State of the World's Sight

VISION 2020: the Right to Sight

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Foreword

In the last decade of the 20th century, the World Health Organization (WHO) drew global attention to the magnitude of avoidable blindness worldwide. The numbers were expected to nearly double by the year 2020 if concerted and coordinated action was not initiated.

WHO sought stronger collaboration with the International Agency for the Prevention of Blindness (IAPB), a coalition of like-minded nongovernmental organizations and civil society. The goal was to assist Member States to control and, to the extent possible, eliminate the causes of avoidable blindness. The aim was to put in place sustainable, affordable and equitable comprehensive eye care systems as an integral part of national health systems based on the principles and practice of primary health care.

The resulting collaborative venture was the "Global Initiative for the Elimination of Avoidable Blindness by the Year 2020", known as VISION 2020: the Right to Sight, which was launched in Geneva on 18 February 1999 by my predecessor, Dr Gro Harlem Brundtland. Our Member States unanimously adopted a resolution in 2003 (WHA 56.26) in support of this initiative. In the six years since the launch of VISION 2020: the Right to Sight much progress has been made, although the agenda is far from completed.

The aim of this document is to offer readers a global overview of the current status of visual health. It presents a brief historical introduction and other background material and uses case studies and personal anecdotes to describe current measures being taken.

It highlights the challenges faced and points to opportunities for action. Information and evidence is provided to help formulate and sustain relevant health policies, health systems and public health initiatives in countries. I hope the document will also stimulate greater involvement of all sectors of society in pursuit of "VISION 2020".

LEE Jong-wook
Director-General
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1

Chapter 1

A Review of Blindness and its Prevention

Blindness is not new. The suffering and anguish it brings has been documented throughout history. Curing blindness is a more recent idea, brought about by medical and surgical advances that have occurred primarily in the 20th century. The concept of 'avoidable' blindness is even more recent – coming into its own in the last few years and arising from efforts to apply new technical and social knowledge to improving the lives of disadvantaged people everywhere.

The earliest public health activities in blindness prevention occurred in relation to onchocerciasis and trachoma. Both these diseases are caused by infectious agents that can be targeted and eliminated in geographical areas where they are known to occur.

Three regional programmes to control onchocerciasis – covering 36 countries – have resulted in a significant reduction in disease morbidity, including visual loss. An initiative for the global elimination of trachoma as a public health problem (the Alliance for the Global Elimination of Trachoma by 2020 – GET2020) was established in 1997 and endorsed by the World Health Assembly in 1998. The number of estimated endemic countries is 48.

Three elements have been essential for these multicountry public-health-control programmes:

- accurate data on the distribution and determinants of the disease, to enable logical planning and implementation of interventions;
- cost-effective disease control interventions; and
- partnerships among communities, nongovernmental organizations (NGOs), government planning agencies, and other donors to ensure coordinated implementation of the interventions.

VISION 2020: the Right to Sight brings these critical components together to address the elimination of avoidable blindness worldwide.

This has included:

- the assessment of the prevalence of blindness worldwide;
- the development and promotion of cost-effective disease control interventions for cataract, refractive errors, trachoma, onchocerciasis, and vitamin A deficiency;
- the development of a partnership of NGOs and other organizations dedicated to the elimination of avoidable blindness and provision of services for those with incurable visual loss.

Blindness prevalence data collection

Early efforts to compile available worldwide data on blindness were hampered by the lack of population-based surveys and the inconsistency with which the term 'blindness' was applied.

In an effort to address this lack of reliable data, blindness surveys were organized during the 1950s in Ghana, Nigeria, Sierra Leone, and central and eastern Africa. These surveys revealed that the prevalence of blindness was much higher than had previously been supposed. In the same decade, the World Health Organization (WHO) initiated efforts to prevent blindness. These efforts took the form of assistance to Member States for research on and control of trachoma.

The need to make available more precise and complete information on blindness gradually became more widely recognized. In 1969, the Twenty-second World Health Assembly requested the Director-General to "…undertake a study on the information which is at present available on the extent and all the causes of preventable and curable blindness".

The Director-General reported to the Twenty-fifth World Health Assembly in May 1972 that the best estimate that could then be generated – based on the fragmentary data available – was a global prevalence of 10–15 million. At the time, experts believed this to be an underestimate. The Health Assembly requested "…additional data on visual impairment and blindness and their prevention with special emphasis on the situation in developing countries, keeping in mind the need for a generally accepted definition of blindness".

…My third example is the WHO Programme for the prevention of blindness, which faces a different sort of challenge. Worldwide, some 150 million people are blind or have disabling visual loss. Ninety percent of them live in developing countries. The successful Onchocerciasis Programme in West Africa has documented the heavy economic cost of blindness to the community in terms of vulnerability, need for social support and, ultimately, increased mortality.

Through intense networking, the WHO's programme for the prevention of blindness has been particularly successful in mobilizing and coordinating funds and support from nongovernmental organizations to match the needs of developing countries. This must be a continuing effort as long as primary health care structure in developing countries remains weak. The general ageing of the population will also rapidly increase the number of people with serious visual disability, with a considerable human and economic impact on all societies in both developed and developing countries. Through its technical and managerial leadership, with seed money and a small core of staff, this WHO programme plays a key catalytic role in enhancing the partnership of INGDO's with Member States.

Dr Hiroshi Nakajima, Director-General, WHO, in his opening address to the WHO Executive Board, January 1995

In November 1972, a WHO study group reconsidered the classification of visual impairment, and recommended that blindness be defined as visual acuity (VA) with both eyes, using best possible correction, of <3/60 (<1/20, 0.05 vision), or visual field around central fixation of <10°. This definition was incorporated in the International classification of diseases, ninth revision (ICD-9), and gradually gained international acceptance.

To ameliorate the predicted precipitous rise in the number of blind worldwide, the study group also recommended efforts to train specialists in public health ophthalmology. The group also suggested that – in addition to existing WHO programmes to control trachoma, onchocerciasis, and xerophthalmia – a cataract surgery programme would have good prospects for immediate and effective international action.

In response to these recommendations, in 1975 the Twenty-eighth World Health Assembly requested that the Director-General "…encourage member countries to develop national programmes for the prevention of blindness especially aimed at the control of trachoma, xerophthalmia, onchocerciasis and other causes and to introduce adequate measures for the early detection and treatment of other potentially blinding conditions such as cataract and glaucoma". In the same year, the International Agency for the Prevention of Blindness (IAPB) was established as the umbrella organization for professional groups and nongovernmental development organizations (NGDOs) involved in eye care.

In 1978, at the urging of IAPB, WHO established the Programme for the Prevention of Blindness (WHO/PBL – now WHO/PBD). One of the mandates of the programme was to establish a blindness databank to store all the information on prevalence and causes of blindness available to WHO. In 1979, a

review of these data was the basis for the first epidemiologically-sound estimate of the global prevalence of blindness. Using data from about 60 distinct geographical areas and applying the ICD-9 definition, the analyses suggested that in 1975 there were 28.1 million blind people.

The databank was updated in 1987, to include the most recent information from 90 geographical areas. This information produced an estimate of the global prevalence of blindness for 1984 of 31 million (± 4 million). A further update in 1994 led to the generation of a global estimate of 37.9 million blind for the year 1990. Consideration of the distribution and causes of cases of blindness comprising the worldwide total for 1990 spurred the development of VISION 2020: the Right to Sight. A more specific overview of these data is found in Annex A.

Partnerships

An additional mandate of the WHO Programme for the Prevention of Blindness involved providing technical cooperation and support to Member States in the formulation of national programmes for the prevention of blindness. By the time VISION 2020 was launched in 1999, over 100 Member States were reported to have 'national programmes' in varying stages of development – ranging from a national focal point in the Ministry

of Health to well-formulated national programmes developed through the activities of national committees.

The Director-General also constituted the prevention of blindness Programme Advisory Group (PAG) soon after the PBL programme had been established. The membership of this group included representation of multidisciplinary expertise and nongovernmental organizations. The last meeting of the PAG (15–18 January 1999) immediately preceded the launching of VISION 2020.

It is therefore clear that the most successful efforts in the move towards the elimination of blindness have come from effective partnerships between national governments, NGOs, donors, and the targeted communities. VISION 2020 was conceived to bring this about in a focused and sustainable way.

2

Chapter 2

The Preventable and Treatable Causes of Blindness

Current definitions of blindness, low vision, and visual impairment

The following definitions are applied within this document unless otherwise specified.

- **Blindness** is defined as a visual acuity (VA) of less than 3/60 with best possible correction[1], or a visual field no greater than 10° around central fixation, in the better eye. This corresponds to loss of walk-about vision, and is equivalent to visual impairment categories 3, 4, and 5 in the International statistical classification of diseases and related health problems, tenth revision (ICD-10).

- **Low vision** is defined as VA less than 6/18 but equal to or better than 3/60, with best possible correction in the better eye (ICD-10 visual impairment categories 1 and 2).
- **Visual impairment** includes blindness and low vision (ICD-10 visual impairment categories 1, 2, 3, 4 and 5).

The term "low vision" is also used in a different sense: a person with **low vision** is one who – after treatment and refractive correction – has impairment of visual function (visual acuity less than 6/18 but equal to or greater than perception of light, or visual field no greater than 10° around central fixation, in the better eye) but who uses or is potentially able to use vision for planning and/or execution of a task.

[1] A 2003 WHO consultation recommended that the definitions of "blindness" and "low vision" be amended, substituting "presenting visual acuity" for "best-corrected visual acuity". The reason for this is that the use of best-corrected VA makes it impossible to gauge the contribution of undercorrected refractive error to the magnitude of visual impairment.

To prevent confusion in this document, when the second meaning of **low vision** is intended it will be referred to as **functional low vision** or used in the context of **low vision services** –which are services for the visual rehabilitation of persons who have functional low vision. Definitions of these and other terms and abbreviations found in this report have been included in the glossary located inside the back cover.

Important causes[2] of visual impairment in adults

Age-related macular degeneration (AMD) is a degenerative disease that affects the macula (the central area of the retina). Clinically, there is loss of central vision with either 'dry' atrophic degeneration of the macula or evidence of a 'wet' haemorrhage with exudate. Age, family history, and smoking are important risk factors. At present, for most people with AMD, there is no effective strategy for prevention or treatment.

Cataract is an opacity of the lens of the eye. It is more common with increasing age. Exposure to ultraviolet light, genetic factors, smoking, steroids, diabetes mellitus or one of a number of other conditions appears to increase the risk. However, these associations are poorly understood. Traumatic cataract can develop following an eye injury. Cataract blindness is readily curable with modern cataract surgery.

Diabetic retinopathy is due to changes in the retinal vasculature of individuals with diabetes mellitus. Signs include microaneurysms, haemorrhages, exudates, alterations in the calibre of the larger vessels, new vessel growth, and macular oedema. Risk factors for retinopathy include the duration of diabetes, poor glycaemic control, hypertension, and hyperlipidaemia. With effective interventions, most vision loss can be prevented.

Glaucomas refer to a group of conditions characterized by an optic neuropathy that is made manifest by both structural abnormalities (the appearance of the optic disc) and functional deficit (loss of the peripheral visual field). These conditions are usually associated with high intraocular pressure. Most cases are 'primary', being without known cause; 'secondary' glaucomas are the result of trauma or some form of eye disease that increases intraocular pressure. The glaucomas are also divided into open-angle and closed-angle forms, and have a strong genetic component. Medical or surgical interventions that reduce the intraocular pressure reduce the risk of vision loss.

Onchocerciasis, or river blindness, is due to infection with the nematode worm Onchocerca volvulus. Adult worms live in the subcutaneous tissues of humans and produce microfilariae, which are found mainly in the skin, from where they may be ingested by biting blackflies of the genus *Simulium*. Transmission to other humans occurs when the flies next feed. *Simulium* breeds

[2] Arranged alphabetically.

in well-oxygenated water, which restricts onchocerciasis to areas adjacent to fast-flowing rivers and streams. Microfilariae migrate throughout the body, including into the eye where they cause keratitis (punctate and sclerosing), chorioretinal atrophy, iridocyclitis (leading to secondary glaucoma or cataract) and optic atrophy. Blindness from onchocerciasis can be eliminated by population-based distribution of the drug ivermectin.

Refractive error is an optical defect of the eye that prevents effective focus of images. If the eye forms the image of a distant object in front of the retina, it is said to be myopic, or short-sighted. If it forms the image behind the retina, it is said to be hypermetropic, or long-sighted. If the eye can sharply focus the image of a straight line in only one meridian of the visual plane at a time, it is said to be astigmatic. When the ageing eye no longer easily changes focus for near objects, it is said to be presbyopic. In many developing countries, inadequate refractive correction of aphakia (absence of the lens) after cataract surgery causes blindness. The aetiologies and possible preventive strategies of 'naturally occurring' refractive errors are areas of active research. Most visual impairment due to refractive error is correctable with the use of spectacles.

Trachoma is a chronic disease of the eye caused by ocular strains of the bacterium *Chlamydia trachomatis*. Transmission of *C. trachomatis* from eye to eye occurs in poor, overcrowded communities in which access to water and sanitation is inadequate and personal and community hygiene are poor. Infection may be associated with the signs of conjunctival inflammation known as 'active trachoma'. Repeated episodes of active trachoma over many years lead to the accumulation of conjunctival scar, which can eventually cause the upper lids to turn inwards so the eyelashes rub against the eye (trichiasis). This may lead to corneal scarring and vision loss. Trachoma blindness is irreversible, but can be prevented with the 'SAFE' strategy: **S**urgery for trichiasis, **A**ntibiotics to treat infections, **F**acial cleanliness, and **E**nvironmental improvement to reduce transmission.

Important causes of visual impairment in children

Congenital cataract may be present at birth or develop in infancy, sometimes with identifiable hereditary or infectious causes. Rubella (German measles) is of importance when women are infected during the first trimester of pregnancy, when infection of the foetus may cause congenital rubella syndrome. Under these condtions, nearly half have ocular involvement including congenital cataract, microphthalmos, corneal opacity, and glaucoma. A single-dose vaccine against rubella provides lasting immunity.

Congenital glaucoma is likely to be present at birth. Its manifestation is usually apparent quite early, although often the signs are not fully present until later in infancy. Without proper treatment, significant visual impairment occurs. Primary congenital glaucoma is caused by abnormal development of the aqueous drainage system of the eye, leading to increased intraocular pressure and

consequent damage of ocular tissues. Glaucoma in children may also be associated with other congenital abnormalities, or be secondary to various ocular disorders such as ocular trauma and inflammation.

Measles is a leading cause of child mortality in developing countries, with a case-mortality rate of 10% or more in some settings. Measles may also cause corneal scarring through multiple mechanisms, including induction of acute vitamin A deficiency (see below), measles keratitis, secondary bacterial or herpes simplex virus infection of the cornea, exposure keratitis, or the use of traditional eye medicines. Immunization is extremely effective in preventing infection.

Ophthalmia neonatorum is conjunctivitis in the first four weeks of life. *Neisseria gonorrhoeae* and genital strains of *Chlamydia trachomatis* are the most important causes. The infection is acquired from the mother's genital tract at birth.

In gonococcal ophthalmia neonatorum, involvement of the cornea occurs earlier and tends to be more severe than in chlamydial disease. Early treatment of conjunctivitis in neonates cures these infections before sight-threatening corneal complications develop.

Retinopathy of prematurity (ROP) occurs in premature babies with immature retinal blood vessels. Blindness results from detachment of the retina. Low birth weight and hyperoxia (due to the use of inadequately-monitored supplemental oxygen in neonatal intensive-care units) are important risk factors. Systemic steroids given immediately prior to preterm birth, and specialist postnatal screening and management can improve outcomes.

Vitamin A deficiency (VAD) can cause **xerophthalmia**. It occurs typically in children aged between three months and eight years, and has a range of clinical features that are related to severity – night blindness, conjunctival and/or corneal xerosis (drying), Bitot spots and corneal ulceration (keratomalacia), or scar. Corneal involvement is a medical emergency as it predicts a high risk of blindness. Superadded measles infection increases the risk of corneal damage in VAD. Blindness from VAD is preventable through breastfeeding support, nutrition education, vitamin A supplementation of children, and/or other measures.

3

Chapter 3

The Rationale for VISION 2020: the Right to Sight

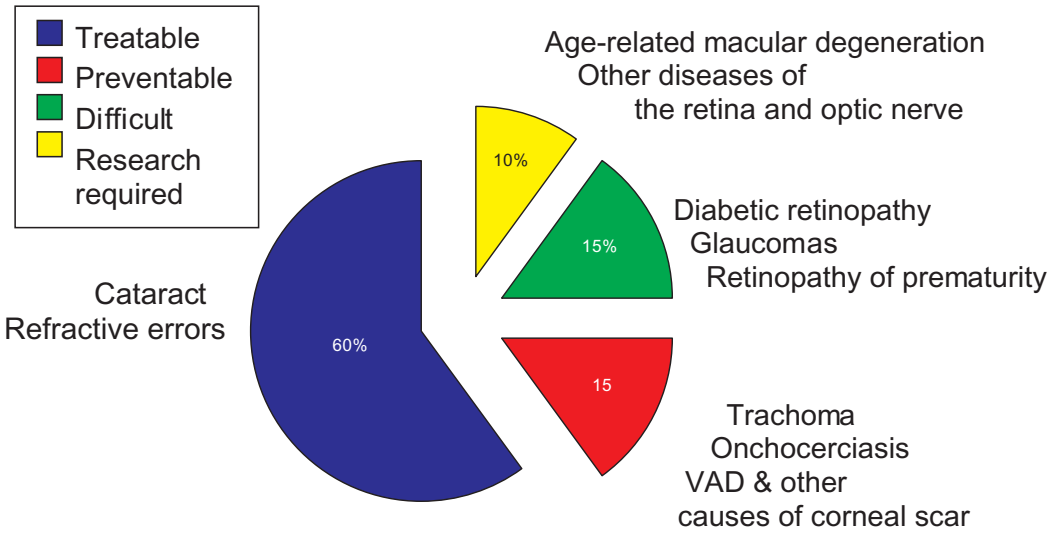
Blindness projections

The first global analysis of data on blindness indicated that in 1975 there were 28 million blind people, i.e., visual acuity less than 3/60 in the better eye with best correction. Estimates in 1990 showed that this figure would continue to increase, from **38 million** in 1990 to **45 million** in 2000. Projections based on the global population increase and ageing, predicted **58 million blind** in 2010 and **75 million** blind by 2020. Low vision (i.e., cannot see 6/18 but can see 3/60 in the better eye) was estimated to affect approximately three times as many people as does blindness.

Of the estimated 45 million blind people in 2000 (Figure 1), approximately 60% of blindness was due to cataract and refractive errors (treatable); 15% was due to trachoma, vitamin A deficiency and onchocerciasis (preventable); another 15% of blindness was due to diabetic retinopathy and glaucoma (partly preventable, although more difficult); and the other 10% was attributable to age-related macular degeneration and other diseases (more research is needed to determine best treatments and possible prevention).

Five conditions – cataract, refractive errors/low vision, trachoma, onchocerciasis, and vitamin A deficiency/other causes of childhood blindness – were determined to be responsible for 75% of all blindness. For each of these five conditions, effective and cost-efficient intervention strategies are available. However, shortages of human resources, training, facilities, equipment, and funds have limited the capacity of intervention strategies to reach the people most in need.

Figure 1. Schematic illustration of the proportion of blindness by cause in the 1990s, grouped by degree of 'avoidability'



Source: Adapted from Foster A. VISION 2020: from epidemiology to program. In: Johnson GJ et al., eds. *The epidemiology of eye disease*, 2nd ed. London, Arnold, 2003:373–383.

It was calculated that of the estimated 45 million blind people in 2000, 1 million per year would have had their sight restored through medical/surgical interventions, and 6 million would die blind each year. An estimated 8 million new cases of blindness, i.e. the 'incidence', were added each year, a net increase of 1 million blind people annually. Of all blind people, 90% lived in poor communities, 60% of their blindness was determined to be treatable, and another 20% preventable.

The VISION 2020 solution

A joint initiative – eventually named VISION 2020: the Right to Sight – was conceived by the World Health Organization and the International Agency for Prevention of Blindness and its constituent members, to provide technical guidance and support to countries that adopt its agenda. At the national level, a strong partnership among the ministry of health, national, and international organizations involved in eye care, professional organizations, and civil society groups – brought together in a national prevention of blindness and/or VISION 2020 committee – should facilitate the implementation of effective and efficient eye-care services in all districts.

If this strategy were successfully implemented, blindness due to cataract, refractive errors, trachoma, vitamin A deficiency, and onchocerciasis – and some due to diabetic retinopathy and glaucoma – would be eliminated. In other words, the projected increase in global blindness to above 75 million by 2020 could be reduced to approximately 24 million.

Economic projections

The economic effects of visual impairment can be divided into 'direct' and 'indirect' costs, as follows.

- Direct costs are those involved in the treatment of eye diseases, including the relevant proportion of the costs of running medical and allied health services, the cost of pharmaceuticals to treat

diseases of the eye, eye research, and administration.

- Indirect costs include lost earnings for the visually impaired; lost earnings for their caregivers; aids, equipment and home modifications; rehabilitation; welfare payments; taxation revenue forgone; and the pain, suffering and premature death that result from visual impairment.

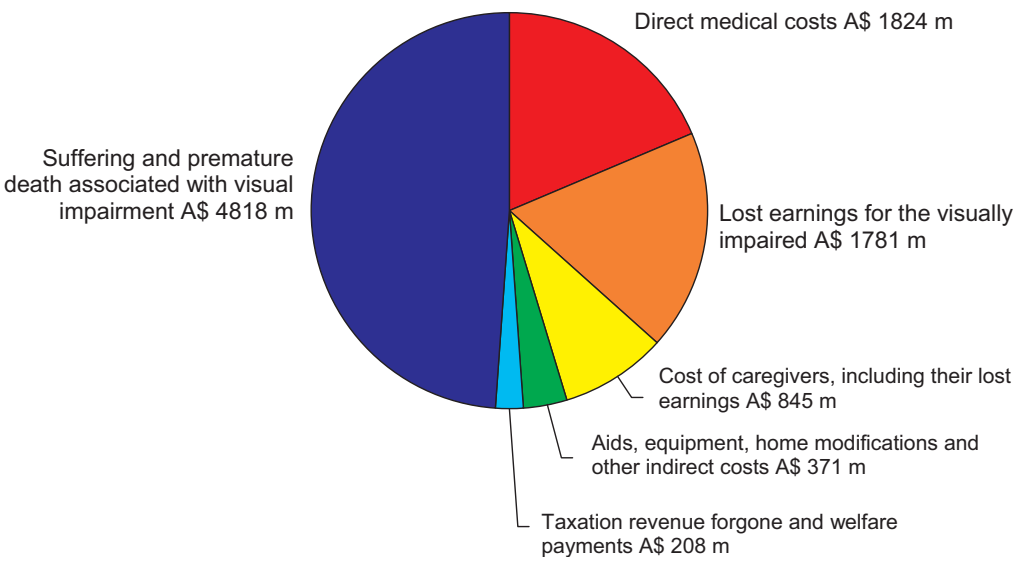
The most comprehensive national-level assessment of the economic cost of visual impairment prepared to date was published in 2004, using data for Australia. Five principal eye conditions account for approximately three quarters of all visual impairment in Australia: cataract, AMD, glaucoma, diabetic retinopathy, and refractive error.

The analyses predicted that the direct costs of treating eye disease in Australia in 2004 would be A$ 1.8 billion (US$ 1.3 billion) — more than the cost of managing coronary heart disease, stroke, arthritis, or depression nationally in that year and more than would be spent on diabetes mellitus and asthma (two of the Australian National Health Priority Areas) combined. Indirect costs were predicted to add another A$ 8.0 billion (US$ 5.6 billion) to the annual national eye-care bill for 2004 (Figure 2).

Economic models of this level of detail have not yet been produced for the world as a whole. However, according to a (conservative) analysis published in 2003, considering only the personal productivity loss of individuals with visual impairment, the annual global economic impact of unaccommodated blindness and low vision in the year 2000 was US$ 42 billion.

Without a decrease in the prevalence of blindness and low vision, this figure was projected to rise to US$ 110 billion per year (in year-2000 US$) by the year 2020 (Figure 3). With successful implementation of VISION 2020, the annual personal productivity loss of individuals with visual impairment was projected to rise to only US$ 58 billion (in year-2000 US$) in 2020. This equates to an overall global saving over 20 years of US$ 223 billion.

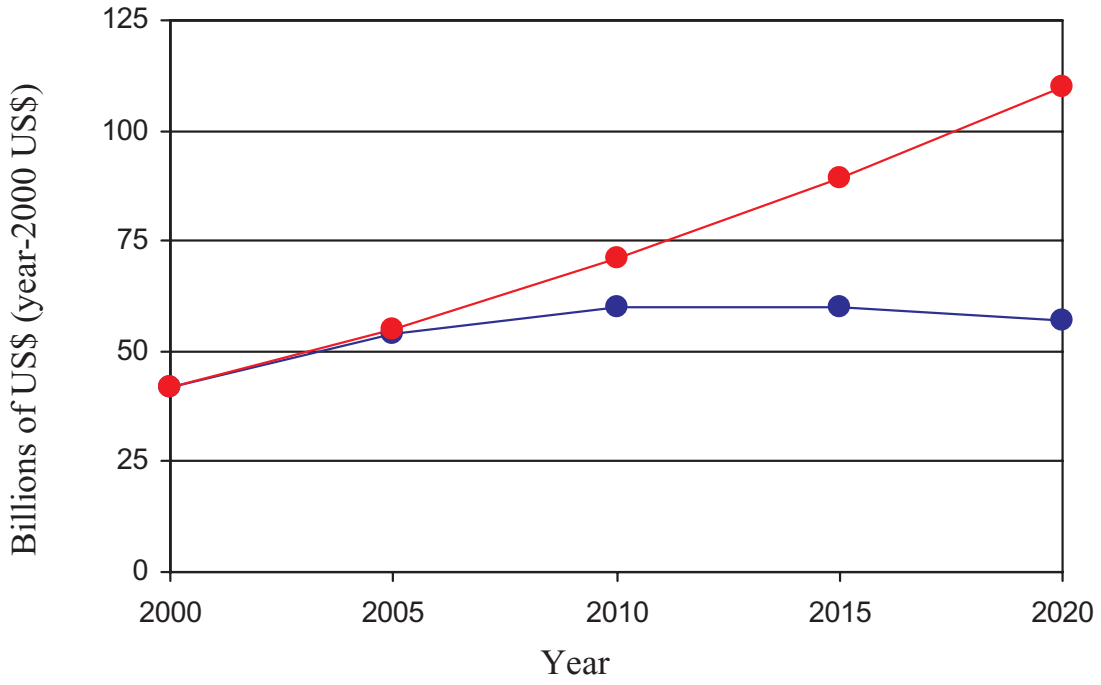
Figure 2. Estimated total costs of eye disease in Australia, 2004



Note: All figures are in Australian dollars.

Source: Data from Access Economics. *Clear insight: the economic impact and cost of vision loss in Australia.* Melbourne, Centre for Eye Research Australia, 2004.

Figure 3. Projected worldwide annual personal productivity loss of individuals with visual impairment, 2000–2020



Note: Blue circles indicate with, and red circles indicate without, a successful VISION 2020 programme (successful implementation would result in an overall global saving over 20 years of US$ 223 billion).

Source: Data from Frick KD, Foster A. The magnitude and cost of global blindness: an increasing problem that can be alleviated. *American Journal of Ophthalmology,* 2003, 135:471–476.

The African country of The Gambia provides a small but highly significant application of the economic perspective. In the period between 1986 and 1996, The Gambian National Eye Care Programme demonstrated a decrease in the crude national prevalence of blindness from 0.70% in 1986 to 0.42% in 1996 — a relative reduction of 40%. In that ten-year period, the Gambian population increased by 51% from 775 000 to 1 169 000. The fall in the prevalence of blindness was attributed principally to successful interventions against cataract and trachoma. The cost of the programme during the period 1986–1996 was US$ 1.28 million (in 1995 US$). Even if all the resources used during this eleven-year period did not prevent any additional cases of blindness after 1996 (which is unlikely), the net economic gain of the programme from 1986 to 2050 (when the youngest individual helped by 1996 would be 54 years old) has been estimated at US$ 1.01 million, consistent with an internal rate of return of 10%. Though the required initial investments, outcomes, and economic effects may differ in other settings, this finding provided substantial support for investment in VISION 2020 programmes.

VISION 2020: the Right to Sight

Mission statement

The **mission** of VISION 2020 is to eliminate the main causes of avoidable blindness in order to give all people in the world, particularly the millions of needlessly blind, the right to sight.

The **goal** of VISION 2020 is to eliminate avoidable blindness by the year 2020. In

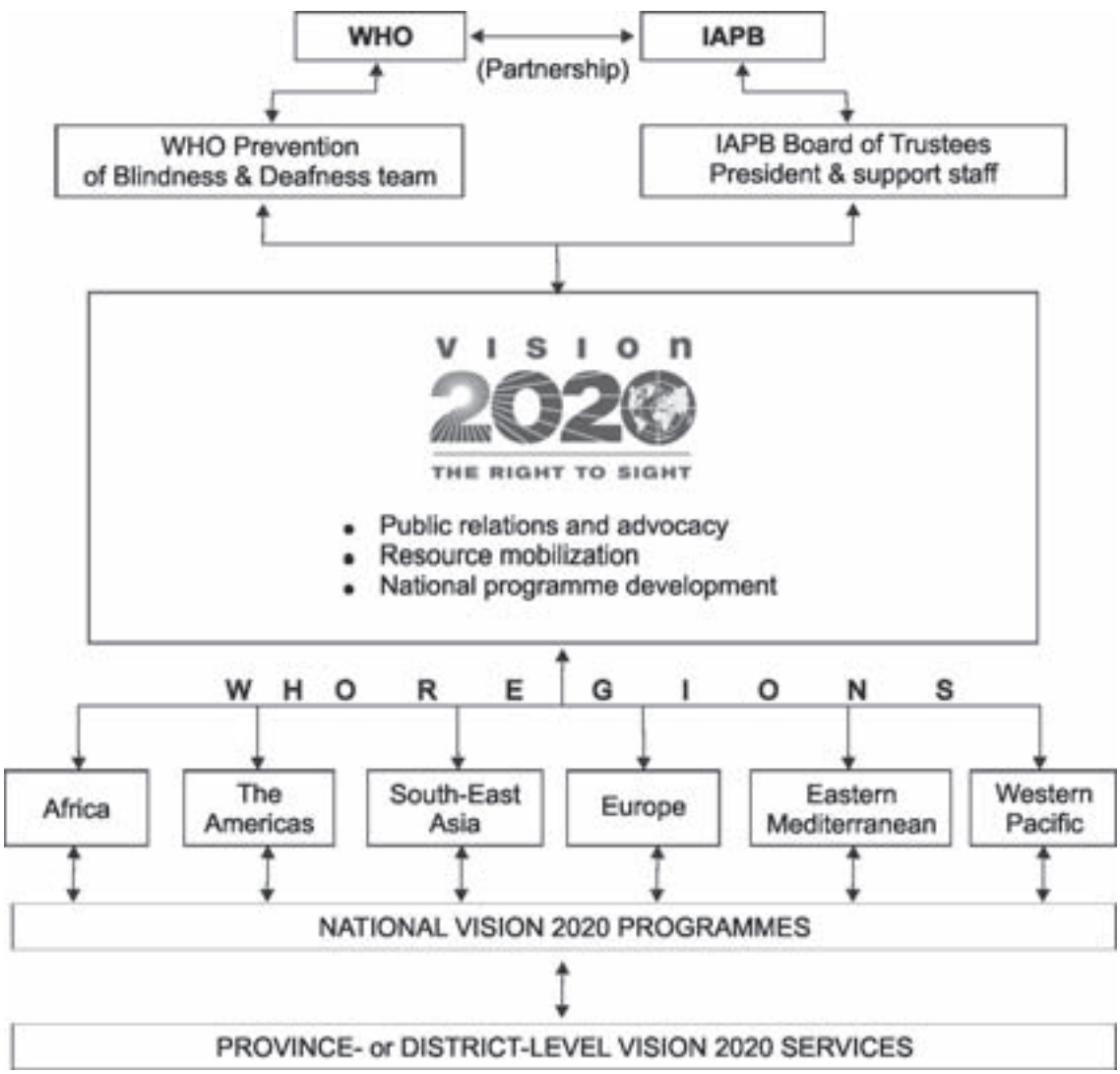
the long term, the initiative seeks to ensure the best possible vision for all people and thereby improve their quality of life. This goal should be achieved through the establishment of a sustainable, comprehensive eye-care system as an integral part of every national health system.

The **objectives** of VISION 2020 are to:

- raise the profile – among key audiences – of the causes of avoidable blindness, and of the solutions that will help eliminate the problem;
- identify and secure the necessary resources around the world in order to provide an increased level of activity in prevention and treatment programmes; and
- facilitate the planning, development, and implementation of the three elements of the VISION 2020 strategic plan by national programmes.

The **strategy** of VISION 2020 is built upon a foundation of community participation, with three essential components or elements:

Figure 4. The structure of VISION 2020



Source: World Health Organization, Prevention of Blindness Programme (WHO/PBD), 2005.

- cost-effective disease control interventions;
- human resource development (training and motivation); and
- infrastructure development (facilities, appropriate technology, consumables, and funds).

The **guiding principles** of VISION 2020 are summarized in the acronym I SEE:

- **I**ntegrated into existing health care systems
- **S**ustainable in terms of money and other resources
- **E**quitable care and services available to all, not just the wealthy
- **E**xcellence –vz a high standard of care throughout.

The details – as originally conceptualized – of the VISION 2020 strategy and implementation package concerning the specific strategies for the targeted diseases, and issues in human resources and infrastructure are presented in Annex B.

Figure 4 shows the structure of the VISION 2020 programme.

In 2003, global political commitment to VISION 2020 was demonstrated by the Fifty-sixth World Health Assembly's adoption of resolution WHA56.26, *Elimination of avoidable blindness*[1].

The resolution urged each Member State to:

- support the Global Initiative for the Elimination of Avoidable Blindness by setting up, not later than 2005, a national VISION 2020 plan, in partnership with WHO and in collaboration with nongovernmental organizations and the private sector;
- commence implementation of such plans by 2007 at the latest; and
- include in such plans effective information systems with standardized indicators and periodic monitoring and evaluation, with the aim of showing a reduction in the magnitude of avoidable blindness by 2010.

The Director-General of WHO was requested to:

- maintain and strengthen WHO's collaboration with Member States and the partners of the Global Initiative for the Elimination of Avoidable Blindness; and
- ensure coordination of the implementation of the Global Initiative, in particular by setting up a monitoring committee grouping all those involved.

[1] The resolution is reproduced in full in Annex C of this report

4

Chapter 4

Five Years of Implementation

World Health Assembly resolution WHA56.26 reiterated the commitment of countries to develop national plans to address issues of blindness prevention consistent with the Global Initiative for the Elimination of Avoidable Blindness – known as VISION 2020: the Right to Sight. Implementation includes four principal steps. Movement towards the accomplishment of these steps is recorded in the WHO *VISION 2020 – Progress towards goals* database.

The work of facilitating national VISION 2020 programme implementation is coordinated between WHO and IAPB through VISION 2020 global and regional coordinators working with VISION 2020 country coordinators. That work includes the following elements.

- **VISION 2020 workshops.** These workshops take three main forms.
  - Short (1–3 day) advocacy workshops sensitize senior eye-care professionals and health-care planners, and seek their ownership of VISION 2020 objectives and strategies.
  - National VISION 2020 planning workshops bring together planners and implementers in the ministry of health, key eye-health professionals, and other individuals and organizations (frequently NGOs) involved in the mobilization of both financial and human resources. These workshops last about five days, during which eye-care activities and current performance in the country are critically reviewed, constraints and gaps in service delivery identified, and a national consensus reached on future priority actions. Planning workshops thus initiate a process that ultimately culminates in the development of a VISION 2020 national plan.

– 'District' (implementation unit)-level workshops produce detailed implementation unit plans. In some countries where decentralization of health services is effective, district planning occurs first – the national plan being consolidated from several district plans.

- **Signing of a VISION 2020 Global Declaration of Support.** It is often during the advocacy workshop that the ministry of health or other national government representatives sign a Global Declaration of Support for the VISION 2020 initiative, thereby committing the government to implementing the goals of VISION 2020: the Right to Sight.
- **National VISION 2020 committee.** The most effective VISION 2020 committees are made up of those who write and agree to implement the national plan. Ideally, these are the parties who participate in the VISION 2020 workshops. They continue to meet, to coordinate efforts to implement the plan and evaluate its effects. They recommend changes to the plan when indicated. They participate in gathering the data necessary to monitor and measure the outcomes.
- **National prevention of blindness (VISION 2020) plan.** The fourth element is the finalization of a national prevention of blindness (VISION 2020) plan, including the resources to bring it about. Often the plan consists of a multiphase approach, during which a country may have several intermediate goals. Once the plan is finalized, the country should immediately move towards its implementation. Local data – on blindness prevalence, cataract surgical rate, number of ophthalmologists per million population, and so on – can be of further help in monitoring the country's progress in the elimination of avoidable blindness. To assist in this process, a 'tool kit' in the form of an interactive CD-ROM entitled *Developing an action plan to prevent blindness at national, provincial and district levels* has been prepared. The CD-ROM contains guidelines, useful background documents, and templates to facilitate the national planning process. Copies can be obtained from IAPB, Hyderabad,

hhttp://www.iapb.org. An online version can be accessed at either of the following web sites: http://www.v2020.org/main_page.asp or http://www.who.int/pbd/blindness/vision_2020/en/index.html.

Data relevant to these parameters have been compiled in Table 1 (Chapter 5) and in Annex E.

World Sight Day

Observed on the second Thursday of October each year, the purpose of World Sight Day is to provide an annual occasion to raise public awareness concerning the problem of blindness. Local blindness awareness or VISION 2020 organizations take this opportunity to launch new activities, introduce new products, or in other ways create favourable publicity for the public involvement in and ownership of the prevention of blindness.

Monitoring and data collection

Progress towards VISION 2020 goals is measured by indicators within a monitoring framework established in June 2002 by a specifically-tasked WHO working group. This group noted that there were considerable advantages in using existing national and district reporting systems and emphasized the importance of feeding back results to those who furnish data, to ensure that they can benefit from the analysis and conclusions.

In practice, data collection has focused on a few readily available key indicators. A portion of the currently-collected data is presented in Annex E. These data will be readily available online shortly, to facilitate feedback to those who provide the information. Full details of the recommended monitoring framework can be found in the working group's report[1].

Monitoring committee for the implementation of VISION 2020

In addition to urging WHO Member States to set up national plans for VISION 2020, the World Health Assembly resolution WHA56.26 mandated the WHO Director-General to establish a committee to monitor and assess progress towards the VISION 2020 goal of eliminating avoidable blindness by the year 2020. This body will convene its first meeting in late 2005. At that time, it will consider the current situation concerning blindness and prepare a report to be submitted to the World Health Assembly in 2006.

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[1] *A framework and indicators for monitoring VISION 2020: the Right to Sight. Report of a WHO working group, Geneva,* 24-26 June 2002. Geneva, World Health Organization, 2003 (WHO/PBL/03.92).

5

Chapter 5

Implementation Successes

National commitment to VISION 2020

In the first five years of the Global Initiative (2000–2004), 69 Member States signed the VISION 2020 Global Declaration of Support, 50 drafted VISION 2020 national plans (example in Box 1), and 43 formed VISION 2020 national committees (example in Box 2). These developments reflected the engagement with VISION 2020 by approximately one quarter of the 192 Member States of WHO – all of which have been asked by the World Health Assembly to set up a national VISION 2020 plan not later than 2005 (Table 1). Full country-by-country data are provided in Annex E. Most Member States have participated in at least one VISION 2020 workshop; and at least 13 additional countries were planning to participate in a workshop for the first time in 2005.

Box1. Developing a national eye-health plan in Australia

About 480 000 of Australia's 20 million residents are visually impaired (defined nationally as VA<6/12), and over 50 000 of these people are blind (defined nationally as VA<6/60 or visual field <10°). Uncorrected or undercorrected refractive error is the leading cause of visual impairment in Australians over the age of 40 (62% of all visual impairment). The other leading causes of visual impairment are cataract (14%), age-related macular degeneration (10%), glaucomas (3%), and diabetic retinopathy (2%). Projections indicate that by 2024 there will be approximately 800 000 Australians with visual impairments.

Following Australia's endorsement of World Health Assembly resolution WHA56.26, VISION 2020 Australia leveraged the Australian Government to facilitate a national vision forum in March 2004. The forum had the specific goal of bringing together all VISION 2020 Australia partners with other significant players in the ophthalmic and broader health sectors to begin to develop a national eye-health plan. The plan had three focus areas: the Australian community,

Box 1. continued...

the Aboriginal and Torres Strait Islander communities, and communities in developing countries (in which Australian organizations contribute towards blindness prevention programmes).

The plan incorporated the health sector's priority areas in eye health through the year 2010 and represented a collective and collaborative response. The plan was submitted in August 2004 to the Australian Health Ministers' Conference, where it was endorsed. Since then, VISION 2020 Australia has worked with the Department of Health and Ageing to develop a document for public consultation. This document should be released during 2005.

Box 2. Comité Nacional de VISIÓN 2020 Paraguay (CONAVIP)

Paraguay has approximately six million residents. In 1999, an estimated 33 000 of them were blind – half due to cataract. Between 4000 and 5000 cataract surgeries are performed nationally every year. However, this leaves an annual shortfall of at least 10 000 operations. Retinopathy of prematurity is thought to be responsible for about one third of all childhood blindness in the country. Some 1–2% of schoolchildren need spectacles to correct visually-disabling refractive error. Diabetes affects about 10% of Paraguay's population, and about 10% of sufferers will develop diabetic retinopathy. Other important causes of blindness include the glaucomas and toxoplasmosis.

More than 90% of the country's 160 ophthalmologists live in the metropolitan area of the capital city of Asunción. As a result, there are 8058 people per ophthalmologist in Asunción, but 34 347 people per ophthalmologist in rural areas. Five residency programmes in ophthalmology exist in Asunción, with 10 new ophthalmologists graduating each year. There are no optometrists in Paraguay; detection and treatment of refractive error is performed by ophthalmologists.

Public facilities in Paraguay are provided by the Ministry of Health and Social Security hospitals, the National University, and the Army Hospital. Many services are provided by NGDOs, which offer high-quality care to low-income groups at affordable prices. In addition, there are many private clinics.

In 2002, Paraguay became the first country in Latin America to establish an incorporated national VISION 2020 committee. The committee was formed by public and private institutions working together. Its first activity was the detection of refractive errors in public-school children in the departments (states) of Caaguazú, Cordillera, Guairá, Paraguarí, and San Pedro. This programme was endorsed by the Ministry of Education and Culture, and the Ministry of Health.

To implement this activity, 1131 people (teachers, parents, students, and health promoters) were trained in 2003 and 2004 to measure visual acuity (VA). A total of 39 815 children

Box 2. continued...

were screened, and 4838 of them with binocular vision lower than 20/40 were referred for further consultation. Of these, 900 received free spectacles, and 180 required surgery (strabismus, traumatic or congenital cataract, and ptosis). Operations were performed in participating institutions, with public and private facilities working hand-in-hand.

In conjunction with national health authorities, CONAVIP has now drawn up a national eye-health plan for prevention and treatment of blinding eye diseases. The objective of this plan is to increase the coverage of eye-health services, particularly in rural areas; to remove barriers that inhibit access of some population groups to these services; and to improve output and quality of care.

Table 1. Indicators of national commitment to VISION 2020 by WHO region in early 2005.

WHO region	Total number of Member States in region	Number of Member States which have			
		Signed VISION 2020 Global Decleration of Support	Formed national committees	Participated in a VISION 2020 workshop	Drafted a VISION 2020 national plan
AFR	46	20 (43%)	15 (33%)	31 (67%)	15 (33%)
AMR	35	12 (34%)	12 (34%)	31 (89%)	12 (34%)
SEA	11	7 (64%)	8 (73%)	9 (82%)	8 (73%)
EUR	52	2 (4%)	16 (31%)	15 (29%)	1 (2%)
EMR	21	21 (100%)	17 (81%)	20 (95%)	9 (43%)
WPR	27	16 (59%)	17 (63%)	22 (81%)	13 (48%)
Total	**192**	**80 (41.7%)**	**78 (41%)**	**115 (60%)**	**53 (27.6%)**

Note: The WHO regions are Africa (AFR), The Americas (AMR), South-East Asia (SEA), Europe (EUR), Eastern Mediterranean (EMR), and Western Pacific (WPR).

Source: WHO/PBD, 2005

Disease control

Cataract

In 1995, WHO estimated that there were 20 million people blind from cataract. Under VISION 2020, the overall global target is to increase the annual number of surgeries performed worldwide from an estimated 7 million in 1995, to 12 million in the year 2000, and 20 million in 2010. The worldwide target for the year 2020 is 32 million surgeries per year. This corresponds to a global cataract surgical rate (CSR) of 1100 in 1995, rising to 2000 in the year 2000, and 4000 in the year 2020.

In 2002, the most recent year for which extensive national-level data are available, national CSRs reported by 125 Member States ranged from fewer than 100 to approximately 8000 cataract operations per million population per year (Annex E). Forty-one countries (33% of those providing reports) had CSRs of below 500 and seven (6%) had CSRs of 4000 or more (Figure 5).

In 2002, WHO estimated that the number of people blind from cataract was 17.6 million. This suggests that, since the 1990s, the global CSR has risen sufficiently so that eye-care services in some countries are beginning to reduce the backlog of unoperated cataract. Based on incomplete data, the

estimated total number of cataract surgeries performed worldwide in 2004 was 14 million — giving an overall global CSR of 2300 in that year.

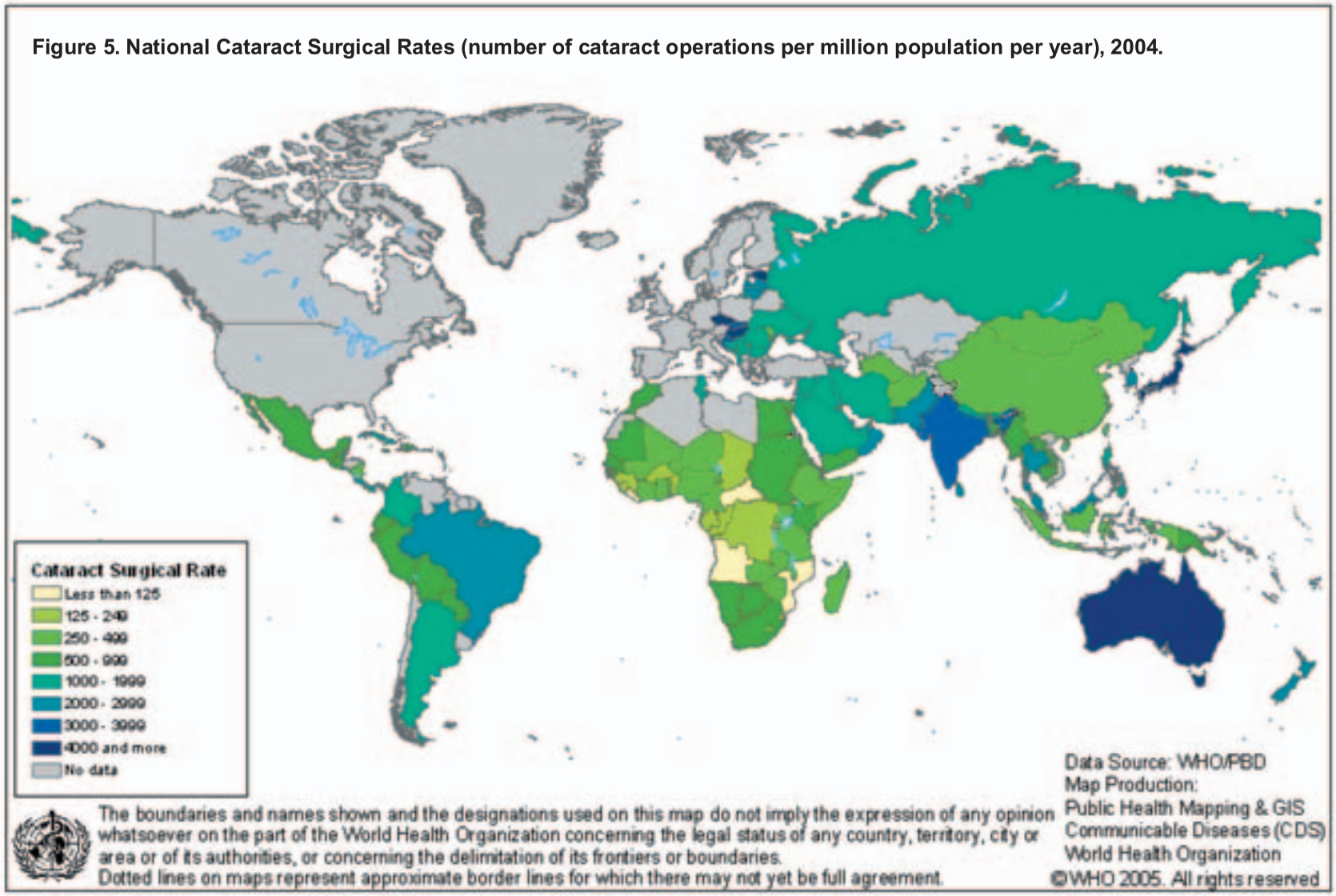
Cataract surgery is one of the most cost-effective of all health interventions. By purchasing low-cost consumables and efficiently utilizing human and material resources, some institutions were able to reduce the cost of providing high-quality cataract surgery to less than US$ 20 per patient during the first five years of VISION 2020. In poorer countries, however, cost may still be a significant barrier to patient uptake of surgery: commitment by governments, donors, or NGDOs to cover the costs for poor patients is necessary (Box 3).

Box 3. Cataract surgery beneficiary in Sirajganj, Bangladesh

Matiur Rahman is 32, and has two sons and three daughters. He used to own 50 rickshaws. In his mid-twenties, he developed bilateral cataract; as his vision deteriorated, so did his business. He progressively sold all his rickshaws, then some of his personal possessions, and finally his house, to feed himself and his family. When he was on the verge of selling his workshop, he was identified by a cataract surgery team, and underwent consecutive operations at age 29 and 30. His business is now thriving again.

> " I'm very well now and have good vision. I run a cycle rickshaw and delivery service. For two years before my first operation I couldn't do my work. At that time it was very hard. My situation was very bad and my prospects looked bleak. I was unable to move on my own, couldn't recognize people, and kept bumping into things on the road. I heard about [the cataract surgery programme], met the medical team and was referred to hospital. I didn't have to pay because of my situation. Now I start work at six every morning and am happy in my work; back then I just cried on my own."

Figure 5. National Cataract Surgical Rates (number of cataract operations per million population per year), 2004.



Trachoma

WHO estimated that in 1990 there were 5.9 million people blind from trachomatous corneal opacity. In 1998, the Organization reported 10.6 million people worldwide with trachomatous trichiasis, and about 146 million with active trachoma; the estimate of 5.9 million blind from trachoma was retained.

During the early 1990s, it was shown that ocular *C. trachomatis* infection could be successfully treated with a single oral dose of the antibiotic azithromycin. This treatment is more practical than the previous first-line antibiotic (tetracycline eye ointment) which required six weeks of twice-daily application to be effective.

The discovery of azithromycin's efficacy against trachoma reignited enthusiasm for the fight against this disease, and the drug's manufacturer (Pfizer Inc.) agreed to donate Zithromax® (azithromycin) to a number of trachoma control programmes. The azithromycin donation is coordinated by the International Trachoma Initiative.

As noted in Chapter 2, antibiotic treatment is one part of a four-pronged strategy which has as its acronym 'SAFE': **S**urgery for inturned eyelids, **A**ntibiotics to treat ocular *C. trachomatis* infection, **F**acial cleanliness, and **E**nvironmental improvement to reduce the risk factors which favour transmission.

The WHO Alliance for the Global Elimination of Trachoma by 2020 (GET2020) was established in 1997 to lead, coordinate, and support a broad coalition of collaborating national governments, NGDOs, and academic institutions. At the time of GET2020's launch, blinding trachoma was estimated to be endemic in 48 countries. GET2020 is a dynamic part of the VISION 2020 initiative; as its name suggests, it intends to ensure that trachoma is eliminated as a cause of blindness by the year 2020.

In support of this goal, the Fifty-first World Health Assembly in 1998 called on Member States to map trachoma-endemic areas, to implement the SAFE strategy, to collaborate with the GET2020 alliance, and to consider all possible intersectoral approaches for community development in trachoma-endemic areas, particularly in the improvement of access to water and basic sanitation for the populations concerned. The countries in which trachoma was thought to be a more extensive public health problem gradually increased to a total of 55.

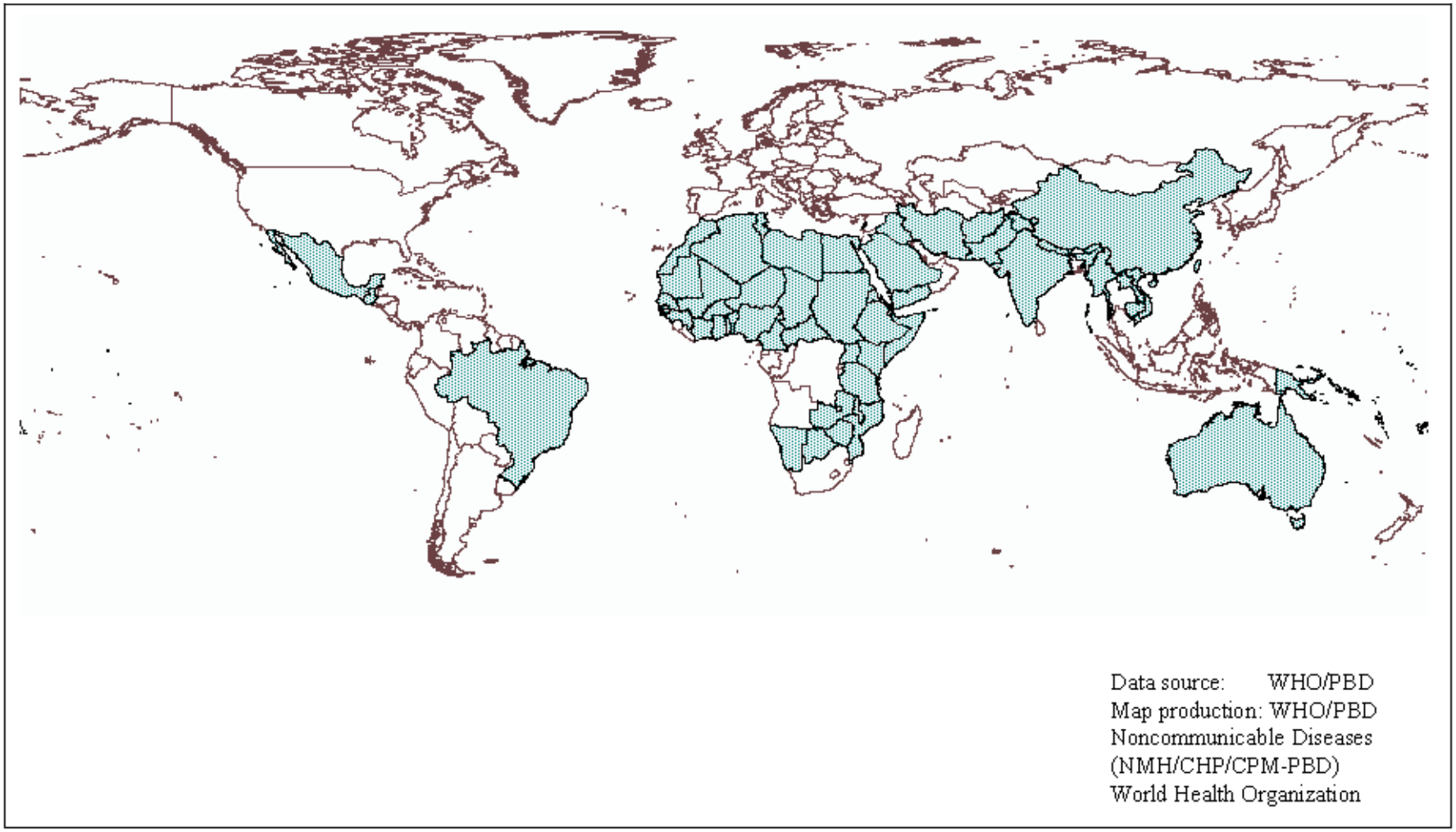
By 2002, five years after the foundation of GET2020, the estimated number of people blind from trachoma was only 1.3 million. In 2004, estimates suggested that 7.6 million people had trachomatous trichiasis worldwide, and that 84 million people in 55 countries had active trachoma, distributed as shown in Figure 6. Each of these totals is considerably smaller than the corresponding estimate made in the previous decade, which may suggest that trachoma is in decline in some countries. Both sets of estimates used for comparison, however, rely on incomplete data.

The development in August 2003 of 'ultimate intervention goals' (UIGs) for trachoma assists countries to plan control activities. The UIGs should provide a useful stimulus for periodic generation of up-to-date information on trachoma prevalence and progress towards its elimination.

Several countries are approaching elimination of trachoma at the national level, with Morocco and Oman both planning to reach this goal in 2006. Two features of the most successful trachoma control programmes are:

- concerted implementation of all four components of the SAFE strategy; and
- alignment of trachoma control with general development of the health sector.

Figure 6. The global distribution of trachoma, 2004



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.
Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The common strand linking these two features is that the first requires, and the second allows, linkage and/or coordination of trachoma control with other effective public health activities and with work being done in the education, water, and sanitation sectors. These have been hallmarks of the highly successful Moroccan trachoma control programme (Box 4).

In 2004, however, only 19 of 55 countries which are believed to have trachoma as a public health problem reported to WHO that they were currently delivering the full SAFE strategy to at least part of their population-at-risk (Annex E). Clearly, more work is needed.

Onchocerciasis

Adult worms of *O. volvulus* are found exclusively in humans. This fact, coupled with a detailed understanding of the biology of the blackfly vector, and the availability of ivermectin (an effective, popular, easy-to-administer microfilaricide), has

Box 4. Trachoma control in the Kingdom of Morocco

In 1992, a national survey of the prevalence and causes of blindness and low vision was undertaken in Morocco. Analyses suggested that approximately 360 000 people had active trachoma nationally, and that between 35 000 and 40 000 had trachomatous trichiasis (TT). Nearly all cases were found in five rural provinces in the south-eastern part of the country: Errachidia, Figuig, Ouarzazate, Tata, and Zagora. Further province-level surveys undertaken by the National Blindness Control Programme in 1993 showed the prevalence of active trachoma in these provinces to be up to 30.5%. As a result of these data, prevention of blindness from trachoma became a priority for the National Blindness Control Programme in these areas.

After gaining political commitment at all levels, appropriate health professionals were trained to conduct the fight against trachoma. Technical, financial, and material support was obtained from national governmental partners, international organizations, and civil society. Planning and follow-up were decentralized, with leadership from the National Blindness Control Programme. The SAFE strategy was implemented at the community level and integrated with other health activities. This has involved:

- provision of high-quality trichiasis surgery at no cost to recipients, by well-trained ophthalmic nurses who are resident in endemic provinces;
- annual high-coverage mass distribution of appropriate antibiotics in endemic areas (including azithromycin since 1997);
- face-washing promotion and health education in schools, community groups, and literacy classes, and the use of posters and videos – all of which have created a widespread and detailed awareness of the problem of trachoma and methods for its control (the community participates actively in these efforts, which are managed through a variety of intersectoral partnerships); and
- a large number of community development projects improving access to clean water and sanitation.

These activities – coupled with a rigorous system for periodic formal evaluation – have enabled the programme to demonstrate a 90% reduction in the prevalence of active trachoma and an 80% reduction in the prevalence of TT between 1997 and 2004. Morocco is on track to eliminate trachoma as a cause of blindness by the end of 2005.

made control of onchocerciasis a practical proposition. In addition to its microfilaricidal action, ivermectin suppresses the production of microfilariae by adult females. As a result, it significantly reduces the incidence of both skin and eye complications.

In 1974, WHO launched the Onchocerciasis Control Programme (OCP) in collaboration with the World Bank and two United Nations agencies – the Food and Agriculture Organization of the United Nations and the United Nations Development Programme – as well as other donors and the national governments of participating countries. The OCP worked in 11 countries (Figure 7) to protect 30 million people living in an area totalling more than 1 200 000 square kilometres.

For over ten years, OCP control activities exclusively involved the spraying of larvicides by helicopters and aircraft over blackfly breeding sites, in order to kill their larvae. A number of different biodegradable insecticides were used, enabling rotation to a different agent whenever resistance was detected.

With the donation of Mectizan® (ivermectin) by Merck & Co., Inc. in 1987, control operations were augmented to combine mass ivermectin treatment with aerial larviciding or – in some areas – changed to treatment with ivermectin alone. Eventually, in Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Niger, and Togo – about 90% of the original programme area – transmission of the parasite effectively ceased. The programme was least successful in Sierra Leone, where operations were interrupted by a decade-long civil war. The OCP was officially closed in December 2002.

The achievements of the OCP include 600 000 cases of blindness prevented, 18 million children born in newly-onchocerciasis-free areas spared from the risk of river blindness, and 25 million hectares of land made safe for cultivation and resettlement.

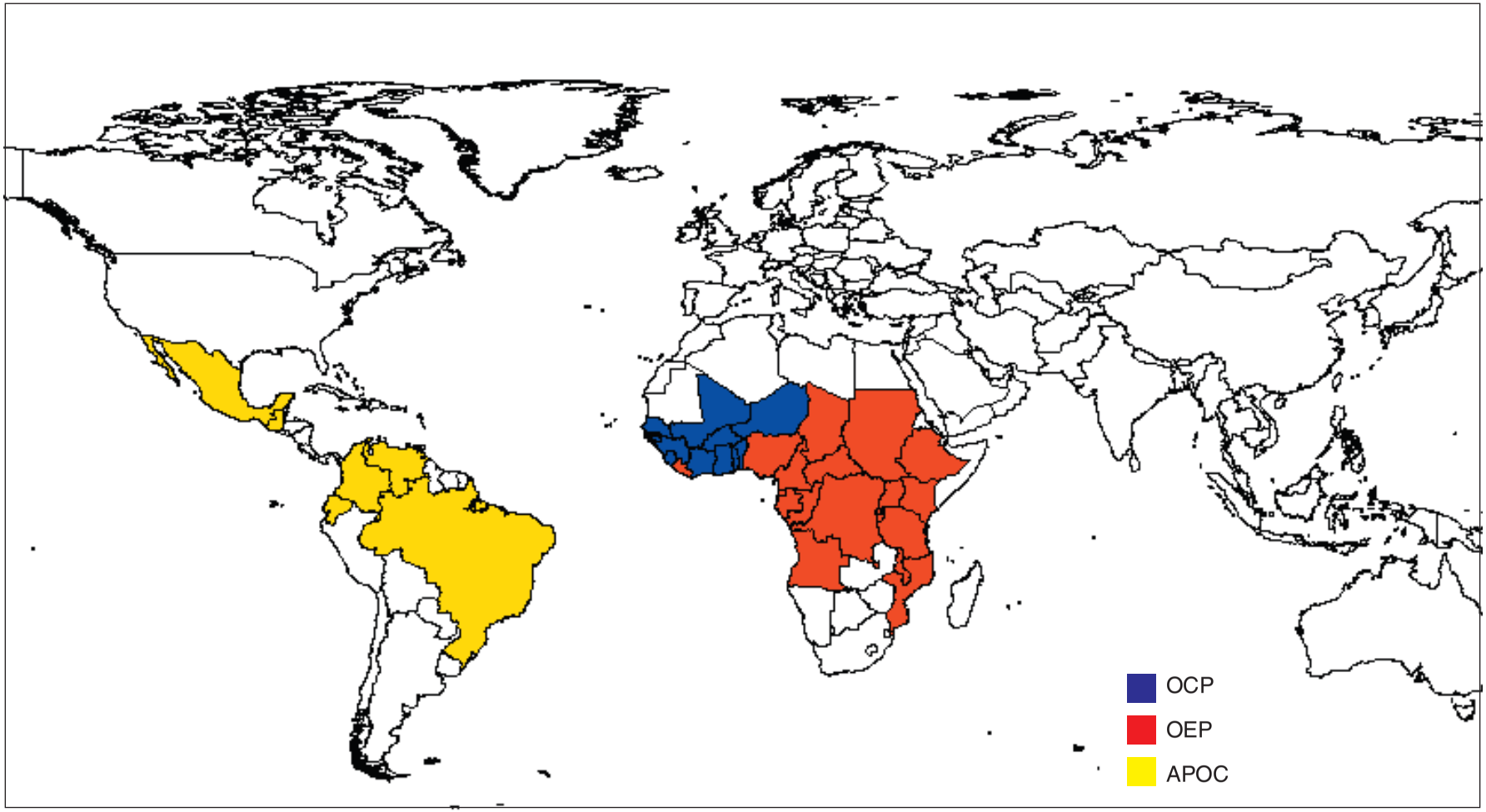
In 1989, some of the NGDOs involved in Mectizan® distribution began to meet to coordinate their efforts, and in 1992 they formed the NGDO Coordination Group for Onchocerciasis Control. In 1995, the OCP's sponsoring agencies and the NGDO Coordination Group jointly launched a second programme to combat river blindness in African countries not involved in the OCP. This programme, known as the African Programme for Onchocerciasis Control (APOC), is ongoing.

APOC involves the national governments and affected communities of 19 participating countries (Figure 7), more than ten international and local NGDOs, the private sector (i.e. Merck & Co., Inc.), donor governments, UN agencies, and the World Bank. Community-directed treatment with one annual dose of ivermectin (CDTI) is the primary strategy for APOC, empowering local communities to fight river blindness in their own villages (Box 5).

After just eight years of operation, APOC has established 107 projects, which in 2003 treated 34 million people in 16 countries[1]. Over the next few years, the programme intends to treat 90 million people annually, protecting an at-risk population of 109 million and preventing 43 000 cases of blindness every year.

[1] Rapid epidemiological mapping of onchocerciasis exercises in Kenya, Mozambique and Rwanda revealed that these countries did not have onchocerciasis.

Figure 7. Participating countries in the Onchocerciasis Control Programme (OCP), African Programme for Onchocerciasis Control (APOC) and the Onchocerciasis Elimination Programme in the Americas (OEPA)



Source: Dr Tony Ukety, Coordinator, Nongovernmental Development Organization for Onchocerciasis.

Box 5. Ivermectin delivery and distribution in the Uele CDTI project, Democratic Republic of the Congo

Source: Dr Tony Ukety, Coordinator, Nongovernmental Development Organization for Onchocerciasis.

In early June 2004, ivermectin tablets for the Uele and Tshopo CDTI projects in north-eastern Democratic Republic of the Congo (DRC) arrived in Kigali, Rwanda. These tablets would normally be transported by road to Goma and then flown from there to the respective project headquarters. However, the town of Bukavu had just been captured by rebel forces, and Rwanda had closed its border with the DRC.

After several weeks, with no sign of the border being reopened, the shipment was taken by road from Kigali to Entebbe, Uganda, and flown to Kisangani by Missionary Aviation Fellowship. Ivermectin tablets were then ready for use by the Tshopo project. How, though, could they be transported to Uele? Years of instability had severely weakened the DRC's infrastructure, with most roads in a poor state of repair, and many bridges impassable.

The answer was bicycles. Five riders took five days to transport ivermectin for 1 531 200 people the 312 km from Kisangani to Buta. These tablets were later distributed by 3820 community-directed distributors, who are active in a region that has no eye-health personnel at all.

The Onchocerciasis Elimination Programme in the Americas (OEPA) was launched in 1992. It operates in the six endemic countries of Latin America (Figure 7). Like OCP and APOC, OEPA is a partnership. The OEPA partnership includes national governments, the Pan American Health Organization, Merck & Co., Inc., and international NGDOs.

Recent evidence suggests that administration of ivermectin more frequently than once-yearly may kill or reduce the fertility of a high proportion of adult female *O. volvulus*. Accordingly, OEPA has begun distributing ivermectin every six months. In each country, the aim is to treat – twice per year – at least 85% of persons who are at risk of the disease. During 2003, the six national programmes provided a total of 819 006 ivermectin treatments, with all six countries exceeding the 85% minimum treatment coverage target; the overall regional coverage was 93%. (The total number of persons at risk of onchocerciasis in Latin America is 444 558.)

The stated aim of OEPA is to eliminate onchocerciasis from the Americas. This is a more ambitious goal than has been set in Africa, where APOC intends simply to eliminate the disease as a cause of blindness. However, the smaller size of the endemic focus in Latin America – and the lighter intensity of transmission there – may make the OEPA target achievable. Achievement of the elimination of onchocerciasis from the Americas would remove the need for ongoing surveillance for recrudescence.

Childhood blindness

Childhood blindness is a priority for VISION 2020 because blind children have a lifetime of blindness ahead of them. Moreover, that lifetime can be very short — up to 60% of children die within a year of becoming blind. Blindness in children is thought to be responsible for about one third of the total economic cost of blindness.

Childhood blindness results from a number of very different conditions than does that in adults. The major preventable causes are VAD, measles, ophthalmia neonatorum, and the harmful use of traditional eye medicines — all of which produce corneal ulceration leading to scarring. The major treatable causes of blindness in children are cataract, ROP and glaucomas. Effective control of all of these conditions requires a range of interventions delivered through multiple services – maternal and child health, community health, education, and tertiary child eye care.

Vitamin A deficiency. The 1990 World Summit for Children committed to the " …virtual elimination of VAD and its consequences, including blindness" by the year 2000. At the time this goal was set, an estimated 40 million preschool children worldwide were thought to be vitamin A-deficient.

Four strategies were proposed to reduce the prevalence of VAD:

- breastfeeding support with vitamin A supplementation for new mothers;
- education of the community about the need for consumption of vitamin A-rich foods, combined – where necessary – with measures to encourage farmers and households to grow appropriate fruits and vegetables;
- vitamin A supplementation for children; and
- (where industrial and commercial infrastructures were adequate) fortification of

foods such as flour, sugar, margarine, or monosodium glutamate.

Vitamin A supplementation is the most practical of these strategies to monitor. In the mid-1990s, only "a handful" of countries had been providing children with vitamin A supplements. In 2002, 43 countries distributed at least one high-dose vitamin A capsule to more than 70% of their children (Annex E). The United Nations Children's Fund (UNICEF) estimates that between 1998 and 2000, about 1 million child deaths may have been prevented by vitamin A supplementation.

The Vitamin A Global Initiative was created in 1998 as an informal network of donors and international organizations seeking to control the problem of VAD. Partners include the Canadian International Development Agency, the Micronutrient Initiative, UNICEF, the United States Agency for International Development, and WHO. This group has now proposed 2010 as a new deadline for elimination of VAD. There is still much more work to be done to achieve this goal: in 2002, it was estimated that about 127 million preschool children and more than 7 million pregnant women were deficient in vitamin A.

Measles. Reported worldwide annual incidence of measles fell by 40% between 1990 and 2000. Global coverage with at least one dose of measles vaccine remained stable at about 70% during the 1990s, but coverage was less than 50% in 14 countries in 1999. In 2003, 102 (53%) of the 192 countries for which data are available reported that at least 90% of their one-year-old children were immunized against measles, with only seven countries (4%) reporting coverage of less than 50% (Annex E).

Other causes of childhood blindness. At present, there are not sufficient reliable data on ROP, ophthalmia neonatorum, congenital cataract or congenital glaucoma to determine whether or not there have been changes in the global incidence of blindness from these conditions during the first five years of VISION 2020. However, it is clear that specific local efforts are helping to save children's sight in some countries (Box 6).

Refractive error and low vision care

Refractive error. For adequately trained and adequately equipped personnel, most refractive errors are relatively easy to diagnose and treat. In the past, however, the lack of available information on the epidemiology of refractive errors and functional low vision presented a problem for prioritizing interventions, and for determining whether or not those interventions were cost-effective.

In 2003, a WHO consultation recommended that the definitions of blindness and low vision be amended, substituting "presenting visual acuity" for "best-corrected visual acuity". This measure should increase the generation of useful data on the prevalence of visual impairment from refractive errors.

Recent studies in developed countries have revealed a surprisingly high prevalence of uncorrected refractive error. In Australia, where 3500 eye care practitioners provide

Box 6. Retinopathy of prematurity screening in Chile

In 1991, a national blind-school survey in Chile showed that 18% of childhood blindness was due to ROP. At that time, only two public hospitals in the country screened for this condition. In five Santiago neonatal intensive care units (NICUs) during 1995, only 61% of infants with birth weights ≤1500 grams were examined by an ophthalmologist. A national screening programme was suggested by the Hospital del Salvador in Santiago. A pilot scheme in that hospital was funded through the national Ministry of Health in 1995.

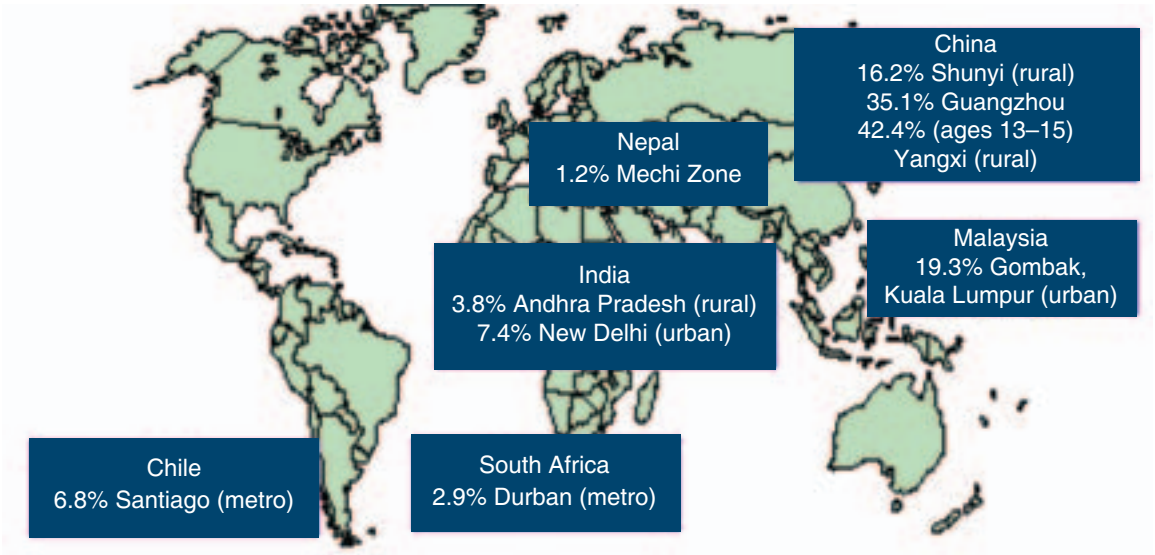
Between 1995 and 1997, increased screening efforts led to referral and treatment of additional babies from around Chile. The epidemiological and clinical data accumulated from this experience allowed formulation of locally-tailored national screening guidelines in 1999. They were aimed to cover the 27 public NICUs in the country, which care for 70% of Chile's total population. The major private NICUs also adopted the guidelines.

To implement the guidelines, three workshops for neonatologists were convened in the north, centre, and south of the country in 1999. In 2000, a national teaching workshop for ophthalmologists was organized. This workshop was filmed, and the proceedings subsequently distributed in VHS format to ophthalmologists nationwide. A teaching CD-ROM was produced and distributed in 2002.

The ROP guidelines were put into practice in 2000. There were 1652 babies born with birth weights of 1500 grams or less in Chile's public sector that year. Of these babies, 1173 survived and 90% of those survivors were screened. Forty-two babies (4% of those screened) received laser treatment. The feasibility of screening was established. Subsequent analyzes suggested that to reduce transfer times and boost favourable outcomes more treatment centres would be required. As a result, new treatment centres are being developed, in addition to the NICU associated with the Hospital del Salvador.

Increased awareness of ROP among public health officials in Chile prompted inclusion of the condition in the new National Health Programme. As a result, screening and treatment of ROP will become mandatory nationwide from the beginning of 2005.

Figure 8. Selected data from recently published studies, indicating prevalence of myopia in children ages 5–15



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Nepal. Pokharel GP et al. Refractive error study in children: results from Mechi Zone, Nepal. *American Journal of Ophthalmology,* 2000, 129:436–444.

refractive services to a total population of about 20 million people and low- or no-cost spectacle supply systems are available to individuals with special health or welfare needs, uncorrected refractive error is still estimated to account for 62% of visual impairment and 4% of all blindness.

On a global scale, it is difficult to find comprehensive figures on the prevalence of refractive errors — although there have been several recent national surveys. The map in Figure 8 indicates prevalence data for childhood myopia in six recently-studied areas. Presbyopia is thought to affect virtually everyone over the age of 45 years, or about 23% of the world's population. Overall, visual impairment due to uncorrected or under-corrected refractive error (VA<6/18 in adults, <6/12 in children) has been estimated to affect as many as 200–250 million people worldwide.

VISION 2020 is striving to make refractive services and corrective spectacles affordable and available to populations-in-need through primary health care facilities, school vision screening, and low-cost spectacle production. The principal target groups are those over the age of 40 with presbyopia and school-age children with myopia.

Low vision care. A population-based survey was completed in the year 2000, to assess the need for low vision services in the Indian state of Andhra Pradesh. This survey suggested that the prevalence of functional low vision in that state was approximately 1%. Extrapolating this result to the country as a whole produced an estimate of 10.6 million people who could benefit from low vision services in India alone. Similar high-quality data are needed from other regions.

For the world as a whole, 2004 estimates using available data suggest a global total of about 9 million people who have no perception of light, and could therefore benefit from mobility training and other forms of rehabilitation. These data also suggest that a further 68 million people with varying degrees of visual impairment might benefit from multidisciplinary low vision care.

The first step in providing low vision services is the identification of individuals who need them. However, shortage of trained eye-care and rehabilitation personnel is often greatest in populations that have the greatest need. Simple but sensitive and specific screening tools for identifying people with low vision have therefore been developed. These tools have been demonstrated to be useful in developing countries (Box 7).

Both children and adults with low vision benefit from the efficient use of visual function that can be developed through visual stimulation and training, education, mobility instruction, and the use of low vision aids. These aids include magnifiers, telescopes, glare control devices, bold line pens and paper, writing guides, magnifying mirrors, needle-threaders, high contrast watches, conversion systems such as talking calculators, variable lighting, enlarged print, video tapes, and computers. A range of low-cost low vision aids can now be purchased by developing countries from the VISION 2020 Low Vision Resource Centre established at the Hong Kong Society for the Blind. This has invigorated low vision programmes in many resource-poor countries.

It is currently unclear what proportion of the estimated 68 million people who could potentially benefit from low vision services would actually want those services. Assuming (as seems likely) that demand outstrips supply, priority should be given to children and to those with the greatest degrees of visual impairment. However, an individual's need for low vision services is determined by the functional advantage that such services could provide to that individual, and this is not easily predicted by considering his or her visual acuity alone.

Box 7. Provision of low vision services in Fiji

At the time VISION 2020 was launched, Fiji had virtually no low vision services. Education and rehabilitation were provided to a small number of children by the Fiji Society for the Blind.

Therefore, a low vision clinic was established in 2002, in the eye department of the Colonial War Memorial Hospital – Fiji's main hospital. Training in assessment and prescription of low vision devices was provided to a senior ophthalmologist.

A priority was the examination of all children in the school for the blind. Training in the use of low vision devices was provided to teachers at the school. Referrals were made from other hospitals and from outreach work. During outreach, spectacles were available for sale, and people with functional low vision were referred for either treatment or low vision care.

Provision of low vision services is thought to have a significant positive impact on recipients' quality of life. However, data using validated outcome measures are relatively scarce, and the best model for low vision interventions is therefore presently unclear. Steps are being taken to resolve this.

A significant development in the area of refractive error and low vision care occurred in early 2004, when IAPB and other partners established Optometry Giving Sight (OGS). OGS aims to raise funds from optometrists, dispensing opticians, and their patients throughout the world, and use the money to support programmes in the correction of refractive error and low vision services that address the VISION 2020 priorities.

Human resource development

Adequately trained human resources are a core requirement for the prevention, treatment, and rehabilitation of avoidable blindness. Particularly in the least-served areas, VISION 2020 has prompted a paradigm

Box 8. Ophthalmologist training programme, Department of Ophthalmology, University of Nairobi, Kenya

In cooperation with the University Eye Hospital in Munich and the German Academic Exchange Service, the University of Nairobi started postgraduate training in ophthalmology in 1978. In May 1991, the Department of Ophthalmology became a WHO Collaborating Centre for Prevention of Blindness.

The Department has so far trained a total of 87 ophthalmologists from 13 African countries. Excluding ophthalmologists in the Republic of South Africa, this figure represents at least 10% of all ophthalmologists in sub-Saharan Africa.

Currently, the programme graduates six to eight new ophthalmologists per year, and plans are in place to increase this to eight to ten per year. Since the anglophone Africa launch of VISION 2020 in the year 2000, the Department has produced 29 new ophthalmologists, including 19 from Kenya, 2 from Cameroon, 2 from Ghana, 2 from Malawi, and 1 each from Ethiopia, India, Uganda, and Zambia.

Subspeciality training is available, including childhood blindness and strabismus, medical and surgical retina, oculoplastics, and orbital surgery, glaucoma, anterior segment, eye infections, and community eye health.

The Department is also actively involved in the training of undergraduate medical students at the University of Nairobi, and of clinical officers/cataract surgeons and ophthalmic nurses at the Kenya Medical Training College.

Apart from teaching, performing specialist clinical services, and conducting research, the Department renders regular outreach services to underserved areas for the Kenya Ophthalmic Programme.

This wide spectrum of activities is managed by a teaching staff of nine consultants (including two visiting lecturers) and one visiting orthoptist.

The success of the programme depends on the trust and commitment of all stakeholders. Founded on the long-term twinning with the University Eye Hospital in Munich and a flexible network of reliable VISION 2020 partners, the programme is well-integrated into national and regional structures and activities.

shift in the way that human resources for eye care are viewed – moving from each member of staff seeing herself/himself as responsible for particular tasks in the care of individual patients, to a state in which groups of professionals work together to eliminate avoidable blindness in whole populations. This philosophy requires a team approach.

Where appropriate, an adequate number of teams should be created so that each team plans and implements activities for a manageable unit of population – 100 000 to 1 000 000 people. This is termed a VISION 2020 or 'district-level' delivery unit. However, in most developing country eye-care programmes, lack of human resources prevents the formation of enough appropriate teams, or the establishment of other effective staffing models.

In 2003, only 13 (28%) of the 46 Member States in the WHO African Region reported an ophthalmologist to population ratio of 1:500 000 or more – the target set for the year 2000. Ten countries (22%) had one or fewer ophthalmologists for every million population (Annex E). Recent initiatives to increase the number of ophthalmologists being trained in Africa include the establishment of new postgraduate training centres in eastern Africa and the very successful two-year Diploma in Ophthalmology training programme for western Africa. In addition, already-established programmes are increasing their output of graduates (Box 8).

Box 9. Course for refractionists, Pakistan Institute of Community Ophthalmology

This course is one of many courses for mid-level ophthalmic personnel run by the Pakistan Centre for Vision Sciences, a department of the Pakistan Institute of Community Ophthalmology. The need for a cadre of refractionists was identified by the Pakistan National Programme as a part of comprehensive eye-care services. Following VISION 2020 guidelines, a strategic action plan for curriculum development, certification and accreditation was developed. The training programme was discussed extensively with national and international partners. A 2+1 year course (incorporating two years' training and a one-year internship) was created, to be taken after 12 years' schooling in science. Each year, 10–15 candidates are selected for the course.

The programme is designed to enable the candidate to:

- refract adults and children;
- identify and meet community optometry needs;
- assess and counsel in low vision;
- perform orthoptic assessment and screen for amblyopia;
- assess for and dispense contact lenses;
- dispense spectacles;
- carry out primary eye care; and
- detect glaucoma and diabetic retinopathy.

Trained refractionists should be able to assist ophthalmologists at the district (secondary) level by providing refractive, low vision, and orthoptic services, and by optical dispensing. In the future, it is planned to create Vision Care Centres, each of which would serve a population of 25 000 to 50 000. Centres would be equipped to meet the refraction needs of the populations they serve, to provide primary eye care, and to detect and refer glaucoma, diabetic retinopathy, and other conditions to the district level.

Training of mid-level personnel – including ophthalmic medical assistants (OMAs), ophthalmic clinical officers, and ophthalmic nurses – is undertaken in a number of countries (Boxes 9–12.) However, most African countries have not yet reached the minimum target of four OMAs per million population, and very few have ten per million (Annex E). Some countries (for example, Malawi, Mali, Uganda, and the United Republic of Tanzania) have trained OMAs to be cataract surgeons. VISION 2020 considers the training of eye doctors and mid-level eye-care workers for Africa a priority activity if the goal of VISION 2020 is to be accomplished.

To help ophthalmologists evaluate their knowledge of the basic and clinical sciences related to ophthalmology, the International Council of Ophthalmology conducts the International Basic Science Assessment for Ophthalmologists and the International Clinical Sciences Assessment in late March or early April each year, at locations around the world (www.icoph.org/assess). The Basic Assessment is offered in English, French, German, Portuguese, Russian, Spanish, and Turkish. At present, the Clinical Assessment is only administered in English. In 2004, about 1200 candidates took the assessments at 84 test centres in 59 countries.

Besides training in clinical and surgical skills, VISION 2020 has identified the need to provide training courses in planning and management of eye-health services based upon a community and public health perspective. Two kinds of course have been developed:

- one-week intensive workshops for planning the VISION 2020 agenda, for eye-care professionals and health administrators; and
- three- to twelve-month programmes in community eye health for leaders of VISION 2020 programme management teams.

Table 2. Six- to twelve-month community eye-health training programmes for trainers and programme managers, 2004

Institution	Programme	Duration	Number of positions
International Centre for Eye Health, London, United Kingdom	MSc in Community Eye Health	1 year	15–20
Pakistan Institute of Community Ophthalmology, Peshawar, Pakistan	MSc in Community Eye Health and Diploma in Community Eye Health	1 year	15
LV Prasad Eye Hospital, Hyderabad, India	Diploma in Community Eye Health	6 months	12
Johns Hopkins University, Baltimore, USA	MPH with Public Health Ophthalmology Fellowship	1 year (every 3 years)	8–10

Institutions in Africa, Latin America Asia, and Europe have been collaborating since 1999 to provide short VISION 2020 workshops. Details of longer community eye-health courses for ophthalmologists, trainers, and programme managers are given in Table 2.

In the future, with advances in information technology, it is expected that training programmes in selected countries will use distance-learning techniques. This would provide an additional means of scaling up human resources.

The care and maintenance of ophthalmic equipment is a priority if the objectives of VISION 2020 are to be achieved. Short courses in equipment maintenance for doctors and support personnel were pioneered in the 1990s by Aravind Hospital, Madurai, India.

Box 10. Lions International Educational Centre of Ophthalmology, Prague, Czech Republic

In the late 1980s, many countries in central and eastern parts of Europe experienced sudden and profound political changes that introduced more liberal market economies. Health-care services moved towards new models for delivering care and introduced compensation based on payments by health insurance companies rather than the state. The region inherited a dense infrastructure of eye-care establishments staffed with a large number of ophthalmic specialists.

However, experience in health-care management and modern ophthalmic technologies was lacking, and many eye-care providers were not ready to cope with the new economic conditions. There was a need to incorporate teaching of public health into clinically-oriented ophthalmological curricula and to help ophthalmologists address emerging disparities in the provision of eye-care services. The idea gained broad international support, and in 2002 – after five years of planning and construction work – the Centre became operational, welcoming its first group of junior ophthalmologists from central and eastern Europe for training.

Today, the Centre serves as the main institutional base for VISION 2020 activities in central and eastern Europe. It provides training on control of the major avoidable causes of blindness in the region (cataract, diabetic retinopathy, glaucomas, and ROP), emphasizing prevention of visual impairment from these and other eye diseases, management of currently available resources, improvement of management skills of eye-care providers, and sustainability of affordable eye services. Hundreds of ophthalmologists have already been trained.

Box 11. Regional Eye Centre, western Africa

The Health for Peace Initiative was established by four countries in western Africa to foster cooperation on priority health issues such as immunization, malaria, HIV/AIDS, and epidemics and complex emergencies. In recognition of the negative impact that blindness has on individuals and their communities, blindness was subsequently included as a fifth priority.

In 2001, technical experts from the countries concerned (the Gambia, Guinea, Guinea Bissau, and Senegal) met in Banjul in the Gambia, to plan strategies – using as a model the relative success of the National Eye Care Programme of the Gambia. One of the priorities identified was to improve human resource capacity within the subregion by initiating training courses for state-enrolled community ophthalmic nurses, leading to a Diploma in Ophthalmic Nursing and an Advanced Diploma in Ophthalmic Nursing (cataract surgery). To this end, it was decided to construct a Regional Eye Centre in Banjul to accommodate these courses. Construction commenced in 2004, and it is anticipated that building will be completed in 2005.

Teaching is already under way in temporary premises and outreach activities are conducted from the Banjul base into Guinea, Guinea Bissau, and Senegal, through the 'Sight by Wheels' campaign. In addition, to facilitate immediate provision of services in the areas visited, local capacity is built and permanent services are established.

Subsequently a similar training programme was established in western Africa at the National Eye Centre, Kaduna, Nigeria. In 2005, a course will be conducted in eastern Africa at the Kikuyu Eye Hospital, Kenya. A CD-ROM covering the essentials of the maintenance of instruments is expected to be available towards the end of 2005, and will be announced on the web site www.v2020.org.

Box 12. Infrastructure development in Nigeria

At the invitation of the Ophthalmic Society of Nigeria, members of the International Council of Ophthalmology conducted site visits to a number of eye-care facilities in Nigeria in 2004. This resulted in a nine-part action plan, to:

- fund at least one broadband Internet centre in each zone with a training programme;
- seek donation of one American Academy of Ophthalmology *Basic and Clinical Science Course* to each of 19 eye units for use in residency programmes;
- focus on subspecialist selection, training, support, and infrastructure;
- establish a subspecialist working group to promote the development of subspecialization;
- establish a national expert in equipment repair and maintenance;
- establish training programmes for management education;
- establish a high-volume outpatient surgical centre as a demonstration model;
- seek support for supply of inexpensive ophthalmic texts; and
- develop a two-week teaching experience programme for visiting experienced teachers.

It is hoped that this pilot project in one country will provide a model and inspiration for initiatives to enhance residency training elsewhere in western Africa and around the world.

Infrastructure and technology development

Infrastructure

Progress in infrastructure development is difficult to measure on a global scale. Targets and norms have been set for the numbers of hospital beds and operating rooms required for eye patients, but data on the present state of these components in eye-care facilities are presently lacking.

A key component of VISION 2020 is self-reliance to build sustainability. Studies to determine patients' willingness to pay for various kinds of ophthalmic care are being undertaken in a number of settings, and models have been developed whereby different sources of income generation are used to subsidize services for patients who cannot pay the full cost (see Box 15, under *Examples of successful comprehensive eye care programmes).*

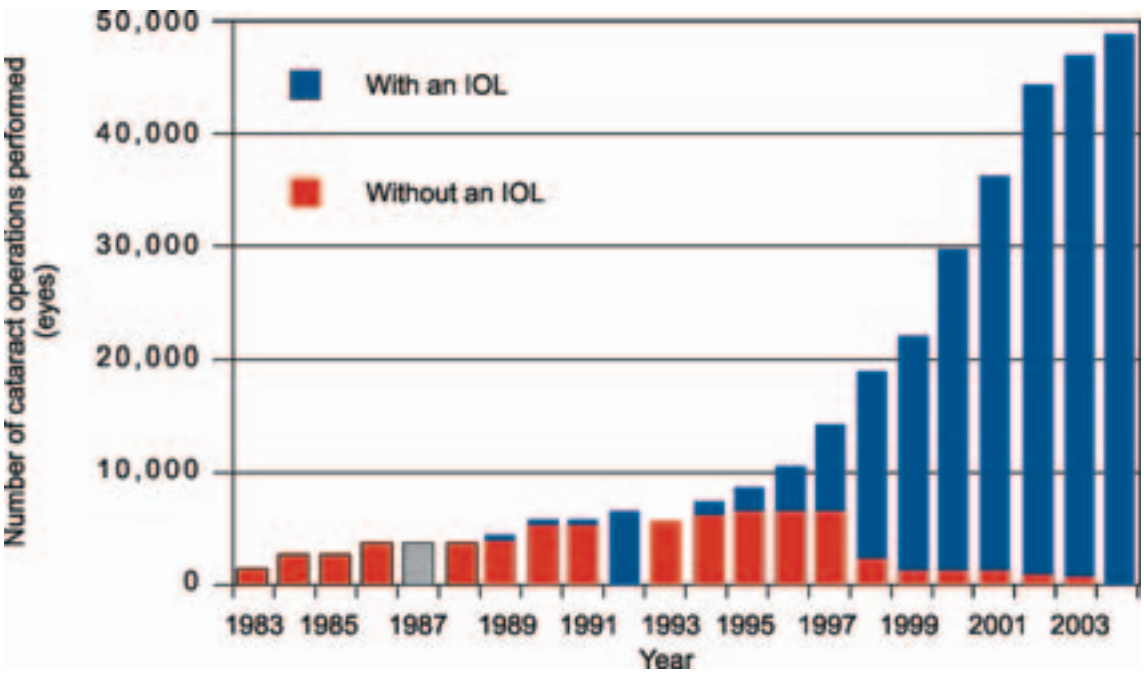
Technology

During the last few decades, technology transfer has enabled low-cost local production of eye drops, spectacles, sutures and – more recently – low vision devices. Such progress has been maintained or has accelerated during the first five years of VISION 2020. The most notable achievements in technology development, however, have been in cataract surgery.

Because it allows placement of an intraocular lens (IOL) to correct the refractive error caused by aphakia, extracapsular cataract extraction (ECCE) is preferred over intracapsular cataract extraction (ICCE) for most patients. In the last decade, IOLs have become progressively more affordable. Mass production of low-cost, high-quality lenses has made possible the widespread use of IOLs in developing countries (Box 13).

Figure 9 shows the impact of the availability of low-cost, high-quality IOLs on cataract

Figure 9. Number of cataract operations performed, Lahan Eye Hospital, Nepal, 1983–2004



Source: Lahan Eye Hospital, Kathmandu, Nepal.

Box 13. Production of IOLs in Eritrea, India, and Nepal

The first low-cost IOL factory, Aurolab, was established at Aravind in Madurai, India in 1992. At that time, IOLs were beyond the reach of eye-care programmes in developing countries. The mission was – and is – to provide high-quality eye-care products at prices affordable in developing economies.

From an initial staff strength of 10 and a production capacity of 100 lenses per day, today 270 staff are employed and 2500 lenses are produced. In addition to manufacturing a variety of three-piece, single-piece and foldable lenses, the factory produces ophthalmic sutures, a range of pharmaceuticals, and the 'Cataract Kit' – a customizable pack of all the surgical supplies required for five cataract surgeries.

As part of its external quality validation processes, Aurolab became the first IOL manufacturer in India to receive ISO 9001:2000 certification. Many of its products are certified by the European Community (EC), confirming their world-class quality. The production of affordable IOLs helped promote and facilitate the use of IOLs in cataract surgery across the developing world; recognizing this, the Aravind Eye-Care System initiated a hugely successful ECCE/IOL surgical training programme for cataract surgeons.

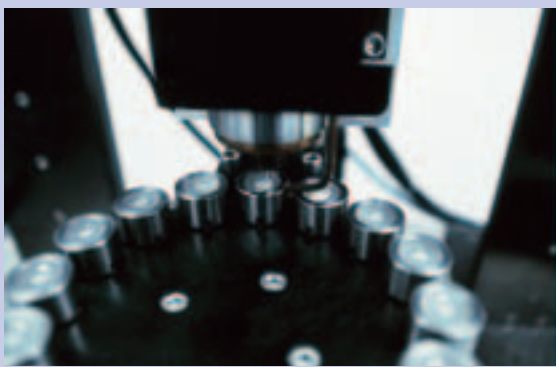
To date, more than five million IOLs have been sold within India and to over 120 countries worldwide, with a primary focus on not-for-profit and government organizations. Many other organizations have followed this lead, producing their own IOLs at locally-affordable prices, while existing manufacturers have been forced to revise their pricing policies.

In 1994, IOL laboratories were also established by other VISION 2020 partners in Asmara, Eritrea, and Kathmandu, Nepal.

These world-class facilities:

- are now sustainable in the production of rigid IOLs;
- are embarking on the development of foldable IOLs in their own right;
- employ approximately 40 local staff each;
- have manufactured more than 1 000 000 IOLs (EC quality-certified);
- produce more than 15 000 IOLs per month;
- have exported IOLs to more than 50 countries; and
- can claim a role in having significantly reduced the market prices for IOLs worldwide, having initially produced IOLs for 3.5% of the cost of other branded lenses.

Profits are ploughed back into the laboratories and into local blindness-prevention programmes. Since 2003, these laboratories have been working towards self-paced transition to hand over the facilities to full local control and management.



surgery output is illustrated by the number of operations performed with and without IOLs at the Lahan Eye Hospital, Nepal, over the past 20 years.

At the same time, the more refined extracapsular extraction technique of phacoemulsification has largely replaced conventional ECCE in industrialized nations. The smaller wound heals faster and with a lower incidence of complications. In addition, because sutures are usually not required, the risk of astigmatism is minimized. Because phacoemulsification technology is still expensive and dependent on skilled maintenance of complex equipment, it has a limited role in treating cataract in developing countries. Eye surgeons have therefore sought alternative techniques that have the same advantages as phacoemulsification but which are more affordable. A number of different small-incision, sutureless cataract surgery techniques have been described and are now in large-scale use.

Development of district-level eye-care services is a key objective of VISION 2020. However, there has been inadequate access to information about the equipment and consumables needed. To rectify this, the VISION 2020 Technology Working Group has produced the *Standard list of medicines, equipment, instruments, optical supplies, and educational resources*. This list aims to assist project managers and medical personnel in choosing affordable but high-quality items suitable for primary and secondary level eye-care services. Revised every two years, the list is both published in print form and freely available on web site www.v2020.org.

The *Community Eye Health Journal,* which is available free of charge to ophthalmic professionals in developing countries, also features articles on technology issues from time to time.

Examples of successful comprehensive eye care programmes

Described below in Boxes 14 and 15 are examples of successful comprehensive eye care programmes.

Box 14. The National Eye Care Programme in The Gambia

A national population-based prevalence survey of blindness and low vision was conducted in The Gambia in 1986. The leading causes of blindness were cataract (55%), trachoma (17%), and other corneal opacities (11% – mainly associated with childhood measles or harmful traditional eye medicines).

In 1987, the National Eye Care Programme (NECP) was established. Faced with a shortage of trained personnel, the NECP focused on the primary health care approach, and attempted to (geographically) phase in services that were affordable, accessible, and appropriate – based on five-year action plans. The programme had the following features:

- a continuum of service from the community through the tertiary level;

Box 14. continued...

- integration into the existing health structure and systems; and
- an emphasis on human resource development at all levels.

The main activities were as follows:

- cataract surgery;
- trachoma control using the SAFE strategy;
- information, education and communication for, of, and with the population;
- construction and equipping of equitably-distributed secondary eye-care centres and local eye drop production units;
- annual programme reviews, five-yearly evaluations, and ten-yearly prevalence surveys; and
- building of capacity for programme management.

The principal innovations of the programme were the extensive use of non-doctors trained as cataract surgeons, and the strong emphasis on community eye health. Over 1000 primary eye-care workers were trained, and collaboration with traditional practitioners was begun.

Ten years later in 1996, the Gambian population had increased by 50%, and average life expectancy had increased by ten years. Despite these demographic changes, a repeat national survey conducted in that year showed a 40% reduction in the overall prevalence of blindness. There was a 50% reduction in cataract blindness, which was probably related to an increase from 1 to 6 in the number of surgeons delivering cataract surgery, a reduction from 500 km to 60 km in the distance that patients had to travel for surgery, an increase from 7 to 63 in the number of hospital beds for eye care, and an increase from 300 to 1500 in the CSR. There was an 80% reduction in blindness due to trachoma. There seemed to be a correlation between the reduction in prevalence of blindness and the advance in geographical coverage of services.

The issue of sustainability was not ignored. The fact that eye care is delivered by Gambian nationals within the routine health service structure is a particular strength in this regard. Financial sustainability was also considered: cost recovery from patient contributions and revenue generation from optical services are in place.

These remarkable achievements have been attained through:

- government commitment;
- partnership with a committed NGDO; and
- research, combined with translation of research results into programme policy.

Since the 1997 evaluation, new features of the programme include:

- services tailored for the urban poor;
- development of refractive error and low vision services, commencing in urban areas;
- increased emphasis on quality of outcomes and the use of ECCE with IOL implantation for cataract surgery, except where contraindicated;
- an even greater focus on community-based eye-care services, with the introduction of *'nyateros'* (Friends of the Eye) for eye-health promotion and referral, and the community-based rehabilitation programme;
- an expansion of the school eye-health programme with improved links to refractive error services; and
- integrated education of visually impaired children.

Box 15. LV Prasad Eye Institute, Andhra Pradesh, India

Andhra Pradesh is a state in southern India. In 2001, it had an estimated population of nearly 76 million, nearly three quarters of whom live in villages. Many communities are located in extremely arid and infertile areas. The annual per capita income is a little over US$ 400. It is estimated that 10% of the state's population has some degree of visual impairment.

The LV Prasad Eye Institute (LVPEI) was established in 1987 in Hyderabad, Andhra Pradesh, with the aim of delivering comprehensive, high-quality eye care to all patients, irrespective of their ability to pay. From the outset, LVPEI's guiding principles have been equity, excellence, and efficiency. Patients who cannot pay are provided with free treatment, funded through a model of cross-subsidization from paying patients. All patients receive the same standard of care in the same examination and operating rooms.

Today, LVPEI has grown into a comprehensive eye-care centre with activities that include patient care and rehabilitation, community eye health, research, training, and product development. Each year, LVPEI provides services to approximately 185 000 outpatients and performs nearly 23 000 surgeries, with 50% of services reserved for patients who are unable to pay. In addition, its rural partner and affiliate centres in the districts of Andhra Pradesh together see nearly 90 000 outpatients and perform 13 000 surgeries each year. LVPEI is a major resource centre for state, national, regional, and global prevention of blindness activities.

The Institute takes a comprehensive approach to eye care, with a focus on the specific needs of the local population. All major subspecialties of the eye are handled. Special programmes have been developed to cater for the needs of the elderly, children, and neonates. Recent additions to the range of patient care services are an ROP programme which has actively engaged the paediatric and neonatal hospitals in the city of Hyderabad, and a fully-fledged children's eye-care centre that specializes in congenital and hereditary eye conditions, as well as developmental disorders. The rehabilitation centre provides a full range of low vision services and takes a lifespan approach to the rehabilitation of people with functional low vision.

The International Centre for the Advancement of Rural Eye Care (the public health ophthalmology wing) conducts community screening programmes, trains ancillary eye-care personnel to work in the rural setting, and undertakes epidemiological and operational research. The Centre has developed a model for sustainable eye-care delivery in a developing country setting. This model envisages a four-tiered pyramidal structure from a centre of excellence at the apex to a base of community participation. In the community, 'vision guardians' are to work closely with primary-care-level 'vision centres'. The model has been implemented successfully in Andhra Pradesh and is in the process of being implemented in other parts of India and other developing countries.

Clinical fees provide the main source of income, and are sufficient to meet all patient-care expenses. They are charged on a four-level sliding scale, based on patient choice: patients who wish to contribute something to the Institute and to receive certain privileges (for example, more luxuriously furnished waiting rooms, appointments on demand, shorter waiting periods) pay twice or three times the base fee. This system of cross-subsidization promotes equity and makes high quality possible, and has been replicated with success in other parts of India, and in Bangladesh and Nepal. Capital expenses are funded through individual and corporate donations, and through competitive grants. In addition, the Institute has several partnerships with large companies in the ophthalmic industry. Approximately 25% of all equipment is donated, 50% is obtained at or below cost, and 25% is purchased at market value. The Institute receives

Box 15. continued...

no public contributions other than grants from government departments for basic and applied research, and these grants are won based on the scientific merit of the proposal.

A significant contribution to LVPEI's success – both in medical and economic terms – has been its programmatic focus. Each sphere of activity (patient care, public health, training, research, and product development) is based on a carefully conceived and carefully managed set of priorities. These priorities are grounded in the context within which LVPEI operates, and the context it seeks to influence. Quality management is data-driven and conducted at multiple levels. LVPEI conducts regional surveys on prevalence of visual impairment and programmatic effectiveness, and builds strategies to address specific problems. At the local level, LVPEI tracks patient adherence, treatment outcomes, costs, and utilization of services. Organizational effectiveness is continually monitored through self-evaluations and quarterly supervisory evaluations, and by applying innovative personnel policies.

6 Chapter 6

The Current Situation

In 2004, WHO published new data based on the 2002 population. Overall, these data showed a global reduction in the number of people who were blind or visually impaired. There was a decrease in the number of people blind from the effects of infectious diseases, but an increase in the number of people who were blind from conditions associated with ageing.

The methodologies used to assess the magnitude of blindness in 1990 and 2002 were different, making direct comparison of the results problematic. The 2002 model was based on more data from recent population-based studies and is therefore the most reliable estimate.

Distribution of blindness by WHO region

Rather than using a combination of socioeconomic and geopolitical criteria to divide the world into regions (as used for the 1990 analyses), the 2002 estimates classified Member States into 17 subregions, using the new divisions made for the Global Burden of Disease 2000 project. In Table 3, these data have been reaggregated to provide information by WHO region.

In 2002, Africa had the highest regional rate of blindness, echoing the position of sub-Saharan Africa as the region with the most disproportionately high share of the world's blindness in the analyses for 1990 see Table 3). Notably (although not reflected in this table), the estimated number of blind people in India fell from 8.9 million in 1990 to 6.7 million in 2002 — a 25% decrease.

Distribution of blindness by age

The estimated global prevalence of blindness in children aged 0–14 years in 2002 was 7 per 1000, compared to 8 per 1000 in 1990. Unfortunately, the age divisions used for the 1990 analyses were not retained for the older-age categories.

Table 3. Regional burden of blindness (RBB), 2002

WHO region	Blind		Population		RBB (=a/b)
	Number (×10³)	% of global total (a)	Number (×10³)	% of global total (b)	
Africa	7 288	19.8	715 289	11.5	1.72
The Americas	2 418	6.6	852 551	13.7	0.48
South-East Asia	12 558	34.1	1 799 358	29.0	1.18
Europe	2 732	7.4	877 886	14.1	0.52
Eastern Mediterranean	2 482	6.7	286 933	4.6	1.46
Western Pacific	9 378	25.4	1 681 851	27.1	0.94
Totals	**36 857**	**100.0**	**6 213 869**	**100.0**	

Source: Data from Resnikoff S et al. Global data on visual impairment in the year 2002. *Bulletin of the World Health Organization*, 2004, 82:844–851.

In 2002, the estimated prevalence of blindness in individuals aged 50 years and above was 2.74%. This age group accounted for 82% of the world's total blindness (Table 4).

Distribution of blindness by cause

In 2002, the leading causes of prevalent blindness (Figure 10) were cataract (17.6 million cases, or 48% of the world's blindness), the glaucomas (4.5 million, or 12%) and AMD (3.2 million, or 9%). Corneal opacities, including those from trachoma, were responsible for a further 9% of world blindness. The estimated number of people blind from trachoma in 2002 was 1.3 million (compared to 5.9 million in 1990), while the estimated number of people blind from onchocerciasis fell from 360 000 to 295 000 in the same period. These changes represent decreases of 78% and 18%, respectively.

Factors unrelated to data collection methodologies are also likely to have contributed to the shift in the global picture of blindness. These factors include:

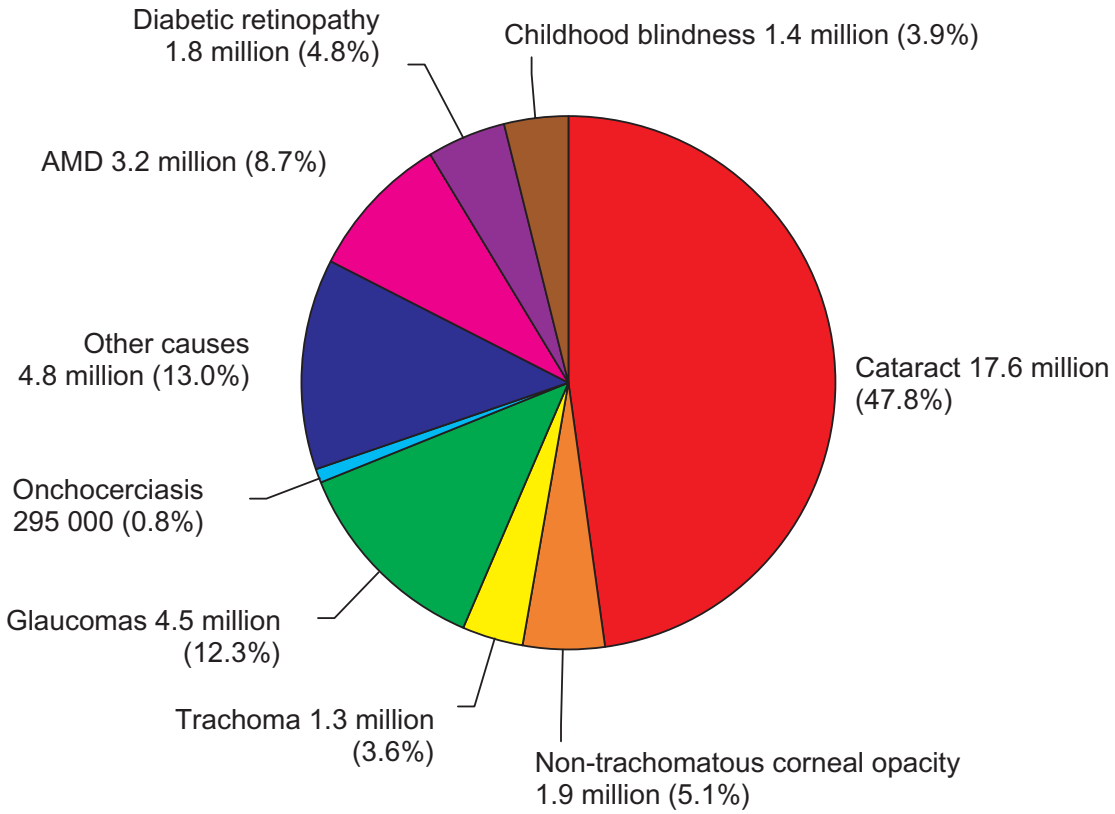
- increased global political commitment to prevention of visual impairment;
- increased professional commitment to prevention of visual impairment;
- increased commitment and support of nongovernmental organizations;
- increased involvement and partnership with the corporate sector;
- development of high-quality, low-cost IOL surgery and increasing its provision in areas of need;

Table 4. Prevalence of blindness by age group, 2002

Age	Blind		Population		Prevalence
	Number (×10³)	% of global total	Number (×10³)	% of global total	(%) total
0–14	1 368	3.7	1 870 375	30.1	0.07
15–49	5 181	14.1	3 237 426	52.1	0.16
≥50	30 308	82.2	1 106 068	17.8	2.74
All ages	36 857	100.0	6 213 869	100.0	0.57

Source: Data from Resnikoff S et al. Global data on visual impairment in the year 2002. *Bulletin of the World Health Organization*, 2004, 82:844–851.

Figure 10. Major causes of blindness worldwide, 2002



Source: Data from Resnikoff S et al. Global data on visual impairment in the year 2002. *Bulletin of the World Health Organization,* 2004, 82:844–851.

- development of the SAFE strategy, and provision of azithromycin for mass distribution;
- donation of ivermectin and increasing its delivery to endemic communities through community-directed treatment with ivermectin;
- increased delivery of vitamin A supplementation to children at risk of VAD;
- increased coverage with measles vaccine;
- more effective primary eye-care activities as part of primary health care;
- increased public awareness and utilization of eye-care services;
- increased availability and affordability of eye-care services;
- increased human resources at the secondary and tertiary levels of eye care; and
- increased transfer of ophthalmic technologies from the developed to the developing world.

7

Chapter 7

A Strategy for the Future

Due to changes in the distribution and major causes of blindness in regions and countries over time, it is important to adapt the VISION 2020 priorities and strategy to changing needs. It is not within the scope of this report to put forth the VISION 2020 strategy for the next five years. However, at the time this report was written, plans were under way to examine the current situation and identify future priorities.

National commitment to VISION 2020

The World Health Assembly resolution WHA56.26 mandates all countries to have national plans for the elimination of avoidable blindness in place by 2005 and to begin their implementation not later than 2007. Most countries have taken at least initial steps in this direction. What is needed now is to find ways to encourage and assist countries to develop realistic national plans and to begin implementing them.

Effective disease control

- The main issues in the treatment of **cataract** blindness are the availability, cost, and outcome of surgery. Programmes for the prevention of blindness must deliver high-output surgical services to large and sometimes scattered populations, at prices that recipients and providers are able to afford, resulting in good visual outcomes for a high proportion of patients.
- In a number of countries, much progress has been made in the control of trachoma – thanks partly to high-quality, high-coverage mass distribution of antibiotics, and partly to coordination of trachoma control activities with education, water, and sanitation activities and

with other health initiatives (together with general economic development). However, to achieve global elimination of trachoma as a cause of blindness by 2020, output of high-quality trichiasis surgery and efforts to improve access of trachoma-endemic populations to water and sanitation need to be increased in many areas. Integration of trachoma control within local primary health care systems will be critical.

- Elimination of new cases of blindness from **onchocerciasis** is achievable by 2010. The success of efforts to reach this goal may depend on the integration of ivermectin distribution systems with other community-based disease control efforts. Working in countries-in-conflict and in post-conflict areas presents a particular challenge. An additional challenge is being encountered in areas where onchocerciasis is co-endemic with *Loa loa.* In a small number of individuals with loiasis, treatment with ivermectin can precipitate an encephalopathy, which can be fatal if management is inadequate. Methods to detect *L. loa* infection in the field are being actively sought. If blindness from *O. volvulus* is eliminated, but the parasite itself is not eradicated from a region, control programmes will need to ensure that effective surveillance systems and the capacity to manage recrudescence are established and maintained.
- In the area of **childhood blindness,** the prevalence of vitamin A deficiency appears to be decreasing, due to the successful efforts of large international consortia coupled with general economic development. VISION 2020 should continue to provide technical and political support to these efforts. Though the annual incidence of measles cases declined by 40% in the 1990s, measles continues to be a major cause of death in sub-Saharan Africa. It returns in conflict areas and other settings in which there is a failure to deliver at least one dose of measles vaccine to each child. Retinopathy of prematurity is already a significant cause of childhood blindness in Latin America and eastern Europe, and is now emerging in urban areas of Asia. Development and adherence to locally-appropriate screening and treatment guidelines will help to minimize the risk of ROP blindness in low-birth-weight babies.
- There is a need for further assessment of the prevalence of **refractive errors** and the role of screening in schools, particularly for myopia. **Low vision services** are important to optimizing residual vision, especially in children. In each country, it will be important to reach consensus on which cadres of eye-care personnel take primary responsibility for dealing with these problems.
- The incidence of both type I and type II diabetes mellitus is on the rise. This will undoubtedly lead to an increased incidence of blindness from **diabetic retinopathy;** by 2002, incidence of this condition had already risen to become the fifth most common cause of blindness worldwide. Fortunately, criteria for screening and treatment are well established. A challenge for national programmes will be to provide sufficient human resources and infrastructure to meet the increasing need.
- The **glaucomas** are now thought to be the second most common cause of blindness. Ongoing trials are examining whether screening for occludable anterior chamber angles followed by prophylactic treatment with laser iridotomy of those at risk of angle closure glaucoma is a useful

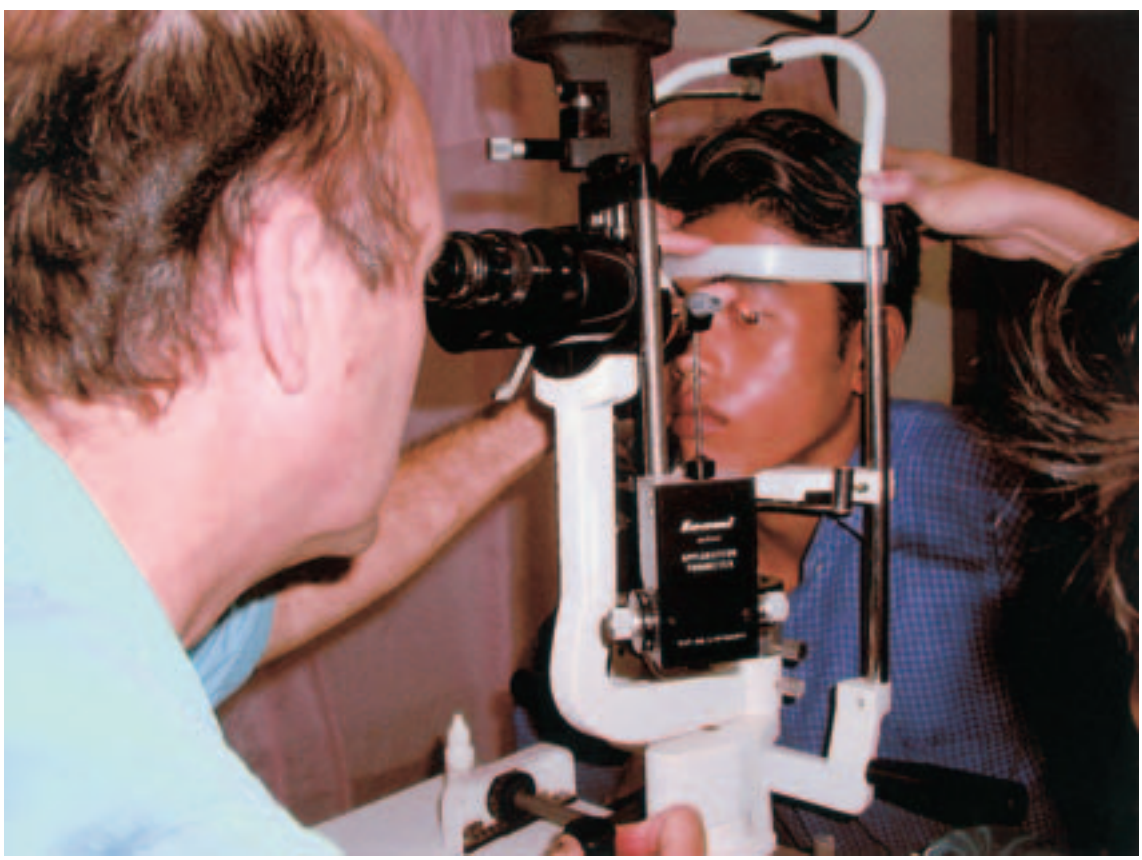
strategy in high-risk populations. For primary open-angle glaucoma, available diagnostic tests are at present insufficiently sensitive and specific to recommend screening of the general population: more comprehensive ophthalmic assessment is required. Research into new methods for rapid case detection is needed, as are improved management protocols appropriate for developing countries.

- **Monitoring**. Increased efforts to collect and make available (including –where appropriate – via Internet access) district-, country-, and regional-level data will be critical, both for ensuring that blindness treatment and prevention activities are directed to areas that need them most, and for demonstrating to others that those activities have been successful.

Human resource development

The greatest challenges facing VISION 2020 are to ensure that there are adequate numbers of appropriately trained and motivated staff for eye care, and that available personnel are effectively and efficiently used. The single biggest current need is for cataract surgery teams in Africa. More staff for refractive services and low vision care are needed in many situations.

It is clear, however, that simply increasing the numbers may not be enough to address the current concentration of eye-care personnel in a few major cities, while leaving vast areas of many poor countries with limited or no eye-care services. Countries need support to develop policies covering the training and retraining of ophthalmic personnel, including their recruitment, deployment, motivation, and retention in their place of work.



Infrastructure and technology

As eye-care teams are developed, the task for technology and infrastructure will be to ensure that those teams are provided with the buildings, systems, equipment, instruments, consumables, and continuing education that they require. In addition, there is a need to continue to develop better, simpler, and more robust ways to do what is already done, and to develop ways to do things that we are currently unable to do. This will include re-examining and addressing issues of regularity in the supply of drugs and other consumables, as well as care and maintenance of equipment – a factor which in no small measure contributes to the underperformance of many public eye-care institutions in low-income countries.

Coordination and partnership

Effective coordination and strong partnerships already exist at the global level and are rapidly developing at the regional level as well. The main challenge remains at the country level – especially in those countries where, prior to VISION 2020, little coordination existed among key partners in blindness prevention and where the VISION 2020 national workshops provided the first real opportunity for them to assess and plan activities together.

Another area to be addressed as a matter of priority is the need to strengthen ministry of health structures and performance, particularly in countries with limited resources and competing priorities such as the fight against HIV/AIDS and malaria control. Increased coordination at country level is important to avoid having VISION 2020 success remain the success of a few – and not that of all – partners.

Community participation

It is critically important for communities that are served by projects under VISION 2020 to have a sense of ownership of these activities. It is therefore necessary that the communities are involved in needs assessment, priority setting, planning, implementation and monitoring.

The success of the onchocerciasis and trachoma programmes demonstrates the potential impact of effective community participation and sense of ownership.

Other areas of VISION 2020 need to follow these examples and develop similar approaches to achieve equitable eye health systems based on "ownership" of the Right to Sight.

Annex A

Blindness Data in the 1990s and their Implications

Prevalence of blindness and low vision in 1990

In 1995, WHO estimated that there were 37.9 million blind people worldwide in 1990, suggesting a global prevalence of blindness of 0.72%. The number of people with low vision was estimated to be 2.9 times the number of blind — 110 million in 1990.

Distribution of blindness by region in 1990

In 1990, blindness was unevenly distributed among countries. The estimated regional prevalence of blindness ranged from 0.3% in the established market economies and Former Socialist economies of Europe, to 1.4% in sub-Saharan Africa. Age-specific prevalences of blindness in most parts of the developing world were several times greater than those in the economically-developed world.

To provide an easy means for determining which regions had a disproportionate share of the world's blind in relation to their share of the world's population, each region's proportion of the global number of blind was divided by its proportion of the global population to determine its **regional burden of blindness** (RBB). See Table A1.

Table A1. Regional burden of blindness (RBB), 1990.

Region/country	Blind		Population		RBB (=a/b)
	Number ($x10^3$)	% of global total (a)	Number ($x10^3$)	% of global total (b)	
Established market economies	2 400	6.3	797 788	15.1	0.4
Former Socialist Europe	1 100	2.9	346 237	6.6	0.4
Latin America and Caribbean	2 300	6.1	444 297	8.4	0.7
China	6 700	17.6	1 133 698	21.4	0.8
Middle-Eastern crescent	3 600	9.6	503 075	9.6	1.0
Other Asian countries and islands	5 800	15.3	682 533	13.0	1.2
India	8 900	23.5	849 515	16.1	1.5
Sub-Saharan Africa	7 100	18.8	510 271	9.7	1.9
Totals	**37 900**	**100.0**	**5 267 414**	**100.0**	

Source: Data from Thylefors B et al. Global data on blindness. *Bulletin of the World Health Organization,* 1995, 73:115–121.

A region with a share of the world's total blindness equal to its share of the world's total population have an RBB of 1.0. Regions with disproportionate shares of blindness have RBBs greater than 1.00. These regions/countries (sub-Saharan Africa, India, and other Asian countries and islands) deserve prioritization when planning prevention of blindness activities.

Distribution of blindness by age in 1990

Of the 37.9 million blind people in 1990, 22.0 million (58%) were aged 60 years or more. Children (aged 0–14 years) accounted for approximately 4% of all blindness (1.43 million). See A2.

The available data probably underestimated the magnitude of blindness in children, for four main reasons.

- Blind registration data from developed countries are often incomplete (although this is probably less true for children than for adults).
- Population-based surveys in Africa and Asia usually fail to take into account children who are attending schools for the blind.
- Certain blinding conditions of childhood (for example, VAD, chromosomal abnormalities, prematurity, and congenital rubella syndrome) are associated with very high mortality. In developing countries, blindness per se is associated with a higher-than-normal mortality.
- Children with multiple handicaps including visual disability are often not registered as blind, at least not until they are very much older.

It is also notable that the definition of blindness as visual acuity below 3/60 (or corresponding loss of visual fields) excludes many children who have severe visual impairment, and who therefore – like blind children – have special education requirements.

Distribution of blindness by cause in 1990

In the analyses of data for 1990, specific models were developed to estimate the relative contributions of cataract, trachoma, the glaucomas, and onchocerciasis to world blindness. Other conditions were not considered separately, but simply bracketed together under the heading 'others'.

The analyses showed that **cataract** was the most important cause of blindness, being responsible for an estimated 15.8 million cases, or 42% of the worldwide total. **Trachoma** accounted for an estimated 5.9 million blind

Table A2. Prevalence of blindness by age group, 1990.

Age	Blind		Population		Prevalence (%)
	Number ($\times 10^3$)	% of global total	Number ($\times 10^3$)	% of global total	
0–14	1 430	3.8	1 710 000	32.5	0.08
15–44	2 470	6.5	2 445 000	46.4	0.10
45–59	12 000	31.7	623 000	11.8	1.90
≥60	22 000	58.0	488 000	9.3	4.40
All ages	**37 900**	**100.0**	**5 267 000**	**100.0**	**0.70**

Source: Data from Thylefors B et al. Global data on blindness. *Bulletin of the World Health Organization,* 1995, 73:115–21.

(16%); the glaucomas 5.1 million (13%); and **onchocerciasis** 360 000 (0.6%). Other conditions caused the remaining 10.7 million cases (28%). Separate studies estimated that ocular trauma was responsible for 500 000 cases of blindness, and ocular leprosy for 250 000 cases.

The main causes of blindness in children contribute only a small proportion of the overall magnitude of blindness. However, these causes are also important because of the number of years of sight lost.

Figure A1 shows the major causes of blindness for all age groups in 1990, in each of the eight geoeconomic regions and countries listed in Table A1. Within each of these, the relative importance of the various causes of blindness varied according to socioeconomic conditions and the availability of health-care services. In general, cataract occurred everywhere, with the prevalence of cataract blindness being proportionate to the availability of cataract surgical services. Corneal scarring from trachoma, VAD, and ocular infections was more common in poor communities. In countries with strong economies, blindness was relatively rare and mainly due to conditions which are more difficult to prevent or treat (e.g. AMD).

A notable limitation of the ICD-9 and ICD-10 definitions of blindness and low vision (and therefore of estimates produced using these definitions, including the estimates for 1990) is that they define categories of visual impairment using visual acuities with best possible refractive correction. This manner of definition implicitly assumes that everyone with **refractive error** has access to, and uses, the most appropriate spectacles — so that the only visual impairment that need concern policy-makers and programme managers is that which remains after the provision of the best correction. Such an assumption is unsound, even in the developed world.

Though few reliable data were available in the 1990s, refractive error probably impaired the day-to-day visual acuity of a relatively large proportion of the world's population. Visual impairment due to refractive error (mainly myopia) typically starts in children and becomes worse at puberty — hindering educational, career, and social development.

Causes of blindness in children

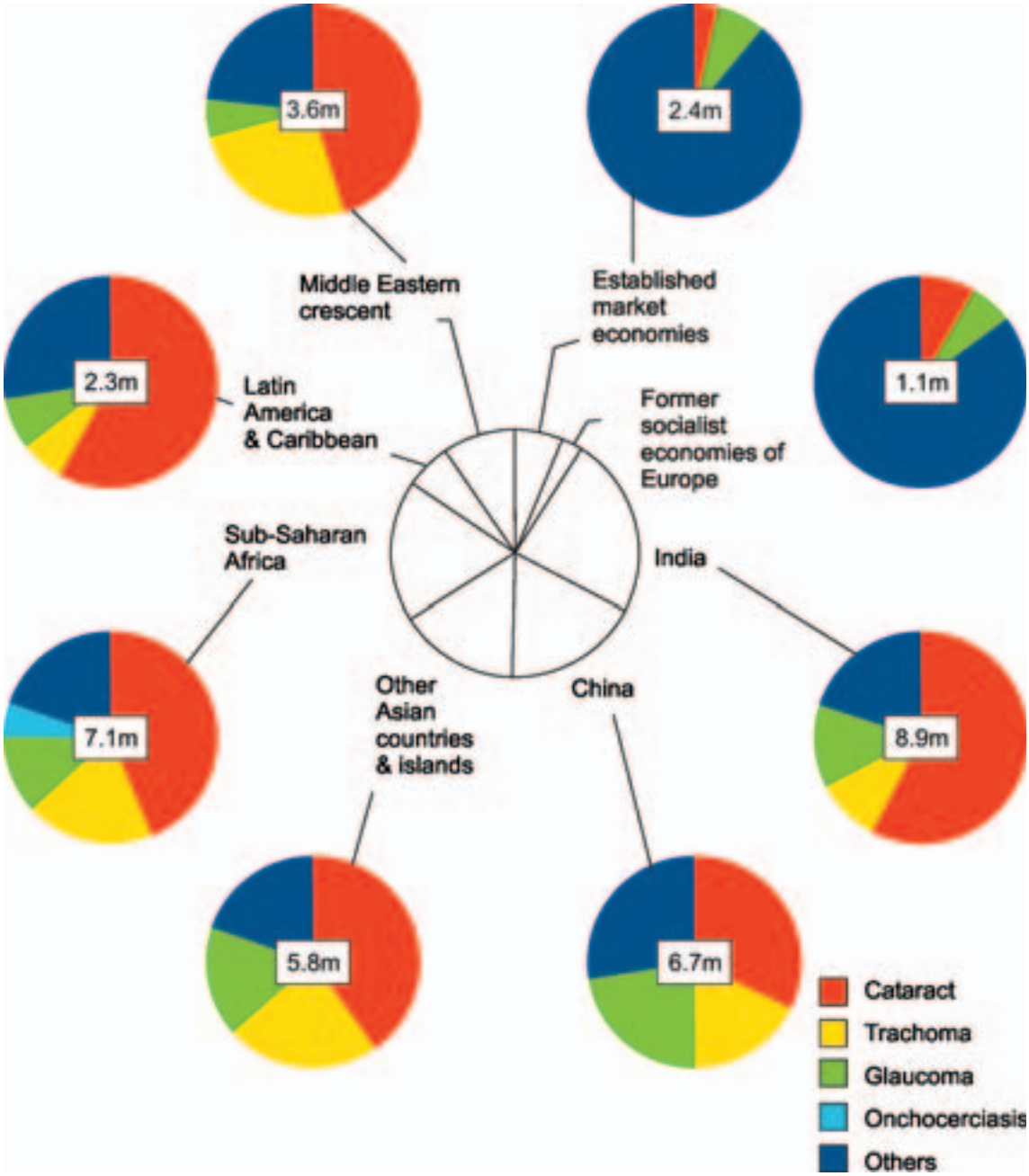
The epidemiology of **childhood blindness** was considered in detail at the WHO Meeting on the Prevention of Childhood Blindness in 1990. The meeting concluded that the major causes of childhood blindness in a community were largely determined by the socioeconomic status of its people and the state of its health services. The major causes of childhood blindness around the world in the 1990s are reflected in Figure A2.

In communities with severe poverty and poor health-care services, corneal scarring accounted for up to 70% of childhood blindness. The major cause was VAD, often associated with protein energy malnutrition, measles, and diarrhoea due to malabsorption.

Other causes included harmful traditional eye practices and ophthalmia neonatorum. In these communities, the prevalence of blindness exceeded 1 per 1000 children, and mortality in blind children was high: 50–70% of children visually impaired by VAD die within months of becoming visually impaired.

In communities with moderate socioeconomic development and health-care services, measles immunization coverage was reasonably high and malnutrition uncommon

Figure A1. Global distribution of blindness among all age groups by region or country (pie chart at centre) and major causes of blindness in each, 1990



Notes: Established market economies are the countries of North America and western Europe, and Australia, Japan, and New Zealand.

Countries in the Middle Eastern crescent include the newly independent states in central Asia.
Numbers are the estimated number of people in millions (m) blind in each country or region.

Sources: Thylefors B et al. Global data on blindness. *Bulletin of the World Health Organization,* 1995, 73:115–121.

– so that blindness from corneal scar was seen infrequently. Congenital cataract and congenital glaucoma (often in association with congenital rubella syndrome) were important causes of childhood blindness. The prevalence of blindness was about 0.5 per 1000 children in these communities.

In communities with well-developed health-care services, the main causes of blindness in children were genetically-determined diseases of the retina and optic nerve and ROP; prevalence of blindness was about 0.25 per 1000 children. In communities in which close intermarriage is common, genetically-determined diseases were the most important causes of childhood blindness. Overall, about 70% of new cases of childhood blindness were estimated to be due to VAD.

'Avoidable' causes of blindness

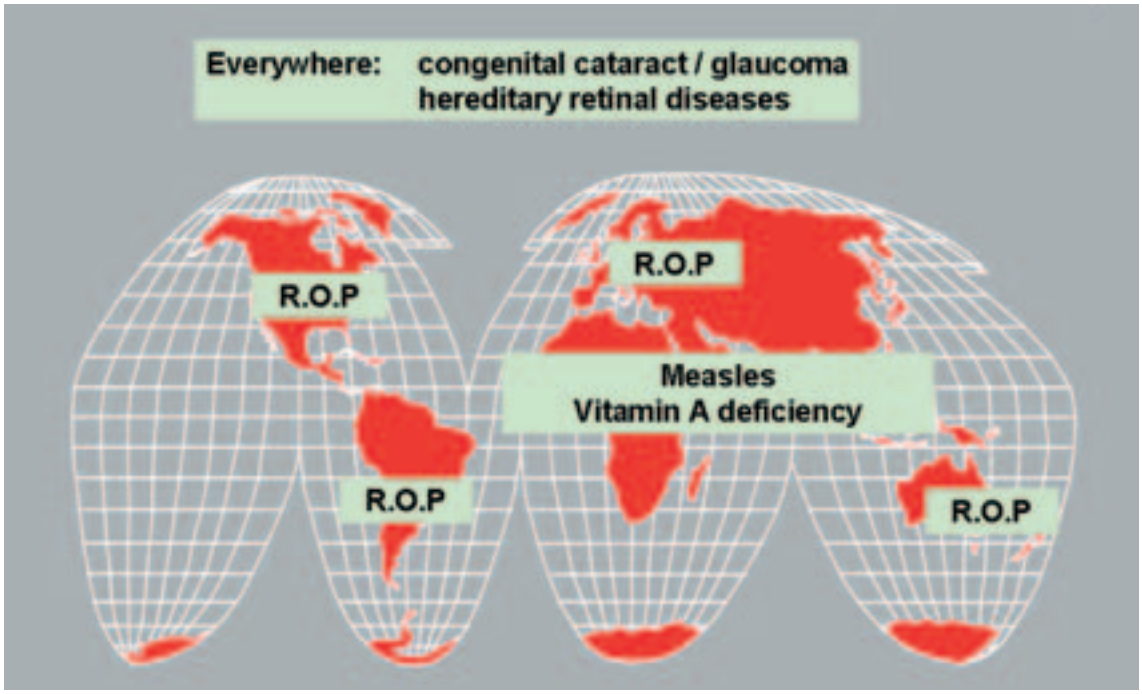
According to the global estimates for 1990 and subsequent WHO consultations on refractive error and childhood blindness, most of the world's blindness was either preventable or treatable (Figure A3).

Cataract and refractive error – each of which occurred worldwide – had highly cost-effective sight-restoring interventions. (Details of current interventions for these conditions are provided in Chapter 5.)

Trachoma, onchocerciasis, and VAD were more focal conditions, important as causes of blindness in many of the poorest communities. Once people were blind from these diseases, it was extremely difficult or impossible to restore their sight. However, blindness from all three of these conditions could be prevented at the community level through improved primary health care and specific therapeutic interventions.

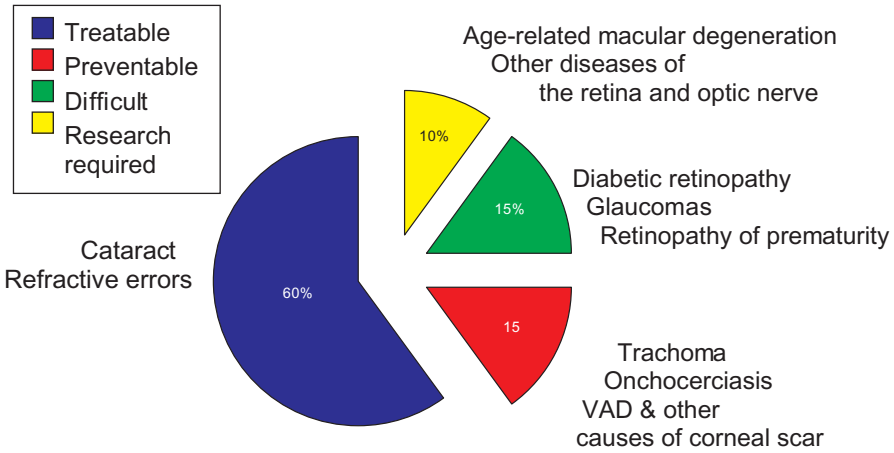
The glaucomas occurred everywhere (albeit at varying rates), and diabetic retinopathy was becoming an increasingly important cause of blindness in more industrialized

Figure A2. Major causes of childhood blindness around the world in the 1990s.



Source: Thylefors B et al. Global data on blindness. *Bulletin of the World Health Organization,* 1995, 73:115–121.

Figure A3. Schematic illustration of the proportion of blindness by cause in the 1990s, grouped by degree of 'avoidability'



Source: Adapted from Foster A. VISION 2020: from epidemiology to program. In: Johnson GJ et al., eds. *The epidemiology of eye disease,* 2nd ed. London, Arnold, 2003:373–383.

societies. Blindness from these two conditions could be prevented if patients presented (or were identified) early in the course of the disease, and effective specialized treatment and follow-up care were provided.

Finally, the major causes of blindness in highly developed societies – the diseases of the retina and optic nerve – still required research to identify their etiology, and ultimately to develop effective strategies for prevention and/or treatment.

Avoidable blindness has been defined as blindness that could reasonably be prevented or cured within the limits of resources that are likely to be made available. Approximately 75–85% of all blindness in 1990 was considered avoidable (Figure A3). This means that in 1990, there were approximately 30 million people worldwide who had 'avoidable' blindness.

Low vision services

Most people who are visually impaired have some residual vision. In many low-income settings, people with residual vision do not have access to the expertise and equipment necessary to allow them to maximize the use of their remaining sight. This failure has serious consequences — particularly for children, in whom reduced functional vision restricts motor, social, and emotional development as well as educational opportunities. For individuals of all ages, reduced visual acuity restricts speed of learning and working, skill in practical subjects, and quality of life.

In the 1990s, few data were available on the prevalence of functional low vision or on the need for low vision services.

Trends in and projections of the magnitude of blindness

The estimates that were produced for 1978 (28.1 million), 1984 (31 million), and 1990 (37.9 million) of the total number of blind persons, were derived using different methodologies, and are therefore not directly comparable. However, the evident trend for this period reflects an increasing number of blind people worldwide. Though few good data on the incidence of blindness have been produced, it has been estimated that the incidence of new cases exceeded the number of sight-restoring interventions and natural mortality to the extent that the overall number of blind people worldwide was increasing by 1–2 million per year.

In 1996, it was calculated that if the 1990 prevalence figures were applied to the 1996 world population, there would be 45 million blind and 135 million people with low vision. These estimates represented increases of nearly 19% and 23%, respectively, above those determined for 1990.

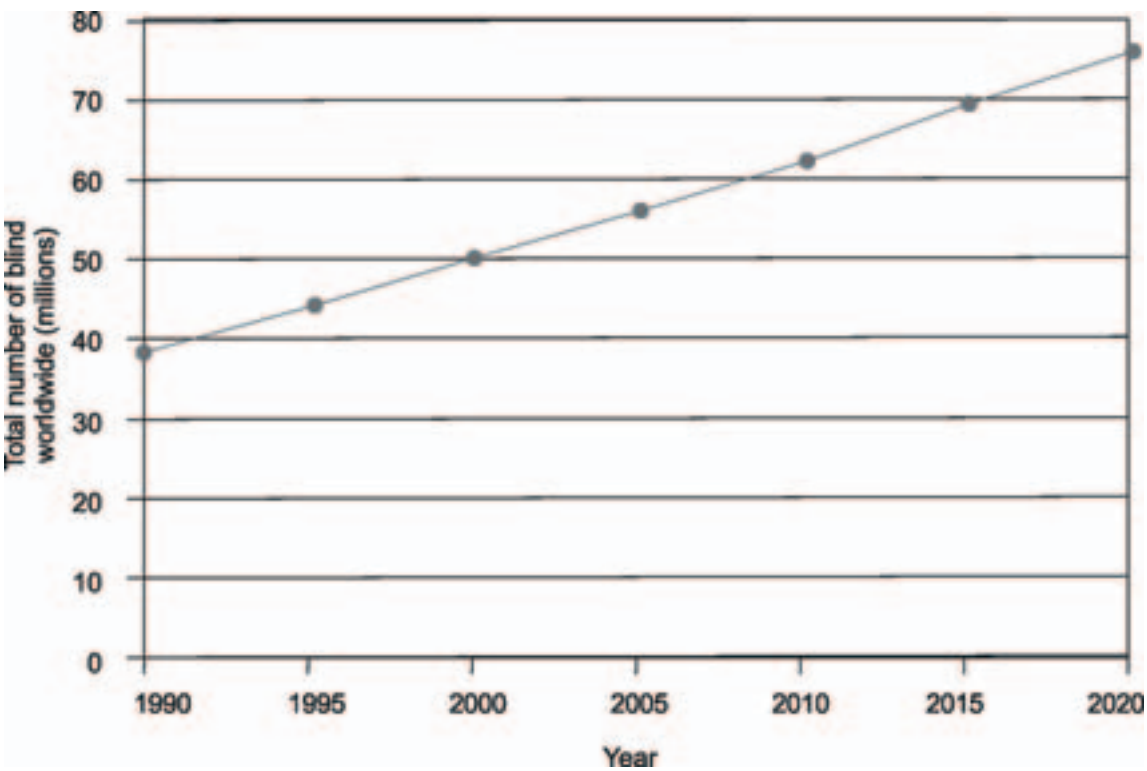
The global population was forecast to increase from 5.8 billion in 1996 to 7.9 billion in 2020. Accompanying that overall increase will be increasing life expectancy. Accordingly, it has been predicted that the proportion of the population aged 65 years or older would increase from 7% in 2000 to 9% in 2020. Moreover, older individuals suffer a higher prevalence of blindness. If age-specific prevalences of blindness do not change, these demographic shifts alone will result in more than 76 million blind people worldwide by the year 2020 (Figure A4).

Economic considerations

In addition to its social consequences, visual impairment has profound economic effects on individuals, their families, and their communities. In the 1990s, little work had been done to quantify these effects. What was clear was that the economic impact of avoidable blindness was not equitably distributed across the globe, with developing countries shouldering a disproportionately large share of the load.

Avoidable blindness can be reduced only if people have access to sight-saving interventions, and these interventions cost money. Unfortunately, changes in the global economy in the late twentieth century affected the least-developed countries in a particularly negative way, resulting in greater unemployment and reduced government

Figure A4. Estimates and projections of the total number of blind people in the world, 1990–2020, based on global data on blindness for 1990



Source: Adapted from Foster A. VISION 2020: from epidemiology to program. In: Johnson GJ et al., eds. *The epidemiology of eye disease,* 2nd ed. London, Arnold, 2003:373–383.

revenue. In those countries, these effects led to a decrease both in the number of people able to pay for their own eye care, and in governmental expenditure on health. In addition, new demands arose for limited resources, particularly through the emergence of HIV/AIDS.

Human resources for eye care in the 1990s

To undertake the work required to treat and prevent blindness and to support individuals who need low vision services, human resources are required at primary, secondary, and tertiary levels of eye care.

Few detailed data on the number and distribution of trained eye-care personnel have been published. However, at WHO workshops on human resource development for eye care in 1988 and 1994, it was agreed that human resource shortfalls were particularly problematic in sub-Saharan Africa – where there was an average of only one ophthalmologist for every million people. There was considerable variation among countries: Botswana had one ophthalmologist for every 200 000 people, Nigeria one per million, and Ethiopia one for every 2.6 million.

The problems associated with having very low ratios of ophthalmologists to population are best appreciated by providing the following example. Estimates suggest that in sub-Saharan Africa as a whole in 1990, unoperated cataract was responsible for blindness in 3.1 million people, and the annual incidence of new blindness due to cataract was at least 500 000. At that time, due in no small part to the lack of trained personnel, only 50 000 blind cataract patients were being operated on each year in the region. Therefore, available human resources were providing services for less than 10% of new blind cataract patients, without even considering the problem of those who were already cataract blind.

However, absolute numbers of ophthalmologists should not be the only parameter considered. In Latin America, the total number of ophthalmologists seemed sufficient to meet eye-care needs, but maldistribution meant that many areas were very poorly served: there were 50 ophthalmologists per million in the cities and only two per million in rural areas. In 12 countries surveyed in eastern Europe in 1998, the number of ophthalmologists per million people ranged from 11 to 34, but the combined effects of budget constraints, low morale, and inadequate case detection kept cataract surgery output per surgeon below 150 operations per year in 8 of these 12 countries. As a result, cataract remained a major cause of blindness in the region.

If ophthalmologists' skills are to be used efficiently, sufficient numbers of auxiliary eye staff – including optometrists and refractionists, ophthalmic medical assistants, ophthalmic nurses, cataract surgeons, and low vision service workers, distributed appropriately to areas of need – are also required. All of these cadres have important patient-oriented roles. In addition to clinicians, eye-care programme managers, specialists in community/public health ophthalmology, staff for local production of eye drops and other consumables, and equipment technicians must also be in place. Few international data on staffing levels for these cadres were available during the 1990s.

Levels of training and competency need to be considered. The foundations of training programmes for eye-care professionals in the developing world were mostly laid by expatriates, who tended – naturally – to draw on their own training experiences. This meant that programmes were not necessarily designed to train graduates to recognize

and manage locally-important causes of blindness, nor to work in ways that suited the local context. Training provided to a particular cadre in one country is not necessarily equivalent to that provided in another. Even when trained in the same country, two graduates given the same designation (such as 'doctor' or 'medical assistant') may have very different levels of competence, depending on which training centre they attended.

Finally, even if sufficient numbers of adequately trained staff are posted to places where their skills are required, there remains the question of whether or not those skills are used. Many ophthalmic personnel have significant general medical or administrative duties in addition to their responsibilities for eye care.

Infrastructure and technology for eye care in the 1990s

In the last few decades, there have been major technological developments in ophthalmic practice in the developed world. These developments have particularly affected the practice of cataract surgery, first with the gradual replacement of intracapsular cataract extraction (ICCE) by extracapsular cataract extraction (ECCE) and posterior chamber intraocular lens (IOL) insertion, and then by small incision (sutureless) cataract surgery with or without phacoemulsification.

These techniques have improved the quality of visual rehabilitation for cataract, but the cost and availability of IOLs initially precluded their use on a large scale in poor communities. In the mid-1990s, high-quality, affordable lenses and eye sutures began to be produced – together with low-cost spectacles and eye drops, which were already available.

However, in many countries there remained shortages of usable diagnostic and therapeutic equipment necessary for practitioners to apply modern techniques. Many countries requiring equipment did not have access to the information necessary to guide them to make appropriate choices. Because such information did not reach decision-makers, inappropriate or extravagant purchases were made – leaving users with sophisticated equipment which was too expensive to operate, maintain, and repair.

Many local personnel did not know how to maintain and repair their own equipment. Local biomedical engineers and technicians were in short supply, and service providers (either direct representatives of manufacturers or independent service organizations) were too distant or too costly for local practitioners, clinics, or hospitals to afford. This resulted in wastage of resources on equipment that was either not indicated, not used, or could not be maintained. Finally, little information on available infrastructure for eye care was published in the 1990s.

Summary

In the 1990s, available data made it clear that:

- at least 75% of blindness occurred in the poor and very poor;
- at least 75% of blindness was the result of five conditions, each of which had a cost-effective means of prevention or cure;
- the number of people blind or at risk of blindness was far greater than could be managed by available services for the prevention and treatment of blindness;
- the shortfall in the supply of such services as compared with the demand for them was widening at an ever-increasing rate; and
- the humanitarian and economic costs of this situation were unacceptably high.

These insights demanded a response that was coordinated among health-care providers, governments, NGDOs and all other interested parties. In 1996 and 1997, at the request of and with support from the Task Force of the Partnership Committee of NGDOs, WHO/PBL held consultations in Geneva to begin to lay out a global plan to eliminate avoidable blindness. This plan developed into the Global Initiative for the Elimination of Avoidable Blindness, known as VISION 2020: the Right to Sight.

B

Annex B

The Concept of VISION 2020: the Right to Sight

Effective disease control

The disease-control element of the strategic plan of VISION 2020 included five priority areas for the first five-year phase of the initiative: cataract, trachoma, onchocerciasis, childhood blindness, and refractive error/low vision services. The choice of these five areas was based on their individual contributions to the overall magnitude of blindness and the feasibility and affordability of interventions proven to prevent or treat them. Details of planned interventions for these priority areas are presented below. VISION 2020 targets created around the time of the initiative's launch are reproduced in Annex D.

Cataract

Aim. Elimination of cataract blindness.

Situation at baseline. In 1995, there were an estimated 16–20 million people bilaterally blind from cataract. In Africa and Asia, it was estimated that at least one person per 1000 became blind from cataract every year. The cataract surgical rate (CSR: the number of cataract operations per million population per year) is a useful measure of the delivery of cataract services. The CSR varied widely from country to country and even within countries, ranging from about 5000 in the USA to approximately 200 in sub-Saharan Africa.

Methods of control. There are no therapies proven to be effective in preventing the onset or delaying the progression of age-related cataract. However, removal of the lens, followed by correction of the optical error caused by aphakia, can restore visual acuity to normal or near-normal levels.

Objectives: to provide cataract surgical services which

- have a high success rate in terms of visual outcome and improved quality of life;
- are affordable for all people;
- are accessible to rural as well as urban populations; and
- cater for more than the number of new cases per year, to eliminate the backlog of cataract over a number of years.

Strategies

- Create demand for service by overcoming barriers to its uptake, through a variety of community interactions. The major barriers to uptake of cataract services are:
  - lack of awareness;
  - poor quality of service/poor outcomes;
  - high cost of treatment; and
  - poor accessibility.
- Develop and mobilize national (and expatriate) manpower and resources to provide cataract services. The training and use of ophthalmic assistants can allow ophthalmologists more time for eye surgery. Private ophthalmologists should be encouraged to be actively involved in outreach programmes where this is appropriate.
- Ensure that cataract surgery is performed with placement of an intraocular lens (IOL) by a well-trained and adequately equipped cataract surgical team, who are regularly auditing their results.
- Promote cataract surgical services at a cost which all patients can afford, so that cost is not an obstacle to obtaining the operation. This may involve different tiers of payment, with subsidies for poor patients.
- Promote cataract surgical services which are available close to where people live, so that distance is not an obstacle to obtaining the operation. Outreach into remote areas should be carried out where appropriate.
- Enlist the help of community health and community-based rehabilitation workers to identify people with cataract and to provide follow-up and rehabilitation for patients after cataract operation.
- In the provision of surgery, priority should be given to bilaterally blind patients with cataract. However, patients should be encouraged to seek treatment before they become blind and lose economic independence – thereby both preventing blindness from cataract and reducing patient dependence on the family and society. When unilateral cataract is operated on, particular efforts should be made to provide for IOL implantation.
- Ensure coordination between governmental and nongovernmental service delivery.

Trachoma

Aim. Elimination of blindness due to trachoma.

Situation at baseline. In 1994, WHO estimated that there were 146 million people with active trachoma, 10.6 million with trachomatous trichiasis, and 5.9 million blind due to trachomatous corneal opacity. In 1997 – to eliminate this cause of blindness – WHO established the WHO Alliance for the Global Elimination of Trachoma by 2020 (GET2020). In 1998, World Health Assembly resolution WHA51.11 supported the establishment and goal of GET2020.

Methods of control. Trachoma blindness can be prevented using the four-pronged 'SAFE' strategy, as follows.

- **S**urgery for individuals with trichiasis.
- **A**ntibiotics to treat ocular *C. trachomatis* infections.
- **F**acial cleanliness (through the promotion of face-washing).
- **E**nvironmental improvement (particularly in access to water and sanitation) to reduce transmission of the organism.

Objectives: to implement the SAFE strategy in endemic areas by

- identifying partners at the national and international levels to implement the SAFE strategy;
- developing intersectoral collaboration with education and water and sanitation sectors;
- advocating for political support to trachoma elimination in the framework of poverty reduction strategies; and
- mobilizing resources to support national trachoma control programmes.

Strategies

- Since trachoma is a focal disease, assess districts and communities to identify those that need trachoma control interventions.
- Train health staff to perform good-quality surgery for trichiasis (pr erably the bilamellar tarsal rotation procedure) to all those with trachomatous trichiasis (TT), as close as possible to where they live, at low or no cost to the sufferer.
- Offer antibiotic treatment (using either oral azithromycin or tetracycline eye ointment) to communities that need it (determined by the prevalence of trachomatous inflammation – follicular (TF) in children), on an annual basis.
- Deliver health education – including information about trichiasis surgery, antibiotic treatment, clean faces and face washing, and environmental improvement – with particular emphasis on im-

provement in water supplies and provision of latrines (or other methods of safe disposal of human faeces).

- Advocate for developmental interventions in trachoma endemic communities.

Onchocerciasis

Aim. Elimination of blindness due to onchocerciasis.

Situation at baseline. In 1993, WHO estimated that there were 122.9 million people at risk of *O. volvulus* infection, 17.7 million infected, and nearly 268 000 blind from onchocerciasis in 37 endemic countries (30 in Africa, 6 in Latin America and 1 – in Yemen – in the Eastern Mediterranean). Over 99% of all infected people lived in Africa. The risk of blindness in some endemic areas of western Africa was sufficiently high to cause whole communities to abandon the fertile river valleys of the savannah in which they had lived, making onchocerciasis a severe obstacle to socioeconomic development.

The Onchocerciasis Control Programme (OCP) had been launched (by WHO and its partners) in 1974. Details of the OCP were presented in Chapter 5.

Methods of control. Sight cannot be restored to eyes that are blind from onchocerciasis. Prevention of blindness from this disease is based on:

- chemotherapy with ivermectin (a well-tolerated, once-a-year microfilaricide); and/or
- control of the blackfly vector, *Simulium* sp.

Strategies

- Establish sustainable community-based ivermectin distribution programmes in areas of meso-and hyper-endemic disease.
- Implement local vector control in selected foci, where appropriate. This involves the use of larvicides against *Simulium* larvae.
- Establish surveillance mechanisms for recrudescence of disease.

Childhood blindness

Aim. Elimination of avoidable causes of childhood blindness. This includes the elimination (and maintenance of elimination) of blindness due to VAD and measles, and the control of blindness in children due to 'surgically-avoidable' or 'surgically-remediable' causes (cataract, glaucoma, ROP, and possibly corneal scar).

Situation at baseline. Prior to the launch of VISION 2020 in 1999, WHO estimated that there were 1.5 million blind children in the world, of whom 1 million lived in Asia, and 300 000 in Africa. It was estimated that 500 000 children worldwide were becoming blind each year. Many of those children would die in childhood, in part as a consequence of their loss of vision. The relative importance of different causes varied from place to place, as previously discussed. In all, considering only cases

for which the cause was known, about 40% of blindness in children was thought to be avoidable – this represents a minimum estimate. Childhood blindness is also important because of the number of years of blindness that ensue.

Objectives

- To develop programmes to prevent childhood visual loss from:
  - VAD;
  - measles;
  - harmful traditional practices;
  - ophthalmia neonatorum; and
  - eye injuries.
- To develop therapeutic and surgical services to treat children with:
  - cataract;
  - ROP;
  - glaucoma;
  - corneal ulcer/scar; and
  - (possibly) corneal scar.
- To develop optical and low vision services for children who have refractive errors or functional low vision.

Strategies

- Identify areas where childhood blindness from preventable disease is common and encourage preventive measures in those areas; examples include:
  - measles immunization;
  - vitamin A supplementation;
  - nutrition education;
  - avoidance of harmful traditional practices; and
  - monitoring of the use of oxygen in newborns.
- Work closely with nutrition, immunization, and primary health care systems to achieve and sustain elimination of VAD.
- Provide specialist training for the management of visual loss in children from:
  - congenital cataract;
  - ROP;
  - congenital glaucoma; and
  - corneal scar.
- Strengthen or develop the expertise and capabilities within existing eye units to provide surgical services for children with avoidable

blindness, including follow-up and low vision services. Such centres could be established on a national, regional, or subregional level.

- Encourage early diagnosis and referral of children needing eye surgical services.
- Increase screening practices for ROP in neonatal units.
- Promote school screening programmes for the diagnosis and management of common conditions, i.e. for:
  - refractive errors, particularly myopia; and
  - trachoma (in endemic areas).
- Promote education about 'how to look after your eyes' as part of the normal school curriculum for children.
- Ensure that all children in schools for the blind are examined by an ophthalmologist (using the WHO form where possible) and receive medical, surgical, optical, or low vision service to maximize their potential vision.
- Monitor the changing patterns in blinding eye disease in children, so that appropriate control measures can be implemented.

Refractive errors and functional low vision

Aims. Elimination of visual impairment due to refractive errors (visual impairment being defined in this context as binocular vision of less than 6/18 in adults, or equal to or less than 6/12 in children). Visual rehabilitation for those with functional low vision.

Situation at baseline. Prior to the launch of VISION 2020, significant visually-disabling refractive errors affected a large proportion of the world's population, including both genders and all ages and ethnic groups, in developing and developed countries alike. However, for reasons that are discussed in Chapter 5, the magnitude of the global problem caused by refractive errors was not known. An unknown, but probably large, number of people had functional low vision. Refractive error could be simply and inexpensively diagnosed, measured, and corrected with spectacles. Assessment of the need for low vision services was inexpensive, but the availability, cost, and quality of those services varied markedly throughout the world.

Methods of control. The steps in the provision of refractive services and low vision care are as follows.

- Screening: identification of individuals who have vision which can be improved by spectacles or other optical devices.
- Refraction: evaluation of the patient to determine what spectacles or device(s) may be required.

- Procurement: procurement of the spectacles or device(s) by local manufacture, external purchase, or donation.
- Dispensing: issuing of the spectacles or device(s), ensuring a good fit of the correct prescription.
- Follow-up: repair of spectacles or device(s), or repeat dispensing.

Strategies

- Create awareness and demand for refractive services through community-based services/primary eye care and screening in schools.
- Develop accessible refractive services for individuals identified as having significant refractive errors – this approach will require training in refraction and dispensing for paramedical eye workers if there are not enough ophthalmologists and/or refractionists.
- Ensure that optical services provide affordable spectacles for individuals with significant refractive errors.
- Develop and make available low vision services and optical devices for all those in need, including children in schools for the blind and in integrated education. Certain low vision devices can be manufactured locally, or purchased externally in bulk to reduce costs.
- Include the provision of comprehensive low vision care as an integral part of national programmes for the prevention of blindness, or rehabilitative services for the visually disabled.

Research agenda

Causes of visual impairment not included in these five priority areas (for example, the glaucomas and diabetic retinopathy) are recognized as priorities in some countries where ocular infections have been controlled. It is also recognized that public health strategies and model programmes for these two diseases (and other areas of unmet need, such as age-related macular degeneration) need to be developed. As VISION 2020 progresses, national VISION 2020 programmes need to include these diseases.

In 2002, the Research Committee of the International Council of Ophthalmology developed a research agenda for global blindness prevention. The Committee identified opportunities for research related to the seven ocular diseases and conditions causing visual disability in the largest numbers of individuals worldwide. The agenda was appraised by a WHO consultation in 2003, which:

- endorsed all the themes of the ICO research agenda, including those concerning important or emerging conditions in developing countries, such as refractive errors and diabetes-related eye disease; and

- recommended that epidemiological and operational research to refine estimates of the prevalence and causes of blindness and low vision be continued.

It is critical that appropriate groups begin to address the identified priority research issues and thereby begin to overcome the obstacles still in the way of international control of avoidable visual impairment.

Human resource development

VISION 2020 promotes human resource development to train and motivate eye-care teams – consisting of a group of individuals with diverse and complimentary skills – to deliver comprehensive eye care at the primary and secondary levels of service delivery.

It is envisaged that ophthalmologists and health-care managers will lead the process of VISION 2020 implementation. Training courses are therefore needed, for the cadres that teach the practice of eye health and service delivery from a public health perspective. This training can be summarized as follows.

Community and primary levels

Background. Primary health care (PHC) is a fundamental concept of WHO for improvement in health. The eight elements of PHC are:

- immunization;
- better nutrition;
- water and sanitation programmes;
- control of common diseases (endemic and epidemic);
- delivery of maternal and child health care;
- health education;
- simple treatment; and
- essential drugs supply.

Prevention of blindness activities lend themselves admirably to integration within PHC, and all of the eight essential elements have relevance (to a varying degree) to the prevention and control of the major blinding diseases.

Objective: to apply the PHC approach to prevention of blindness. Provision of eye care as an integral part of PHC should be a key strategy adopted by all national programmes.

Strategies

- Use PHC activities to prevent diseases that may lead to blindness and visual impairment (primary and secondary prevention).
- Use PHC activities to facilitate referral for sight-restoring surgery for cataract (tertiary prevention), through patient education and motivation.

Where community-based rehabilitation (CBR) projects are ongoing, CBR workers may help in identifying blind and visually impaired persons for referral.

The following exemplify the manner in which the elements of PHC can contribute to prevention of blindness.

- **Immunization.** The Expanded Programme on Immunization can reduce the incidence of blindness from measles. Immunization programmes can include the distribution of vitamin A supplements. Rubella immunization programmes reduce the incidence of blindness induced by congenital rubella syndrome.
- **Nutrition.** Improved intake of vitamin A-rich foods can prevent blindness from VAD.
- **Water and sanitation.** Promotion of personal (facial cleanliness) and environmental hygiene are critical parts of the SAFE strategy for prevention of blindness from trachoma.
- **Control of common diseases.** Treatment of trachoma or onchocerciasis in endemic areas can reduce the prevalence of visual loss from these diseases.
- **Maternal/child health care.** Better care of the pregnant woman and young child can lead to a reduction in the incidence of visual disability as a result of pregnancy and childbirth. For example, nutritional support and instruction in health-promoting habits can reduce the incidence of premature birth. Breastfeeding support and vitamin A supplementation of new mothers can help protect against VAD. Personal hygiene and facial cleanliness can be promoted in maternal and child health clinics.
- **Health education.** The prevalence of blindness from many causes (for example, trauma and trachoma) can be reduced by health education.
- **Essential drugs supply.** It is important that tetracycline eye ointment be available for treatment of trachoma and other common eye infections, vitamin A capsules for treatment of xerophthalmia, ivermectin for treatment of onchocerciasis, and tetracycline or chloramphenicol eye ointment for treatment of corneal abrasions and infections.

The role of the PHC worker in primary eye care involves the following.

- **Identification.** PHC workers are ideally placed to identify blind and visually disabled children and adults in their own homes.
- **Assessment and diagnosis.** PHC workers can be taught to identify individuals who could be helped by services at the secondary or tertiary levels of care (for example, people with cataract).

- **Treatment and/or referral.** After providing treatment themselves where appropriate, PHC workers can encourage individuals to go for further management, and can provide the referral system to promote this approach.
- **Follow-up and evaluation.** After treatment, PHC workers can follow up with patients in their homes to help with visual rehabilitation (of, for example, post-cataract-surgery patients); give advice on any treatment; and make sure that spectacles are available if required.

Secondary and tertiary levels[1]

Ophthalmologists

Objective: to retain and utilize ophthalmologists in an effective and efficient eye-care service and to achieve a minimum ratio of at least one ophthalmologist per 250 000 population, and preferably one per 100 000[2].

Strategies

- Create one ophthalmologist post and facility per 100 000–250 000 population through government and/or private sectors, with equal distribution for urban and rural populations.
- Increase quality and productivity of existing training centres for ophthalmologists.
- Increase the number of training centres for ophthalmologists, where appropriate.
- Attract and retain staff through appropriate incentives, including career structure and remuneration.

Ophthalmic medical assistants (OMAs) and ophthalmic nurses

Objective: to train OMAs and ophthalmic nurses to assist in the delivery of primary and secondary eye care, so that there is a minimum of one OMA or eye nurse per 100 000 population, increasing to two to three per 100 000.

Strategies

- Establish OMA/ophthalmic nurse training in eye care, based on country needs.
- Establish OMA/ophthalmic nurse training in cataract surgery, based on country needs and policy.

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[1] The categories of health personnel involved in the provision of eye care at different levels vary from country to country. In VISION 2020 strategy and planning documents, reference is made to some only of these categories, considering common staff at the specialist care level, auxiliary clinical personnel, and staff development needs for management and technology.

[2] Africa is considered the region of the world with the greatest need for human resource development for eye care. Targets given here are therefore minimum figures for Africa. Higher targets should be expected for other parts of the world.

- Secure funded posts for trainees.
- Integrate OMA/ophthalmic nurse services in health-care systems.

Other medical staff

Objectives: to train all medical graduates in basic eye care. Where needed, existing medical staff should also be trained (for example, doctors and surgeons should be trained to undertake cataract surgery).

Strategy: the International Council of Ophthalmology and other ophthalmological societies should work towards including core ophthalmology content in undergraduate and postgraduate medical education curricula, using appropriate available models.

Refractionists

Objective: to train sufficient and appropriate staff for refraction of underserved populations.

Strategy: develop training programmes in refraction for appropriate staff, based on national needs and resources.

Low vision care

Objective: to train sufficient and appropriate staff for providing low vision care among underserved populations.

Strategies

- Identify regional centres for low vision care to serve as resource institutions for training of trainers/personnel and standardization of curricula.
- Identify appropriate cadres of personnel for low vision care at each level of service delivery, and structure training programmes accordingly.
- Train primary resource persons for low vision care in each facility providing low vision services.

Managers

Objectives

- To provide training in basic principles of management for medical/paramedical staff.
- to provide trained managers for tertiary and large secondary eye-care facilities and programmes.

Strategies

- Provide short courses in planning and management for eye care at the regional or country level.
- Develop courses in eye-care programme management at selected venues for full-time managers.

Equipment technicians

Objective: to develop manpower for equipment maintenance and repair, low-cost spectacle production, and eye drop preparation.

Strategy: provide short courses on equipment maintenance at the regional or country level.

Infrastructure and technology development

This component of the strategic plan involves building sustainable national capacity to provide universal coverage with easy-to-access eye-care services.

At the very least, prevention of blindness programmes need the diagnostic, therapeutic, and surgical equipment and consumables required to prevent and treat conditions in the five VISION 2020 disease control priority areas. Such infrastructure needs to be securely accommodated in locations that are accessible to the population-in-need. The population should be aware that services are available.

Transfer of technology to developing countries is needed to help ensure that advances in ophthalmology can improve eye care for poor people. Technology transfer allows high-quality equipment and consumables to be manufactured at low cost. Local production of IOLs for cataract surgery in developing countries is a good example.

VISION 2020 also envisages regional consortia for the bulk purchasing of instruments, spare parts, and consumables. This approach will significantly reduce costs — including maintenance and repair expenses.

Infrastructure development

Objective: to provide universal coverage and access to services for the preservation of vision and restoration of sight.

Strategies: development of district-level eye-care services, with primary eye care integrated into the PHC system for a population of between 0.5 and 2 million people, through

- assessment to determine current infrastructure, capacity, and level of utilization;
- reorientation to a consumer-provider model within the PHC system;
- establishment of productivity norms for key resources (for example, cataract surgeries per ophthalmologist per year);
- obtaining long-term sustainability through the introduction of user fees, where appropriate; and
- operations research to determine how to increase the productivity of the available infrastructure.

Technology development

Objectives

- To provide practitioners, hospitals, and clinics with information on good quality and affordable technology.
- To ensure availability of spectacles, low vision devices, ophthalmic supplies, and equipment at costs appropriate to local economies — as and when required.
- To provide appropriate donated equipment to countries that cannot afford to purchase such equipment.
- To assist users to evaluate, select, and purchase appropriate equipment using methods that will help to prolong its useful life.
- To provide training – using seminars and teaching materials – to doctors and technical support staff, so that they are capable of maintaining and repairing their own ophthalmic equipment.
- To introduce new technologies, such as computers and computer networks, to improve management efficiency and information exchange.

Strategies

- Encourage the development of a worldwide communications network for providing information on ophthalmic equipment and technology.
- Conduct feasibility studies on new technologies to ensure cost-effectiveness.
- Distribute to practitioners and purchasing authorities information from NGDOs concerning recommended equipment and instruments.
- Establish a purchasing consortium to procure and distribute supplies and equipment at the best possible prices.
- Establish regional training centres with faculty and equipment capable of providing short courses for technicians and engineers (and practitioners, if appropriate).
- Encourage local entrepreneurs to produce basic supplies (such as eye drops and spectacles).
- Facilitate technology transfer (for example, by augmenting the existing technical library of video and written materials donated to eye-care institutions and training centres).

Criteria for developing local production are as follows:

- costs are high and can be reduced by local production; or
- supplies are not dependable; or
- supply time is unacceptably long.

Annex C

World Health Assembly Resoulution WHA56.26 Elimination of Avoidable Blindness

The Fifty-Sixth World Health Assembly,

Having considered the report on elimination of avoidable blindness;

Recalling resolutions WHA22.29, WHA25.55 and WHA28.54 on prevention of blindness, WHA45.10 on disability prevention and rehabilitation, and WHA51.11 on the global elimination of blinding trachoma;

Recognizing that 45 million people in the world today are blind and that a further 135 million people are visually impaired;

Acknowledging that 90% of the world's blind and visually impaired people live in the poorest countries;

Noting the significant economic impact of this situation on both communities and countries;

Aware that most of the causes of blindness are avoidable and that the treatments available are among the most successful and cost-effective of all health interventions;

Recalling that, in order to tackle avoidable blindness and avoid further increase in numbers of blind and visually impaired people, the Global Initiative for the Elimination of Avoidable Blindness, known as VISION 2020: the Right to Sight, was launched in 1999 to eliminate avoidable blindness;

Appreciating the efforts made by Member States in recent years to prevent avoidable blindness, but mindful of the need for further action,

1. URGES Member States:

(1) to commit themselves to supporting the Global Initiative for the Elimination of Avoidable Blindness by setting up, not later than 2005, a national VISION 2020 plan, in partnership with WHO and in collaboration with nongovernmental organizations and the private sector;

(2) to establish a national coordinating committee for VISION 2020, or a national blindness prevention committee, which may include representative(s) from consumer or patient groups, to help develop and implement the plan;

(3) to commence implementation of such plans by 2007 at the latest;

(4) to include in such plans effective information systems with standardized indicators and periodic monitoring and evaluation, with the aim of showing a reduction in the magnitude of avoidable blindness by 2010;

(5) to support the mobilization of resources for eliminating avoidable blindness;

2. REQUESTS the Director-General:

(1) to maintain and strengthen WHO's collaboration with Member States and the partners of the Global Initiative for the Elimination of Avoidable Blindness;

(2) to ensure coordination of the implementation of the Global Initiative, in particular by setting up a monitoring committee grouping all those involved, including representatives of Member States;

(3) to provide support for strengthening national capability, especially through development of human resources, to coordinate, assess and prevent avoidable blindness;

(4) to document, from countries with successful blindness prevention programmes, good practices and blindness prevention systems or models that could be applied or modified in other developing countries;

(5) to report to the Fifty-Ninth World Health Assembly on the progress of the Global Initiative.

D

Annex D

VISION 2020 Targets

Cataract

Table D1. Estimated global prevalence of cataract blindness in 1995, projected global prevalence for 2000–2020 if services remain at 1995 level, and targets for 2000–2020.

Year	Global population (millions)	(Projected) number of cataract blind at 1995 service level (millions)	Target number cataract blind (millions)
1995	5700	20.0	
2000	6100	25.0	15.0
2010	6800	35.0	7.0
2020	7900	50.0	0.0

Note: In 2002, the estimated global population was 6214 million. There were still 17.8 million people blind from cataract – slightly behind the target set for 2000.

Table D2. Global cataract surgical rate (CSR) in 1995 and targets for 2000–2020.

Year	Global CSR (cataract operations per million population per year)	Global number of cataract operations (millions)
1995	1100	7.0
2000	2000	12.0
2010	3000	20.0
2020	4000	32.0

Note: Based on incomplete data, the estimated global CSR for 2004 was 2300, with an estimated total of 14.0 million cataract operations performed.

Table D3. Regional cataract surgical rates (CSR) in 1995 and targets for 2000.

Year		India	China	Other Asia and Middle East[1]	Sub-Saharan Africa	Latin America and Caribbean	Former Socialist Europe[2]	Established market economies
1995	Population (millions)	950	1250	1300	550	500	350	800
	No. of cataract operations (millions)	1.6	0.2	0.8–1.3	0.1–0.2	0.8–1.5	0.3–0.5	2.5–3.5
	Cataract surgical rate	1800	200	600–1000	200–400	600–1000	1000–1500	3100–4400
2000	Population (millions)	1000	1300	1450	600	550	375	825
	No. of cataract operations (millions)	3.0	1.4	2.2	0.6	1.1	0.7	3.0
	Cataract surgical rate	3000	1100	1500	1000	2000	2000	3500

In 2004, based on available but incomplete data, estimated regional output was as follows:

Year		India	China	Other Asia and Middle East[1]	Sub-Saharan Africa	Latin America and Caribbean	Former Socialist Europe[2]	Established market economies
2004	Population (millions)	1100	1300	1500	750	550	375	825
	No. of cataract operations (millions)	4.2	0.7	2.3	0.3	0.9	0.8	4.8
	Cataract surgical rate	3800	550	1500	400	1600	2100	5800

[1] Other Asian countries and islands, and the Middle Eastern crescent, including newly independent states in central Asia.

[2] Former Socialist economies of Europe.

Trachoma

The overall target for trachoma control is its global elimination by the year 2020.

Table D4. Estimated global prevalence of trachomatous trichiasis (TT) and trachomatous inflammation – follicular (FT) in 1995, and targets for 2000–2020.

Year	Global population (millions)	Number with TT (millions)	Number with TF (millions)
1995	5700	10.6	146.0
2000	6100	10.0	120.0
2010	6800	5.0	60.0
2020	7900	0.0	8.0

Note: In 2004, WHO estimated that there were 7.6 people worldwide with TT, and 84 million with TF. These figures suggest trachoma control is on target.

Table D5. Number of countries implementing the SAFE strategy in 1995, and targets for 2000–2020 (of 48 countries endemic for blinding trachoma in 1997).

	WHO region(s)				
Year	Africa	The Americas	South-East Asia and Western Pacific	Eastern Mediterranean	Total
1995	0	0	0	0	0
2000	10	1	3	5	19
2010	20	2	5	7	34
2020	30	2	7	10	48

Note: In 2004, 25 countries provided data to WHO/PBL showing their progress in or plans for implementation of the SAFE strategy.

Onchocerciasis

Table D6 . Targets for number of national onchocerciasis control programmes and incidence of onchocerciasis blindness, 2000–2020.

Year	Number of national onchocerciasis control programmes with satisfactory coverage	Incidence of blindness from onchocerciasis
2000	25	Surveillance systems being established
2010	37	Surveillance systems in place
2020	37	0

Note: Of 37 countries considered onchocerciasis-endemic at the time of VISION 2020's launch, 7 have controlled the disease to the point where transmission no longer occurs, and 3 have been found (through rapid epidemiological mapping) not to be onchocerciasis-endemic. Of the remaining 27 countries, only 6 (all in the Onchocerciasis Elimination Programme in the Americas) reported ivermectin coverage of 85% or greater in 2003.

Childhood blindness

Table D7. Estimated number of blind children in 1995, and targets for 2000–2020.

Year	Population aged 0–15 years (millions)	Number of blind children (millions)	
		Estimated/projected	Target
1995	1800	1.45	1.45
2000	2000	1.60	1.45
2010	2200	1.80	1.25
2020	2500	2.00	1.00

Note: In 2002, there were an estimated 1.44 million blind children worldwide.

Table D8. Status of surveillance systems and incidence of blindness from vitamin A deficiency (VAD) in 1995, and targets for 2000–2020.

Year	Surveillance systems	Incidence of blindness from VAD
1995	Being established	?
2000	In place in all countries	Nil in all countries except disaster situations
2010	Maintained as needed in selected countries	Nil in all countries except disaster situations

Note: These targets remain relevant; data on progress towards their achievement are currently unavailable.

Human resource development

Table D9 . Human resource targets for sub-Saharan Africa, 2000–2020.

Year	Ratio of personnel[1] to population			% of eye facilities with trained personnel in the positions indicated			
				Tertiary		Secondary	
	Ophths	Nurses	Refracts	Mgrs	Techs	Mgrs	Techs
2000	1:500 000	1:400 000	1:250 000	20	20	5	5
2010	1:400 000	1:200 000	1:100 000	80	60	25	25
2020	1:250 000	1:100 000	1:50 000	100	100	50	50

Note: These targets remain relevant for national programme planning.

Table D10. Human resource targets for Asia, 2000–2020.

Year	Ratio of personnel[1] to population			% of eye facilities with trained personnel in the positions indicated			
				Tertiary		Secondary	
	Ophths	Nurses	Refracts	Mgrs	Techs	Mgrs	Techs
2000	1:200 000	1:200 000	1:250 000	20	20	5	5
2010	1:100 000	1:100 000	1:100 000	80	60	25	25
2020	1:50 000	1:500 000	1:50 000	100	100	50	50

Note: These targets remain relevant for national programme planning.

[1] Ophths=ophthalmologists; Nurses= ophthalmic nurses or ophthalmic medical assistants; Refracts=refractionists; Mgrs=managers; Techs=equipment technicians.

Table E1. VISION 2020 implementation data[1], by country

Please note: information in this table has been kindly provided by VISION 2020 focal points in country and regional offices and is based on their best available estimates.

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
Africa	Algeria	N	N		N					84		
	Angola		N		N	54		b	88	62		
	Benin	N	N	Y	N	152 (56)			85	83	4.0	

[1] Blank cells indicate that no information is available.

[2] GD: Signed the VISION 2020 Global Declaration of Support by April 2005: Y=yes; N=no (WHO/PBL data)

[3] NC: Formed a VISION 2020 national committee or prevention of blindness committee by April 2005: Y=yes; N=no (WHO/PBL data)

[4] W: Participated in a VISION 2020 workshop by April 2005: Y=yes; N=no (IAPB data)

[5] NP: Drafted a VISION 2020 national plan by April 2005: Y=yes; N=no (WHO/PBL data)

[6] CSR: Cataract surgical rate (number of cataract surgeries performed per million population within one calendar year), 2002 or most recent available (WHO/PBL data)

[7] IOL%: Proportion of cataract operations involving insertion of an intraocular lens, 2002 or most recent available (WHO/PBL data)

[8] TC: Trachoma control programme actively implementing the SAFE strategy, 2004 Y=yes; N=no (WHO/PBL data)

[9] CDTI%: Ivermectin coverage, 2003 (WHO/PBL data); a=no data; b=CDTI launched 17th January 2005; c=CDTI launch planned for early 2005

[10] VA%: Proportion of 6–59 month-old children given vitamin A supplementation, 2002 (UNICEF data)

[11] MI%: Proportion of one-year-old children immunized against measles, 2003 (UNICEF data)

[12] Ophth: Ophthalmologists per million population, 2002 or most recent available (WHO/PBL data)

[13] Nurse: Ophthalmic nurses or ophthalmic medical assistants per million population, 2002 or most recent available WHO/PBL data)

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Botswana		N	Y	N	550			85	90	1.1	
	Burkina Faso	N	Y	Y	N	221 (75)	Y	a	97	76	1.7	
	Burundi		N		N			c	89	75		
	Cameroon	Y	Y	Y	Y	375		76	86	61	3.2	
	Cape Verde	Y	N	Y	N	444 (100)				68	11.0	
	Central African Republic	Y	N	Y	N	24 (59)		53	90	35	0.8	2.1
	Chad		N	Y	N	176		70	85	61	0.2	
	Comoros		N		N					63		
	Congo		N	Y	N	200		52	86	50		
	Côte d'Ivoire		N		N	275			97	56	2.7	
	Democratic Republic of the Congo	Y	Y	Y	Y	200		25	62	54	0.7	
	Equatorial Guinea		N		N	200		a		51	4.2	
	Eritrea					750			51	84	0.5	
	Ethiopia	Y	Y	Y	Y	290	Y	74	16	52	1.0	
	Gabon	Y	Y	Y	Y	200		68	87	55	6.9	
	Gambia	N	Y	Y	Y	1430	Y		91	90	1.4	4.3
	Ghana	Y	Y	Y	Y	498 (98)	Y	72	99	80	2.2	12.7

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Guinea	Y				178		78	95	52	1.9	1.0
	Guinea-Bissau	N		Y		433 (100)			80	61	0.7	
	Kenya	Y	Y	Y	Y	575			91	72	1.0	
	Lesotho			Y		380				70	1.1	
	Liberia	Y	N		N	81 (91)		0	40	53	1.9	3.7
	Madagascar	N	N	Y	Y	291			95	55		
	Malawi	Y	Y	Y	Y	473		36	86	77		
	Mali	Y		Y	N	396 (85)	Y	75	68	68	1.7	4.8
	Mauritania		N		N	625	Y		89	71		
	Mauritius		N	Y	N	2000				94	6.6	
	Mozambique			Y		53	Y		71	77		
	Namibia	Y		Y		700			96	70		
	Niger	N	Y	Y	N	288 (30)	Y		77	64	0.6	1.7
	Nigeria	Y		Y		333 (75)	Y	79	79	35	2.1	0.8
	Rwanda	Y	Y		Y	131			36	90		
	Sao Tome and Principe		N			50				87		
	Senegal	Y	Y	Y	Y	619 (45)	Y	73	83	60	4.5	5.2
	Seychelles		N		N					99	50.0	

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Sierra Leone		N			190		20	87	73	0.6	8.6
	South Africa	Y	Y	Y	Y	630				83	6.0	
	Swaziland			Y		210			68	94		
	Togo	N	Y	Y	Y	308 (70)		55	95	58	3.5	7.9
	Uganda	Y	Y		Y	331	Y	75	46	82		
	United Republic of Tanzania	Y	N	Y	Y	313 (80)	Y	65	94	97	0.7	
	Zambia	Y		Y		429			80	84	1.3	5.0
	Zimbabwe			Y		479			78	80		
The Americas	Antigua and Barbuda	N	N	Y	N	1340				99	27.3 [1]	
	Argentina	Y	N	Y	N	1744 (93)				97	89.5	
	Bahamas	N	N	N	N					90		
	Barbados	N	N	Y	N					90	11[14]	
	Belize	Y	N	Y	Y	1650				96	40[14]	
	Bolivia		N	Y	N	500			50	64	22.9	3.5
	Brazil			Y		2470		97		99	62.4	
	Canada		N							95		
	Chile		Y	Y	Y					99	44.7	

[1] Population in this country is considerably less than 1 million. Figure is misleading as it actually represents only a very few persons.

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Colombia	Y	Y	Y	Y	1200 (90)		100		92	29.8	
	Costa Rica	N	N	Y	N	1400				89	24.4	
	Cuba	N	Y	Y	Y	1600 (83)				99	55.4	12.9
	Dominica	Y	Y	Y	Y	1800				99		
	Dominican Republic	N	N	Y	N	710			31	79	25.5	
	Ecuador	Y	N	Y	N	850		96	50	99	23.4	
	El Salvador	N	N	Y	N	1000				99	21.8	
	Grenada	N	Y	Y	N	1800				99		
	Guatemala	N	Y	Y	Y	793		96	33	75	12.8	
	Guyana	Y	Y	Y	Y					89		
	Haiti	Y	Y	Y	Y	350				53	6.7	
	Honduras	N		Y	N				61	95	8.1	
	Jamaica	Y	Y	Y	N	500				78	17.1	
	Mexico	Y	Y	Y	Y	950 (90)	Y	91		96	32.4	5.6
	Nicaragua	N	N	Y	N	400				93	10.9	
	Panama	N	N	Y	N	1958 (99)				83	44.0	
	Paraguay	Y	Y	Y	Y	800 (85)				91	27.9	
	Peru	Y	Y	Y		765 (90)			6	95	29.9	0.7

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Saint Kitts and Nevis	N	N	N	N					98		
	Saint Lucia	N	N	Y	Y					90		
	Saint Vincent and the Grenadines	N	N	Y	N					94	16.8[14]	
	Suriname	N	N	N	N					71		
	Trinidad and Tobago	Y	N	Y		2600				88		
	United States of America		N	Y						93		
	Uruguay	N		Y	N					95	64.9	
	Venezuela		N	Y	Y			93		82	138.7	2.5
South-East Asia	Bangladesh	Y	Y	Y	Y	957 (59)			84	77	4.4	4.3
	Bhutan	Y	Y	Y	Y	1019				88	1.4	
	Democratic People's Republic of Korea								99	95		
	India	Y	Y	Y	Y	3650 (83)			27	67	10.5	
	Indonesia	Y	Y	Y	Y	468 (90)			82	72	3.2	4.6
	Maldives			Y		700			51	96		
	Myanmar	N	Y	Y	Y	819	Y		92	75	4.0	4.6
	Nepal	Y	Y	Y	Y	1490 (96)	Y		83	75	4.1	

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Sri Lanka	Y	Y	Y	Y	2538 (98)				99	2.0	10.6
	Thailand	Y	Y	Y	Y	2090 (92)				94	12.8	7.1
	Timor-Leste								35	60		
Europe	Albania			Y		1111 (78.3)				93		
	Andorra									96		
	Armenia									94		
	Austria									79		
	Azerbaijan									98		
	Belarus									99		
	Belgium									75		
	Bosnia and Herzegovina			Y		1168 (85.8)				84		
	Bulgaria		Y	Y		1195 (93.2)				96		
	Croatia			Y		3180 (94.7)				95		
	Cyprus									86		
	Czech Republic	N	Y	Y	N	5899 (99.4)				99		
	Denmark									96		
	Estonia	N	Y	Y	N	6123 (99.7)				95		
	Finland									97		

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	France									86		
	Georgia									73		
	Germany	Y	Y	N	N					92		
	Greece									88		
	Hungary	N	Y	Y	N	5321 (98.5)				99		
	Iceland									93		
	Ireland									78		
	Israel									95		
	Italy									83		
	Kazakhstan	N	Y	Y	N					99		
	Kyrgyzstan									99		
	Latvia	N	Y	Y	N	2921 (99.8)				99	34.8	
	Lithuania	N	Y	Y	N	2502 (98.1)				98		
	Luxembourg									91		
	Malta									90		
	Monaco									99		
	Netherlands	N	Y	N	N					96		
	Norway									84		
	Poland									97		

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Portugal									96		
	Republic of Moldova	N	Y	Y	Y	403				96		
	Romania	N	Y	Y	N	1511 (96.5)				97		
	Russian Federation	N	Y	Y	N	1600				96		
	San Marino									91		
	Serbia and Montenegro					1419 (82)				87		
	Slovakia					3235 (97.9)				99	37.8	
	Slovenia									94		
	Spain									97		
	Sweden									94		
	Switzerland									82		
	Tajikistan	N	Y	N	N					89		
	The Former Yugoslav Republic of Macedonia									96		
	Turkey									75		
	Turkmenistan		Y			455				97		
	Ukraine	N	Y	Y	N	1222				99		

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	(IOL%[7])	TC[8]	CSR[6] CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	United Kingdom	Y	Y	Y	N					80		
	Uzbekistan								79	99		
Eastern Mediterranean	Afghanistan	Y	Y	Y	Y	499 (25)	Y		84	50	3.0	
	Bahrain	Y	Y	Y	Y	2175 (100)				100	62.37	98.6
	Djibouti	Y	Y	Y	N	979 (57)			91	66	4.0	13.3
	Egypt	Y	Y	Y	N	692 (56)				98	68.9	74.8
	Iran (Islamic Republic of)	Y	Y	N	Y	1489 (100)				99	18.0	
	Iraq	Y	Y	Y	N	1187(70)	Y	none		90	5.5	9.3
	Jordan	Y	Y	Y	Y	1126 (97)				96	41.3	
	Kuwait	Y	N	Y	N	1308 (99)				97	51	51
	Lebanon	Y	Y	Y	N	1700				96	59.2	
	Libyan Arab Jamahiriya	Y	Y	Y	N					91	27.4	
	Morocco	Y	Y	Y	Y	768 (56)	Y			90	32.2	
	Oman	Y	Y	Y	Y	2401 (92)	Y		97	98	35.9	None[1]
	Pakistan	Y	Y	Y	Y	2400 (58)	Y		95	61	13	3.6
	Qatar	Y	Y	Y	Y	1036 (97)				93	39.0	
	Saudi Arabia	Y	Y	Y	N	1671 (100)				96	36.0	

[1] General nursing staff work in ophthalmology after being trained by ophthalmologists.

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	(IOL%[7])	TC[8]	CSR[6] CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Somalia	Y	N	Y	N	284			60	40	0.4	
	Sudan	Y	Y	Y	Y	932 (80)		29	93	57	3.4	19.4
	Syrian Arab Republic	Y	N	Y	N	1757 (90)				98	37.9	
	Tunisia	Y	Y	Y	N	1329 (95)				90	35.8	
	United Arab Emirates	Y	N	Y	N	1200 (97)				94	31	
	Yemen	Y	Y	Y	N	650 (80)			49	66	10.1	
Western Pacific	Australia	Y	Y	Y	Y	8000 (100)	Y			93	40	
	Brunei Darussalam	N	Y	Y	N					99	28.6	
	Cambodia	Y	Y	Y	Y	749 (88)	Y		34	65	2.4	
	China, Hong Kong SAR & Macao SAR	Y	Y	Y	Y	380	Y			84	17	
	Cook Islands	Y	N	Y	Y	2800 (100)				99	nil	
	Fiji	N	Y	Y	Y	1354 (99)				91	13.3	
	Japan	Y	Y	Y	Y	6830 (99)				99	105.1	
	Kiribati	N	N	Y	N	1690 (100)				88	nil	
	Lao People's Democratic Republic	Y	Y	Y	Y	627 (98)			58	42	3.6	

Region	Country	GD[2]	NC[3]	W[4]	NP[5]	CSR[6] (IOL%[7])	TC[8]	CDTI%[9]	VA%[10]	MI%[11]	Ophth[12]	Nurse[13]
	Malaysia	Y	Y	Y	Y	2290 (97)				92	12.5	
	Marshall Islands								51	90		
	Micronesia (Federated States of)								71	91		
	Mongolia	Y	Y	Y	Y	442 (87)			84	98	36	
	Nauru	Y	N	N	N					40	nil	nil
	New Zealand	Y	N	Y	N	2080[1] (99)				85		
	Niue									86		
	Palau									99		
	Papua New Guinea	N	Y	Y	N	716 (85)				49	1.6	0.1
	Philippines	Y	Y	Y	Y	1200 (95)			86	80	17	
	Republic of Korea	Y	Y	Y	N	2762 (100)				96	41.7	
	Samoa	N	Y	Y	Y					99	1[14]	15[14]
	Singapore	Y	N	Y	N	4289 (100)				88	28.5	
	Solomon Islands	N	Y	Y	N	817 (99)				78	4[14]	28[14]
	Tonga	Y	Y	Y	N	2039 (100)				99	10[14]	30[14]
	Tuvalu	N	N	Y	N	2647				95	nil	100[14]
	Vanuatu	Y	Y	Y	Y	1539 (97)				48	10[14]	35[14]
	Viet Nam	Y	Y	Y	Y	997	Y		55	93		

[1] Figure based on public sector surgery only. Probably an equal or greater amount in private sector, but data currently unavailable.
Source: VISION 2020 focal points in country and regional offices, based on their best available estimates.

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Glossary

Aphakia	Absence of the lens
APOC	African Programme for Onchocerciasis Control
AMD	Age-related macular degeneration
Blindness	Defined in this report, except where otherwise indicated, as VA<3/60 (0.05) with best possible correction, or a visual field no greater than 10° around central fixation, in the better eye (visual impairment categories 3, 4 and 5 in ICD-10)
CBR	Community-based rehabilitation
CDTI	Community-directed treatment with ivermectin
CONAVIP	Comité Nacional de VISIÓN 2020 Paraguay
CSR	Cataract surgical rate
DRC	Democratic Republic of the Congo
EC	European Community
ECCE	Extracapsular cataract extraction
Functional low vision	VA <6/18 but ≥perception of light, or a visual field no greater than 10° degrees around central fixation, after treatment and refractive correction, in the better eye, which is useful or potentially useful for planning and/or execution of a task
GET2020	WHO Alliance for the Global Elimination of Trachoma by 2020
IAPB	International Agency for the Prevention of Blindness
ICCE	Intracapsular cataract extraction
ICD-9	International classification of diseases, ninth revision
ICD-10	International statistical classification of diseases and related health problems, tenth revision
ICO	International Council of Ophthalmology
IOL	Intraocular lens
Low vision	Defined in this report, except where otherwise indicated, as VA<6/18 (0.3) but ≥3/60 (0.05) with best possible correction, in the better eye (visual impairment categories 1 and 2 in ICD-10) (cf. functional low vision)
Low vision services	Services for the visual rehabilitation of persons who have functional low vision

NGDO	Nongovernmental development organization
NGO	Nongovernmental organization
NICU	Neonatal intensive care unit
OCP	Onchocerciasis Control Programme
OEPA	Onchocerciasis Elimination Programme in the Americas
OGS	Optometry Giving Sight
OMA	Ophthalmic medical assistant
PHC	Primary health care
RBB	Regional burden of blindness
ROP	Retinopathy of prematurity
SAFE	Surgery, antibiotics, face washing and environmental improvement, to prevent trachoma blindness
TF	Trachomatous inflammation – follicular
TT	Trachomatous trichiasis
UIG	Ultimate intervention goal
UNICEF	United Nations Children's Fund
VA	Visual acuity
VAD	Vitamin A deficiency
WHO	World Health Organization
WHO/PBL	World Health Organization Programme for the Prevention of Blindness (currently WHO/PBD)