



# BLINDNESS AND VISUAL IMPAIRMENT

## THINK

Blindness and visual impairment is a disability suffered by millions of people around the world. The great tragedy is that most blindness and visual impairment is avoidable, preventable or treatable.

Every individual who is working to eliminate avoidable blindness and visual impairment is a part of a remarkable global team. Together we will work towards eliminating avoidable blindness and visual impairment by the year 2020.

## AIM

This unit introduces you to the leading causes of blindness and visual impairment, and discusses treatment and prevention strategies.

## LEARNING OUTCOMES

When you have worked through this unit you should be able to:

- define blindness, visual impairment and low vision
- describe the major causes of avoidable blindness and visual impairment
- list the barriers to prevention and treatment of blindness or visual impairment
- explain the cost of avoidable blindness and the savings that can be made by preventing or treating it
- state the goal of *VISION 2020: The Right to Sight*
- discuss how uncorrected refractive error contributes to avoidable blindness and visual impairment
- explain how vision can be restored to millions of people by correcting their refractive error.

## REVIEW: NEAR REFRACTION FOR PRESBYOPIA

<b>REFRACTIVE ERROR</b>	<ul style="list-style-type: none"> <li>• A person who has a refractive error will need to wear spectacles (glasses) or contact lenses so that they can see clearly and comfortably. This is because their eye is not the correct size and shape.</li> <li>• There are four main types of refractive error: myopia, hyperopia, astigmatism and presbyopia.</li> <li>• A person with a refractive error will have eyes that look normal, but they will not see well.</li> <li>• An eye examination that tests for refractive error is called a refraction.</li> </ul>
<b>VISUAL ACUITY</b>	<ul style="list-style-type: none"> <li>• Visual acuity (VA) is a measure of how clearly a person sees when they are looking directly (straight) at an object.</li> <li>• Common causes of poor VA are: <ul style="list-style-type: none"> <li>– Refractive error (this person needs spectacles to see clearly)</li> <li>– Eye health problem (this person has a health problem with their eyes).</li> </ul> </li> <li>• There are several types of VA measurements: <ul style="list-style-type: none"> <li>→ <b>Unaided VA:</b> VA without the person's spectacles.</li> <li>→ <b>Aided VA:</b> VA with the person's spectacles <ul style="list-style-type: none"> <li>– distance spectacles for distance VA testing</li> <li>– near spectacles for near VA testing.</li> </ul> </li> <li>→ <b>Presenting VA:</b> The person's VA when they arrive to have their eyes examined. This will be the same as: <ul style="list-style-type: none"> <li>– aided VA if they arrive wearing their spectacles</li> <li>– unaided VA if they arrive not wearing their spectacles.</li> </ul> </li> <li>→ <b>Habitual VA:</b> VA that the person usually has. This will be the same as: <ul style="list-style-type: none"> <li>– aided VA if they usually wear their spectacles</li> <li>– unaided VA if they do not usually wear their spectacles.</li> </ul> </li> <li>→ <b>Best corrected VA:</b> The best possible VA that a person can have with spectacle lenses.</li> <li>→ <b>Monocular and binocular VA:</b> Monocular VA is the VA that a person gets when just one eye is used (when the other eye is covered). Binocular VA is the VA that a person gets when both eyes are open and uncovered. Binocular VA is usually better than monocular VA.</li> </ul> </li> <li>• VA must be measured at different distances: distance and near <ul style="list-style-type: none"> <li>→ distance VA is usually measured at 6 m</li> <li>→ near VA is usually measured at 40 cm.</li> </ul> </li> <li>• Distance VA is measured using a distance VA chart <ul style="list-style-type: none"> <li>→ Snellen notation is usually used (a VA measurement of 6/6 means that the person has good vision).</li> </ul> </li> <li>• If the person cannot see the distance VA chart you can: <ul style="list-style-type: none"> <li>→ Reduce the test distance (and change the top number of the Snellen fraction accordingly)</li> <li>→ Ask the person to count your fingers at different distances</li> <li>→ Move your hand in front of the person's face</li> <li>→ Check for light perception or no light perception with pentorch.</li> </ul> </li> <li>• Near VA is measured using a near VA chart (or reading card) <ul style="list-style-type: none"> <li>→ Most near VA charts use N point measurements</li> <li>→ Normal near vision is usually N6.</li> </ul> </li> </ul>

## VISUAL IMPAIRMENT, BLINDNESS AND LOW VISION

The definitions of visual impairment, blindness and low vision are regularly reviewed and changed. Future definitions may include linking functional status to visual acuity (VA).

As at August 2008, the following definitions were recommended by the International Agency for the Prevention of Blindness Refractive Error Program Committee (REPCoM) based on World Health Organization (WHO) policy, published evidence, and REPCoM consensus:

**Table 28.1:** Blindness and visual impairment for distance.



Definition	Presenting VA in better eye worse than	Presenting VA in better eye equal to or better than
No visual impairment	–	6/18
Visual impairment for adults	6/18	–
Visual impairment for children	6/12	–
Moderate visual impairment	6/18	6/60
Severe visual impairment	6/60	3/60
Blind	3/60	–

**Table 28.2:** Blindness and visual impairment for near.

Definition	Presenting VA in better eye worse than	Presenting VA in better eye equal to or better than
No visual impairment	–	N8
Visual impairment	N8	–
Blind	N64	–

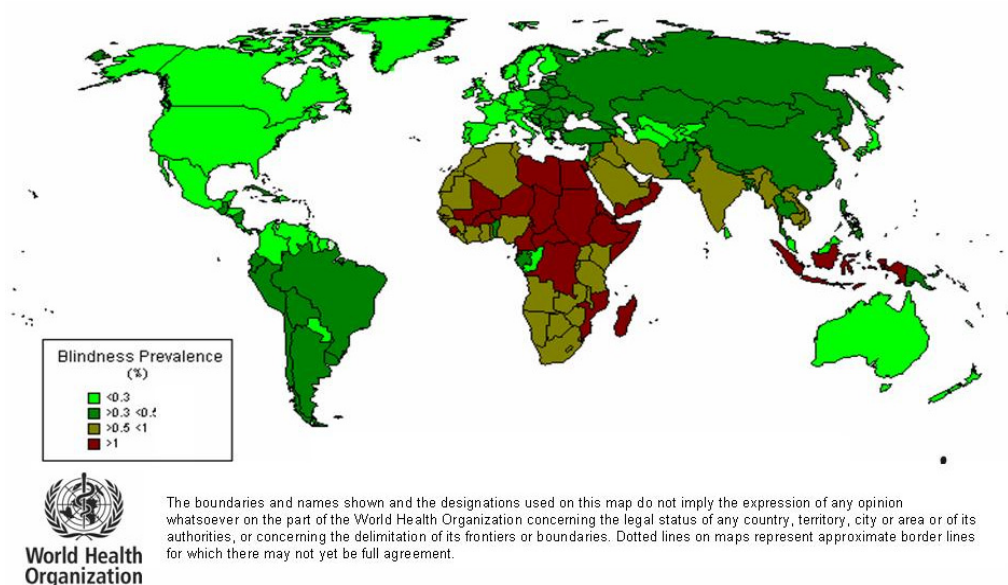
**Table 28.3:** Low vision.

Definition	Best corrected VA in better eye worse than	Presenting VA in better eye equal to or better than
Low vision	6/18 or binocular visual field less than 10° from fixation	Light perception

<b>VISUAL IMPAIRMENT</b>	<p>Visual impairment describes presenting VA in the better eye (the eye that sees best) that is:</p> <ul style="list-style-type: none"> <li>– for distance vision → worse than 6/18 (or for children, worse than 6/12)</li> <li>– for near vision → worse than N8.</li> </ul>  <p>Visual impairment is sometimes referred to as “vision impairment”. The WHO refers to visual impairment. REPCoM refers to vision impairment.</p>
<b>BLINDNESS</b>	<p>Blindness describes presenting VA in the better eye that is:</p> <ul style="list-style-type: none"> <li>– for distance vision → worse than 3/60</li> <li>– for near vision → worse than N64</li> </ul>  <p>Blindness does not always mean that the person sees nothing. Some blind people only see darkness, but others can see large shapes or can tell the difference between light and dark.</p>
<b>LOW VISION</b>	<p>Low vision describes best corrected VA in the better eye that is worse than 6/18 for distance or which has a binocular visual field less than 10° from fixation, but better than light perception. This means that a person with low vision either:</p> <ul style="list-style-type: none"> <li>• cannot see the 6/18 line on a VA chart even when they are wearing spectacles to correct their refractive error, or</li> <li>• have a binocular visual field that is constricted to less than 10° from their fixation point.</li> </ul> <p>People with low vision can be prescribed low vision devices, such as magnifiers, to help them see better.</p>

## BLINDNESS AND VISUAL IMPAIRMENT FACTS

- The WHO estimates that 314 million people globally have visual impairment for distance:
  - including 45 million people who are blind
  - including 1.4 million children (younger than 15 years old) who are blind
  - including 124 million people who have low vision.
- Most blindness is avoidable
  - At least 75% of adult blindness can be prevented or treated
  - Approximately 50% of childhood blindness can be prevented or treated.
- More than 90% of all visually impaired people live in developing countries.
- Most visually impaired people are aged 50 years and over.
- Most blind people are women.
- More than 161 million people are visually impaired due to eye diseases, such as cataracts, glaucoma and macular degeneration:
  - including 37 million people who are blind from eye disease
  - including 124 million people who have low vision.
- 153 million people have significant distance visual impairment due to uncorrected refractive error (because they do not have spectacles)
  - including 8 million people who are blind from uncorrected refractive error.
- In 2005, 1.04 billion people were estimated to have visual impairment for near due to uncorrected refractive error (presbyopia) and 517 million of these people were without adequate near spectacles or had no spectacles at all.
- Compared to the other major causes of visual impairment, refractive error develops at a younger age
  - If left uncorrected, refractive error is responsible for significantly more blind years than most other causes.
- The number of blind people worldwide is expected to increase to 76 million by 2020 if no action is taken.



**Figure 28.1:** Prevalence of global blindness map. (Source: WHO)

## CAUSES OF BLINDNESS AND VISUAL IMPAIRMENT

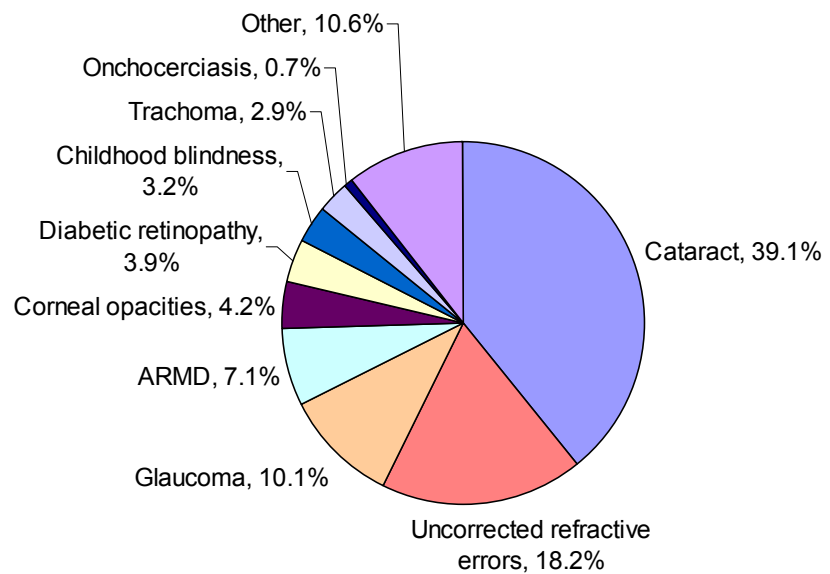
Globally, the most common causes of blindness are:

<b>CATARACTS</b>	<ul style="list-style-type: none"> <li>→ Cataracts form in the eye's crystalline lens causing it to become opaque (cloudy).</li> <li>→ In developing countries cataracts are the leading cause of blindness.</li> <li>→ Cataracts can be removed by cataract surgery – a relatively simple eye operation.</li> </ul>
<b>UNCORRECTED REFRACTIVE ERROR</b>	<ul style="list-style-type: none"> <li>→ Refractive error includes hyperopia, myopia, astigmatism and presbyopia.</li> <li>→ Uncorrected refractive error is the second most common cause of blindness, and the leading cause of visual impairment.</li> <li>→ Uncorrected refractive error is the easiest cause of blindness to manage and treat: an eye examination and a pair of spectacles are all that is required.</li> </ul>
<b>GLAUCOMA</b>	<ul style="list-style-type: none"> <li>→ Glaucoma is a disease of the optic nerve.</li> <li>→ In its early stages glaucoma is usually asymptomatic (the person has no symptoms), but if it is left untreated this condition results in irreversible (permanent) blindness.</li> <li>→ Glaucoma can be detected by a routine eye examination which includes examination of the optic nerve head and measurement of intraocular pressures.</li> </ul>
<b>AGE-RELATED MACULAR DEGENERATION (ARMD)</b>	<ul style="list-style-type: none"> <li>→ ARMD is a degenerative condition of the macula (central part of the retina).</li> <li>→ It is most common in people aged 50 years and over.</li> <li>→ ARMD is the most common cause of blindness in developed countries.</li> <li>→ ARMD permanently affects central vision, but peripheral vision is not affected.</li> </ul>
<b>CORNEAL OPACITY</b>	<ul style="list-style-type: none"> <li>→ A corneal opacity (a clouding of the cornea) occurs when the cornea is scarred by an eye disease or trauma.</li> <li>→ Treatment options are limited, but sometimes surgery can help.</li> </ul>
<b>DIABETIC RETINOPATHY</b>	<ul style="list-style-type: none"> <li>→ Diabetic retinopathy is a complication of diabetes mellitus.</li> <li>→ 15 years after diagnosis: <ul style="list-style-type: none"> <li>– 15% of diabetic people have severe vision loss</li> <li>– 2% of diabetic people become blind.</li> </ul> </li> <li>→ Diabetic retinopathy is characterised by bleeding and ischemia (not enough oxygen) of the retina.</li> <li>→ In its early stages diabetic retinopathy is usually asymptomatic (the person has no symptoms), but if it is left untreated this condition results in irreversible (permanent) blindness.</li> <li>→ People with diabetes should have regular eye examinations because detection and prompt treatment (usually laser photocoagulation) can reduce the risk of vision loss by 90%.</li> </ul>
<b>TRACHOMA</b>	<ul style="list-style-type: none"> <li>→ Trachoma is the most common cause of infectious blindness – it is caused by a bacteria.</li> <li>→ This condition typically affects poor communities who have poor sanitation, limited access to clean water, and poor health services.</li> </ul>

## CAUSES OF BLINDNESS AND VISUAL IMPAIRMENT (cont.)

### ONCHOCERCIASIS

- Onchocerciasis (also called river blindness) is caused by a parasitic worm that enters the body and causes a strong immune system response.
  - This can result in a variety of health problems, including eye disease and blindness.
- The diagram below shows the different eye conditions that cause blindness and visual impairment in the world today. Note that only visual impairment for distance from uncorrected refractive error is shown (presbyopia is not included here).



**Figure 28.2:** Global causes of blindness (not including near refractive error) as a percentage of total blindness, 2004. (reproduced from Resnikoff et al)<sup>1</sup>

<sup>1</sup> Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. *Bulletin of the World Health Organization*. 2008;86(1):63–70.



## CHILDHOOD BLINDNESS

The main causes of blindness in children are not the same as in adults. Childhood blindness in developing countries is often caused by preventable conditions. Management of childhood blindness must include the participation of children's families and their communities.

- The WHO estimates that 1.4 million children (aged 15 years or younger) are blind, including:
  - 1 million children in Asia
  - 300,000 children in Africa.
- Half a million children become blind each year – that is nearly one child per minute.
- Most blind children are either born blind or become blind before the age of 5 years.
- The most common causes of childhood blindness are:
  - Corneal opacities – corneal scarring from Vitamin A deficiency, measles or trauma
  - Cataracts – congenital (at birth) or traumatic
  - Glaucoma – congenital (at birth) or traumatic
  - Retinopathy of prematurity – affects some babies who are born prematurely
  - Refractive error – typically in school-age children, but can be congenital (at birth).



**Figure 28.3:** Corneal scarring following trauma

- 40% of the causes of childhood blindness are treatable or preventable.
- Corneal opacities caused by Vitamin A deficiency and measles are the most preventable cause of childhood blindness.
- Uncorrected refractive error is the easiest cause of childhood blindness to treat – an eye examination and a pair of spectacles are all that is required. However, child compliance with spectacle wear can be low.
  - Common causes for poor compliance include:
    - Uncomfortable spectacle frames
    - Poor vision or asthenopia (headaches or eye strain) when wearing spectacles
    - Need for spectacles not understood
    - Poor cosmesis (dislike the way the spectacles look)
    - Social pressure (teasing from other children).
  - Compliance can be significantly improved with parental support and community education.

## CHILDHOOD BLINDNESS (cont.)

- Amblyopia is a common cause of childhood monocular (one eye) visual impairment:
  - Amblyopia occurs when a child's eye does not receive a clear visual image and as a result the visual pathways to the brain fail to develop.
  - Uncorrected refractive error and cataracts are the main causes of amblyopia
    - these conditions can usually be treated with spectacles or surgery.
  - Amblyopia can only be treated in children; adults with amblyopia have permanent visual impairment.
  - Monocular visual impairment is more significant for children than for adults because they have a greater number of life years yet to live, and so more chance of developing a problem with their other eye (their “spare” eye).
- Visual impairment affects a child's learning and participation in the classroom and in their community. This restricts their overall education and limits their future employment opportunities.
- Effective treatment of childhood blindness and visual impairment requires more careful monitoring than is required for adult blindness. This is because children are more likely than adults to have:
  - complications following treatment, including amblyopia
  - poor compliance with treatment.
- Elimination of childhood blindness is a challenge because there is often:
  - a lack of awareness among parents and communities about how to prevent eye problems.
  - a lack of awareness that the vision of blind children can often be improved.
  - difficulty accessing eye care including: lack of awareness, distance, cost, fear and limited resources.
  - a shortage of eye care providers who are trained to detect, diagnose and manage eye problems in children.



## BARRIERS TO PREVENTION AND TREATMENT

Even when eye care services are available for people, there are many reasons why they may not be used. These reasons include practical, social, financial and psychological factors.

<b>ACCESSIBILITY AND AVAILABILITY</b>	Eye care services may not be available in an area, or there may not be enough trained eye care providers. If eye care services are too far away, people may not be able to reach them. Problems of accessibility and availability are common in rural or remote areas.
<b>ACCEPTABILITY</b>	Different communities expect and require different eye care services and methods of care. An eye care service must address the needs of the community it is serving.
<b>AFFORDABILITY</b>	Eye care services may cost too much. Costs may include the cost of the: <ul style="list-style-type: none"> <li>- eye examination</li> <li>- treatment (including spectacles)</li> <li>- travel</li> <li>- lost earnings of the person and their carer.</li> </ul>
<b>AWARENESS</b>	People may not know that their eye problem can be treated, or they may fear treatment. Other people just accept their poor vision as something that is part of life and cannot be changed – this is often especially true for elderly people who may think that their poor vision is a normal consequence of getting old.
<b>GENDER AND AGE</b>	Globally, more women than men are blind, but women get treatment less frequently. The elderly are also more likely to be blind and have difficulty accessing treatment. Reasons for this difference in accessibility may include family demands and gender and age inequalities within some communities.
<b>SOCIO-ECONOMIC CONDITIONS</b>	Many of the causes of avoidable visual impairment are directly related to poverty (including malnutrition, access to clean water and sanitation, education levels and access to health care). Equally, visual impairment also increases the risk of becoming poor.

## COST AND BURDEN OF BLINDNESS AND VISUAL IMPAIRMENT

- Visual impairment is one of the leading causes of disability worldwide, and it affects people:
  - Physically (unable to see or move around)
  - Functionally (unable to work, study or drive)
  - Socially (limits social contact and relationships with others)
  - Psychologically (increases frustration, sadness and isolation).
- In Australia, visual impairment has been shown to:
  - double the risk of falls (2X)
  - triple the risk of depression (3X)
  - increase the risk of hip fractures by 4X to 8X
  - more than double the risk of death.
- The cost of global blindness and low vision was estimated at US\$42 billion in 2000. Unless the prevalence of blindness and low vision is reduced, the total annual cost is projected to increase to US\$110 billion by 2020.
- The cost of eliminating avoidable blindness and vision impairment in the world is significantly less than the cost to communities and countries if it is not eliminated.
  - For every US\$1 that is invested in eye care or prevention of vision loss, there is a US\$5 return to the community.
- Many eye care interventions are simple and cost-effective. Developed countries and developing countries alike cannot afford avoidable vision loss.

## VISION 2020: THE RIGHT TO SIGHT

- The *VISION 2020* goal:



**VISION 2020 aims to eliminate the main causes of avoidable blindness by the year 2020 – to give all people in the world the right to sight.**

- VISION 2020* was jointly established in 1999 by the World Health Organization (WHO) and the International Agency for the Prevention of Blindness.
- VISION 2020* aims to:
  - provide technical support and advocacy to blindness prevention activities globally
  - work with Ministries of Health in governments, professional associations, national and international non-government organisations and civil society groups to create and introduce new eye care programs in all countries.
- VISION 2020* is based on three core strategies, namely:
  - disease control
  - human resource development (training and motivation)
  - infrastructure development (facilities, technology, consumables, funds).



**Figure 28.4:** The *VISION 2020* Concept (Source: *VISION 2020*)

- The guiding principles of *VISION 2020* are:
  - Integrated into existing health care systems
  - Sustainable in terms of money and other resources
  - Equitable care and services available to all, not just the wealthy
  - Excellence – a high standard of care throughout.

These can be summarised by: “ISEE”.

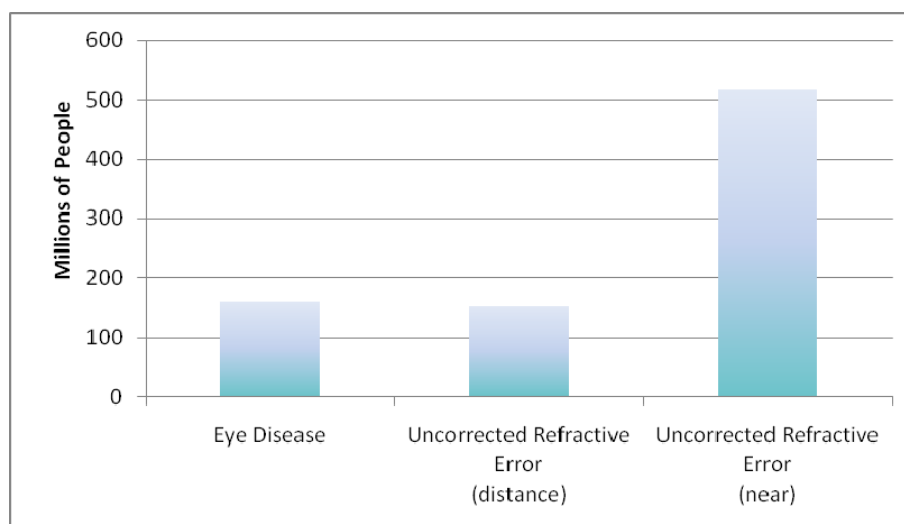
- Currently 45 million people in the world are blind. Without major intervention, the number of blind people is projected to increase to 76 million by the year 2020.
  - If the *VISION 2020* initiative is successful in eliminating the causes of avoidable blindness by the year 2020, the number of blind people will be limited to 24 million.

## VISION 2020: THE RIGHT TO SIGHT (cont.)

<b>VISION 2020 PRIORITIES</b>	<ul style="list-style-type: none"> <li>• Cataract</li> <li>• Refractive errors</li> <li>• Low vision</li> <li>• Trachoma</li> <li>• Childhood blindness</li> <li>• Onchocerciasis</li> <li>• Glaucoma</li> <li>• Diabetic retinopathy</li> <li>• Age-related macular degeneration</li> </ul>
<b>VISION 2020 FOCUS AREAS</b>	<ul style="list-style-type: none"> <li>• <b>Increasing awareness of blindness as a major public health issue</b> <ul style="list-style-type: none"> <li>- Governments, communities and individuals must be made aware of blindness as a major public health issue.</li> <li>- Education on how to prevent and treat many of the causes of blindness.</li> <li>- Supporting blindness prevention activities.</li> </ul> </li> <li>• <b>Creating an infrastructure to manage the problem</b> <ul style="list-style-type: none"> <li>- Ensuring availability of eye care facilities and services, particularly in underprivileged areas.</li> <li>- Appropriate technology development for surgical and eye examination equipment, local production of eye medicines, spectacles and low vision devices.</li> </ul> </li> <li>• <b>Training eye care personnel to provide appropriate eye care</b> <ul style="list-style-type: none"> <li>- Improving quality of training for eye care professionals.</li> <li>- Performing school screening and working with the community.</li> <li>- Providing referrals for people needing eye care.</li> <li>- Training to identify and manage common eye conditions.</li> <li>- Performing refractions and prescribing low vision aids.</li> <li>- Special training for the management of childhood blindness.</li> </ul> </li> <li>• <b>Implementing specific programs to control the major causes of blindness</b>  <b>Example:</b> <ul style="list-style-type: none"> <li>- Vitamin A global initiative → aiming to eliminate Vitamin A deficiency by the year 2010.</li> <li>- Measles Initiative → aiming to decrease deaths caused by measles by the year 2010.</li> </ul> </li> </ul>

## REFRACTIVE ERROR

- The WHO has only recently recognised uncorrected refractive error as a major cause of blindness and visual impairment. This is because the traditional definition of blindness was based on best corrected VA instead of presenting VA.
- On World Sight Day in 2006, the WHO revealed its updated estimates of blindness and visual impairment:
  - An estimated 153 million people are visually impaired (presenting VA  $<6/18$  in the better eye) as a result of uncorrected refractive error at distance
    - of which at least 8 million are blind (presenting VA  $<3/60$  in the better eye).
  - Around 45 million working age adults and 13 million children globally are affected by uncorrected refractive error
    - 90% of these people live in low or middle income countries.
- These WHO figures do not include visual impairment that is a result of uncorrected presbyopia, which is estimated to affect 517 million people over the age of 45.
- We know now that uncorrected or under-corrected refractive error:
  - is a major cause of blindness and the leading cause of visual impairment in the world
  - affects people of both sexes, as well as all age and ethnic groups
  - may result in lost education and employment opportunities, lower productivity and impaired quality of life for otherwise healthy people
  - requires simple and very cost-effective treatment – in most cases an eye examination and an appropriate pair of spectacles can provide an immediate solution to the problem
  - is the most treatable of all causes of visual impairment.
- It is a great tragedy then, that millions of people, especially in the developing world, are visually impaired simply because they do not have access to basic eye care services and affordable spectacles.



**Figure 28.5:** Number of people affected globally by blindness and visual impairment as a result of eye disease and uncorrected refractive error

## ELIMINATION OF REFRACTIVE ERROR VISUAL IMPAIRMENT

- Providing an appropriate pair of spectacles to those in need would decrease global blindness by approximately 25% and decrease visual impairment by approximately 50%.
- The elimination of uncorrected refractive error requires:
  - trained eye care personnel to provide refractive error services
  - infrastructure (a refraction clinic containing eye examination and dispensing equipment)
  - supply of quality affordable spectacles
  - advocacy (a well-informed community and government support).

**Trained eye care personnel + Infrastructure + Affordable spectacles + Advocacy  
= PEOPLE WHO CAN SEE**

<p><b>TRAINED EYE CARE PERSONNEL</b></p>	<p>Elimination of refractive error requires people who are trained to do refraction eye examinations and dispense spectacles.</p> <p>Most eye care providers live and work in developed countries – not many provide eye care services in the developing world. Eye care personnel are also typically concentrated in urban areas.</p> <div data-bbox="459 920 619 1059"> </div> <p>Countries should aim to have at least one refractionist for every 100,000 people by 2010, and then increase the number of refractionists to one for every 50,000 people by 2020.</p> <p>Both mid- and low-level cadres of eye care personnel are required for refractive error services. Eye care providers should be trained to provide one or more of the following services:</p> <ul style="list-style-type: none"> <li>• Screening for refractive error visual impairment</li> <li>• Best vision sphere refraction</li> <li>• Sphero-cylindrical refraction (for astigmatism)</li> <li>• Prescribing, dispensing and distributing spectacles</li> <li>• Recognition of potentially blinding eye disease</li> <li>• Referral of people for further treatment where necessary</li> <li>• Visual health promotion.</li> </ul> <div data-bbox="459 1442 619 1599"> </div> <p>Appropriately trained mid-level personnel can diagnose and manage uncorrected refractive error.</p> <p>This means that eye care personnel who are trained to correct refractive error can meet 70% or more of the overall eye care needs of a community.</p> <p>An eye care provider who has been trained to do refractions only must also know when to refer people who require further examination or treatment. If the person has an eye health problem this should be managed before spectacles are prescribed.</p> <p>Where possible, eye care providers should receive continuing education (“refresher courses”) to maintain their knowledge and learn about new techniques, equipment and eye care procedures.</p>
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## ELIMINATION OF REFRACTIVE ERROR VISUAL IMPAIRMENT (cont.)

### EYE CARE INFRASTRUCTURE

In order to provide quality refraction services, eye care providers need:

- a clinic or centre that is suitable for eye examinations and allows privacy for patients if required
- access to appropriate refraction and dispensing equipment
- a good spectacle supply
- referral locations (a list of eye care providers who can provide other eye care services if more than a refraction is required)
- standard operating procedures to ensure that the clinic or centre runs efficiently.



Figure 28.6: Measuring visual acuity in a refraction clinic

### SPECTACLE SUPPLY

The elimination of refractive error visual impairment requires access to new, affordable and good quality spectacles.

However, in many areas of the world, the spectacles needed for refractive error correction are too expensive or not available at all.

Depending on the situation there are different types of spectacles that can be prescribed:

- Readymade spectacles
- Custom-made spectacles
- Donated recycled spectacles (not recommended).

#### Readymade Spectacles

- Mass produced spectacles
  - Inexpensive (low cost)
  - Variable quality (care must be taken to ensure that only high quality readymade spectacles are dispensed).
- Convenient (after a refraction, the person can receive their spectacles immediately).
- Provide spherical correction (both plus and minus) of the same power in both eyes
  - Give good vision to approximately 75% of people with distance refractive errors, and to most people with presbyopia.
  - Not suitable for people with high refractive errors, significant amounts of anisometropia or astigmatism.

#### Custom-Made Spectacles

- Made in optical workshops staffed by personnel trained to edge and fit lenses into spectacle frames.
- Correct all refractive errors.
- Provide more spectacle correction options
  - Allow people to choose a lens design that best suits their needs (Examples: bifocals, tinted lenses)
  - Provide a greater range of spectacle frame options.
- Facilitate capacity building for sustainable delivery systems
  - can generate money for other refraction services.



## ELIMINATION OF REFRACTIVE ERROR VISUAL IMPAIRMENT (cont.)

### SPECTACLE SUPPLY (cont.)



Figure 28.7: Edging lenses in an optical workshop

#### Donated Recycled Spectacles

- Not cost-effective.
- Difficult to match frames and lenses with people who have specific refractive errors and face shapes.
- Quality control of frames and lenses problematic
  - the majority of donations are unusable.
- Must rely on constant donations from other countries
  - sustainability cannot be achieved.
- The use of donated spectacles is not recommended.



Recycled spectacles can be thought of as being like a set of false teeth: they are made especially for one person, and cannot easily be used for someone else. It is difficult to find a person with a refractive error who needs exactly the same prescription and same frame size.

### ADVOCACY

Health care providers and policy makers frequently under-estimate the impact of uncorrected refractive error in the community. This is why advocacy is so important. People need to be told about the problems associated with uncorrected refractive error and what can be done to manage it.

Advocacy for refractive error should aim to:

- increase awareness of refractive error blindness and visual impairment
- mobilise resources to address the refractive error problem
- increase the quality of eye care services
- promote the VISION 2020 initiative.

People you should talk to include:

- at-risk groups and their communities
- Governmental and health officials
- eye care professionals
- corporations (businesses) in the eye and vision care industry
- international not-for-profit organisations
- donor agencies and donor communities.

Community awareness:

- It is very important to involve local communities and to educate them about eye care.
- Even if eye care services are available, these services may not be used if the community does not appreciate their value.
- Talk with the community leaders, parents, and teachers to find out which visual problems are most important to people.
- Educate the community about the importance of eye and vision care and let them know that many eye and vision problems can be prevented or treated.



## YOU ARE A PART OF THE SOLUTION

- Even though providing appropriate spectacles is one of the simplest and most cost-effective ways to improve vision, many people with uncorrected refractive error are still unnecessarily blind or vision impaired.
- The reasons why many people in need are still living with uncorrected refractive error include:
  - inadequate service delivery → not enough eye care services.
  - inadequate human resources → not enough people trained to examine eyes.
  - limited affordable technology → expensive examination methods.
  - inadequate equipment → equipment not suitable for refraction examination and spectacle dispensing.
  - inadequate infrastructure → clinic or vision centre unavailable or not good enough to perform eye examinations and spectacle dispensing.
  - poor community awareness → people in the community do not know how or when to access eye care services.
- You are part of the global effort to eliminate avoidable blindness and vision impairment.
- You can provide:
  - vision screenings at schools and community centres to detect refractive error and other eye and vision problems
  - refraction services for people with refractive error
  - spectacles which are culturally acceptable, attractive, comfortable and durable
  - referrals for other eye problems that may cause visual impairment or blindness
  - community education about eye and visual health
    - what eye care services are available to the community
    - what these services are for
    - who should use these services
    - how often these services should be used
    - how to prevent eye and vision problems from occurring or getting worse.
- In order to achieve the goals of VISION 2020, individuals around the world are providing refraction services, spectacle correction, and other eye care services. You are one of these individuals and you are part of a global team. Together we will eliminate avoidable blindness and vision impairment by the year 2020.

## SUMMARY: BLINDNESS AND VISUAL IMPAIRMENT

### VISUAL IMPAIRMENT, BLINDNESS AND LOW VISION

- Visual impairment describes presenting visual acuity (VA) in the better eye that is:
  - for distance vision: worse than 6/18
  - for near vision: worse than N8
- Blindness describes presenting VA in the better eye that is:
  - for distance vision: worse than 3/60
  - for near vision: worse than N64
- Low vision describes best corrected VA in the better eye that is:
  - worse than 6/18 for distance (or a binocular visual field that is less than 10° from fixation), but better than light perception.

### BLINDNESS AND VISUAL IMPAIRMENT FACTS

- 314 million people have visual impairment for distance.
- 90% of visually impaired people live in developing countries.
- Most blindness is avoidable
  - 75% of adult blindness is avoidable
  - 50% of childhood blindness is avoidable.
- 153 million people have visual impairment for distance as a result of uncorrected refractive error.
- 517 million people have visual impairment for near as a result of uncorrected refractive error.
- Refractive error develops at a younger age compared with the other major causes of visual impairment – this means that uncorrected refractive error causes significantly more blind person years than most other causes.

### CAUSES OF BLINDNESS AND VISUAL IMPAIRMENT

- Cataracts
- Uncorrected refractive error
- Glaucoma
- Age-related macular degeneration
- Corneal opacity
- Diabetic retinopathy
- Trachoma
- Onchocerciasis

### CHILDHOOD BLINDNESS

- 1.4 million children are blind and 0.5 million more children become blind each year.
- 40% of the causes of childhood blindness are treatable or preventable.
- The most common causes of childhood blindness are:
  - corneal opacities
  - cataracts
  - glaucoma
  - retinopathy of prematurity
  - refractive error.
- Visual impairment affects a child's learning and participation in the classroom and in their community. This restricts education and limits their future employment opportunities.

## SUMMARY: BLINDNESS AND VISUAL IMPAIRMENT (cont.)

### BARRIERS TO PREVENTION AND TREATMENT

- Accessibility and availability
- Acceptability
- Affordability
- Awareness
- Gender and age
- Socio-economic conditions.

### COST AND BURDEN OF BLINDNESS AND VISUAL IMPAIRMENT

- Global cost of blindness was estimated to be US\$42 billion in 2000. Unless action taken this cost will more than double by 2020.
- The cost of eliminating avoidable blindness and visual impairment is less than the cost of no action:
  - for every US\$1 that is invested in eye care there is a US\$5 return.

### VISION 2020: THE RIGHT TO SIGHT

- Goal is to eliminate the main causes of avoidable blindness by the year 2020.
- Joint initiative of World Health Organization and International Agency for the Prevention of Blindness
  - provides technical support and advocacy
  - works multilaterally
  - three core strategies: disease control, human resource development, infrastructure development.

VISION 2020 priorities:

- Cataracts
- Refractive errors
- Low vision
- Trachoma
- Onchocerciasis
- Childhood blindness
- Onchocerciasis
- Glaucoma
- Diabetic retinopathy
- Age-related macular degeneration

### REFRACTIVE ERROR

- Leading cause of visual impairment globally.
- Affects people of both sexes, and all age and ethnic groups.
- Often results in lost education and employment opportunities, lower productivity and impaired quality of life.
- Requires simple and cost-effective treatment: an eye examination and an appropriate pair of spectacles
  - the most treatable of all causes of visual impairment.

## SUMMARY: BLINDNESS AND VISUAL IMPAIRMENT (cont.)

### ELIMINATION OF REFRACTIVE ERROR VISUAL IMPAIRMENT

- Providing spectacles to those in need would reduce:
  - global blindness by 25%
  - global visual impairment by 50%.
- Elimination of uncorrected refractive error requires:
  - trained eye care personnel
  - infrastructure
  - quality affordable spectacles
  - advocacy.

**Trained eye care personnel**  
 +  
**Infrastructure**  
 +  
**Affordable spectacles**  
 +  
**Advocacy**  
 =  
**PEOPLE WHO CAN SEE**

#### Trained eye care personnel:

- Countries should aim to have:
  - 1 refractionist for every 100,000 people by 2010
  - 1 refractionist for every 50,000 people by 2020.
- Eye care providers should be trained to provide one or more of these services:
  - vision screening
  - best vision sphere refraction
  - sphero-cylindrical refraction
  - prescribing, dispensing and distributing spectacles
  - recognition of potentially blinding eye disease
  - referral of people for further treatment as necessary
  - visual health promotion.
- Eye care personnel who are trained to correct refractive error can meet more than 70% of a community's eye care needs.

#### Eye care infrastructure:

- Required infrastructure includes:
  - a clinic or centre for eye examinations
  - refraction and dispensing equipment
  - good spectacle supply
  - referral locations
  - standard operating procedures.

#### Spectacle supply:

- Recommended spectacle types:
  - readymade spectacles
  - custom-made spectacles.
- Not recommended:
  - donated recycled spectacles.

## SUMMARY: BLINDNESS AND VISUAL IMPAIRMENT (cont.)

### ELIMINATION OF REFRACTIVE ERROR VISUAL IMPAIRMENT (cont.)

#### Advocacy:

- Advocacy should aim to:
  - increase awareness of refractive error blindness and visual impairment
  - mobilise resources
  - increase the quality of eye care services
  - promote the VISION 2020 initiative.
- People you should talk to include:
  - at-risk groups and their communities
  - Governmental and health officials
  - eye care professionals
  - eye care corporations and industry
  - international not-for-profit organisations
  - donors.

### YOU ARE PART OF THE SOLUTION

- In order to achieve the goals of VISION 2020, individuals around the world are providing refraction services, spectacle correction, and other eye care services.
- You are one of these individuals and you are part of a global team.

## TEST YOURSELF QUESTIONS

1. Define blindness and visual impairment.

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2. a) What is the leading cause of visual impairment in the world?

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b) How many people are estimated to be affected by this condition (for distance and near)?

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3. List the barriers that may prevent people from receiving treatment for an eye or vision problem.

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4. What is the goal of *VISION 2020*?

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5. What are the main *VISION 2020* priorities?

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6. Briefly explain what is required to eliminate blindness and visual impairment as a result of uncorrected refractive error.

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## NOTES