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Evaluation of a national eye care programme: re-survey after 10 years

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Abstract

***Aim*—To re-survey the Gambia after an interval of 10 years to assess the impact of a national eye care programme (NECP) on the prevalence of blindness and low vision.**

***Method*—Comparison of two multistage cluster random sample surveys taking into account the marked increase in population in the Gambia, west Africa. Samples of the whole population in 1986 and 1996 were taken. The definition of blindness is presenting vision less than 3/60 in the better eye, or visual fields constricted to less than 10° from fixation. Low vision is less than 6/18 but 3/60 or better. Causes of blindness were determined clinically by three ophthalmologists.**

***Results*—The crude prevalence of blindness fell from 0.70% to 0.42%, a relative reduction of 40%. During the same 10 year period, the population increased by 51% from 775 000 to 1 169 000. When the results were standardised for age, a west to east gradient was found for changes in risk of blindness over the 10 year period. This matched the phased west to east introduction of the NECP interventions. There was a modest but significant increase in the risk of low vision across the whole country.**

***Conclusions*—The overall reduction in risk of blindness, in those areas where the NECP has been active, appears to justify the programme and the support of donor organisations. The low vision cases due to cataract must now be addressed.**

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A national eye care programme (NECP) was established in the Gambia in 1986 to provide an integrated approach to reducing the national burden of blindness and low vision. At the outset, in order to assist with planning, a national survey of blindness and low vision was undertaken in 1986.[1] A second national survey of blindness and low vision was carried out in 1996 as part of an evaluation of the activities of the NECP. We compare the risk of blindness (and of low vision) in 1986 with that in 1996 and examine whether the changes over the 10 year period can be attributed to the activities of the NECP.

Methods

The surveys followed the same strategy[1] but the two samples were independent. A multistage random sampling method was used in each case. In 1986 the country was divided into three main health regions, while in 1996 the country was stratified into seven health divisions. Within each region/division a sample of districts was randomly selected using proportional probability sampling (PPS) and, within each selected district, a sample of settlements was selected, again using PPS, with stratification by settlement size (small <400 residents and large 400+ residents). Within each settlement, a compound to compound census was undertaken to provide an up to date sampling frame from which a sample of compounds was selected. All residents within the selected compound were examined. Data from the seven health divisions used in the 1996 survey were transformed into the three old health regions of 1986 to enable direct regional comparison to be made.

The field work was undertaken using two teams in 1986 and three teams in 1996, each working in a different part of the country after standardisation of examination methods.

A two part ophthalmic examination was carried out. All subjects aged 5 years and older had measurement of visual acuity and an anterior segment examination by an ophthalmic medical assistant with a focused torch and ×2 loupe. Everybody aged 35 and over and any younger person with a visual acuity of less than 6/18 in either eye was referred for detailed examination by an ophthalmologist, who used a direct and an indirect ophthalmoscope and a hand held slit lamp in addition to the torch and loupe. In 1996 every person aged 35 and over also had visual fields screened with a Henson CFA3000 visual field analyser, intraocular pressure measured with a Schiotz tonometer, and the optic disc inspected.

Blindness was defined as presenting visual acuity of less than 3/60 in the better eye, or a visual field constricted to less than 10° from fixation in the better eye. Low vision was presenting visual acuity of less than 6/18 but not less than 3/60 in the better eye. These defi-

Table 1 Risk of blindness in the Gambia in 1996 compared with that in 1986, in the three main administrative regions. The western region includes Banjul City where the eye hospital is located. The age adjusted risk ratios are Mantel–Haenszel weighted relative risk estimates from analysis of age stratified data

Administrative region	Year	Sample	Blind	Prevalence (%) of blindness		Blindness: age adjusted risk ratio (95% CL)	p Value
				Crude	Age standardised to 1986 sample		
Western	1986	3 146	25	0.79	0.79		
	1996	7 538	21	0.28	0.37	2.2 (1.2–3.8)	0.01
Central	1986	2 007	18	0.90	0.90		
	1996	1 504	12	0.80	0.84	1.1 (0.5–2.1)	>0.99
Eastern	1986	2 379	10	0.42	0.42		
	1996	4 004	22	0.55	0.69	0.6 (0.3–1.3)	0.28
All regions	1986	7 532	53	0.70	0.70		
	1996	13 046	55	0.42	0.55	1.3 (0.9–1.9)	0.19

Table 2 Risk of low vision in the Gambia in 1996 compared with that in 1986, in the three main administrative regions. The western region includes Banjul City where the eye hospital is located. The age adjusted risk ratios are Mantel–Haenszel weighted relative risk estimates from analysis of age stratified data

Administrative region	Year	Sample	Low vision	Prevalence (%) of low vision		Low vision: age adjusted risk ratio (95% CL)	p Value
				Crude	Age standardised to 1986 sample		
Western	1986	3 146	44	1.40	1.40		
	1996	7 538	111	1.47	1.90	0.7 (0.5–1.0)	0.07
Central	1986	2 007	31	1.54	1.54		
	1996	1 504	38	2.53	2.77	0.6 (0.4–0.9)	0.01
Eastern	1986	2 379	31	1.30	1.30		
	1996	4 004	60	1.50	1.91	0.7 (0.5–1.0)	0.08
All regions	1986	7 532	106	1.41	1.41		
	1996	13 046	209	1.60	2.05	0.7 (0.6–0.9)	<0.001

nitions were based on the WHO criteria (International Classification of Diseases 10),[2] but included uncorrected aphakia and other major refractive errors.

Formal standardisation between observers was carried out after the training sessions at the beginning of the survey, and repeated midway through the survey in respect of visual acuity, Schiotz tonometry, cup/disc ratio, trachoma grading, and perimetry.

In calculating estimates for prevalence and 95% confidence limits, the survey design (stratified cluster random sampling) was taken into account and any excess sampling error arising from the design (extrabinomial variation) were incorporated into the calculations. Age adjusted comparison of prevalence in the 1986 and 1996 samples within each of the three main health regions were based on the Mantel–Haenszel method of stratified data analysis.

Results

A high response rate was achieved in each survey: 94% (8174/8696) in 1986, and 92% (13046/14110) in 1996. Complete data were available for 7532 (87%) individuals from the 1986 survey.

The population of the Gambia increased from 0.8 million in 1986 to 1.17 million in 1996. There was a 25% increase in the population aged 50 and older, from 85 000 to 106 000. The population is currently growing by 4% per year, and life expectancy had increased from 43.5 in 1983 to 53.5 in 1993. More than half (56%) of the population now lives in the western health region where the capital Banjul is located.

The data reported in Table 1 suggest that the risk of blindness was reduced to half its 1986 level in the western region where the national eye care programme was started (age adjusted risk (prevalence) ratio 2.2, p=0.01). The main contributor to the reduction in risk was a drop in prevalence of cataract blindness from 0.38% (12/3146) in 1986, to 0.07% (5/7538) in 1996. The age standardised prevalence of cataract blindness in 1996 (using the 1986 age structure as standard) was 0.08% in the western region, suggesting that the risk was about 4.5 times higher in 1986. The prevalence of blindness due to other causes showed a more modest reduction during the 10 year period in the western region, from 0.41% (13/3146) to 0.21% (16/7538), the standardised prevalence being 0.25% in 1996.

There was no evidence of significant change in the risk of blindness in the central and eastern health regions (Table 1). However, the gradient of the risk ratios across the three regions from west to east, as shown in Table 1, reflects the expected effect of the phased intervention, and suggests a causal relation between the intervention and the changes in risk of blindness.

Between 1986 and 1996 there was a modest increase in the risk of low vision across the country (Table 2). The age adjusted risk ratio (1986:1996) was 0.7 with 95% confidence limits of 0.6–0.9 (p<0.001). The most common cause of low vision was cataract (51%).

The estimated numbers of people who were blind and had low vision in the population of Gambia in 1996 were derived from prevalence weighted according to the sampling probability within each of the health division. The number blind (to nearest 100) was estimated at 6300 (95% confidence limits 2900–9800), of whom 1900 cases (30%) were blind from cataract. The number of low vision cases was estimated at 17 100 (95% confidence limits 11 500–

22 800), of whom 8800 cases (51%) had low vision as a result of cataract.

Discussion

At the introduction of a national intervention programme in 1986, the NECP targeted its resources at reducing the burden of blinding cataract, as this accounted for half of all blindness. The programme was implemented in stages. Phase I covered Banjul and the western region. Phase II commenced part way through the 10 year period and expanded the programme into the central region, and phase III focused on the eastern region, commenced in 1994. Cataract surgery was initially by intracapsular cataract extraction and spectacle correction of the aphakia. More recently, extracapsular techniques and posterior chamber intraocular lenses have been introduced.

Over 1000 village health workers were trained in primary eye care. This included health promotion activities, identification and referral of cataract and trichiasis cases, and recognition and treatment of conjunctivitis. The children in many schools were screened for trachoma, the children were encouraged to wash their faces, and tubes of tetracycline ointment were distributed to those with active inflammation.

Surgery was performed by ophthalmologists and also by a paramedic cadre, ophthalmic medical assistants who had been specially trained for this function. These assistants were selected from state registered staff nurses who had at least 2 years' post-qualification experience. They received training at the School of Health Sciences in Malawi in ophthalmology for one calendar year following a 6 month internship in the Gambia. On successful completion they functioned as ophthalmic medical assistants. Those who showed the requisite aptitude, dexterity, and attitude were further trained for another calendar year in cataract surgery (intracapsular cataract surgery in the period under review) followed by a 6 month internship and mentoring period. These graduates were the senior ophthalmic medical assistants, who could perform cataract surgery and lid surgery for trachomatous entropion and trichiasis, and diagnose and manage patients within specified limits. They were also known as "cataract surgeons". They staffed secondary eye units and were each responsible for the eye health of a population of 150 000–200 000.

Five cataract surgeons were trained over the period. The total number of surgeries performed over this period was 9006, performed by ophthalmologists and cataract surgeons, the latter performing 24% of these operations at secondary eye centres which started functioning in the second half of the period under review.

Similar prevention of blindness programmes in Africa are the Kenya ophthalmic programme and the Malawi ophthalmic programme. Both use paramedics and cataract surgeons, outreach surgery, and clinics but have not developed community level activities to this same extent. The impact of their work has not been evaluated by the repeat national surveys.

The west to east sequence in which the NECP was introduced parallels the west to east gradient in changes in blindness over the 10 year period. Greatest improvements occurred in the western region, including Banjul city (reduction in risk of blindness by more than half), areas where the NECP has been active for the longest period. The only region where the risk of blindness increased during the 10 year period was the eastern region, an area where the NECP has only recently commenced its activities. These results strongly suggest that the activities of the NECP have contributed to the reduction in blindness. By 1996 the prevalence of blindness was 0.31% in Banjul, and 0.15% in the surrounding urban and periurban areas, which is similar to that found in countries with established market economies. This should be of encouragement to eye health workers and funding agencies who have embarked on eyecare programmes in similar developing countries.

The eastern region of the country should be viewed as a control situation, as the introduction of the NECP to the area was too recent to have had any real impact on the burden of the disease, and illustrates what might have occurred nationwide in the absence of the NECP. By applying the 1986 prevalence figures (age specific) to the larger 1996 population, we estimate that the national burden of blindness would have increased over the 10 year period by at least 35% in the absence of the NECP.

The highest proportion of uncorrected aphakia occurred in Banjul and the western region (19% of blindness) and the lowest in the eastern region (5% of blindness). This regional variation parallels the cataract surgery activities of the NECP. Initially the NECP provided aphakic glasses free to surgery patients. A high number of aphakes had lost or broken their glasses. With the introduction of a charge and recycling of the money to ensure sustainability of provision of aphakic glasses, and the introduction of intraocular lens implants into the NECP in 1995, uncorrected aphakia following cataract surgery should become less of a problem in the future.

Visual field criteria were included in the definition of blindness in 1996, but in the event only one person with glaucoma (and central vision of 6/18) was diagnosed blind on the basis of the field.

The numbers of people blind or with low vision due to specific causes are presented in Table 3. In most cases they are too small for

Table 3 Causes of blindness and low vision in the 1996 sample

Cause	*Blindness No (%)*	*Low vision No (%)*
Cataract	25 (45)	109 (52)
Aphakia	7 (13)	19 (9)
Trachoma	3 (5)	9 (4)
Other corneal	9 (16)	13 (6)
Glaucoma	5 (9)	1 (0.5)
Refractive error and others	6 (11)	58 (28)
Totals	55 (100)	209 (100)

Table 4 Prevalence of active trachoma (WHO classification grades TF or TI) in children aged 0–14 in the Gambia, in 1986 and 1996

Year	*Sample*	*Cases*	*Prevalence (%)*	*Risk ratio (95% CL)*	*p Value*
1986	3411	366	10.73		
1996	6399	308	4.81	2.2 (1.9–2.6)	< 0.0001

useful comparisons to be made with the numbers or proportions in 1986. However, the prevalence of active trachoma from the two surveys can be compared and fell by 54%, as previously described.[3] There was also an 80% relative reduction in blinding trachomatous corneal opacities over the 10 year period.

Trachoma was hyperendemic in the Gambia until recently. The fall in blinding trachoma has resulted from reductions in the prevalence of active inflammatory trachoma over recent decades (Table 4) as well as from surgical correction of cases of trichiasis. Improvement in general public health standards in the Gambia over past decades may have played a key part.[4] Fourteen people were diabetic,[5] but no examples of diabetic retinopathy were seen. There was no evidence of current vitamin A deficiency/xerophthalmia in any of the sample.

In 1996 there were an estimated 8800 people with low vision due to cataract. This represents a little over half of the national burden of low vision. As the national capacity for cataract surgery increases and the burden of blinding cataract falls, the visual acuity threshold for cataract surgery could be lowered to include cases with severe visual impairment (best visual acuity <6/60–3/60). One could expect that the reduction in both prevalence and burden of blindness will continue in the coming years as the activities of the NECP consolidate throughout the country, with the central and eastern regions having reductions in blindness and blinding cataract similar to that already seen in Banjul and the western division. The programme will then increasingly be able to target the problem of low vision.

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