Global Vision Database & Visualisation

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On behalf of the GBD Vision Loss Expert Group:

Gretchen Stevens
Hugh Taylor
Serge Resnikoff
Richard A White
Seth R Flaxman
Holly Price
Jost Jonas
Jill Keeffe
Janet Leasher
Kovin Naidoo
Konrad Pesudovs
et al (n=79)

Special thanks:
Tejah Balantrapu & IAPB
<table>
<thead>
<tr>
<th>GBD</th>
<th>WHO Vision Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>National/subnational/local</td>
<td>“country-representative”</td>
</tr>
<tr>
<td>Population representativeness</td>
<td></td>
</tr>
<tr>
<td>≥ 60% (95% are &gt;70%)</td>
<td>Response rate accepted</td>
</tr>
<tr>
<td>≥ 80%</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Gender breakdown for 0-49 yrs</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Borrowing strength from neighboring countries, using covariates,</td>
<td>Handling country-years that lack data</td>
</tr>
<tr>
<td>and over time</td>
<td>Regional estimates by imputing estimates for countries lacking data using</td>
</tr>
<tr>
<td></td>
<td>economic groupings</td>
</tr>
<tr>
<td>&lt;6/12</td>
<td>Lowest limit of VI</td>
</tr>
<tr>
<td>&lt;6/18</td>
<td></td>
</tr>
<tr>
<td>more complex model</td>
<td>Temporal trends</td>
</tr>
<tr>
<td></td>
<td>based on most recent sources vs older sources</td>
</tr>
<tr>
<td>Planned open access to sources &amp; modeling process</td>
<td>Access</td>
</tr>
<tr>
<td></td>
<td>Not all sources referenced are entered in model</td>
</tr>
</tbody>
</table>
Global Burden of Disease

GBD study GBD2010

Vision Loss Expert Group (coordination of 79 members) and WHO collaboration (Gretchen Stevens, Colin Mathers)

First comprehensive systematic review of all blindness/vision impairment data published since 1980-2010: 2.9 million vision examinations from 243 studies

GBD Study- principle all-disease resource for governments/NGOs- DALYs

December 2012
Global Vision Database

Vision Loss Expert Group extended the systematic review to 2012: added many rapids + microdata

Independently of the GBD, we calculated prevalence of blindness and vision impairment for 1990 and 2010, by: age, gender, country, region, cause

Stevens et al, Ophthalmology 2013: 120(12):2377-84

Bourne, Stevens et al, Lancet Global Health : 2013
Global Vision Database

Vision Loss Expert Group has further extended the systematic review to August 2014

Extracting data from 300 new studies (2012-2014) and seeking microdata from key studies

Consensus panels & Aditi Das & Alex Silvester: Research Fellows
ESTIMATING THE BURDEN OF DISEASE ASSOCIATED WITH BLINDNESS AND VISION IMPAIRMENT

The goal is to develop and deploy new and improved evidence on the prevalence of blindness and vision impairment.

More
http://www.iapb.org/maps

GVD Maps

The Global Vision Database is a comprehensive database of population-based prevalence eye surveys, dating from 1980 to 2014, from published and unpublished sources. It includes estimates of numbers of blind and vision impaired by region/worldwide, by age, by sex and by cause.

This database will soon be available as maps, visualizing its various aspects:

- Prevalence of Blindness and Visual Impairment
- By Sex (Male, Female and both)
- By Country and Region
- "Time-lapse" (the impact over time, from 1995-2010)
All ages

1. Age-standardised prevalence of blindness has declined over 20 years.

2. The decline is striking and evident in every World region.

3. However, rates of blindness in low-income countries is considerably greater than in high-income countries.
Age-standardised prevalence (all ages)
Acknowledgements

Professor Mike Thorne & PMI of Anglia Ruskin University
Vision & Eye Research Unit (Shahina Pardhan, Holly Price, Aditi Das, Alexander Silvester, John Somner)

Co-members of Vision Loss Expert Group

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Bill & Melinda Gates Foundation, Fight for Sight, Brien Holden Vision Institute
Spare slides
Step 2: Conversion to core definitions of VA

Data sources report a variation of Visual Acuity thresholds. Few studies reported mild VI (<6/12 to 6/18) or severe VI (<6/60 to 3/60). Most reported blindness and ‘low vision’ (<6/18 to 3/60).

High correlation between prevalence of mild, moderate, severe VI and Low Vision.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Intercept Value</th>
<th>Intercept Standard error</th>
<th>Coefficient Value</th>
<th>Coefficient Standard error</th>
<th>N</th>
<th>Adjusted R-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conversion to blind (&lt;3/60)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from &lt;6/60</td>
<td>-1.062</td>
<td>0.039</td>
<td>0.892</td>
<td>0.012</td>
<td>636.000</td>
<td>0.895</td>
</tr>
<tr>
<td>from ≤6/60</td>
<td>-1.213</td>
<td>0.139</td>
<td>0.813</td>
<td>0.030</td>
<td>76.000</td>
<td>0.905</td>
</tr>
<tr>
<td><strong>Conversion to low vision (&lt;6/18 and ≥3/60)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from &lt;6/18</td>
<td>-0.521</td>
<td>0.016</td>
<td>0.905</td>
<td>0.006</td>
<td>902.000</td>
<td>0.965</td>
</tr>
<tr>
<td>from &lt;6/12</td>
<td>-1.280</td>
<td>0.057</td>
<td>0.837</td>
<td>0.021</td>
<td>85.000</td>
<td>0.951</td>
</tr>
</tbody>
</table>

Blind (<3/60)

Low Vision (<6/18 to 3/60)
Step 3: Conversion to age-specific data

Studies that reported age-specific data were used to fit 2 universal age patterns for:

- Blind
- Low Vision

Age patterns then fitted to data from studies which was only available by wide age group to calculate prevalence by 5-year age intervals.

Ensured that the age-specific prevalence values summed to the reported wide age range prevalence, when weighted by the country’s population.
Step 4: Analysis of VI prevalence by country, year, age & sex

2 hierarchical logistic regressions to estimate VI prevalence over time by:
- age group
- sex
- country

Relative weight: is informed by availability & consistency of data from these sources

Blind

Low Vision

Sao Paulo Eye Study 2004
Sao Paulo East Zone 2002
Campinas (rapid) 2003
Botucatu Eye Study

Relative Weight vs data from:

Data from other countries in: same region

other regions
Step 4: Analysis of VI prevalence by country, year, age & sex

2 hierarchical logistic regressions to estimate VI prevalence over time by:
- age group
- sex
- country

Relative weight: is informed by availability & consistency of data from these sources

Data from other countries in:
- same region
- other regions

Cambodia Eye Survey 1996- all ages-
- subnational
RACSS 2002- 50-99 yrs- Battambang subnational
RAAB 2007- 50-99- national
Cambodia: blindness
Hierarchical linear trends modelled over time for 4 world regions, allowing for:

- **region-specific**
- **gender-specific**
- **age-specific** (3-piece linear spline with knots at ages 40 and age 70)

Fitted a fixed effect for data recording **presenting visual impairment**

**3 country-specific covariates** evaluated:

- GDP per capita
- Mean years of adult education
- Access to health care

**2 study-specific covariates**: a fixed offset for studies carried out in **urban** areas, and a fixed offset for studies carried out in **rural** areas.

**Step 5**: Predict the prevalence of severe, moderate, and mild visual impairment for each country, year, age, and sex.

- **Blind**
- **Low Vision**
  - Severe VI
  - Moderate VI
  - Mild VI
Results: Data availability

Data sources identified

- No data
- 1
- 2
- 3-5
- 6 or more
Global Burden: Blind

Age-stand. Prev.  Number blind

<table>
<thead>
<tr>
<th>Year</th>
<th>Age-stand. Prev. (%)</th>
<th>Number blind</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>1.6%</td>
<td>35,000,000</td>
</tr>
<tr>
<td>1995</td>
<td>1.4%</td>
<td>30,000,000</td>
</tr>
<tr>
<td>2000</td>
<td>1.2%</td>
<td>25,000,000</td>
</tr>
<tr>
<td>2005</td>
<td>1.0%</td>
<td>20,000,000</td>
</tr>
<tr>
<td>2010</td>
<td>0.8%</td>
<td>15,000,000</td>
</tr>
</tbody>
</table>
Regional burden of BLIND age-standardised prevalence (all ages)
Global Burden: Visual Impaired

[Graph showing trends in different visual impairment categories from 1990 to 2010.]

- Mod + Severe VI
- Mild VI
- ASP mod+ sev
- ASP mild
More women are blind and visually impaired - Ratio F:M

- WORLD
- Sub-Saharan Africa, West
- Sub-Saharan Africa, Southern
- Sub-Saharan Africa, East
- Sub-Saharan Africa, Central
- Oceania
- North America high-income
- North Africa and Middle East
- Latin America, Tropical
- Latin America, Southern
- Latin America, Central
- Latin America, Andean
- Europe, Western
- Europe, Eastern
- Europe, Central
- Caribbean
- Australasia
- Asia-Pacific high-income
- Asia, Southeast
- Asia, South
- Asia, East
- Asia, Central
Prevalence of blindness by cause (≥ 50 years)

- 2.4% of blindness due to glaucoma
- 9.1% of blindness due to glaucoma

Caribbean:
- 9.1% of blindness due to glaucoma

South Asia:
- 2.4% of blindness due to glaucoma
Global Vision Database  
updates & maintenance  
Aditi Das & Alex Silvester: GBD Fellows  
Visualisation Project  

Dissemination: Governments, NGO’s, professional societies, public. Policy decisions, resource allocation.
Acknowledgements

Professor Mike Thorne & PMI of Anglia Ruskin University
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