	1:1
East Kimberley	1:3
West Kimberley	1:8
Pilbara	1:41
National Average	1:5

Table 1. Ratio of ophthalmology to optometry supply.

CLINIC

Clinic attendance rates vary greatly and are often poor in outreach eye services.

Differences in culture and language between patients and visiting staff compound difficulties with communication.

Good liaison with Aboriginal community is essential.

Survey respondents described unique difficulties relating to outreach services in some remote regions, particularly those with a high proportion of Indigenous people. These relate to language barriers, cultural brokerage requirements, poor patient understanding regarding preventative eye care (e.g. diabetic screening/treatment and trachoma). High non-attendance rates and unpredictable fluxes of patient populations relating to community events (e.g. funerals, sporting events) or weather also make planning difficult.

There is very high non-attendance in NT Top End outreach of 70-80% – NT
A major problem is non-attendance and lack of awareness of treatment and prevention benefits – WA
There is no one size fits all for eye programs when considering Australia's diverse remote regions – WA

Given the barriers to access and eye care some providers have commented it is crucial to invest extra time in consultations to establish rapport with patients and to appropriately explain eye care concepts. This is sometimes hampered by multiple workers and sporadic visitors providing a service. An increased investment in cultural brokers or Aboriginal liaison officers for these settings was deemed worthwhile. Additionally resources to equip the local health workers to provide education and awareness of eye conditions would be helpful.

In the NT patients need longer consultations to effectively communicate the required treatment and prevention management. Often interpreters and cultural brokers are required to help – NT

More investment in cultural brokers is required – essential for effective outreach – NT
Education campaign needs to promote benefits/importance of treatment and prevention… maybe a role for the RANZCO Eye Foundation? – WA

There appeared to be a lack of continuity and follow-up in some regions where improvements in medical record systems to communicate history and management would be welcomed e.g. further investment in electronic records.

Patient records are more fragmented with multiple providers in the public sector system – WA
Improved electronic records are needed that are not duplicating the work for clinicians – SA/NT

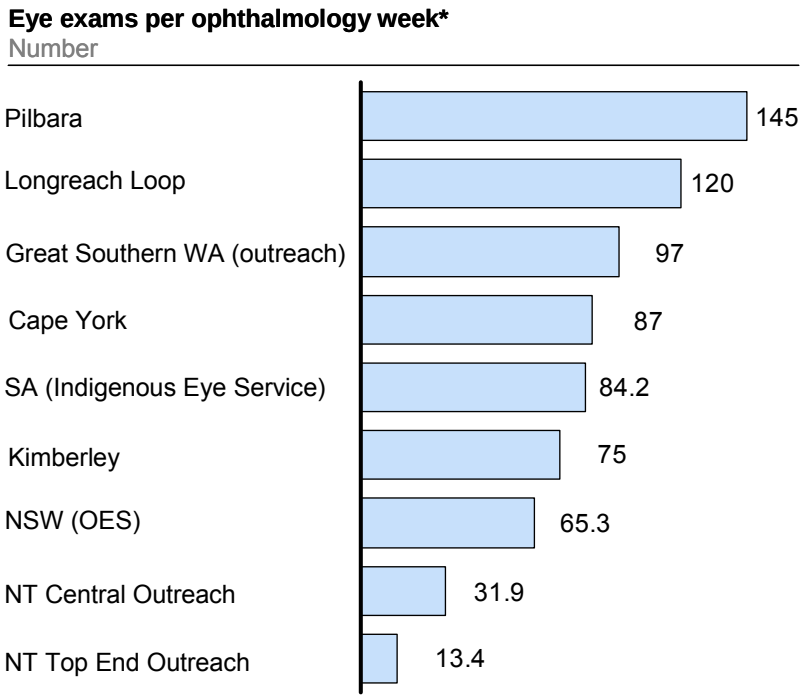
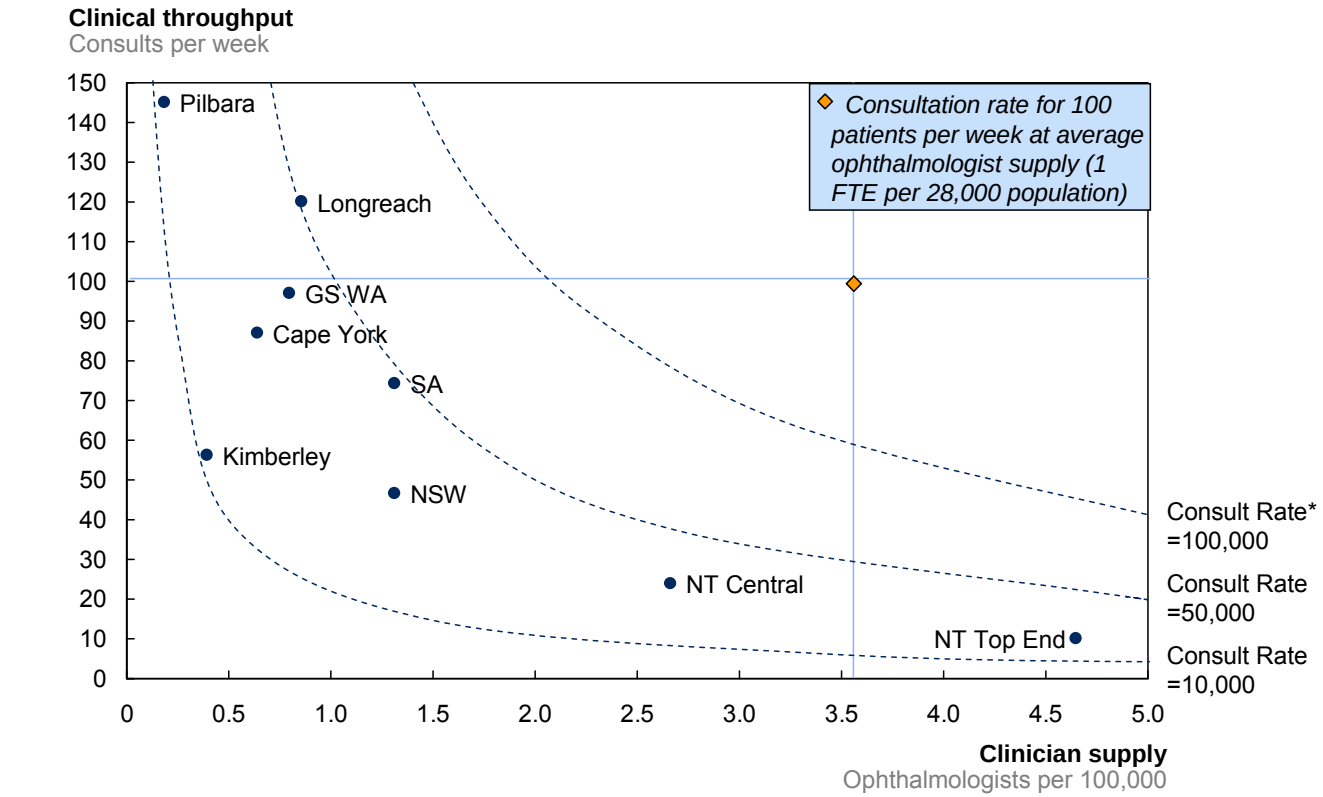


Figure 4. Clinic throughput per ophthalmology week.



*Total number of clinic consultations per million population per year

Figure 5. Schematic demonstrating effects of clinic throughput and ophthalmologist supply on consultation rate.

A large range in clinic efficiency is seen across the regions (figure 5). To meet the need in outreach regions, efficient, high volume clinics as seen in the Pilbara are required. Increased clinic time and staff levels are also required. Better staffed outreach services such as the NT Top End need to develop more efficient services by addressing system issues.

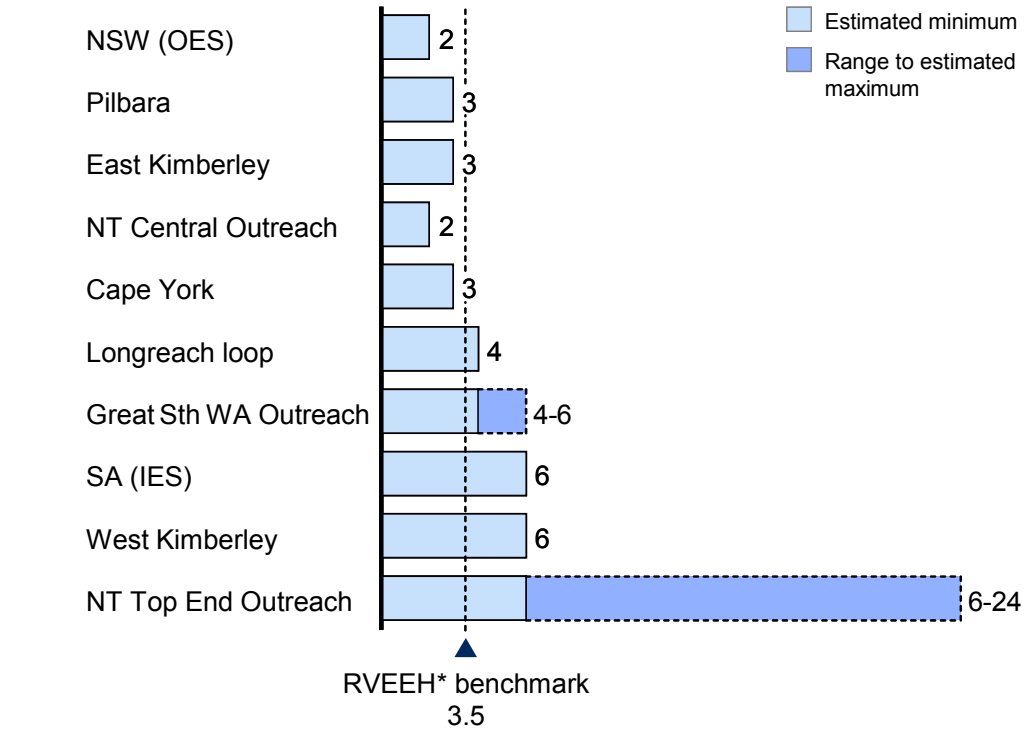


Figure 6. Average waiting times (months) for clinic appointments.

There is significant variation in waiting times for clinic appointments in different regions, from two months to two years. Ranges indicate differences between clinics at various centres within a region (figure 6).

SURGERY

Cataract Surgery Rates in outreach regions are up to ten times lower than the Australian average and suggest a large potential unmet need.

Efficient surgical services have only consultants performing surgery, experienced visiting theatre "scrub" nurses and technical representatives in attendance.

Intensive surgery weeks may have benefits for improved patient attendance, efficient use of resources and improved cataract surgery rates.

Conducting surgery in regional hospitals in outreach locations was generally regarded as an important part of an eye service.

Getting patients to a distant capital for surgery can be a big ordeal. One patient required a 3-day round trip with a 20-hour bus ride. We later discovered the person had never actually made it to the hospital but had remained in the Adelaide bus station for 3 days. – SA

All outreach regions provided surgical services except the South Australian Indigenous Eye Service where patients go to Adelaide or Alice Springs for surgery. The Outback Eye Service at Bourke was the only region to have a defined cap on the number of operations performed each year dictated by the local area health service.

Patient Accommodation

Accommodation for patients was adequate in all regions except in the Kimberley. Where other regions were able to use local motels relatively cheaply, this was not the case in the Kimberley due to expensive public accommodation and no hostel for patients. Two services charged the patient for accommodation. In NSW patients are asked to contribute $50. In Longreach patients paid $300/night in the hospital, although this fee was waived for those unable to afford it.

Follow-up

Follow-up after cataract surgery generally included a one-day review followed by an examination at the next ophthalmology or optometry visit (ranging from 1-3 months). In

the Pilbara, patients were also seen on day 2 and 3. Patients in NSW were seen one week post-operatively by a registrar who remains in Bourke for this purpose.

Registrar Surgery

Registrars were allowed to operate in two surveyed regions, although this depended upon their level of experience. There are a number of unique characteristics of outreach surgery that make the training of registrars in these settings more complex: the lack of easy follow-up; significant travel and costs incurred if surgical complications occur requiring transfer to urban centres; nursing staff and supervising ophthalmologists less familiar with equipment available in the region; and often more difficult or complex surgery. In addition, there are negative consequences of complications for future patient and community acceptance in remote or Indigenous communities.

The consequences of complications are amplified with follow-up and community acceptance for future work… not a good place for registrar training – Qld
These are tougher cases, with communication, follow-up and pathology issues – WA

Equipment

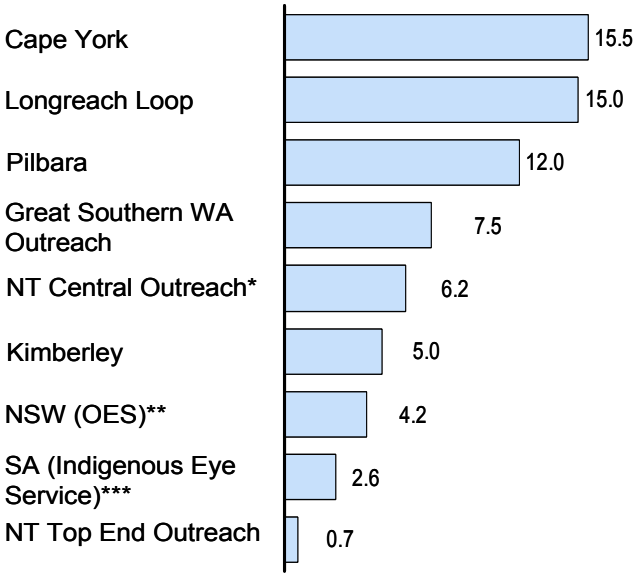
Equipment is varied but in most regions was at an adequate standard. The majority of sites visited had equipment that was satisfactory and met the local surgeon's expectations. An upgrade of phaco-emulsification machines has been requested in Katherine, Gove and Derby by local clinicians. New microscopes would also be beneficial in Katherine and Gove.

Intensive Surgery Weeks

A total of seven intensive surgery weeks have been carried out in Central Australia. These have occurred every 4 months or so over the last three years. The Cape York service has also conducted an annual intensive surgery week for ten years. These are widely regarded by staff and patients as being a successful approach to outreach surgical services:

There are very few non-attenders as these weeks are well accepted by the community –Qld
Works well as all hands on deck for the week and we provide the same service as a city-based practice – Qld

Surgery weeks dramatically reduce waiting lists, lead to less non-attendance and are less scary for patients as patients from the community come as a group – NT

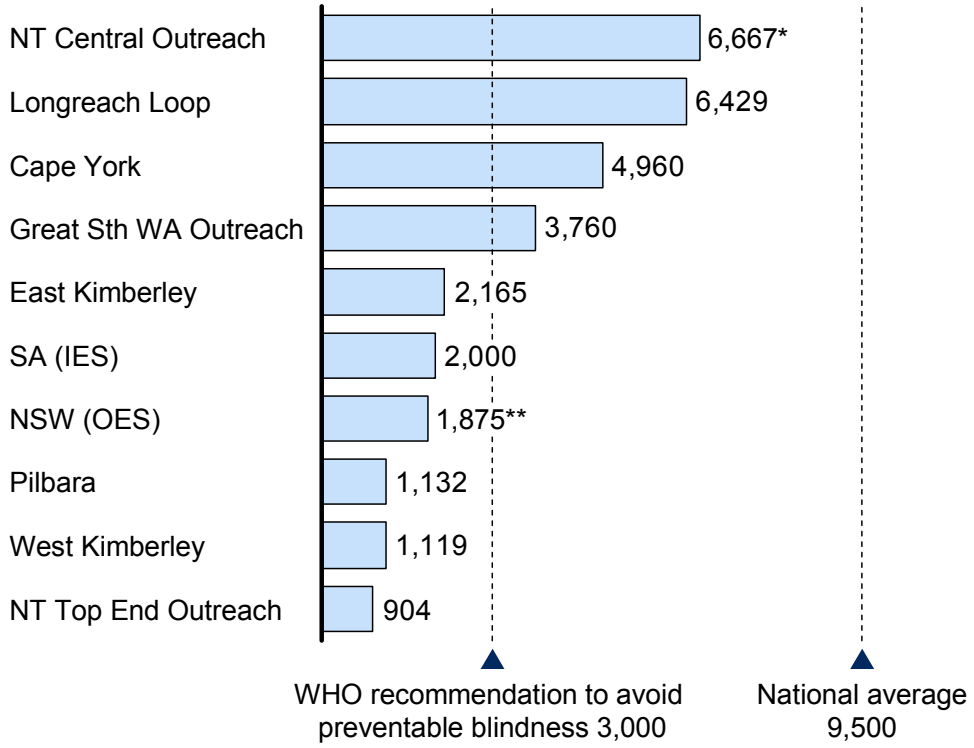


Only Consultants Operate	Visiting Theatre Nurse	Technical Rep. present	ATSI %
+	+	+	97%
+	-	+	2%
+	+	-	50%
+	-	-	2%
+	+	+/-	90%
-	-	-	70%
-	+	+	8%
-	-	-	100%
-	-	-	100%

* Includes operations conducted during a 2008/09 "blitz". Figures in prior years ~40-50% lower
** Total service is capped to 60 cataract operations annually
*** Due to limited available data this was based on author's estimate of the number of cases conducted in Adelaide
ATSI: Patients who identify themselves as of Aboriginal or Torres Straight Islander descent

Figure 7. Number of cataract operations performed per week of ophthalmologist time. Adjacent to graph, the key factors are tabulated: ≤ 2consultants only operating; visiting specialist theatre 'scrub' nurse; technical representative from equipment company present; and the proportion of Indigenous of patients in the eye service.

There is wide variation in the number of cataracts performed per week across the regions. The table of characteristics in figure 7 above demonstrates a cluster of positive features including the presence of a visiting theatre "scrub" nurse and technical representatives from the companies that supply the phaco-emulsification machines and consumables.



* Includes operations conducted during a 2008/09 "blitz". Figures in prior years ~40-50% lower
** OES is capped to 60 cataract operations annually

Figure 8. Cataract Surgery Rates (CSR) – number of cataract operations performed/million population/year.

The cataract surgery rates (CSR) were lower than the national average in all regions – with some up to ten fold lower (figure 8). More than half of the regions visited had CSR that were even less than the minimum rate recommended by WHO to avoid preventable blindness in developing countries (<3/60 bilaterally)[3]. This suggests a large potential unmet need, but this would require population based prevalence data to delineate. The Central Australia outreach figures are a result of the recent intensive surgery ("blitz") weeks to address the excessive cataract surgery waiting times. Prior to this initiative their rate was closer to 3300.

[3] World Health Organization Global Initiative for the Elimination of Avoidable Blindness. Geneva, Switzerland: World Health Organization; 2000. WHO/PBL/97.61 Rev 2

Figure 9 shows threshold CSRs with respect to the surgical efficiency (weekly thoughput/ ophthalmology week) and the supply of ophthalmologists. This graph demonstrates that in order to improve the CSR, a region such as the NT Top End Outreach needs to address health service or system issues to increase surgical efficiency whereas a service such as in the Pilbara operates very efficiently but may require an increase in the supply of ophthalmologists.

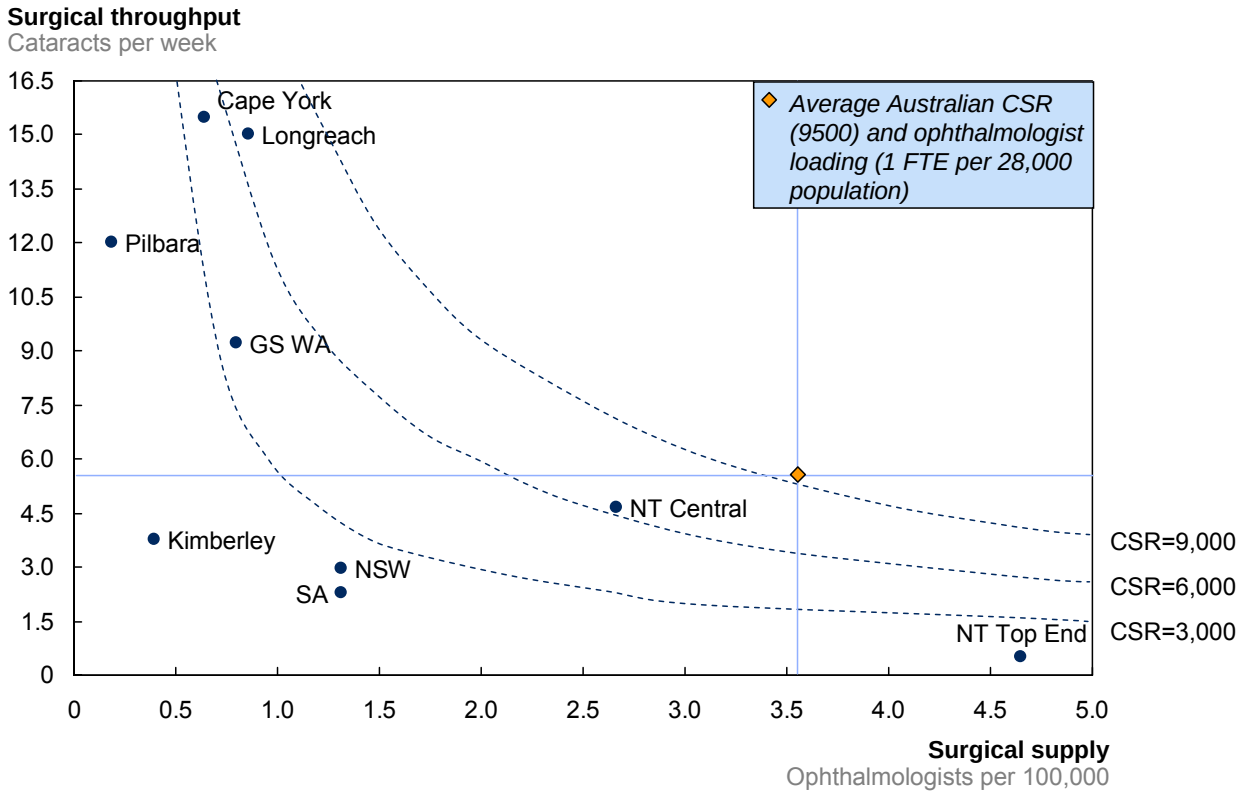


Figure 9. Schematic demonstrating effects of surgical efficiency and ophthalmologist supply on cataract surgery rates. Threshold CSR 3000 = WHO recommendation to eliminate preventable blindness (<3/60 bilaterally), CSR 6000 = estimate of CSR required to eliminate vision impairment at 6/12 bilaterally (driving vision), Australian national CSR is 9500 (RANZCO).

There is significant variation in waiting times for surgery in different regions from 3 months to 24 months. Ranges indicate differences between various surgical centres within a region (figure 10).

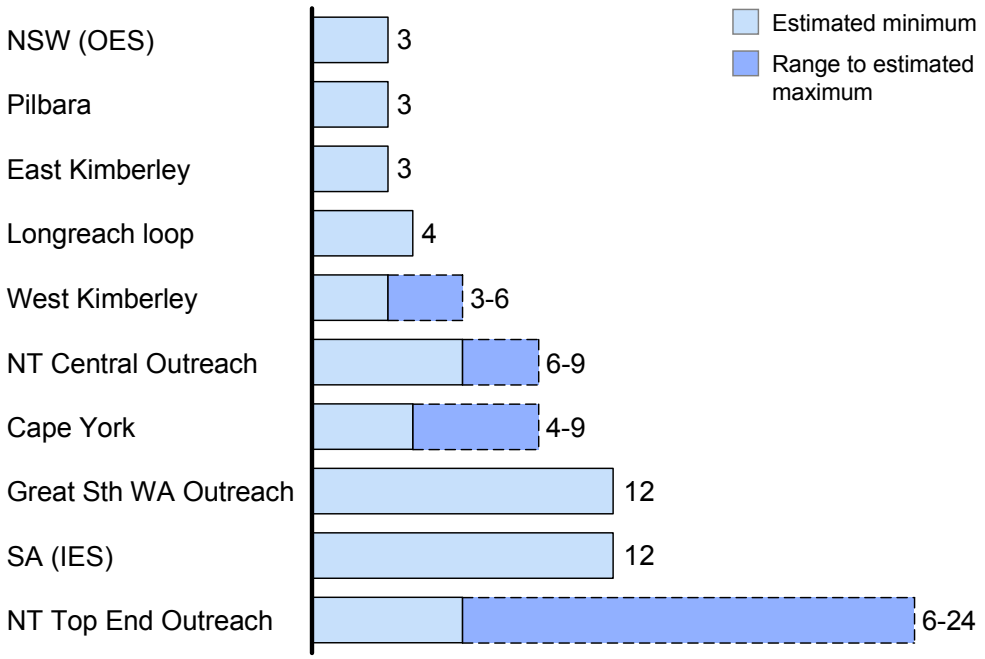


Figure 10. Average waiting times (months) for surgery in surveyed regions.

INDIGENOUS SERVICES

Some of the outreach services in the survey provided services almost entirely dedicated to Indigenous patients whereas other services included only a low proportion of Indigenous patients.

The clinical throughput, waiting times and cost-effectiveness were assessed with respect to the proportion of Indigenous patients seen in each eye service. Those with a majority of Indigenous patients were found to have lower surgical throughput (41% less), lower clinical throughput (45% less), longer waiting times (2X) and were more expensive (1.9X) (figure 11). When multivariate linear regression was conducted to account for funding model and service integration, only the cost per attendance remained statistically significant (β coefficient $399, p 0.04, (CI 28 – 770). To provide adequate services to Indigenous people additional funds are likely to be required.

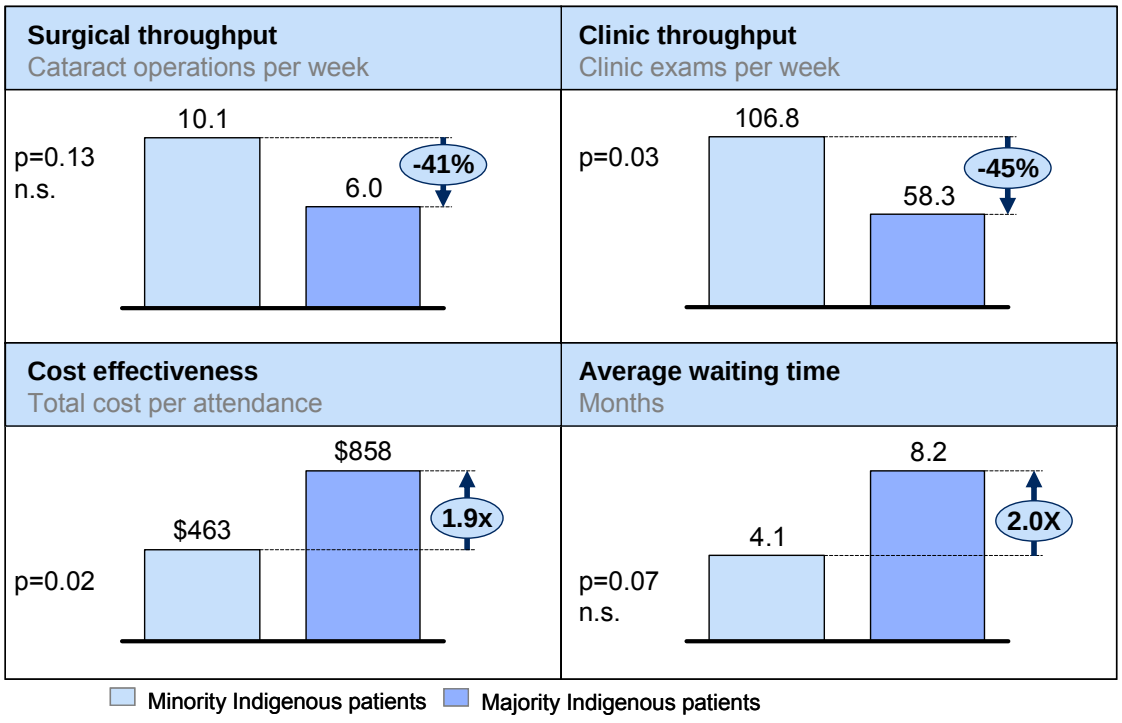


Figure 11. Analysis of service efficiency and cost-effectiveness according to ATSI population.

When the number of Indigenous patients having cataract surgery is calculated for the Indigenous population in the region, the cataract surgery rates (CSR) change, although they still remain below the national average (figure 12).

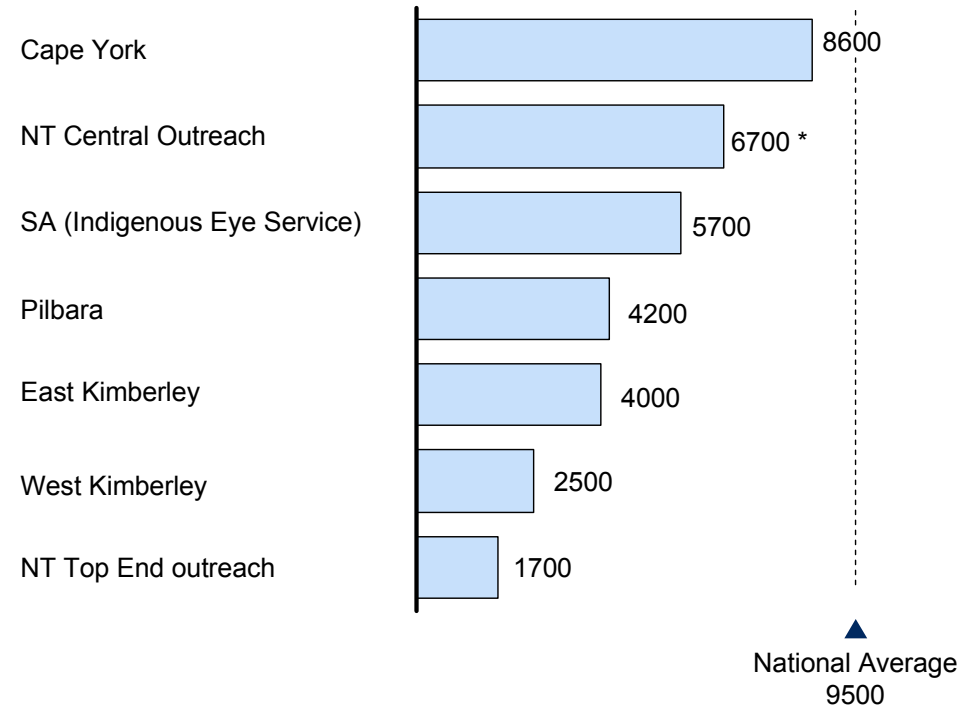


Figure 12. Cataract Surgery Rate (CSR) for Indigenous patients, cataract operations/million population/year.

COORDINATION

Improving integration of services and visits between optometry and ophthalmology appears to reduce waiting times, and does not increase costs per patient attendance.

The coordination roles for eye services needs to be clearly defined.

Regional Eye Health Coordinators (REHC)

The Taylor report [4] led to the creation of REHC. Recommendations from the report were implemented, but modified as the Aboriginal REHC were based in an AMS. It was envisaged that approximately 35 posts would be created, but some were never filled. Across the regions, the roles were varied (table 2). This scheme is funded federally through OATSIH.

After a review of eye care services in 2003[5] the specific funding for these eye health posts was replaced by pooled funding for "chronic disease management" to enable the AMS to determine their own priorities.

The shift of REHC funding from 'eyes' to 'global health' (2008) has seen a focus on eye care evaporate – WA
The change of funding to global health has resulted in a complex, multi-tasked role and difficulty recruiting to these positions – NSW
A recent dilution of REHC funding is a problem for ICEE's work in NSW as there is less clear liaison with community controlled clinics – NSW

Though some REHCs have forged a successful role working with visiting teams and acting as community liaison officers or sometimes as clerks, the expectation that all those Aboriginal health workers (AHW) appointed to the role would have sufficient experience in management was not realistic.

[4] Taylor HR. Eye Health in Aboriginal and Torres Strait Islander Communities 1997. Health and Family Services. Commonwealth of Australia.

[5] Taylor V, Ewarld D, Liddle H, Warchivker I. Review of the Implementation of the National Aboriginal and Torres Strait Islander Eye Health Program. *Department of Health and Ageing* 2003.

There has been little guidance or mentoring to help REHCs act effectively in the role – NT
The role of coordinating all the eye services in a large region, with state government, community controlled clinics and many individual optometrists and ophthalmologists requires high level management skills – NSW

The importance of liaison officers to communicate well with community controlled clinics and act as cultural brokers with patients must not be overlooked in the delivery of outreach eye services. In some regions local Aboriginal liaison officers or AHW are employed when the eye team visits. This role is seen as vital by eye health practitioners

Patient attendance relies on motivated Aboriginal health workers and clinic administrators – SA
Increased investment in cultural brokers is essential for eye outreach programs – NT

Region	Number	Relationship with optometrists/ ophthalmologists	Main Roles
Cape York	2	Yes	Organise all outreach trips, liaise with clinics, audit patient numbers
Great Southern WA	0	N/A	N/A
Kimberley	1.15	None	Screening for Diabetic retinopathy
Longreach	0	N/A	N/A
NSW OES	5	Mainly with optometrists	Facilitate optometry visits to AMS One has contact with OES
NT Central Outreach	2	Yes	Coordination, administration, assist with clinics
NT Top End Outreach	3	Moderate	Some screening for diabetic retinopathy, assistance with outreach visits
Pilbara	1	None	Not clear from survey or interviews
SA (IES)	1	Yes	Coordinate optometry/ ophthalmology Visits, attend trips, help admin

Table 2. Regional Eye Health Coordinators in surveyed regions.

Other coordinators

In NSW, the Outback Eye Service has two coordinators/managers who administer a program of visiting eye services. This runs under the auspices of the Prince of Wales Hospital, Sydney and is supported with federal funding. Both managers are ex-nurses and although they are based in Sydney, they attend all visits with clinicians.

The federally funded Visiting Optometry Scheme (VOS) is coordinated by agencies in each state. 15% of funding is allocated to administrative costs. Non-government organizations also provide coordination roles in the NT and NSW. These include the Fred Hollow's Foundation (FHF) and the International Centre for Eye Care Education (ICEE).

In the Kimberley and Pilbara, an individual optometrist has coordinated eye services for many years without specific funding. Recently, the State government has recognised the importance of this role and offered some funding to support it in 2009. In Cape York, an optometrist has been involved for many years and coordinates the other visiting optometrists. In return for the management of the service, a 20% service fee is paid by the visiting optometrists to the manager/optometrist from their Medicare earnings. The State government also funded travel/accommodation for the visiting eye care providers and other associated costs. However, with recent changes to VOS the State contribution is no longer as clearly defined.

Continuity and Leadership

Opinions relating to the eye service leadership and responsibility pointed to two different approaches. In one the responsibility for an eye health program lay with a public hospital and multiple consultants. In the other a single consultant was responsible for all coordination. Having multiple people results in service being:

… less susceptible to sudden cessation compared to solo practitioner leading a program – WA
…less reliant on one individual ophthalmologist which works well sometimes but can be a disaster if a poor communicator/leader is in charge – NSW

NGOs play an important role acting as advocates for eye healthcare… but government should take on the responsibility for proven programs – NT

However, there are also disadvantages to the city public hospital or a group taking on the responsibility for a service. They include:

Lack of a unified voice to provide authority because each clinician is only loosely involved. A lack of leadership and personal responsibility to improve efficiency may result – WA

Some of the most efficient services have relied on strong individual leadership and appear to depend on the continuity of a single consultant ophthalmologist acting as the driver to maintain the high standards of the service e.g. Longreach, Cape York and the Pilbara.

Service Integration Analysis

Service integration refers to the collaboration and communication between optometry and ophthalmology services (table 3).

Options for coordination		Demonstrated in efficient regions
1 Informal	▪ Optometry and ophthalmology visits not coordinated, but close communication at all times	▪ Pilbara: Close relationship between optometrists and ophthalmologists, including direct phone contact any time
2 Sequenced	▪ Early optometry trips for screening purposes followed later by joint trips and post-operative optometry-only visits ▪ Pros: Improves efficiency and less duplication of screening roles ▪ Cons: Additional screening appointment can result in patient fatigue	▪ Cape York: Optometrists provide screening role for ophthalmologist in sequenced visits
3 Same Day	▪ Initial vision screening and refraction performed by optometrist and review and operation by ophthalmologist on same day if required ▪ Pros: Good communication between service providers ▪ Cons: Patients may have to wait for next ophthalmologist visit if busy schedule	▪ Cape York and Longreach: Trips are coordinated so optometrist/ ophthalmologist visit at the same time and same site

Table 3. Service Integration Methods.

An analysis of coordination between optometrists and ophthalmologists was performed to detect any correlation between clinical throughput, waiting times and cost-effectiveness.

An arbitrary scale from one to ten was used to score regions according to their quality and level of co-ordination – termed 'service integration' (Table 3). Structured qualitative interviews and observation were used to grade regions according to the following criteria:

- scheduled simultaneous or sequential collaboration and co-operation of the visiting optometrists and ophthalmologists
- clarity and strength of communication channels for shared care and referrals
- history of a REHC facilitating systems between the two professions

Region	Rating*	Rationale
Cape York	10/10	▪ 10 years of REHC + assistant + sequenced and simultaneous clinics
Longreach	10/10	▪ Run privately with co-located optometry and ophthalmology planned to visit simultaneously
Great Southern WA	3/10	▪ No co-ordinators or collaboration with local optometrists
Pilbara	8/10	▪ Roving optometrist who co-ordinates remote community visits with good communication channels. No effective REHC
Kimberley	5/10	▪ Roving optometrist co-ordinates, no effective REHC, but due to multiple clinicians, less effective communication than Pilbara
NSW (OES)	7/10	▪ 2 managers and simultaneous optometry clinics. But poor communication channels with ICEE optometry network
NT Top End	2/10	▪ Multiple co-ordination agencies but poor communication between optometry and ophthalmology and REHC
NT Central Outreach	7/10	▪ Effective REHC, simultaneous clinics
South Australia (IES)	9/10	▪ Long-term REHC with simultaneous clinics and optometry pre-screening

* Author grading according to eyewitness, interviews and adjacent rationale

Table 4. Service Integration Scores.

Good service integration between ophthalmology and optometry appears to improve clinical throughput and reduce waiting times, but has little bearing on cost per patient attendance (figure 14). Multivariate linear regression accounting for confounding drivers confirmed that good service integration was associated with reduced waiting times (β coefficient of -4.9 months, $p < 0.03$, CI -9.08 to -0.72).

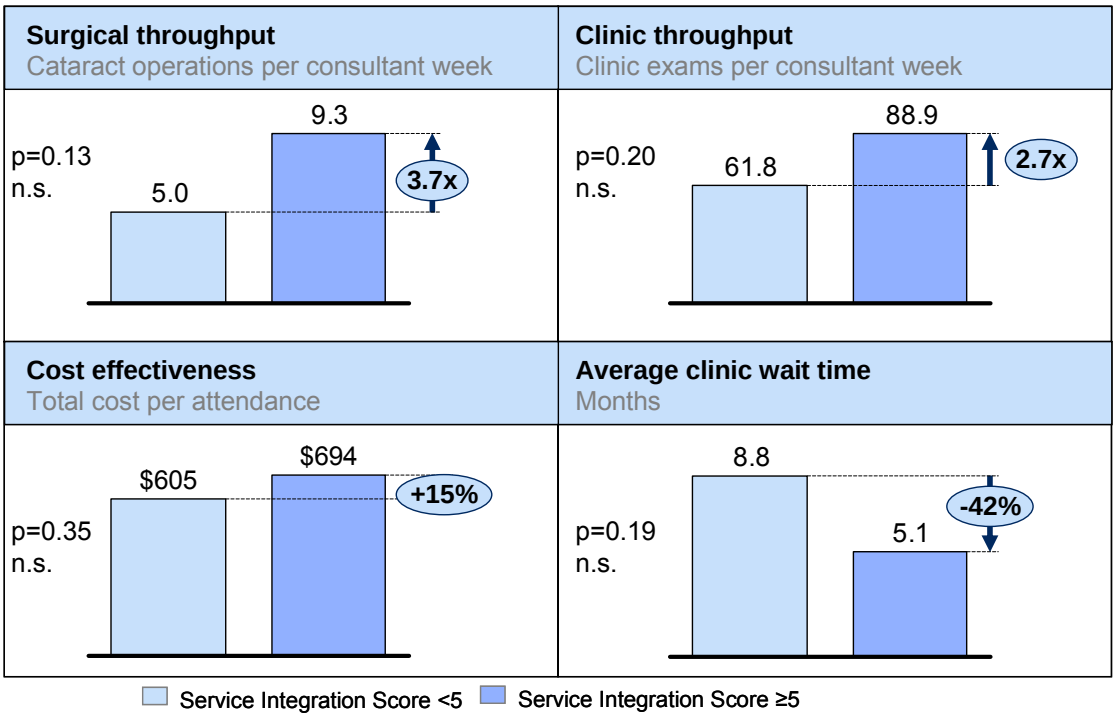


Figure 14. Univariate results for analysis of Service Integration between optometry and ophthalmology showing the influence on clinical outcomes and cost/attendance.

We have defined the Surgical Case Rate (SCR) as the number of cataract operations that are performed as a percentage of the total number of patients seen in clinic. The SCR can act as a marker of effective referrals to the clinic from primary eye care providers. There was a significant correlation between surgical case rate and service integration (figure 15).

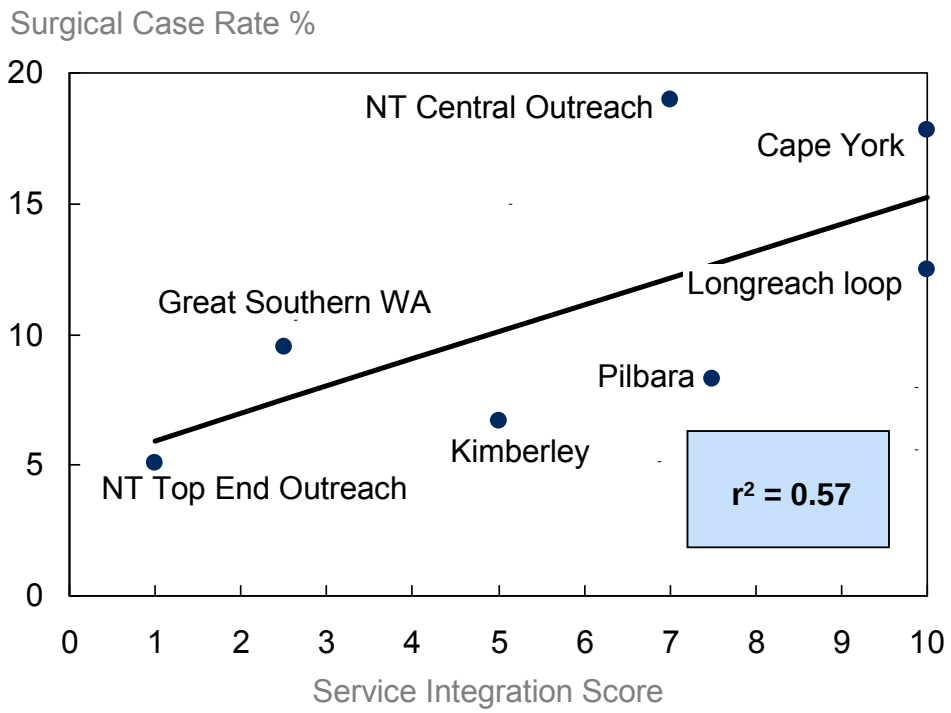


Figure 15. Correlation between Surgical Case Rate and Service Integration.

These quantitative findings are supported by opinions expressed in interviews where there is consensus that good coordination between the two professions is of paramount importance. Those regions satisfied with their current service integration commented:

We undertake less primary screening than the city thanks to the optometrists that work ahead of us – Qld

In contrast those regions with poor service integration made comments such as:

A large proportion of our outreach ophthalmology is primary screening – NT
Eye health coordination could be improved significantly with appropriate resources – WA
Ophthalmologists would ideally visit less but do more if coordination with optometry was better – NT
There is very little communication between visiting optometry services and the Outback Eye Service – NSW

We need a sole coordinator to organise all VOS, MSOAP, ophthalmology and optometry visits – NT

Increased funding does not necessarily lead to better coordination if there are multiple agencies trying to coordinate eye services independently. Although the NT Top End outreach service had several coordinating bodes, there was a challenge in avoiding duplication of services. In NSW there was little communication between the Outback Eye Service run under the auspices of the Prince of Wales Hospital, Sydney and the ICEE which also coordinates an extensive network of optometry services even though both groups are based at the University of NSW.

One example of efficient coordination has operated successfully for ten years in Far North Queensland (figure 16). Here it has been found by experience that the ratio of three optometric visits to one ophthalmic visit plus one surgical visit provides a good balance of skills and services.

CASE STUDY – Cape York has 4 visiting rounds:

Visit 1: Optometry only: Screening visits

Visit 2: Optometry and Ophthalmology simultaneously:
Pre-operative preparation and laser treatment for diabetic retinopathy

Visit 3: Ophthalmology only: Intensive surgery week on previously identified patients

Visit 4: Optometry only: Post operative checks and refractive correction plus further screening

Figure 16. Case study of Cape York Eye Health Programme demonstrating sequenced and simultaneous optometry and ophthalmology services.

FUNDING

A Fee-for-service (FFS) funding model for surgery appears to improve efficiency, reduce waiting times and is more cost-effective.

Diverse funding models and sources make planning outreach services complex.

Incentives including differential rebates are required to make reimbursement for outreach work comparable to urban practice, recognizing challenging case loads, travel time and base-practice costs.

FUNDING MODELS

Two key funding models currently operate in Australia. A Fee-for-service (FFS) model remunerates a healthcare provider per patient attendance or procedure performed. Salaried or sessional rate models are independent of patient numbers and have a capped daily allowance. Regions varied mainly according to these two systems which may be applicable to surgical services, clinic attendances or both (Tables 5 and 6).

Some regions had hybrid models of varying complexity. For example in the NT there are systems for billing Medicare per outpatient attendance. The funds are collected by a private practice trust fund and ophthalmologists then receive a capped portion of their base salary (30-35%). For the Central Outreach approximately 50% of surgery is performed on 'non-admitted' patients and therefore is also FFS. The reimbursement is effectively independent of throughput as the system is capped at a much lower rate than the true billings.
For comparison an urban public hospital in SA allows 65% of base salary from FFS billings. The hybrid model used in SA outreach includes a safety-net to allow for the rare occasion when unforeseen events result in a very low patient attendance for the day. Doctors use FFS for each attendance but if the daily threshold is not reached, an invoice is sent to the AMS for the difference. This rarely occurs as when several laser treatments are performed or 20 or so patients are seen the threshold is reached.

In those regions with FFS for surgery, there are different fees depending on whether there is a State contribution or a Medicare rebate is paid. In Queensland, the surgical fee is a Medicare rebate (85% of the scheduled fee). In WA and NSW the State funded fee is approximately 50% more than the Medicare rebate.

Region	Funding model	Source
NSW (OES)	FFS	State fee
NT (excl Darwin)	Salary (some non-admitted patients FFS towards capped bonus salary)	Territory salary/ MBS rebate
SA	Salary	State salary
WA (Pilbara, Great Sth, Kimberley	FFS	State fee

Table 5. Funding models used for surgery in surveyed regions. FFS (fee-for-service).

Region	Funding model	Source
NSW (OES)	FFS	MBS rebate
NT (excl Darwin)	Hybrid Salary (FFS towards capped bonus on salary)	Territory salary/MBS rebate
QLD (Cape York)	FFS	MBS rebate
QLD (Longreach)	Private FFS	MBS rebate plus patient gap
SA	Hybrid FFS with daily safety-net	MBS rebate (+/- OATSIH top-up)
WA (Great Sth)	FFS	MBS rebate
WA (Pilbara*, Kimberley)	Salary	Sessional fee

* Pilbara was FFS for 19 years until changing last year to sessional. Therefore deemed FFS in analysis as nature of practice based on this model and unchanged

Table 6. Funding models used for clinic in surveyed regions. FFS (fee-for-service).

OPTOMETRY FUNDING

Most outreach optometry clinics used a FFS model as they do in urban centres.

There were a few exceptions. In NSW, optometrists had an option to work for a daily rate in International Centre for Eyecare Education (ICEE) clinics. However, most opted for the usual FFS arrangement.

In South Australia, some optometrists have negotiated a hybrid funding model similar to that available to ophthalmologists with a daily fee being the 'safety-net'. If the billing for the day did not reach this threshold then an invoice was issued to the individual AMS for the difference. Any excess funds obtained from Medicare billings were retained by the optometrist and an invoice was not sent to the AMS.

In various regions, optometrists worked in the same clinic as the ophthalmologist and pre-screened patients recording visual acuity, refraction and dilating patients prior to an ophthalmology review. These patients were billed as MBS short consults by the optometrist in SA, NSW and Cape York. In the Katherine service (NT) a sessional daily rate was funded by the State hospital for the optometrist to pre-screen patients. This does not occur for the routine ophthalmology visits from Darwin, but only as a special arrangement for the external visiting consultant from NSW who visits Katherine once or twice per year. The Longreach service may have an optometrist or an orthoptist to assist with vision screening, but this was privately funded by the ophthalmologist. Moreover in Longreach, there was an optometrist running a concurrent independent standard consultation service.

The cost of providing glasses in outreach areas is usually covered by the individual State and Territory subsidized spectacle schemes (Table 7, over).

Region	Details of state or territory subsidy
NSW	A free pair of bifocals or 2 free single vision glasses are given every 2 years (unless lost, broken/changed prescription). All Indigenous people qualify. Pensioners and Healthcare card holders have to pass a means test (single person <$500 in any savings, couple <$1,000 in any savings)
NT	2 Schemes: Low Cost Spectacle Scheme (LCSS) & NT pensioner and carers concession scheme (PCCS) PCCS gives free spectacles to qualifying persons every 2 years (NT resident, female, >60yrs, or male >65yrs (no means test), parenting/carer/disability pension. LCSS for remote residents only. Single vision specs currently $48 and bifocals $90
QLD	Free pair of spectacles every 2 years as long as prescription has changed for all pensioners and healthcare card holders
SA	25% discount on one pair/2years. Prices range from $40–$85. This is for pensioner or concession card holders
TAS	Means tested on application — criteria not released but some healthcare cards/pensioners are not eligible. One pair every 3 years. $13 single vision and $28 for bifocals. The optometrists receive a further $30–60 from the government
VIC	In Melb. discount for pensioners/healthcare card holders and Indigenous patients at public clinics (Vic College of Optometry) $37 single vision, $47 bifocals. Rural areas access scheme via private optometrists
WA	$50 subsidy or half the cost (whichever is less for one pair every 2 years. Only for pensioners/senior/disability and war but not for healthcare card holders or single mother pension. No means testing

Table 7. Low cost spectacle schemes in each state

ANALYSIS – THROUGHPUT AND COST-EFFECTIVENESS

An analysis comparing outreach service outcomes based on funding model structure was performed.

When compared to services that had salaried arrangements for surgery, FFS surgical reimbursement improved surgical throughput 3.2 times (p=0.01) and clinic throughput by 2.3 times (p=0.05). The waiting time was also improved with a 58% reduction (p=0.07). In addition, the cost per attendance was almost halved (p=0.04) (figure 17).

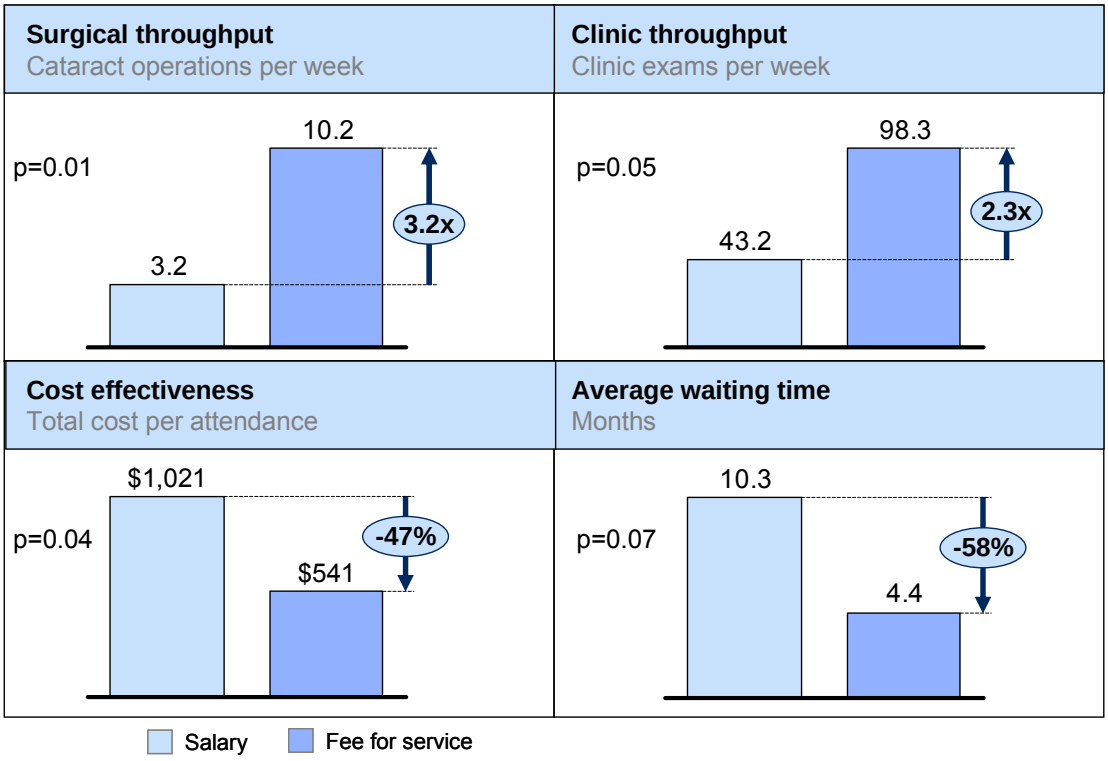


Figure 17. Univariate analysis comparing clinical efficiency and cost-effectiveness for services according to funding model used for surgery.

If the funding model for the clinic was used as the independent variable, then FFS regions had 2.5 times clinic throughput (p=0.03) and 2.5 times surgical throughput (p=0.04). However waiting times (40% shorter) and cost differences (35% less) did not reach statistical significance (p=0.19, 0.13 respectively).

Multivariate linear regression was performed to account for possible confounders including ophthalmology service integration with optometry and the Indigenous

proportion of the patient population (table 7). Significant results were found for waiting times which were 6 to 7 months shorter and costs/attendance which were $458 less expensive where a FFS funding model for surgery was used. The method used to fund clinic services did not change the performance or costs of the service significantly (table 8).

	FFS versus Salary					
	Surgery FFS			Clinic FFS		
Measure	β	(95% CI)	P	β	(95% CI)	P
Surgical throughput/week	7.5	(-2.3 to 17.4)	0.1	1.2	(-10.8 to 13.1)	0.8
Clinic throughput/week	33.7	(-25.6 to 93)	0.19	33.85	(-28.6 to 96.3)	0.21
Wait times (months)	-6.72	(-13.1 to -0.3)	0.04	2.68	(-3.0 to 8.3)	0.26
Cost/attendance ($)	-458	(-694 to -223)	0.008	267	(-51 to 209)	0.08

Table 8. Multivariate regression coefficients for relationship between funding model, clinical efficiency and cost effectiveness.

A safety-net minimum daily rate may be required when servicing smaller communities that are less accessible, less efficient or liable to fluctuation in clinic numbers. Otherwise, 'market forces' will deter clinicians from attending these remote settings which may lead to further disadvantage for these communities. It would seem that a preferred model would be a hybrid system that allows for FFS but has a threshold that can be claimed if unforeseen circumstances result in a day with poor attendance. There is still the incentive to make the service as efficient as possible and work extra hours if need be because of FFS payments, but a safety-net is provided.

FUNDING SOURCES

Multiple sources contribute to the outreach eye services in Australia and are listed in table 9.

Source	Components
State	• Local Area Health Services • Low cost spectacle schemes • Clinic/Surgical infrastructure and consumables • Patient travel and accommodation schemes • Some clinician travel and accommodation
Federal	• Medicate rebates • Visiting Optometry Scheme (VOS) • Medical Specialist Outreach Access Program (MSOP) • Regional Eye Health Coordinators (OATSIH) • Rural Retention Program (RRP)
Other	• Non-government organizations, e.g. The Fred Hollow's foundation (FHF) • International Centre for Eye Care Education (ICEE) • Corporate Sponsorship, e.g. BHP Billiton • Private Funding, e.g. from service provider • Patient out-of-pocket income

Table 9. Sources of funding for outreach eye services.

The proportions of funds from different sources varied between the various regions Total costs relating to optometry and patient transport assistance schemes could not be obtained for several regions due to problems with public access to what was considered to be confidential information. As a result the graphical representations in figure 18 do not include these data and are more representative of the ophthalmology component of the eye services. All regions had contributions from State and Federal sources. Relative to each other, there was a range from 8.4% Federal contribution in the Kimberley to 60% in NSW.

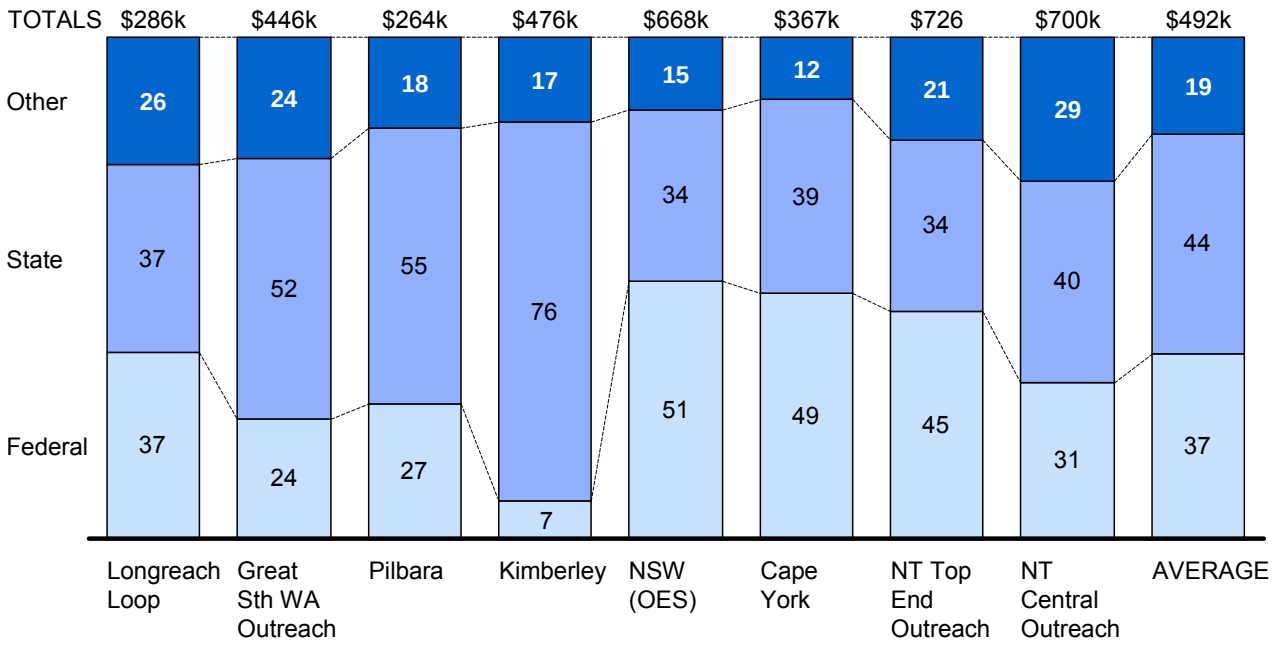


Figure 18. Breakdown of annual funds by source (See Table 9 for breakdown of State, Federal and Other).

Total costs from the various sources described above were calculated and divided by the number of attendances (both clinic and surgical) to the ophthalmology service (figure 19). There was greater than a threefold increase in costs per patient when comparing the most expensive and least expensive services. Isolation, accessibility and size of communities may alter the cost-effectiveness significantly. The 'value for money' of an outreach service also depends on the performance of the service. For example, although the NT Top End outreach and Cape York have similar cost-effectiveness, there are large differences in clinical throughput and waiting times

The costs per person in a region according to the population are also presented (figure 20). Between the least expensive and most expensive, there is an 8 fold difference in cost/person in a region spent on outreach eye health care.

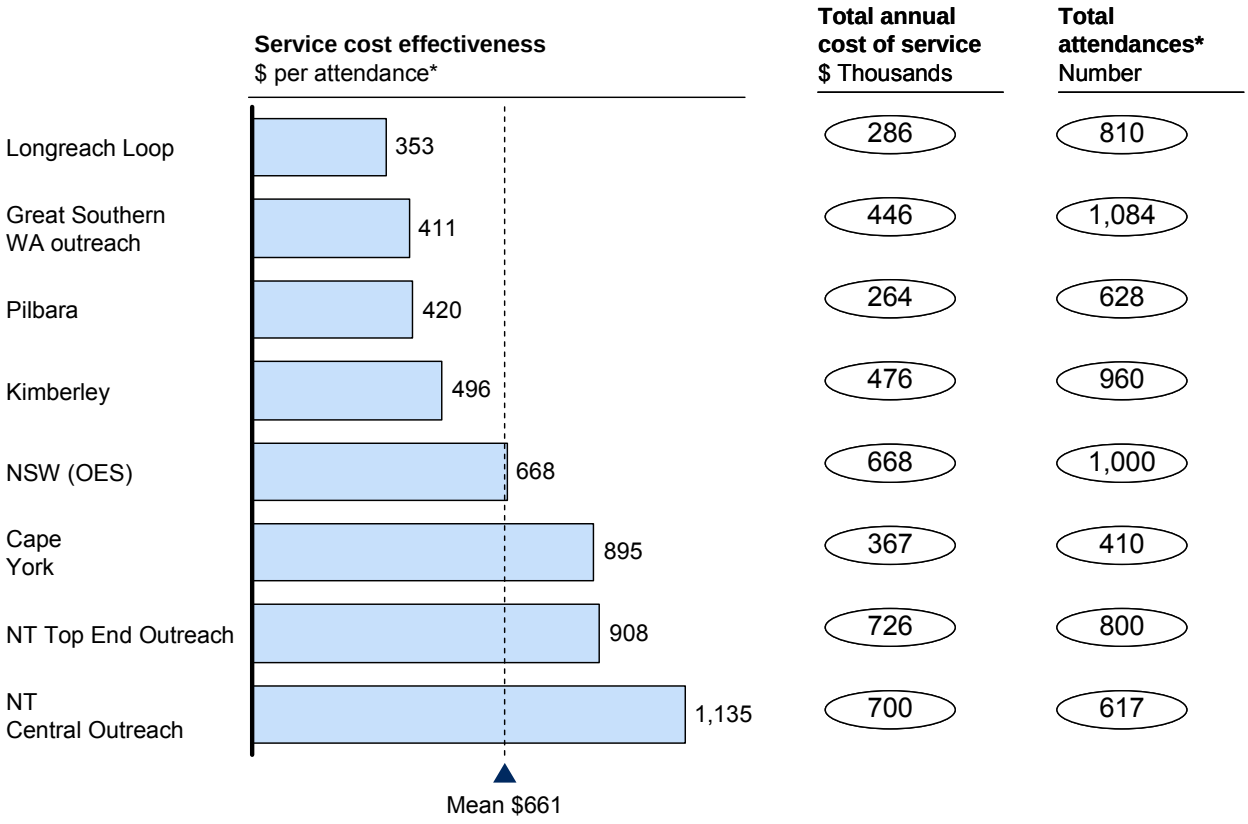


Figure 19. Service cost-effectiveness by region

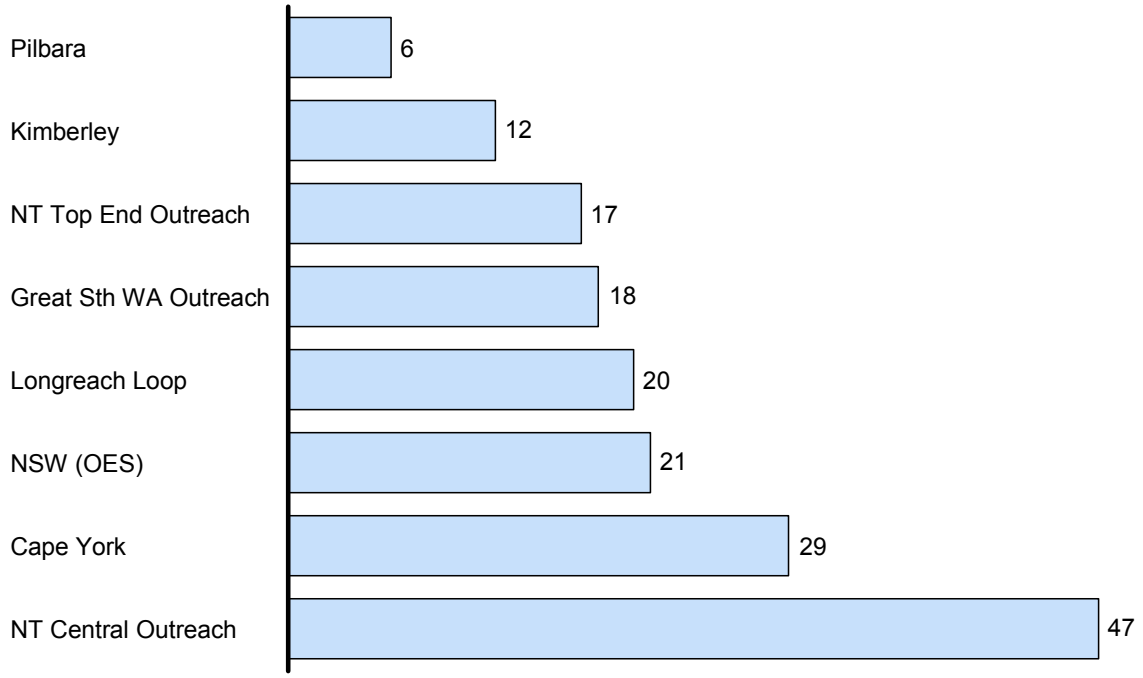


Figure 20. Service cost per capita by region (according to total population in region).

REIMBURSEMENT OPTIONS

Funding mechanisms should recognize the challenges of outreach ophthalmology including the need to maintain a base-practice and that one is working in less efficient settings with complex communication barriers and pathology.

Covering base costs is the biggest problem for outreach services, especially solo practitioners –WA
If there was a subsidy for base practice costs while doing remote work, then bulk-billed service in remote areas more feasible –Qld
If relying on charity from individual ophthalmologists, then service will not be sustainable – NSW
We need to ensure that outreach is not a financial burden on the participating service providers – Qld

Some have suggested there should be differential rebates to recognize the differences in providing services to remote and Indigenous populations:

Consider being able to bulk-bill 115% rebate for very remote services due to low efficiency and numbers of patients in outreach compared to urban practice – Qld
The Rural Retention Program for GPs works well as no audit/admin and rewards for total billings for year, but needs to be adapted for specialists – Qld

The complex funding mechanisms and various government sources create confusion and lack transparency when establishing a service or meeting demand in existing services:

There's a three-way blame game between State, Local Area and Federal health services regarding the funding of eyes and how much surgery is done – Anon.

TRAVEL FUNDING

Due to the vast distances of some regions, outreach trips often involved significant time spent travelling. This ranged from an average of about 10 hours/week up to about 20 hours/week if several communities were visited in the same week.

Funding for the time spent travelling was variable. Two services (Great Southern WA outreach and some of the ophthalmologists in the SA outreach service) were paid travel time under MSOAP. However, most ophthalmologists were not paid for time spent travelling. The ophthalmologists working in the NT who had salaried posts had their travel time indirectly paid if travelling during working hours. However, much outreach travel was outside normal work hours and was unfunded.

Under the federal VOS scheme most optometrists were funded for time spent travelling at an hourly rate.

ADMINISTRATION FUNDING

Those ophthalmologists in full-time salaried public posts were rostered approximately one half day per week for administration. The ophthalmologists servicing SA remote areas had to process their own Medicare billing and some kept private databases of patient details. This typically took up to 2 hours per outreach visit and was not funded or reimbursed. For some regions staff from the base private practice performed the administration required for the outreach service. This occurred for the Great Southern WA outreach, Pilbara and Longreach services and was privately funded by the ophthalmologists (from 2 days to 11 days per week of outreach work).

Most optometrists who are funded by VOS received funding for administrative time. Most visiting optometrists spend approximately 5 hours per week organizing patient records, audits, receipts from trips and equipment re-stocking.

INCENTIVES AND FUNDING SCHEMES

A number of federal schemes exist to support the work of outreach eye services (table 10). The Visiting Optometric Scheme (VOS) has recently been overhauled and the Medical Specialist Outreach Assistance Program (MSOAP) is currently undergoing review and due for updating in 2010.

VOS Visiting Optometric Scheme	▪ Federally funded and administered ▪ Supports outreach with travel time and costs, accommodation, meals, admin time and base practice admin and locum all reimbursed ▪ Recently revamped
MSOP Medical Specialist Outreach Assistance Program	▪ Federally funded but administered by local agencies ▪ Travel/accommodation/meals costs covered for new services ▪ Not as comprehensive or transparent as VOS for base practice or travel time expenses ▪ Regional idiosyncrasies due to outsourced administration (costs 15% of budget)
RRP Rural Retention Program	▪ Federally funded and administered automatically based on Medicare Billings and Remoteness Scores ▪ Aimed at rural GPs … but a few ophthalmologists qualify unwittingly due to frequency and longevity of visiting services

Table 10. Summary of Federal schemes for remote work.

SCREENING FOR DIABETIC RETINOPATHY

The majority of surveyed regions do not have established or on-going diabetic retinal screening programs.

Sustainable funding is required for the retinal photography or "image capture" and for the reporting retinal images.

All people with diabetes are recommended to have a regular, annual eye examination. [6] In some remote areas it may not be feasible for all patients to be seen for a dilated examination with an eye health professional and programs have been developed to perform retinal photography as a screening service for people with diabetes. The experiences have varied across the country. Of the regions surveyed, only WA and the Top End NT had a service that continues to function intermittently in some regions. Opinions mainly focused on difficulties around the 'image-capture' end and the need for sustainable funding to support the retinal photography:

The image capture end of tele-health has been the hurdle and ultimately lead to the demise of our efforts to establish a program – Qld

For a program to be sustainable, funding for the taking of photos needs to be formalized. A FFS model will provide further incentive – WA

The advantages of locally driven screening programs include:

Involving the community health workers in the eye program has been beneficial to encourage local engagement with the problem of diabetic retinopathy – WA

In some smaller regions with multiple visits to communities the addition of extra screening services was questioned, but in geographically large regions the opposite opinion was provided.

[6] NHMRC guidelines.

Between three clinic visiting rounds per year in Cape York outreach, why add another check where no treatment can be given? – Qld

It is impossible to get around to some communities more than once a year currently, so a diabetic screening service is valuable - WA

Region	Capture	Funding	Interpretation	Funding
Gascoyne	REHC	OATSIH	Consultant in Perth	$2,000 stipend over 2 years from State health (WACHS)
Great Southern	REHC	OATSIH	Consultant in Perth	$8/patient (unclear source)
Kimberley	REHC	OATSIH	Consultant in Perth	$8/patient from Kimberley Population Health Unit
Pilbara	REHC Visiting Nurse	OATSIH (federal) Corporate (BHP)	2 consultants in Perth	Consultant who visits Pilbara (pro bono and $8/patient from BHP for other non-visitor

Table 11. Funding arrangements for retinal photography in Western Australia.

Western Australia was the only surveyed region with funding arrangements for retinal photography – though these were variable (table 11).

In one year to April 2009, there were 310 photos taken in the Kimberley with 25-50% of people with diabetes in individual communities being screened. Audit data was difficult to obtain from other regions and did not seem accessible.

APPENDIX 1. Summary of Outreach Eye Services in Survey.

Region	Service provided
Cape York	Four ophthalmologists visit conduct two1-week trips. One trip is a surgical intensive week in Weipa with two ophthalmologists alternation cases. The other visits are clinic trips for laser treatment and pre-operative work up in communities. Optometrists perform primary care screening visits and post-operative visits. In addition the work closely with the ophthalmologists during their clinic visit. The outreach has been structured in this way for 15 years
Great Southern WA Outreach	A single ophthalmologist based in Albany visits Esperance for 7 1-week trips and monthly 1–2-day visits to Katanning. Surgery is performed at both sites. The service is administered by a private secretary but all equipment and facilities are provided by the state. Permanent optometrists are based in both locations
Kimberley	Eight ophthalmologists and accompanying registrar visit the Kimberley for 8 1-week trips (equally divided between East and West). Surgery is provided at each visit to Broome, Derby and Kununurra. The services are administered by WACHS. A full-time optometrist is regionally based and coordinates the VOS scheme with 16 optometrists visiting small communities. Broome has a full-time optometrist
Longreach	Two ophthalmologists have visited the Longreach region together for 15 years for 3 1-week trips. Barcaldine and Blackall have clinic visits and surgery is performed at Longreach. The service is administered by the private practice manager and is funded as such. A visiting optometrist attends during the same weeks and has independent clinics. Other optometrists also provide regular services in the towns
NSW Outback Eye Service (OES)	For 10 years, ophthalmologists and optometrists have visited 4 remote towns. There are monthly 2-day trips to Bourke which involve surgery. There are 4–6 1-day clinic visits to Lightening Ridge, Walgett and Brewarrina. The service is administered by the Prince of Wales Hospital, Sydney with two full-time managers. This service does not include the optometry clinics organized by the International Centre for Eyecare Education (ICEE)
NT Central Outreach	A full-time public ophthalmologist and registrar are based in Alice Springs. The outreach component of the post includes weekly 1–2-day visits to communities. Surgery is performed at Tennent Creek (at the time of this survey it is undergoing renovations) and at Alice Springs hospital. Optometrists frequently accompany the ophthalmology outreach trips. There are also independent optometry visits organized through VOS
NT Top End	A full-time public ophthalmologist is designated to outreach ophthalmology services and accompanied by a registrar on al visits There are weekly clinic visits to communities and surgery is performed at Gove, Katherine and Darwin hospitals
Pilbara	A single ophthalmologist provided quarterly 1-week visits to Port Hedland for 19 years. Surgery is performed at each visit. This is coordinated primarily by private practice staff. Optometrists are based in the Pilbara full time and outreach visits occur through VOS
SA Indigenous Eye Service (IES)	For 5 years a Regional Eye Health Coordinator has administered biannual clinic visits to 13 communities for ophthalmologists and optometrists. The service is specifically for Indigenous people. Surgical cases are referred to Adelaide or Alice Springs. There are also separate optometry visits organized through VOS

APPENDIX 2. Thematic category summary of opinions from interviews.

Theme	Summary of opinions
Service Delivery	• Barriers to access and lack of awareness regarding eye health lead to poor attendance. Increased use of cultural brokers may help • No 'one size fits all' in outreach eye services for Australia's diverse regions
Outreach Surgery	• Regionally-based surgery is worthwhile • Amplified consequences of complications and difficult cases mean outreach is not an appropriate training environment for registrars • Intensive surgical weeks work well for staff and patients
Service Integration	• Improving co-ordination between optometrists and ophthalmologists results in more efficient division of primary and secondary eye care roles • The regional eye health coordinator role needs to be divided into three; primary eye care, Indigenous liaison and managing the outreach service
Reimbursement	• Diverse funding models and sources make planning outreach services unnecessary complex • Incentives required to make outreach comparable to urban areas by recognising challenging case load, time-consuming travel and the burden of base practice costs
Responsibility	• One individual with long-term commitment provides continuity. If multiple practitioners servicing a remote area, then there needs to be a unified voice or leader to liaise with funding agencies and local services
Diabetic Screening	• Image-capture end needs a formalised and sustainable funding process • Careful integration with other eye services is required to ensure no duplication or redundancy

APPENDIX 3. Interviews with key stake-holders.

Andrew Griffiths	Optometrist
Angela	Nurse – Theatre manager
Angela Dwyer	Nurse
Ann	Ward nurse
Anna Morse	Optometrist ICEE
Barbara O'Connor	Regional Eye Health Coordinator
Bill Glasson	Ophthalmologist
Brian Layland	ICEE
Carol Muir	MSOAP administrator
Chee	Registrar
Dee	Outpatient Clerk
Denis Stark	Ophthalmologist
Desley Culpin	Regional Eye Health Coordinator
Dimitri Yellachich	Ophthalmologist
Erica Hayes	Orthoptist
Frances Booth	Ophthalmologist
Francois de Salve Villedieu	Medical Director
Garry Brian	Ophthalmologist
Henry Newland	Ophthalmologist
Joanna Barton	Outback Eye Service
Karen	Scrub nurse
Kate House	Practice Manager
Kerry	Practice Manager
Mahendrarajah, T.	Ophthalmologist
Maree O'Hare	Regional Eye Health Coordinator
Margie O'Neil	Optometrist
Mark Loane	Ophthalmologist
Noel Rofe	Regional Eye Health Coordinator
Patti Smith	Specialist Co-ordinator

Phil House	Ophthalmologist
Richard Mills	Ophthalmologist
Rodger Todd	Medical Director
Ros Eatts	AHW
Rowan Churchill	Optometrist
Russell Phillips	Ophthalmologist
Shifee Ajaran	Specialist coordinator
Shirley-Anne	Outpatient Clerk
Son	Registrar
Sue	Registrar
Tess Presswell	Optometrists FHF
Tim Henderson	Ophthalmologist
Tony Watson	Medical Director
Trisha Keys	ICEE

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