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Global Initiative for the Elimination of Avoidable Blindness

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Preamble

- This document has been produced following consultations held in Geneva during 1996 and 1997, convened by the WHO Programme for the Prevention of Blindness and Deafness (PBD) at the request of, and with support from, the Task Force of the Partnership Committee of Nongovernmental Development Organizations.

- The purpose of these meetings was to initiate the development of a global plan to enable all parties and individuals involved in combating blindness to work in a focused and coordinated way to achieve the common goal of eliminating all avoidable blindness.

- The document outlines objectives, strategies, indicators and targets for service delivery of eye care, in order to eliminate blindness from the five most amenable causes of avoidable blindness at the present time. Information is also given on strategies for the control of other significant causes of blindness.

- The document does not attempt to address research priorities and is not comprehensive for all causes of visual loss and blindness.

Section 1

Overview of the present global blindness situation and future trends

1.1 PRESENT MAGNITUDE AND MAJOR CAUSES OF VISUAL IMPAIRMENT

An analysis of the available data on blindness and low vision, through the PBD Data Bank, points to the following situation analysis:

- There are nearly **38 million blind** people and almost **110 million with low vision**, giving a total of nearly 150 million people with some degree of visual impairment.[1]
- There are 8.9 million blind people in India, 6.7 million in China and 7.1 million in Africa - together this constitutes nearly 60% of the global burden of blindness.
- The major cause of blindness in India, China and sub-Saharan Africa is cataract. Globally there are at least **16 million people who are blind from cataract**.
- Trachoma is the second cause of blindness in sub-Saharan Africa, China and the Middle-Eastern countries, with a global estimate of **5.9 million people being blind from trachoma**.
- Glaucoma occurs in all parts of the world, but different types of glaucoma are seen in different regions. It is estimated that **5.2 million people are blind from glaucoma**.
- Onchocerciasis is an important cause of blindness in endemic foci in West and Central Africa, being responsible for 0.3 million blind people.
- Other causes of blindness, particularly diseases of the posterior segment of the eye, account for more than 10 million blind people.
- The prevalence of blindness increases from 0.08% in children to 4.4% in people aged over 60 years, with an **overall global prevalence of 0.7%**.
- There are no good available data on the incidence of blindness, although it is estimated that at least 7 million people become blind each year and that the number of blind people worldwide is at present **increasing by 1-2 million per year**.

[1] These figures are based on the 1990 global population. If the 1996 population situation were applied, there would be a projected number of 45 million blind and 135 million people with low vision.

It should be noted that, although there are limited population-based data from some regions of the world, the available data are sufficient to enable a strategic plan to be developed and confirm that:

- the age-specific prevalence of blindness in most parts of the developing world is several times greater than that in the economically developed world;
- **two-thirds or more of all blindness is avoidable**, in that the causes are preventable or treatable;
- unoperated cataract has been shown to be the major cause of blindness, accounting for 40%-80% of all causes of blindness in the available population-based surveys.

1.2 TRENDS AND FUTURE PROJECTIONS

Data on projected global trends over the next 25 years, with regard to demographic, economic and health care situations, have been used by the PBD secretariat to assess trends and to make some future projections.

- During the last 20 years, there has been an **economic crisis** which has affected the least developed countries in a particularly negative manner, resulting in greater unemployment and reduced governmental revenue for health expenditure.
- The **global population will increase** from 5.8 billion in 1996 to an estimated 7.9 billion by 2020; most of this increase will take place in the developing world.
- The **global population is ageing**, with an estimated 1 billion people aged over 45 years in 1996, increasing to 2 billion by 2020.
- There is **increasing urbanization**, with 45% of the global population now living in cities, which will increase to 60% by 2020. This urbanization, which particularly affects cities in the developing world, is due mainly to an internal migration of young people and leaves rural areas increasingly marginalized.
- The ageing population is resulting in an **increase in noncommunicable chronic diseases**.
- At present the Disability-Adjusted Life Years (DALYs) are more or less equally distributed between communicable and noncommunicable diseases, but over the next 20 years it is projected that the **proportion of DALYs due to noncommunicable diseases will increase**.
- An analysis of interventions over the last 10-20 years in five countries has shown a decrease in the prevalence of blindness in some communities, but an increase in others. It is, however, difficult to draw any definite conclusions from the limited data.

- Governments are increasingly looking to consumers of health care to pay for health services and treatment, while consumers, who have increasing expectations, are seeking hospital as opposed to primary care, having the perception that hospital care is of better quality than primary care.

- There is generally a **reduction in available funds for blindness prevention** from the governments of developing countries, due to a combination of economic recession and new competing demands for the limited resources.

1.3 BENEFITS AND COSTS OF BLINDNESS PREVENTION

Blindness has profound human and socioeconomic consequences in all societies. The costs of lost productivity, and rehabilitation and education of the blind, constitute a significant economic burden, particularly in many developing countries. Furthermore, blindness is often associated with lower life expectancy in such settings; thus, the prevention and cure of blindness can provide enormous savings and facilitate societal developments.

In its World Development Report in 1993, the World Bank developed the concept of •Disability-Adjusted Life Years• (DALYs), which is a composite measure of the time lived with a disability, together with the time lost due to premature mortality. The •DALY• measure allows for a comparative assessment of health care interventions in terms of cost per DALY saved. Although this measure is not perfect, and sometimes criticized, it is increasingly used as a tool for comparative assessment of cost-utility.

Cataract is by far the major cause of easily curable blindness worldwide. As there are no known effective means of preventing the most common forms of cataract, all efforts have to be made to provide surgery to all those in need. Cataract surgery can be one of the most cost-effective of all health interventions, with a cost per DALY saved in the order of US$ 20-40. In fact, good-quality, high-volume cataract surgery can be provided at less than US$ 10 per DALY in some settings. Cataract interventions are thus as cost-effective as immunization and can have a very significant and rapid impact in reducing the burden of avoidable blindness in a population.

Onchocerciasis is being successfully brought under control in West Africa through the Onchocerciasis Control Programme (OCP). Eleven countries in West Africa have got rid of the disease as a public health problem, implying more than 600 000 cases of blindness prevented, some five million years of productive labour added with 25 million hectares of land freed up. The overall success of OCP has been analysed in economic terms and shown to give a highly satisfactory Economic Return Rate of 20%; this is a measure of the total economic benefits of the Programme, compared to total costs. Almost equally advantageous, the new African Programme for Onchocerciasis Control (APOC), covering the remaining 19 endemic countries in Africa, will yield an Economic Return Rate of 18%.

Trachoma is a disease requiring a range of medical, behavioural and environmental interventions. Available data from some endemic countries have shown that both non-surgical (education and antibiotics) and surgical interventions (lid surgery for trichiasis) for trachoma control share with cataract surgery the distinction of being among the most cost-effective blindness prevention measures.

In the field of **childhood blindness**, the control of xerophthalmia has been shown to be particularly cost-effective. The mass distribution of vitamin A capsules at semi-annual intervals is one of the highest ranked of all health interventions available, yielding a cost per DALY saved of only US$ 9. The comparable cost for vitamin A fortification would be around US$ 29 per DALY.

Some preliminary analysis recently undertaken suggests that the direct economic cost of the global burden of blindness is US$ 25 billion; this figure may double, or triple, if indirect costs are also considered. Given the cost-effective interventions available to prevent or cure blindness, as described above, there is every reason to consider blindness prevention as one of the most worthwhile public health and developmental interventions that can be undertaken.

See further Annex 1.

1.4 WHY A 25-YEAR GLOBAL PLAN?

1.4.1 Reasons for a global plan

A global plan is important for the following reasons:

(a) It allows **priorities** to be defined and appropriate effective and efficient **strategies** to be determined and then implemented, including appropriate long-term research strategies.

(b) It can be used for **advocacy** and **resource mobilization**, as all partners can use the global plan to raise new funds and to develop prevention of blindness activities.

(c) It facilitates the **coordination** and **development** of work by the different partners involved in prevention of blindness.

(d) It encourages the building of **new partnerships** between the government, private, corporate and voluntary sectors in society.

(e) It allows the **evaluation** of activities, in order to learn from experience, as targets and objectives for the programme have been defined.

1.4.2 Available coordination mechanisms

At present, prevention of blindness activities are coordinated through a number of different mechanisms. These include the following:

(a) The **WHO Programme Advisory Group**, which meets every two years to advise on the WHO Programme•s development, including its collaboration with NGDOs and identified collaborating centres.

(b) Annual meetings of NGDOs with WHO/PBD in the **Partnership Committee**, and quarterly meetings with the **Task Force** of NGDOs to initiate new activities.

(c) The **WHO collaborating centres for the prevention of blindness** involved in training and research for blindness prevention, on a joint work plan basis with each institution.

(d) Direct **official relations** between some NGDOs and WHO, implying a joint workplan agreement on a regular three-year basis. This is of particular importance for **human resource** development at all levels of health care. In many settings, **ophthalmologists** will play a key role as national coordinators or in initiating specific activities, mainly for training or provision of **eye care**, including common surgery, for example for cataract. The International Federation of Ophthalmological Societies, through its executive branch, the International Council of Ophthalmology, maintains close relations with the WHO Programme for this purpose. **Other cadres** of eye care personnel are also important in national programme developments, such as ophthalmic medical assistants, nurses or clinical officers, optometrists, opticians, etc., as applicable in each specific country situation (*see section 2.2*).

(e) **Specific programmes**, including SightFirst, trachoma control and ivermectin distribution.

1.4.3 Development of work

The **WHO collaborating centres** have an important role to play in prevention of blindness through:

(a) appropriate **operational research**, which can make the use of existing resources more effective and efficient;

(b) **technical consultancy** to multilateral agencies, national programmes for the prevention of blindness and NGDOs;

(c) the provision of **training** for eye care professionals in prevention of blindness and particularly in community ophthalmology;

(d) conducting **evaluations** of blindness prevention activities and projects, at the request of other interested parties.

1.4.4 Partnership development

The International Agency for the Prevention of Blindness (IAPB) functions as an umbrella organization which has played an important role in promoting prevention of blindness globally and continues to have an essential **coordinating and advocacy** role. IAPB brings together the human resources of the International Federation of Ophthalmological Societies and the financial resources of the NGDOs, which can result in programme activity, in accordance with WHO/PBD technical strategies, through the national committees of blindness prevention in Member States. The development of regional workshops over the last eight years has been successful in bringing together interested parties to look at priorities and strategies for controlling blindness at the regional level. These workshops could be further developed and used as an instrument for promoting the global plan, establishing regional initiatives and strengthening national programmes.

1.5 MOBILIZATION OF RESOURCES

Funding for prevention of blindness activities can be generated from a number of different sources. These include the following:

(a) Cost-recovery from patients

Patients with high income can be provided with high-quality services which can be used to generate income to subsidize services for patients with low income, who could otherwise not afford treatment. This model has been successful in India, but needs to be developed and implemented in other regions.

Fees from patients with less severe eye problems can be a source of income to subsidize services for low-income patients who are blind, or in danger of going blind. For example, income from reading spectacles can be used to subsidize cataract surgical costs.

(b) Government subsidy

Governments in developing countries have very limited and often decreasing resources for health care, and prevention of blindness is usually not seen as a priority, despite the evidence that restoration or preservation of sight is an extremely cost-effective health intervention. Greater awareness needs to be created within governments of the benefits of preventing and curing blindness, although it can generally not be expected that governments will increase their resource

allocations to blindness prevention; in most developing countries, there will be attempts to develop a mix of governmental **and** nongovernmental financing of health care, and this could form a good basis also for blindness prevention work.

(c) Insurance schemes

Private or governmental health insurance schemes are available in a number of countries to assist patients in covering the cost of medical treatment. These schemes, however, are most often found in the developed nations, and so far there is usually limited coverage of poor population groups in the developing countries; in fact, in many instances such insurance schemes cover only government employees and people with remunerated posts.

(d) Voluntary and private sector

There is a group of nongovernmental development organizations (NGDOs) which are particularly active in the field of blindness prevention. Increasing competitiveness in the donor market has meant that most organizations struggle to maintain a stable level of income for support of eye care activities in the developing world. For this group of NGDOs, the development of a global plan is seen as an important instrument to create awareness and encourage new sources of revenue from private donors which would become available for blindness prevention.

(e) Bilateral and multilateral governmental agencies

Recent reports and initiatives have clearly documented that health care and, particularly, blindness prevention can have important developmental and economic benefits for people, particularly in developing countries. It is envisaged that a coordinated global initiative to eliminate avoidable blindness would be of interest to donor agencies in the developed countries, as part of aid for poverty alleviation and community development.

1.6 INTERACTION AND COORDINATION BETWEEN INTERESTED PARTIES

As previously discussed in sections 1.4.2 and 1.4.4, various bodies and mechanisms are already in place for interaction on the global plan. In particular, the WHO/PBD Programme will play the lead role, in close consultation with the Task Force of NGDOs; and the regional workshops of IAPB offer an appropriate forum for all interested parties to interact in addressing regional priorities and initiatives. The importance of bringing new actors on the scene - in particular the World Bank and UNICEF, already directly involved in blindness prevention activities - was underlined. Furthermore, the link to governmental development agencies needs to be strengthened.

The role of governments, through their ministries of health, is crucial for the success of any long-term plan for global blindness prevention. The development of appropriate and effective **national programmes** for the prevention of blindness will be the key to large-scale, coordinated action, with input from collaborating nongovernmental organizations at the international, regional and country level, as well as the private sector. There is a strong rationale for national plans and programmes for blindness prevention in **all** countries, even if needs and opportunities for intervention vary between countries. It is essential that ministries of health maintain, through an appropriate national committee or similar body, the **setting** of technical standards and norms and that they **issue** needed guidelines, **coordinate** the input from all parties, and arrange for regular **monitoring** and **evaluation** of activities and achievements. As a rule, programme evaluations should include external, neutral parties, and the WHO Programme should be available, in consultation with interested collaborating centres or others, to undertake such evaluations at the invitation of national authorities.

Considering the present and future global situation as far as blindness and visual disability are concerned, there is a very **strong rationale** for increased preventive measures, in order:

- to remove socioeconomic barriers to community developments in developing countries;
- to reduce costs for medical and social care for the visually disabled;
- to provide optimal opportunities for individual achievements and quality of life for all;
- to apply cost-effective interventions against avoidable blindness;
- to achieve feasible global action to control blindness and visual disability as a public health problem.

Section 2

Outline of main activities within a Global Initiative for the Elimination of Avoidable Blindness

INTRODUCTION

There are three essential elements to a global plan for the elimination of avoidable blindness:

(a) Strategies/targets for **disease control**

(b) **Human resource** needs and development

(c) **Infrastructure/technology** needs and development

2.1 CONTROL OF MAJOR CAUSES OF BLINDNESS

Disease: **CATARACT**

Aim: Elimination of cataract blindness (person with less than 3/60 in both eyes)

Present situation:

1. Cataract (opacification of the lens) is the major cause of blindness in the world (an estimated 16-20 million people bilaterally blind from cataract) and the number is increasing. This is the prevalence (backlog) of cataract blind.

2. It is estimated that in Africa and Asia at least one person per 1000 population goes blind from cataract every year, i.e., 600 000 per year in Africa and 900 000 per year in India. This is the incidence of cataract blindness.

3. Cataract is more common with increasing age. Other less common causes of cataract are injury, other eye diseases (uveitis) and diabetes, and it sometimes occurs in children.

4. There is no known prevention of cataract due to ageing. Treatment involves removal of the lens and then correction of the optical error known as aphakia.

   There are two ways in which the cataract can be removed:

   (a) Intracapsular cataract extraction (ICCE) - remove the whole lens intact.

   (b) Extracapsular cataract extraction (ECCE) - open the lens capsule, remove the lens cortex and nucleus, but leave the capsule in place.

There are three ways of correcting aphakia:

(a) Spectacles

(b) Contact lens

(c) Intraocular lens

5. The cataract surgical rate is a quantifiable measure of the delivery of cataract services. It is the number of cataract operations/million population/per year. In Europe this is about 3000, in India 2000, in Latin America 500-1500, and in Africa generally less than 500.

The cataract surgical rate is meaningful to estimate only when there is ample information on **all** cataract surgery performed in a country, for example including the private sector.

Objectives: To provide cataract surgical services which:

(a) have a high success rate in terms of visual outcome and improved quality of life;

(b) are affordable for all people (fees from services to high-income patients may be used to subsidize services for low-income patients);

(c) are accessible to rural as well urban populations;

(d) cater for the number of new cases/year (incidence) and so eliminate the backlog of cataract over a number of years.

Indicators:

1. Global and national prevalence of cataract blindness

2. Regional and national cataract surgical rates

3. Proportion of aphakia/pseudophakia in relation to cataract blind, in defined population groups

Strategies:

1. Create demand for service by overcoming barriers to uptake of services, through a variety of community interactions. The major barriers to uptake of cataract services are:

   - lack of awareness;
   - poor quality of service;
   - high cost of treatment;
   - accessibility not easy.

2. 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.

3. 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, and subsidy for poor patients.

4. 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.

5. 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.

6. In the provision of surgery, priority should be given to bilaterally blind patients with cataract. However, patients should be encouraged to seek treatment before becoming blind, thereby 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 intraocular lens implantation.

7. Ensure coordination between governmental and nongovernmental service delivery.

8. Develop methods and data for assessment of cataract incidence.

9. Investigate new methods and appropriate technologies in the treatment of cataract.

Targets:

1. Global cataract prevalence targets 1990-2020

Year	Population (millions)	Projected no. cataract blind at 1995 service level (millions)	Target	
			No. cataract blind (millions)	Prevalence cataract blindness (%)
1990	5400	16.0	16.0	0.3
1995	5700	20.0	20.0	0.35
2000	6100	25.0	15.0	0.25
2010	6800	35.0	7.0	0.10
2020	7800	50.0	0	0

2. Global cataract surgical rate targets 1995-2020

Year	Global cataract surgical rate (cataract operations/million population/year)	Global no. of cataract operations (millions)
1995	1100	7.0
2000	2000	12.0
2010	3000	20.0
2020	4000	32.0

3. Regional cataract surgical rate targets 1995-2000

Region	Year 1995			Year 2000		
	Population (millions)	No. of cataract operations (millions)	Cataract surgical rate (cat. ops/ million/year)	Population (millions)	Target cataract operations (millions)	Target cataract surgical rate (cat. ops/ million/year)
India	950	1.6	1800	1000	3.0	3000
China	1250	0.2	200	1300	1.4	1100
Rest of Asia and Middle-Eastern Crescent	1300	0.8-1.3	600-1000	1450	2.2	1500
Sub-Saharan Africa	550	0.1-0.2	200-400	600	0.6	1000
Latin America and Caribbean	500	0.8-0.5	600-1000	550	1.1	2000
Former socialist economies of Europe	350	0.3-0.5	1000-1500	375	0.7	2000
Established market economies	800	2.5-3.5	3100-4400	825	3.0	3500

Total	**5700**	**5.8-7.8**	**1100**	**6100**	**12.0**	**2000**

4. Costing of subsidy for cataract surgery based on the target for year 2000

Region	Population (millions)	Target cataract surgical rate (per million population/year)	Total no. of cataract ops (millions)	Subsidy	
				%	No. operations
India	1000	3000	3.0	20	600 000
China	1300	1100	1.4	20	280 000
Rest of Asia and Middle-Eastern Crescent	1450	1500	2.2	20	440 000
Sub-Saharan Africa	600	1000	0.6	80	480 000
Latin America and Caribbean	550	2000	1.1	10	110 000
Former socialist economies of Europe	375	2000	0.7	10	70 000
Established market economies	825	3500	3.0	-	-
Total	**6100**	**2000**	**12.0**		**1 980 000**

1 980 000 cataract operations at a subsidy of US$ 40 per operation = **US$ 79.2 million**.

Disease: **TRACHOMA**

Aim: Elimination of blindness due to trachoma

Present situation:

1. An estimated 146 million people have the active infection with the microorganism *Chlamydia trachomatis*, for which antibiotic treatment is indicated.

2. There are approximately 10.6 million adults with inturned eyelashes (trichiasis/entropion), for which eyelid surgery is needed to prevent blindness.

3. An estimated 5.9 million adults are blind from corneal scarring due to trachoma.

4. Trachoma is common in areas of the world characterized by:

   (a) lack of water;
   (b) lack of sanitation;
   (c) excess of flies;
   (d) lack of health/eye care services;
   (e) poverty and isolation.

Indicators:

1. Trichiasis in adults

2. Active infection in children

3. Implementation of the SAFE strategy in countries with blinding trachoma

Strategies: Implementation of the SAFE strategy integrated within primary health care in all communities identified as having blinding trachoma within a country. This includes the following:

1. Assessment to identify communities with blinding trachoma.

2. Delivery of community-based trichiasis **Surgery** by trained paramedical staff (S of SAFE).

3. **Antibiotic** treatment (either tetracycline ointment or azithromycin suspension) for children with active disease (A of SAFE).

4. Promotion of **Facial cleanliness** (F of SAFE) and **Environmental improvement** (E of SAFE), including personal hygiene and community sanitation as part of primary health care.

Targets:

1. Global trachoma targets for cases of trichiasis and active infection, 1995-2020

Year	Total population (millions)	No. with trichiasis (TT) (millions)	No. with active disease (TF) (millions)
1995	5700	10.0	146.0
2000	6100	10.0	120.0
2010	6800	5.0	60.0
2020	7800	0	8.0*

* This is equivalent to a prevalence of TF of 5% in the at-risk population of 800 million, of whom 160 million would be children aged 0-10 years.

2. Cumulative numbers of countries for implementation of the SAFE strategy in 49 countries* with blinding trachoma, 1995-2020

Year	**WHO Region**			
	Eastern Mediterranean	Africa	South-East Asia and Western Pacific	Americas
1995	0	0	0	0
2000	5	10	3	1
2010	7	20	5	2
2020	10	30	7	2

* See WHO report on "Planning for the Global Elimination of Trachoma (GET)" - document WHO/PBL/97.60.

Disease: **ONCHOCERCIASIS**

Aim: Elimination of blindness due to onchocerciasis

Present situation:

1. An estimated 17 million people are infected with onchocerciasis.
2. Approximately 0.3-0.6 million are blind from the disease.
3. The disease is endemic in 30 countries of Africa and occurs in a few foci in six Latin American countries and in Yemen.

Indicators:

1. National onchocerciasis control programmes with satisfactory coverage
2. Zero incidence of blindness from onchocerciasis

Strategies:

1. Establish sustainable community-based ivermectin distribution programmes in areas of hyper- and mesoendemic disease.
2. Implement local vector control in selected foci where appropriate.
3. Establish surveillance mechanisms for recrudescence of disease and for new cases of blindness.
4. Implement the control programmes through the Onchocerciasis Control Programme (OCP, 11 countries of West Africa), the African Programme for Onchocerciasis Control (APOC, 19 countries of Africa) and the Onchocerciasis Elimination Programme in the Americas (OEPA, 6 countries of Latin America).

Targets:

Target	2000	2010	2020
National onchocerciasis control programme with satisfactory coverage in onchocerciasis-blinding areas	25 countries	37 countries	37 countries
Incidence of blindness from onchocerciasis	Surveillance systems being established	Surveillance systems in place	No new cases in all countries

Cause: **CHILDHOOD BLINDNESS**

Aim: To eliminate avoidable causes of childhood blindness

Present situation:

1. There are an estimated 1.5 million blind children in the world, of whom 1 million live in Asia and 300 000 in Africa. The prevalence is 0.5-1 per 1000 children aged 0-15 years.

2. There are an estimated 500 000 children going blind each year (one per minute). Many of these children die in childhood.

3. The causes of childhood blindness vary from place to place and change over time. The major causes are as follows:

Africa	- Corneal ulcer/scar (measles, vitamin A deficiency and harmful traditional practices) - Congenital cataract - Hereditary disorders
Asia	- Vitamin A deficiency - Congenital cataract/rubella - Hereditary retinal diseases
Latin America	- Congenital cataract and glaucoma/rubella - Retinopathy of prematurity
Industrialized countries and urban centres	- Retinopathy of prematurity - Congenital cataract - Hereditary diseases

4. It is estimated that childhood blindness causes 75 million blind years (number blind x length of life), second only to cataract.

Objectives:

1. To develop promotive and preventive eye disease programmes to stop childhood eye disease and visual loss from:

   - vitamin A deficiency
   - measles
   - harmful traditional practices
   - ophthalmia neonatorum
   - eye injuries

2. To develop therapeutic and surgical services to treat children with:

   - cataract
   - glaucoma
   - corneal ulcer/scar
   - retinopathy of prematurity

3. To develop optical and low vision services for children with refractive errors or low vision, but with useful potential vision.

Strategies:

1. To identify areas where childhood blindness from preventable disease is common and to encourage preventive measures, for example:

   (a) measles immunization;
   (b) vitamin A supplementation;
   (c) nutrition education;
   (d) avoidance of harmful traditional practices;
   (e) monitoring of use of oxygen in newborns.

2. To provide specialist training and services for the management of surgically remediable visual loss in children from:

   (a) congenital cataract;
   (b) congenital glaucoma;
   (c) corneal scar;
   (d) retinopathy of prematurity.

3. To develop low vision services for visually handicapped children.

4. To promote school screening programmes for the diagnosis and management of common conditions, i.e.:

   (a) refractive errors, particularly myopia;
   (b) trachoma (in endemic areas).

5. To promote education about •How to look after your eyes• as part of the normal school curriculum for children.

6. To make sure that all children in blind schools are examined by an ophthalmologist (using the WHO form where possible) and receive medical, surgical, optical or low vision service to maximize potential vision.

Targets: See ••Vitamin A deficiency• and •Surgically avoidable causes• for details.

VITAMIN A DEFICIENCY

Aim: To achieve and sustain the elimination of blindness due to vitamin A deficiency.

Indicators:

1. Surveillance systems for blinding xerophthalmia

2. Incidence of blinding xerophthalmia

Strategies: The control of xerophthalmia is expected to be achieved by the year 2000 through the Global Child Survival Programme. This consists of a number of short-, medium- and long-term strategies.

1. To work closely with nutrition, immunization and PHC systems to achieve and sustain elimination of vitamin A deficiency.

2. To establish surveillance systems to identify any new cases of blinding xerophthalmia and report the occurrence for action by child survival programmes.

Targets:

Target	1995	2000	2010
Surveillance system	Being established	In place in all countries	Maintenance as needed in selected countries
Incidence of blindness	?	Nil in all countries	Nil in all countries except disaster situations

SURGICALLY AVOIDABLE CAUSES

Aim: To control blindness in children from cataract, glaucoma and retinopathy of prematurity (ROP).

Indicators:

1. Number of eye centres with paediatric-oriented services

2. Number of surgical procedures for childhood cataract, glaucoma and retinopathy of prematurity

Strategies:

1. 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.

2. Encourage early diagnosis and referral of children needing eye surgical services.

3. Increase screening practices for ROP in neonatal units.

4. Monitor the changing patterns in blinding eye disease in children, so that the appropriate control measures can be implemented.

Targets:

Year	Population aged 0-15 years (millions)	Number of blind children	
		Projected (millions)	Target (millions/prevalence)
1995	1800	1.45	1.45 (0.8/1000)
2000	2000	1.60	1.40 (0.7/1000)
2010	2200	1.80	1.20 (0.5/1000)
2020	2500	2.00	1.0 (0.4/1000)

Cause: **REFRACTIVE ERRORS AND LOW VISION**

Aim: Elimination of visual impairment (binocular vision of less than 6/18 in adults or less than 6/12 in children) and blindness (less than 3/60) due to refractive errors. Visual rehabilitation for those with permanent low vision.

Present situation:

1. Significant visually disabling refractive error affects a large proportion of the world's population, affecting both genders and all age and ethnic groups. Many have permanent low vision (less than 6/18 binocularly) that requires rehabilitation services. Refractive error can be simply diagnosed, measured and corrected with spectacles. Their provision is extremely cost-effective and should be an integral part of eye care delivery. The lack of refraction services and spectacle provision in underserved communities has negative consequences in terms of lost educational and employment opportunities, impaired quality of life and productivity for the individual, the family and society.

2. The steps in the provision of refraction services and low vision care for a patient are as follows:

   - ***Screening***: Identification of individuals with poor vision which can be improved by spectacles or other optical devices.

   - ***Refraction***: Evaluation of the patient to determine what spectacles or device may be required.

   - ***Manufacture***: Manufacture of the spectacles or an appropriate device, both of which may be manufactured locally, purchased externally, or donated.

   - ***Dispensing***: Issuing of the spectacles or device, ensuring a good fit of the correct prescription.

   - ***Follow-Up***: Repair of spectacles/devices or repeat dispensing.

Indicator: Prevalence of blindness and visual impairment due to uncorrected refractive errors and of low vision, and percentage of people corrected/rehabilitated.

Strategies:

1. Create awareness and demand for refractive services through community-based services/primary eye care and school screening.

2. Develop accessible refractive services for individuals identified with significant refractive errors. This will require training in refraction and dispensing for paramedical eye workers if ophthalmologists and/or refractionists are not available in sufficient number.

3. Ensure that optical services provide affordable spectacles for individuals with significant refractive errors.

4. Develop and make available low vision services and optical devices for all those in need, including children in blind-school or integrated education. Certain low vision devices can be manufactured locally, or purchased externally in bulk supplies to reduce costs.

5. 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.

2.2 HUMAN RESOURCE DEVELOPMENT

2.2.1 COMMUNITY LEVEL

Background: Primary health care (PHC) is a fundamental concept of the World Health Organization for improvement in health. The main activities in PHC are:

(a) immunization;
(b) better nutrition;
(c) water and sanitation programmes;
(d) control of common diseases (endemic and epidemic);
(e) delivery of maternal and child health care;
(f) health education;
(g) simple treatment;
(h) essential drugs supply.

Prevention of blindness activities lend themselves admirably to integration within primary health care, and the eight essential elements all have a relevance in varying degrees to the prevention and control of the major blinding diseases.

Aim: The PHC approach to prevention of blindness. The provision of eye care as an integral part of primary health care is a key strategy that is adopted in all national programmes.

Strategies: To use PHC activities to prevent diseases that may lead to blindness and visual impairment (primary and secondary prevention) and to facilitate referral for sight-restoration 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.

Elements of PHC

The following exemplify the manner in which the elements of primary health care contribute to prevention of blindness:

- ***Immunization***: The expanded programme on immunization (EPI) can result in prevention of blindness from measles. Immunization programmes can include the distribution of vitamin A supplements. Rubella immunization programmes prevent congenital rubella syndrome including blindness.

- ***Nutrition***: Better nutrition, particularly with vitamin A, can prevent xerophthalmia and the resultant blindness.

- ***Water and sanitation***: Both water and sanitation have a direct relevance to the prevention of blindness from trachoma, where personal hygiene (clean face) and environmental hygiene are critical parts of the SAFE strategy.

- ***Control of common diseases***: Treatment of trachoma or onchocerciasis in endemic areas can reduce the prevalence of visual loss from these eye diseases.

- ***Maternal/child health care***: Better care of the pregnant woman and young child can lead to less visual disability as a result of pregnancy and childbirth.

- ***Health education***: Many causes of blindness can be prevented by health education, for example trauma.

- ***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, and ivermectin for treatment of onchocerciasis.

- ***Primary eye care (PEC) as part of PHC***: Primary eye care as an integral part of primary health care is a key strategy that is adopted in all national programmes. It includes promotion of eye health and the provision of basic preventive and/or curative treatment for common eye disorders.

The role of the PHC worker

- ***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 assess those individuals who could be helped by the services of a specialist, for example identifying cataract for referral to an ophthalmologist.

- ***Referral for management and treatment***: PHC workers can encourage individuals to go for treatment and can provide the referral system that will promote this.

- ***Follow-up and evaluation***: After treatment, the PHC worker can follow up the patient at home to help with visual rehabilitation (the patient after cataract surgery, for example), give advice on any treatment and make sure that spectacles are available.

Eye care personnel

The categories of health personnel involved in the provision of eye care at different levels vary from country to country. In the present document, reference is made to some only of these categories, considering common staff at the specialist care level, auxiliary clinical personnel, and staff developments for management and technology. In addition, there are other professional categories in many countries, for example optometrists, orthoptists, ophthalmic and dispensing opticians, and others involved in certain elements of eye care, in particular refraction and low vision services.

2.2.2 SECONDARY AND TERTIARY LEVELS

Africa is considered the region of the world with the greatest need for human resource development for eye care. The targets given are therefore minimum figures for Africa. Higher targets can be anticipated for other regions of the world.

Category of health personnel: Ophthalmologists

Objective: To retain and utilize ophthalmologists in an effective and efficient eye care service and to achieve a ratio of at least one ophthalmologist per 250 000 population.

Indicator: Number of ophthalmologists/population

Strategies:

1. Create one ophthalmologist post and facility per 250 000 population through government and/or private sector with equal distribution for urban and rural populations.

2. Increase quality and productivity of existing training centres for ophthalmologists.

3. Increase number of training centres for ophthalmologists, where appropriate.

4. Attract and retain staff through appropriate incentives including career structure and remuneration.

5. There should be an evaluation of the two-year diploma courses (for example Bangladesh and West Africa), and similar courses should be developed if the results are positive.

Targets:

Target	2000	2010	2020
Ophthalmologists per population:			
Sub-Saharan Africa	1 : 500 000	1 : 400 000	1 : 250 000
Asia	1 : 200 000	1 : 100 000	1 : 50 000

Category of health personnel: Ophthalmic medical assistants and ophthalmic nurses

Objective: Where there are insufficient ophthalmologists, train OMAs and ophthalmic nurses for secondary eye care, so that there is a minimum of one OMA or eye nurse per 200 000 population, improving to one per 100 000 over time.

Indicator: Proportion of OMAs/eye nurses per population

Strategies:

1. Establish OMA/ophthalmic nurse training in eye care, based on country needs.
2. Establish OMA/ophthalmic nurse training in cataract surgery, based on country needs.
3. Secure funded posts for trainees.
4. Integrate OMA/ophthalmic nurse services in health care systems.

Targets:

Target	2000	2010	2020
OMAs or eye nurses per population:			
Sub-Saharan Africa	1 : 400 000	1 : 200 000	1 : 100 000
Asia	1 : 200 000	1 : 100 000	1 : 50 000

Category of health personnel: Other medical staff

Objectives:

1. All medical graduates to be trained in basic eye care.
2. Where needed, training of other medical staff, for example doctors and surgeons in eye care, including cataract surgery where appropriate.

Indicator: Proportion of medical graduates with basic eye care training

Strategies: International Council of Ophthalmology and ophthalmological societies to work towards including core ophthalmology content in medical curriculum and postgraduate medical education, using appropriate available models.

Targets:

Target	2000	2010	2020
Proportion of medical schools teaching basic eye care	50%	90%	100%

Category of health personnel: Refractionists

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

Indicator: Proportion of refractionists per population

Strategies: Develop training programmes in refraction for appropriate staff, based on the country needs and resources.

Targets:

Target	2000	2010	2020
Number of trained refractionists per population	1 : 250 000	1 : 100 000	1 : 50 000

Category of health personnel: Managers

Objectives:

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

Indicator: Trained managers at facilities and in programmes

Strategies:

1. Short courses in planning and management for eye care at regional or country level.

2. Development of courses in eye care programme management at selected venues for full-time managers.

Targets:

Target	2000	2010	2020
% of tertiary facilities with trained managers	20	80	100
% of secondary facilities with trained managers	5	25	50

Category of health personnel: Equipment technicians

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

Indicators:

1. Proportion of tertiary eye facilities with trained technicians

2. Proportion of secondary eye facilities with trained technicians

Strategies: Short courses on equipment maintenance, at the regional or country level.

Targets:

Target	2000	2010	2020
Proportion of tertiary eye facilities with a trained technician	20%	60%	100%
Proportion of secondary eye facilities with a trained technician	5%	25%	50%

2.3 INFRASTRUCTURE AND APPROPRIATE TECHNOLOGY DEVELOPMENT

2.3.1 INFRASTRUCTURE

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.

1. Assessment to determine current infrastructure, capacity and level of utilization.

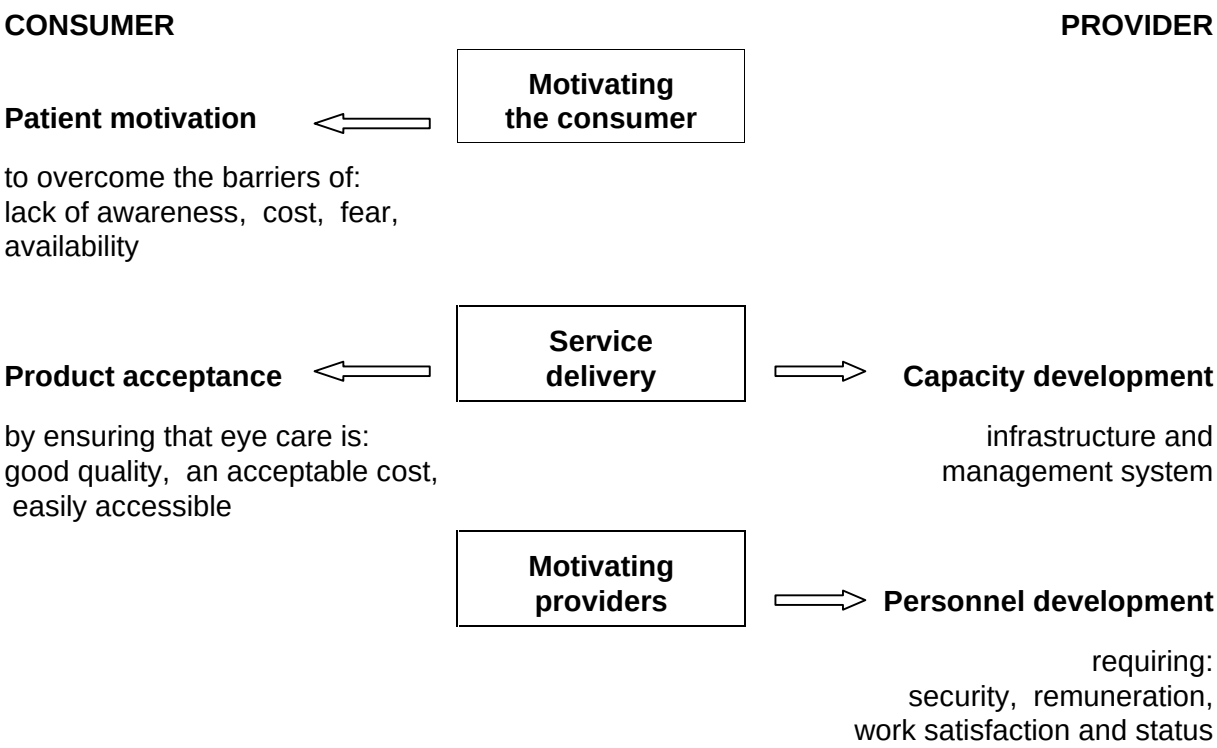
2. Reorientation to a consumer-provider model within the PHC system.

3. Establishment of productivity norms for key resources (for example cataract surgeries per ophthalmologist per year).

4. Obtaining long-term sustainability through the introduction of user fees where possible.

5. Operations research to determine how to increase the productivity of the available infrastructure.

Generic model



Level	Activity	Key manpower	Other infrastructure
District	Cataract surgery Refraction services Spectacle supply Training Outreach activities Coordination	Ophthalmologist (1:250 000) Ophthalmic assistant/ nurse (1:100 000) Manager (1 or 2 per district)	1 eye bed/20 000 population 1 eye operating theatre per district 1 spectacle workshop and eye drop unit per district (optional)
Subdistrict	Case referral Outreach cataract surgery Refraction services Trichiasis surgery	As above	Refraction facility Spectacle dispensary
Primary	Screening/case referral Health education Treatment of common eye infections	PHC worker trained in primary eye care (1:5000)	Vision measurement Basic eye medicines: tetracycline eye ointment vitamin A capsules (ivermectin)

Indicators:

1. Ratio of ophthalmologists, ophthalmic assistants and other personnel to population
2. Proportion of district eye units with personnel and facilities
3. Proportion of PHC workers trained in primary eye care
4. Cataract surgical rate (cataract operations/million population/year)
5. Spectacles dispensed per million population

Targets: For infrastructure development, access, utilization and coverage

Target	2000	2010	2020
Availability of infrastructure	50%	90%	95%+
Accessibility	40%	75%	90%+
Utilization	25%	50%	90%+
Coverage	25%	50%	90%+

2.3.2 TECHNOLOGY

Background:

1. There exist, in many parts of the world, shortages of usable diagnostic and therapeutic equipment necessary for practitioners to apply modern, but fundamental, techniques in their efforts to combat blindness.

2. Countries requiring appropriate technology often do not have access to the information necessary to acquire such equipment and instruments. Because information on low-cost technologies does not reach the decision-makers, inappropriate or extravagant purchases are often made, leaving the users with sophisticated equipment which is too expensive to operate, maintain and repair.

3. Local doctors do not know how to maintain and repair their equipment. Local biomedical engineers and technicians do not receive training in the basic and complex repairs of ophthalmic instrumentation. Commercial service providers, either direct manufacturers• representatives or independent service organizations (ISOs), are too distant or too costly for local practitioners, clinics or hospitals to afford. Where sophisticated technology has been introduced, the equipment is often broken, unserviceable, or inappropriate.

Objectives:

1. To provide practitioners, hospitals and clinics with information on good-quality and affordable appropriate technology.

2. To ensure availability of spectacles, ophthalmic supplies and equipment at costs appropriate to local economies, as and when required.

3. To provide appropriate donated equipment to countries which cannot afford its purchase.

4. To assist users to evaluate, select and purchase appropriate equipment using methods which will help to prolong its useful life.

5. 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.

6. To introduce new technologies such as computers and computer networks to improve management efficiency and information exchange.

Strategies:

1. Encourage the development of a worldwide communications network for providing information on ophthalmic equipment and appropriate technology.

2. Conduct feasibility studies on new technologies to ensure cost-effectiveness.

3. Distribute information from international nongovernmental development organizations (INGDOs) of recommended equipment and instruments to practitioners and purchasing authorities.

4. Establish a purchasing consortium to procure and distribute supplies and equipment to obtain best prices.

5. Establish regional training centres with faculty and equipment capable of providing short courses for technicians and engineers (and practitioners, if appropriate).

6. Encourage local entrepreneurs to produce basic supplies (eye drops, spectacles, etc.).

7. Facilitate technology transfer (for example augment the existing technical library of video and written materials which can be donated to eye care institutions and training centres).

Criteria for developing local production:

1. Costs are high and can be reduced by local production.

2. Supplies are not dependable.

3. Supply time is unacceptably long.

Indicator: Proportion of district eye units providing adequate eye medicines, spectacles and other eye services

Targets: See the table for infrastructure development for details.

Section 3

Structure and work plan development for the Global Initiative for the Elimination of Avoidable Blindness

INTRODUCTION

- The Global Initiative will intensify and accelerate present prevention of blindness activities so as to achieve the goal of eliminating avoidable blindness by 2020.
- It will focus initially on certain diseases which are the major causes of blindness and for which proven cost-effective interventions are available.
- It will establish a structure for the focused planning, coordination and implementation of programmes between national governments, NGDOs, the private sector and the donor community.
- It provides a common theme and goal to be used by individual NGDOs in advocacy and fundraising; the common goal with defined targets will allow for resource mobilization from multilateral donors and large foundations which may not be accessible to individual NGDOs alone.
- It will expand the existing technical assistance of the WHO Programme to countries, to facilitate sustainable programme development and service delivery in collaboration with NGDOs and donor agencies.

3.1 STRUCTURE FOR THE GLOBAL INITIATIVE

3.1.1 Coordination

At the **GLOBAL** level, this would be achieved through existing mechanisms and meetings within the PBD Programme, i.e.:

Programme Advisory Group
International Agency for the Prevention of Blindness (IAPB)
Partnership Committee
Task Force

A post should be developed in PBD for a person to coordinate the Global Initiative.

At the **REGIONAL** level, the following measures should be taken:

- Appoint a full-time person in WHO/PBD for the African and Eastern Mediterranean Regions (later this may be made two positions).
- Appoint a full-time person in WHO/PBD for the South-East Asia and Western Pacific Regions.
- IAPB Regional Officers to work in close collaboration with the WHO Regional Advisers.

- Regional IAPB workshops to be held every one to two years for exchange of information and reporting from national coordinators.

- Regional versions of the •Global Initiative• document need to be written by 1998. These regional/language-specific versions will be sent to countries as a template for writing/revising national plans.

- Regional programmes should be considered for funding proposals by multilaterals (e.g. regional training programmes in Africa).

At the **NATIONAL** level:

- Each country to develop or revise its own national plan using the regional document as a template.

- Involvement of the ministry of health and interested NGDOs through national committees or a task force.

3.2 PHASES OF IMPLEMENTATION

At the **GLOBAL** level, consider a **three-year** planning cycle **initially**, e.g.:

Phase 1: 1997-1999 to include
- structure development
- advocacy
- planning at regional level
- resource mobilization for 2000-2004

This would be followed by four **five-year phases** of implementation:

Phase 2: 2000-2004
Phase 3: 2005-2009
Phase 4: 2010-2014
Phase 5: 2015-2019

At the **REGIONAL** level, Member countries should be assisted by the WHO Advisers in the revision or development of national plans for elimination of avoidable blindness, through site visits and national and intercountry workshops, applying the above phases of implementation.

More specifically, the involvement of countries per region is suggested as follows:

Region (Number of countries)		Number of Member countries	
		1997-1999	2000-2004
Africa	(46)	23	23
Americas	(36)	12	12
Eastern Mediterranean	(22)	7	11
Europe	(51)	0	13
South-East Asia	(10)	9	1
Western Pacific	(28)	15	3
Total	**(193)**	**66**	**63**

At the **NATIONAL** level:

- Each country should constitute a national committee or task force (MOH and NGDO and other interested parties) to execute the national plan.

- Each country should consider development of its own national plan in the following phases:

    - Planning phase
    - Implement strengthened cataract services, in addition to ongoing activities
    - Develop further cataract services and next priority disease
    - Develop further cataract services and all other priority diseases
    - Consolidate services to meet targets

3.3 MONITORING AND EVALUATION

There is need for a management system which is simple and gives useful information to monitor the development and activities of national programmes in terms of process, output and outcome. Existing guidelines from WHO/PBD should be applied and developed further.

Indicators for monitoring the Global Initiative should be developed by the Task Force, taking into account existing criteria for monitoring/evaluation within WHO and IAPB.

ANNEX 1

BENEFITS AND COSTS OF BLINDNESS PREVENTION INITIATIVES

1. INTRODUCTION

Blindness imposes a significant burden on society in terms of human suffering, the cost of lost production and lower productivity and the costs of financing rehabilitation and education of the blind. In addition, some causes of blindness are associated with lower life expectancy in many developing countries. Conversely, prevention and cure of blindness can provide enormous savings in terms of both money and human misery.

In order to obtain an up-to-date assessment of the potential economic benefits of available interventions to prevent and cure blindness, the Task Force of the Partnership Committee commissioned a study to review available literature dealing with the cost-effectiveness and cost-benefit of such interventions. This work was undertaken by Margaret Thomas, a health economist, working under the auspices of the International Centre for Eye Health (1). The comments in this annex are based on this literature search and are confined to selected priority diseases identified in the Global Initiative.

The research identified 274 relevant articles and publications, thus providing a reasonably broad base on which to make assessments. There is a variety of different methodological approaches used in identifying and quantifying the respective costs and benefits associated with PBL interventions, but the most widely used are:

- cost-minimization analyses
- cost-utility analyses
- cost-effectiveness analyses
- cost-benefit analyses

These approaches are discussed fully in the report and are not considered further here. Mention should be made, however, of a particular approach based on cost-utility which has been used increasingly in recent years and recurs frequently in the literature.

The 1993 World Bank World Development Report, •Investing in Health• (2), introduced a measure of health status known as the Disability-Adjusted Life Year (DALY). It is an indicator of the time lived with a disability together with the time lost due to premature mortality. The measure depends on assigning weights to different health states (0 for death through 1.00 for perfect health). These weights are then multiplied by the number of years that the health state exists and discounted at a 3% discount rate to the present. The idea of a single measure of the burden of disease is highly attractive, as it permits comparisons across diseases, populations and countries. When this measure is allied to the availability and costs of interventions, it leads to an assessment of their comparative cost-effectiveness, i.e. cost per DALY saved. This measure is being used frequently in cost-effectiveness studies in the health sector and in many such studies dealing with blindness interventions. A much-quoted list of potential health service interventions grouped by cost per DALY has been produced by Jamison (3) and is referred to later.

DALYs are not without their critics, however. As with all such composite measures of health status, obtaining appropriate weights for mortality and for all possible forms of morbidity is problematic. The DALY concept is continually being refined to accommodate this and other criticisms but it does serve, meanwhile, to provide a reasonable comparative measure of cost-utility.

The main thrust of the Global Initiative will be in four areas:

- Cataract
- Onchocerciasis
- Trachoma
- Xerophthalmia (vitamin A deficiency)

2. CATARACTS

Cataract is by far and away the major cause of curable blindness worldwide and cataract surgery is a priority area for intervention under the Global Initiative. Vision can be restored by effective surgery involving either intracapsular cataract extraction or extracapsular cataract extraction. There is an increasing body of literature on the costs of different types of cataract interventions, but limited data on cost-effectiveness or economic benefits. However, the evidence which is available demonstrates that cataract surgery is a highly cost-effective health intervention. Below, we look specifically at evidence provided by World Bank research (3) undertaken in the early 1990s and at a more recent study of the Lumbini Zonal Eye Care Programme in Nepal (4).

2.1 Disease control priorities in developing countries

The Health Sector Priorities Review published by the World Bank in 1993 (2) consists of analyses that assess the significance to public health of individual diseases and of what is known about the cost-effectiveness of relevant interventions for their control. The cost-effectiveness of more than 50 specific health interventions was evaluated using a standard methodology for costs and benefits. The cost-effectiveness of interventions was summarized by estimates of marginal cost per DALY gained. Jamison comments: "... although this measure is imperfect, and often varies with the scale of the control effort and across environments, its estimation, for each of a large number of interventions, does indicate priorities for the allocation of resources to disease control".

The following costs for cataract surgery and costs per DALY saved were given as follows:

Cost-utility of cataract surgery

Intervention	Cost per DALY saved (US$)
Bilateral cataract surgery (US$ per eye)	
18.00	15.70
26.80	21.50
42.50	31.80
Unilateral cataract surgery (US$ per eye)	
18.00	15.00
26.80	19.00
42.50	27.00

Source: Javitt, Chapter 26 - *Disease Control Priorities in Developing Countries* (Jamison et al., eds, 1993)

This placed cataract surgery as one of the most cost-effective of all public health interventions available and on a par with other well-accepted interventions such as DPT and poliomyelitis immunization (US$ 20-40 per DALY).

2.2 Lumbini Eye Care Programme

A comprehensive blindness programme serving two million people living in the Lumbini Zone, south-central Nepal, has been operating since 1985. The programme includes a base eye hospital, field-based services including eye camps, screening camps and district-level clinics. Cataract surgery is performed on an outpatient basis under local anaesthetic followed by seven days of observation at the eye hospital or eye camp. Typically, patients undergo extracapsular cataract removal followed by insertion of a posterior chamber intraocular lens, although a significant percentage of patients undergo intracapsular cataract extraction and receive standard +10 cataract spectacles.

An assessment (4) of the cost-effectiveness of this programme has been undertaken and its findings were as follows: On the basis of an average cost per operation of US$ 21.71, cataract surgery in Lumbini costs US$ 5.06 per DALY. This is even lower than the previously reported World Bank estimates and shows it to be among the few health interventions that cost less than US$ 10 per DALY saved.

Sensitivity analysis was undertaken to test both the upper and the lower limits around these estimates. The following variables were adjusted: case cost, discount rate, rate of surgical success, utility rate for blindness and sight restoration, and mortality rate among unoperated cataract blind. The •worst case• scenario increased the DALY cost to US$ 20.53. This reflected a set of conditions that did not exist in Nepal but which might apply in other countries. But, as noted above, even a DALY cost of this level is highly attractive and suggests that, even under unfavourable conditions, cataract surgery is likely to compare favourably with most other widely accepted public health interventions.

In response to the question of how typical are the conditions in Nepal, the author commented as follows:

> "Conditions affecting cost-effectiveness vary from country to country. These include the cost of drugs and supplies, personnel costs, mortality rates and cataract prevalences. Nepal•s poor transportation and communication infrastructure combined with difficult terrain may tend to make programme expenses higher than in many other countries. On the other hand, the low cost of Indian-made supplies and equipment tends to keep costs lower than they might be in other developing country eye care programmes. Purchase costs may also increase in areas with lower cataract prevalences since more resources would need to be devoted to case-finding and to transportation. The prevalence of cataract blindness in Nepal (0.54%) is typical or even somewhat low for a developing country. The rate in Botswana is 0.63%, in Indonesia 0.80% and in Pakistan 1.34%. Overall, this suggests that Nepal is fairly typical of low-income countries as far as the conditions that affect the cost-effectiveness of cataract surgery are concerned."

2.3 Conclusion

Other studies reported in the literature support the findings of the evidence quoted here. Cataract interventions are highly cost-effective. Although it is a disease of advancing age in the majority of cases, its cost-effectiveness derives from characteristics such as speed of operation (about 30 minutes), the potential for high volume and the fact that cataract surgery is almost always successful. There is clearly scope for more full cost-benefit work (as opposed to just DALY calculations) for different types of cataract interventions, but existing evidence demonstrates the economic efficiency of such interventions. Patients have better vision and improved quality of life, can maintain occupations and activities and can continue life at home.

3. ONCHOCERCIASIS

The fight against onchocerciasis under the initial Onchocerciasis Control Programme (OCP) is now nearing completion. Eleven countries, together with WHO, World Bank and others, have participated in a vector control programme running from 1974 to 2002, with benefits continuing to at least 2012. The programme has been well written up and widely discussed, demonstrating significant benefits - both in health and in economic terms, viz.:

- 34 million people protected
- 600 000 cases of blindness prevented
- 5 million years of productive labour added
- 25 million hectares of arable land freed up
- 12 million children spared the disease

Given the magnitude of the benefits, it is perhaps not surprising that the economic rate of return has been calculated as 20% (5). Unlike the calculation of DALYs saved, this measure values the economic benefits associated with the programme and compares them with total programme costs. With a 20% return, this represents a highly successful intervention, not just in health sector terms but as an investment when compared to other public sector investments.

OCP is being followed by a second programme with the objective of eliminating river blindness as a public health hazard. The African Programme for Onchocerciasis Control (APOC) consists of the same players (although different countries) as OCP but with the addition of NGDOs and Merck & Co. as suppliers of Mectizan• (ivermectin). The coverage of the programme extends beyond the original OCP countries to a further 19 African countries. The benefits which are expected to derive from this programme are again considerable. Assuming a compliance ratio of 70% (Mectizan• usage among end-users) and a progressive reduction in blindness incidence, reaching 90% in year 6, the following benefits are anticipated:

- 1 million cases of blindness prevented
- 7.8 million years of labour added

This gives an economic rate of return of 18% (6). This is very similar to the cost-benefit return of OCP and likewise represents an excellent return on investment in terms of both health and development.

4. TRACHOMA

There is limited material available on the cost-effectiveness of interventions for the prevention of trachoma. However, a very comprehensive review has been undertaken by economists from the Harvard Center for Population and Development Studies of the trachoma control programme in Myanmar (7).

The paper compares the costs and benefits of two types of trachoma interventions employed over a 30-year period by the trachoma control programme (TCP) in Myanmar. The aim was to derive insights on vertical and horizontal approaches to trachoma control, in addition to identifying the optimal mix of interventions to prevent trachomatous visual impairment. Drawing on studies of the prevalence of trachomatous blindness in Myanmar and of the efficacy of surgical prevention, the effectiveness and utility of non-surgical and surgical interventions were derived. This is expressed as the number of cases of visual impairment prevented and handicap-adjusted life years (HALYs) saved. HALYs, like other composite measures of ill-health such as DALYs (disability-adjusted life years) and QALYs (quality-adjusted life years) expresses as a single unit the years of life lost due to premature mortality and life years lost while living with morbidity, disability or handicap for each individual with a disease.

The total annual average cost-utility of non-surgical interventions (community education and antibiotic treatment) over the 30-year duration of TCP was US$ 11 per HALY saved compared with US$ 59 per HALY saved for surgical intervention. This reduced to US$ 3 and US$ 10 per HALY respectively when comparing marginal cost-utility.

The absence of studies that have used HALYs as a measure of effectiveness limits direct comparison with other studies. However, as noted earlier, Jamison estimates the marginal cost of cataract surgery to be between US$ 18 and US$ 42. The marginal cost per trichiasis surgery performed in Myanmar was between US$ 2 and US$ 15. Assuming the benefits from cataract and trichiasis surgery are similar in that they restore/preserve vision among the elderly, it is reasonable to assume that the cost-effectiveness and utility are similar. Thus both surgical and non-surgical interventions for trachoma control share with cataract surgery the distinction of being among the most cost-effective prevention activities.

5. CHILDHOOD BLINDNESS (XEROPHTHALMIA)

It is estimated that childhood blindness causes 75 million blind years, second only to cataract. Up to half-a-million children go blind annually and up to 80% of those that go blind die within one year (8). Vitamin A deficiency is the major cause. Yet much of this is preventable through the administration of doses of vitamin A. There is a considerable body of literature on the success of vitamin A programmes.

A relatively comprehensive cost-benefit study of a vitamin A intervention for reducing xerophthalmia was undertaken by Popkin et al. (1980) (9). The study was based on data from the Philippines in which the economic benefits of reducing xerophthalmia were viewed as increased income and the reduction in costs of outpatient care because fewer children would die, go blind, or become sick due to the disase. The assumption was that xerophthalmia affects both the future productivity and the development of children aged one through 15. Higher mortality and total blindness from xerophthalmia lower the productive life span. Increased morbidity, mortality and partial blindness reduce future productivity. Reductions in prevalence also reduce treatment costs. Three types of interventions were analysed for their costs and effectiveness in reducing xerophthalmia: mass-dose capsules of vitamin A every six months; fortification of monosodium glutamate (MSG) with vitamin A; and, thirdly, a programme of health and nutrition education, disease prevention through sanitation and immunization, and limited curative work. The benefits

were found to be substantially greater than costs for the mass-dose capsule and MSG fortification interventions, but costs exceeded benefits for public health interventions. For the mass-dose capsule, benefits were from 2.4 to 3.4 times the costs. For fortification, the benefits were six to 21 times the costs.

Other research (Tilden & Grosse) (10) has found that, over time, long-term programmes such as dietary modifications are even more cost-effective than shorter-term interventions.

Further evidence of the cost-effectiveness of vitamin A interventions is available from Chapter 19, on micronutrient deficiency disorders, in the World Bank study (11). Using the current prevalence of deficiencies commonly observed in developing countries and certain assumptions about demographics, death and disability, coverage and effectiveness (75%), the discount rate (3%) and life expectancy (70 years), the discounted cost per DALY gained was calculated based on available costs of micronutrient control programmes. The cost per DALY is estimated at US$ 9 (semi-annual dosage of vitamin A among children 0-5 years) and US$ 29 (vitamin A fortification).

6. CONCLUSION

The evidence summarized above demonstrates the very favourable cost-benefits and cost-utility of the existing interventions available in four disease areas. The following table summarizes the key findings of the evidence quoted.

	Cost per DALY saved (US$)	Cost-benefit	Economic rate of return
Cataract			
World Bank	15-32	-	-
Lumbini	5	-	-
Onchocerciasis			
OCP			20%
APOC			18%
Trachoma			
Non-surgical	3-11	-	-
Surgical	10-59 (HALY)	-	-
Childhood blindness (xerophthalmia)			
Mass-dose capsule	9	2.4-3.4	-
Fortification	29	6-21	-
Measles immunization	2-15		

This demonstrates the outstanding returns available from interventions in all of these areas. Obviously, local conditions will dictate the specific returns available to individual programmes, but the effectiveness of the interventions available and the robust nature of the existing evidence point

to the tremendous cost-effectiveness of blindness prevention and intervention strategies proposed in the Global Initiative.

There is, of course, still considerable scope for further exploring the economic aspects of blindness prevention measures particularly beyond the calculation of DALY costs.

A.F. Smith (12) has prepared some initial, "back of the envelope", calculations to demonstrate the huge economic burden imposed by blindness resulting from all conditions (including the four listed above). By making some broadbrush assumptions about the loss of productive economic capacity due to blindness, he concludes that the direct economic cost of global blindness would be equivalent to US$ 25 billion. He believes this could be doubled or tripled if indirect costs were also taken into account, that is, the lost time of carers, rehabilitation costs, etc. These are formidable numbers and, while subject to further refinement, again indicate the considerable economic costs of blindness.

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ANNEX 2

CONTROL OF OTHER CAUSES OF BLINDNESS

Disease: GLAUCOMA

Aim: To control visual loss and reduce the prevalence of blindness from glaucoma.

Background:

1. Glaucoma is becoming an increasingly important cause of blindness. It is responsible for 10%-15% of blindness worldwide, i.e., 5 million people.

2. There are different types of glaucoma. Primary open-angle glaucoma is more common in black populations and angle-closure glaucoma more common in south-east Asian countries.

3. Glaucoma is defined as a level of intraocular pressure (often raised above normal) which damages the optic nerve and causes loss of vision. It can occur at any age, but is more common in people over the age of 40 years.

4. The early diagnosis of glaucoma is difficult, there being no single test or examination which is sufficiently sensitive or specific to be used alone to screen a population for this disease.

5. There is a variety of treatment options, all of which aim to lower the pressure and stop further loss of vision. Treatment cannot restore vision which has already been lost.

6. Glaucoma is a priority disease for further research into the etiology, early diagnosis and best method of control, if prevention of blindness from this disease is to become a reality.

Strategies:

1. To increase awareness among high-risk populations of the need for regular glaucoma examinations.

2. To train eye workers in the diagnosis of glaucoma and to refer patients for treatment before the onset of blindness.

3. To provide treatment and follow-up for patients with glaucoma in order to avoid further loss of vision and blindness. *Open-angle glaucoma*: The recommended treatment for most patients is an operation. Medical treatment may be indicated in some patients. *Angle-closure glaucoma*: The recommended treatment is an operation (iridectomy), or an iridotomy using a laser.

4. Further evaluation and research are required to determine the appropriate screening and treatment methods for use in developing countries.

Disease: **DIABETIC RETINOPATHY**

Aim: To reduce the prevalence of blindness from diabetic retinopathy.

Background:

1. The prevalence of diabetes mellitus varies in different populations according to genetic predisposition and environmental risk factors (particularly diet).

2. Diabetic retinopathy is becoming a major cause of avoidable blindness in middle-aged populations living in urban situations, with an estimated 2.5 million people blind from this disease (7.5% of global blindness).

3. Early treatment with laser applications to the retina can prevent visual loss if given in time.

Strategies: Consideration should be given to developing services to prevent diabetic retinopathy in communities where diabetes is responsible for at least 10% of all blindness. The following strategies should be implemented:

1. Promotion of community awareness about diabetes and visual loss.

2. Education of medical practitioners regarding good control of diabetics and the need for annual fundoscopy of all diabetics to detect early retinopathy before the onset of visual loss.

3. Provision of a laser and trained ophthalmologist to provide a diabetic retinopathy treatment service.

Disease: **CORNEAL SCAR**

Aim: To reduce the prevalence of blindness from corneal scar.

Background:

1. Most of the causes of corneal blindness, such as vitamin A deficiency, measles and trachoma, can be prevented effectively and inexpensively by primary health care measures, for example measles immunization, nutrition education, improved hygiene.

2. However, some corneal conditions, particularly keratoconus and other corneal dystrophies, cannot be prevented. They primarily affect young people and, for these patients, corneal transplantation is the only way of restoring sight.

3. A major limitation to corneal grafting in many countries is the lack of suitable donor material. Corneas can now be preserved in eye banks for up to two weeks following the death of the donor. This permits a single eye bank to provide corneas to many different eye hospitals, some of which may be thousands of kilometres from the eye bank.

4. The results of corneal grafting (penetrating keratoplasty (PKP)) depend upon the following:

   (a) The original corneal pathology - some causes of corneal visual loss do badly with PKP (for example dense vascularized corneal scarring) and some do reasonably well (for example keratoconus).

   (b) The quality of the donor material - high-quality corneal banks will produce better donors and therefore more chance of success.

   (c) The skill of the surgeon.

   (d) The compliance of the patient to regular follow-up visits after surgery.

5. Results from developing countries suggest the following:

   (a) Corneal grafting for keratoconus and other corneal dystrophies has a good prognosis.

   (b) Corneal grafting requires a great deal of commitment on the part of the surgeon and the patients if it is to have any chance of success.

   (c) Corneal grafting for scarring resulting from the commonest causes of corneal blindness - such as trachoma, measles, ophthalmia neonatorum, etc. - carries a very poor prognosis.

Strategies:

1. To promote the development of corneal grafting in specialized centres which have the staff and the expertise to carry out the surgery and postoperative follow-up.

2. To promote the development of eye banks so that donor material can be made readily available.

3. Priority for corneal grafting should be given to young people with keratoconus or other corneal dystrophies, and to bilaterally blind patients.

OTHER CAUSES OF BLINDNESS

Background: The other major causes of blindness not discussed in the previous sections are:

(a) leprosy;
(b) diseases of the retina;
(c) optic atrophy;
(d) uveitis;
(e) trauma.

Strategies:

1. Identification of the important diseases which cause blindness in any area.

2. Development of a preventive/curative strategy to control these diseases.

3. Provision of service delivery through existing health and eye care services.

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