Overview

- Magnitude
- Challenges
- Trends
Blindness and Visual Impairment & Refractive Error: WHO Definitions

FROM EYE DISEASE

- 37 million blind with less than 3/60 in the better eye
- 124 million have treatable or untreatable low vision

A Total of 161 million people

FROM REFRACTIVE ERROR

- 153 million people – including 5 million blind from RE
- A further 39 million children with vision less than 6/12 in the better eye
- A further 150 million (at least) who have significant near visual impairment due to presbyopia

Over 300 million people
Refractive Errors

25% myopic \( (1.6 \text{ billion}) \)
24% presbyopic \( (1.5 \text{ billion}) \)
11% other
\( \text{(significant hyperopia, astigmatism, etc)} \)

\[ = \]

60% of the World’s population

\[ = \]

3.8 billion people
Helping people **SEE** better

Low vision & refractive services change people’s lives.
Join us in marking World Sight Day.
Sight test and glasses could dramatically improve the lives of 150 million people with poor vision
WHO releases new global estimates to mark World Sight Day

11 OCTOBER 2006 | GENEVA -- A simple sight test and eyeglasses or contact lenses could make a dramatic difference to the lives of more than 150 million people who are suffering from poor vision. Children fail at school, adults are unable to work and families are pushed into poverty as a result of uncorrected visual impairment.

To mark World Sight Day, 12 October 2006, the World Health Organization (WHO) has released new global estimates which, for the first time, reveal that 153 million people around the world have uncorrected refractive errors (more commonly known as near-sightedness, far-sightedness and astigmatism). Refractive errors can be easily diagnosed, measured and corrected with eyeglasses or contact lenses, yet millions of people in low and middle income countries do not have access to these basic services.

Without appropriate optical correction, millions of children are losing educational opportunities and adults are excluded from productive working lives, with severe economic and social consequences. Individuals and families are frequently pushed into a cycle of deepening poverty because of their inability to see well. At least 13 million children (ages 5 to 15) and 45 million working-age adults (ages 16 to 49) are affected globally. Fully 90% of all people with uncorrected refractive errors live in low and middle income countries.

“These results reveal the enormity of the problem,” said Dr Catherine Le Gales-Camus, WHO Assistant Director-General, Noncommunicable Diseases and Mental Health. “This common form of visual impairment can no longer be ignored as a target for urgent action.”

WHO previously estimated that 161 million people were visually impaired from eye diseases such as cataract, glaucoma and macular degeneration. Uncorrected refractive errors were not included in these earlier estimates. These latest WHO estimates add to the previous number and effectively double the estimated total number of visually-impaired people worldwide, bringing it to some 314 million people globally. The estimates also confirm that uncorrected refractive errors are a leading cause of visual impairment worldwide.

As part of the VISION 2020 Global Initiative to eliminate avoidable visual impairment and blindness worldwide, WHO has been working with its partners to improve access to affordable eye exams and eyeglasses for people in low and middle income countries. This new information concerning the prevalence of refractive errors will strengthen the efforts of the VISION 2020 partnership to raise awareness of the magnitude of the problem and spur increased commitment for action.

“Correction of refractive errors is a simple and cost-effective intervention in eye care,” said Dr Sergei Resnikoff, Coordinator of WHO’s Chronic Disease Prevention and Management Unit. “Now that we know the extent of the problem of uncorrected refractive errors, especially in low and middle income countries, we must re-double our efforts to ensure that every person who needs help is able to receive it.”

NOTE TO EDITORS

Refractive errors occur when the eye is not able to correctly focus images on the retina. The result is blurred vision, which is sometimes so severe that it creates functional blindness for affected individuals.

The three most common refractive errors are:
WHO Press Release....

“To mark World Sight Day, 12 October 2006, the World Health Organization (WHO) has released new global estimates which, for the first time, reveal that 153 million people around the world have uncorrected refractive errors (more commonly known as near-sightedness, far-sightedness and astigmatism)”.

“Refractive errors can be easily diagnosed, measured and corrected with eyeglasses or contact lenses, yet millions of people in low and middle income countries do not have access to these basic services”. 
Prevalence of Refractive Error in Children (<0.5D to >+2.00D)

* RESC Studies, Ellwein et al, 2000, 2002

USA
(Inner City Children, HKW)
37%
67% Uncorrected

China*
41%
85% Uncorrected

India and Nepal*
3%
88% Uncorrected

Chile*
15%
56% Uncorrected

RE: 56% to 88% Uncorrected
Significant Myopia:
55% girls @ 16yrs
38% boys @ 16yrs
85% No Rx

Refractive Error Study in Children: Results from Shunyi District, China,
Jialiang Zhao, Xiangjun Pan, Ruifang Sui, Sergio Munoz, Robert Sperduto, Leon Ellwein. Amer J, Ophthal, April, 2000, 427 - 435
Service Delivery Gap for Africa

In Africa it is estimated that between 1% and 35% of people are getting the vision care they need.
WHO Press Release....

11 OCTOBER 2006  GENEVA –
“A simple sight test and eyeglasses or contact lenses could make a dramatic difference to the lives of more than 150 million people who are suffering from poor vision. **Children fail at school, adults are unable to work and families are pushed into poverty as a result of uncorrected visual impairment.**”

**Severe economic and social consequences**
Barriers

- Access
- Affordability
- Lack of trained eye care personnel
- Lack of awareness
- Cultural barriers
Refractive Error
Issues in Latin America
Latin America Issues

- All countries in the region have at least ophthalmologists and opticians (unique exception Trinidad & Tobago)
- Only 37% of the countries have optometry as a profession at different academic levels.
- Even in all the countries where optometry exists as a profession, local authorities sometimes do not give it recognition.
<table>
<thead>
<tr>
<th>Country</th>
<th>Nº Optometrists</th>
<th>Nº Opticians</th>
<th>Nº Ophthalmologists</th>
<th>Population (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>No recognition</td>
<td>2000</td>
<td>3400</td>
<td>40’</td>
</tr>
<tr>
<td>Bolivia</td>
<td>Do not exist</td>
<td>180</td>
<td>120</td>
<td>10’</td>
</tr>
<tr>
<td>Brazil</td>
<td>No recognition</td>
<td>3500</td>
<td>11350</td>
<td>188’</td>
</tr>
<tr>
<td>Colombia</td>
<td>3700</td>
<td>-</td>
<td>1200</td>
<td>47’</td>
</tr>
<tr>
<td>Ecuador</td>
<td>565</td>
<td>215</td>
<td>340</td>
<td>17’</td>
</tr>
<tr>
<td>Perú</td>
<td>650</td>
<td>250</td>
<td>850</td>
<td>28’</td>
</tr>
<tr>
<td>Uruguay</td>
<td>Do not exist</td>
<td>380</td>
<td>250</td>
<td>3.5’</td>
</tr>
</tbody>
</table>
Refractive errors in Africa

The Main challenges

- Data on Refractive Errors still very limited
- Human Resources largely inadequate and opportunities and places to train more remain limited
- Infrastructure to support and sustain refractive service still in its infancy in many countries and still poorly distributed
- Access to technology and spectacles remain limited, especially to the poor and needy.
Comparing the Cost Effectiveness of SES vs. PEC model to provide refractive error services in India

This study talks about School Eye Screening is more cost effective than Primary Eye Care model.

SES:
The cost to examine a child: $0.64
The cost to examine a child and dispense a spectacle: $12.13

PEC:
The cost to examine a child: $3.10
The cost to examine a child and dispense a spectacle: $25.58

For the details of this study please contact: lester_bj@hotmail.com  Barry A Lester

This study is done in India and a very recent study.
South Africa - National Refractive Error Program
The Challenge

- South Africa is in the unique position of technically having enough optometrists to meet the needs of the population; however there are enormous inequities in the provision of health care services throughout the country.

- The Department of Health estimates that 85 percent of the population relies on public health care, yet only 2% of optometrists are employed in the public sector - effectively leaving 25 optometrists to meet the needs of 38 million people.
South Africa

- Estimates are that at least 10 percent of those South Africans ages 15 to 42 have some refractive error, with the elderly, women and children disproportionately affected.

- A recent Refractive Error Study in school going children, 5 to 15 years of age, revealed that of those children requiring glasses, only 20 percent had them. The remaining 80 percent will struggle with learning and have reduced opportunities for the future as a result of poor vision.

- In addition, data indicates that women in South Africa bear a much higher burden of blindness - up to 40 percent higher - often due to cultural and economic reasons.
Key Challenges in dealing with refractive error

- Lack of Data for planning
- Poor Practitioner to Patient Ratio
- Uneven distribution of personnel
- Poorly Trained Personnel
- Availability of Equipment
- Availability of Spectacles
- Funding
Key Challenges in dealing with refractive error

- Data
- Human resources
- Infrastructure
- Financing
Difficulties with Current Data

- Lack of evidence about availability of RE services in the community versus base hospital
- Non-uniform definitions across studies
- Non-representative study populations (convenience rather than population-based)
- Dissimilar demographics of study population (age and sex)
- Different Refraction procedures used in different studies (with/without cycloplegia etc)
Human resources

- Inadequate HR for screening
  - High inadequacy at the community level

- Training more optometrists/refractionists urgently needed

- Inadequate and differing standards of certification
INFRASTRUCTURE

- Vision Centres
  - Eye care clinics, stand alone or in Community Health Centre
- “Optishop”
  - Optical workshop & dispensing unit
- Optometry/Refractionist training
- Outcomes research
COST to Correct URE (spectacles)

300 million PEOPLE @
US$3 per person

= $1 billion (Approx.)

($1 billion set up and running costs for first 3 years and then Self-sustaining)
Australia: Access Economics
(CERA and Vision CRC, 2005)

- The Cost of Vision Disorders is
  A$9.85 billion per year ...
  ($500 per person in direct and indirect costs)

Frick and Foster, April 2003:

- “US$102 billion can be saved, and 100 million people
  prevented from going blind, over the next 20 years through
  the successful implementation ..... VISION 2020:The Right to
  Sight “
The ICEE Solution

Trained Eyecare Personnel + Affordable Glasses = People Who Can See

- Identify regional need
- Develop relationships with existing NGOs and ECPs
- Develop a model for eyecare services with local community participation
- Review and improve the model with local input
SOUTH AFRICA – CASE STUDY

From Outreach to Sustainability
Optometry team

Optometrist
- Trial case
- Ophthalmoscope and retinoscope
- Autorefractor (from 2002)

Admin/Dispensing assistant
- Paperwork
- Manage readymade stock
- Assist with frame selection

Volunteers
Optometry service

- Minimal pre-screening of patients

  - Twin objectives
    - Screen for pathology
    - Refract and prescribe

  - ALL patients where screened before eye examinations where conducted
    - Very rudimentary screening to identify patients with mature cataracts etc needing referral
Spectacle Provision

**Ready mades**
- Least cost
- Immediately available
- Mainly readers

Made to order
- Cost more
- Single vision and bifocal
- Tints optional
Challenges

- **Weather dependent**
  - No flights in bad weather

- **Language barrier**
  - Translators required

- **Physical space**
  - Most hospitals were formerly Mission Hospitals
  - Hospitals had limited space
  - Improved as hospital infrastructure was upgraded

- **Huge Demand**
  - Limited time per patient
What do we need to do

Countries should move away from disjointed RE activities

More urgently needed: coherent and effective "system" to deliver refractive services to the community at large.

Such a system could include:
- policies for training, recruitment and deployment of staff throughout the country
- a sustainable system for the procurement and distribution of affordable spectacles
- targeting high priority groups, e.g., school children, "professional presbyopes (nurses, teachers, industry workers etc)
SRILANKA MODEL OF REFRACTIVE ERROR SERVICES THROUGH VOLUNTEERS
Personal Demographics

Where did our volunteers come from?

Map of Australia with percentages of volunteers from different states and territories:
- Western Australia: 6.5%
- Northern Territory: 3.2%
- South Australia: 0%
- New South Wales: 19.4%
- Victoria: 38.7%
- Tasmania: 3.2%
- ACT: 6.5%
- International Volunteers: 3.2%
HELPING PEOPLE TO IMPROVE
QUALITY OF LIFE
GLOBAL INITIATIVE
REALLY A NEED

La Oroya 2000

La Campiña 2001

Ayacucho 2001

Nazca 2004
Thank You
What can be done?
INDIA: Causes of Impaired Vision
(6/18 or less)

- Myopia: 46.4%
- Hyperopia: 11.6%
- Aphakia: 0.8%
- Pseudophakia: 0.6%
- Other: 43.6%

Refractive Error - 56.4%

Dandona et al, Jan 1998, LVPEI
Sri Lanka

33,107 people seen

*86% needed refractive error correction*

28,103 glasses dispensed

*75% had never had an eye exam before*

*17% needed high Rx*

6% referrals
PAKISTAN-Results: refractive errors as a cause of visual loss

- **Blindness prevalence (<3/60 p. VA better eye):**
  - Prevalence = 3.4% (3.1-3.7%)

- **Blindness causes:**
  - Cataract = 51.5%
  - Refractive errors = 2.7% (30,780)

- **Mild + severe visual impairment prevalence (<6/18 – 3/60 p. VA better eye):**
  - Prevalence = 14.3% (13.8 to 14.9%)

- **Mild + severe visual impairment causes:**
  - Refractive errors = 39% (2,141,000)

**TOTAL VI due to refractive errors** = >2,000,000
## Magnitude by Province
(from age/sex standardised prevalence)

<table>
<thead>
<tr>
<th>Province</th>
<th>Myopia (all)</th>
<th>Hypermet. (all)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punjab</td>
<td>9,310,000</td>
<td>7,370,000</td>
<td>16,680,000</td>
</tr>
<tr>
<td>Sindh</td>
<td>3,415,000</td>
<td>2,045,000</td>
<td>5,460,000</td>
</tr>
<tr>
<td>NWFP</td>
<td>1,670,000</td>
<td>1,380,000</td>
<td>3,050,000</td>
</tr>
<tr>
<td>Balochistan</td>
<td>530,000</td>
<td>630,000</td>
<td>1,160,000</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>14,925,000</strong></td>
<td><strong>11,425,000</strong></td>
<td><strong>26,350,000</strong></td>
</tr>
</tbody>
</table>

- **Myopia** *(more than -0.5D)*  Total = 8,150,000
- **Myopia** *(more than -5.0D)* Total = 1,000,000

* after excluding those with significant lens opacities: 5,775,000
## Overview of Studies

<table>
<thead>
<tr>
<th>Author / Year</th>
<th>Country</th>
<th>Sample size</th>
<th>Study population</th>
<th>Definition</th>
<th>Prevalence of RE(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wong 2000</strong></td>
<td>Singapore</td>
<td>1232</td>
<td>Adult Chinese in Singapore aged 40 - 79 years</td>
<td>(\geq 0.50) D Myopia</td>
<td>38.7</td>
</tr>
<tr>
<td><strong>Wu 2001</strong></td>
<td>Singapore</td>
<td>15095</td>
<td>Militray conscripts 16 - 25 years</td>
<td>(\geq 0.50) D</td>
<td>Chinese 82.3 Indians 68.7 Malays 65.0</td>
</tr>
<tr>
<td><strong>Saw SM 2005</strong></td>
<td>Malaysia</td>
<td>1792</td>
<td>7 - 9 yr old Malay, Chinese, Indian</td>
<td>Myopia (\geq 0.50)</td>
<td>Malays - 22.1 Chinese - 30.9 Indians - 12.5</td>
</tr>
<tr>
<td></td>
<td>Singapore</td>
<td>1962</td>
<td>7 - 9 yr old Malay, Chinese, Indian</td>
<td>Myopia (\geq 0.50)</td>
<td>Malays - 47.7 Chinese - 38.4 Indians - 34.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Author / Year</th>
<th>Country</th>
<th>Sample size</th>
<th>Study population</th>
<th>Definition</th>
<th>Prevalence of RE(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Woo 2004</strong></td>
<td>Singapore</td>
<td>157</td>
<td>Second year medical students (19-23 yrs of age)</td>
<td>Myopia (\geq 0.50) Hyperopia (\geq 0.50) Astigmatism</td>
<td>Myopia - 89.8 Hyperopia - 1.3 Astigmatism 82.2</td>
</tr>
<tr>
<td><strong>Quek 2004</strong></td>
<td>Singapore</td>
<td>946</td>
<td>Grade 9 &amp; 10 students (15-19 yrs of age)</td>
<td>Myopia (\geq 0.50) Hyperopia (\geq 0.50)</td>
<td>Myopia 73.9 Hyperopia 1.5 Astigmatism 58.7</td>
</tr>
<tr>
<td><strong>Saw SM 2002</strong></td>
<td>Riau Province, Sumatra, Indonesia</td>
<td>1043</td>
<td>21 yrs and older</td>
<td>Myopia (\geq 1.0) Hyperopia (\geq 1.0) Astigmatism (\geq 1.0)</td>
<td>Myopia 26.1 Hyperopia 18.5 Astigmatism 15.1</td>
</tr>
</tbody>
</table>
A nationally representative sample of 12 782 adults 30 years of age and older
- 6412 (57.3%) were emmetropic
- 2469 (22.1%) were myopic (<-0.5 D)
- 2308 (20.6%) were hypermetropic (+0.5 D)
- 216 subjects (1.8%) were high myopic (<-5 D)
Adult Chinese population in Singapore, aged 40 to 79 years

- Prevalence of myopia - 38.7%
- Hyperopia - 28.4%
- Astigmatism - 37.8%
- Anisometropia - 15.9%

Prevalence of high myopia was 9.1%
Prevalence survey of 1043 adults >=21 years of age was conducted in five rural villages and one provincial town of the Riau Province, Sumatra, Indonesia.

- Prevalence of myopia (SE >= -1.0 D) - 26.1%
- Hyperopia (SE >= +1.0 D) - 18.5%
- Astigmatism (>= -1.0 Dcyl) - 15.1%
AUSTRALIA
Prof Hugh Taylor, et al

Less than Driving Vision (6<12)
Total 340,500

Legal Blindness (<6/60)
Total 52,800

- Refractive Error: 53%
- AMD: 14%
- Glaucoma: 8%
- Cataract: 17%
- Diabetes: 5%
- Other Retinal: 6%
- Neuro-opthalmic: 23%
- Others: 27%