

## ***Global Vision Database & Visualisation***

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**NO FINANCIAL DISCLOSURES**

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Brien Holden Vision Institute



**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**

## What was there before? WHO estimate

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

# Global Burden of Disease

## GBD study GBD2010



December 2012

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

# Global Vision Database

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## Global Prevalence of Vision Impairment and Blindness

*Magnitude and Temporal Trends, 1990–2010*

Gretchen A. Stevens, DSc,<sup>1</sup> Richard A. White, PhD,<sup>2</sup> Seth R. Flaxman, BA,<sup>3</sup> Holly Price, BSc, PhD,<sup>4</sup> Jost B. Jonas, MD,<sup>5</sup> Jill Keeffe, PhD,<sup>6</sup> Janet Leasher, OD, MPH,<sup>7</sup> Kovin Naidoo, OD, PhD,<sup>8</sup> Konrad Pesudovs, PhD,<sup>9</sup> Serge Resnikoff, MD, PhD,<sup>10</sup> Hugh Taylor, AC, MD,<sup>11</sup> Rupert R.A. Bourne, FRCOphth, MD,<sup>4</sup> on behalf of the Vision Loss Expert Group\*

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

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

## Causes of vision loss worldwide, 1990–2010: a systematic analysis



Rupert R.A. Bourne\*, Gretchen A. Stevens\*, Richard A. White, Jennifer L. Smith, Seth R. Flaxman, Holly Price, Jost B. Jonas, Jill Keeffe†, Janet Leasher†, Kovin Naidoo†, Konrad Pesudovs†, Serge Resnikoff†, Hugh R. Taylor†, on behalf of the Vision Loss Expert Group



### Summary

**Background** Data on causes of vision impairment and blindness are important for development of public health policies, but comprehensive analysis of change in prevalence over time is lacking.

Published Online  
November 11, 2013  
<http://dx.doi.org/10.1016/>

Bourne, Stevens et al, *Lancet Global Health* : 2013

Br J  
Ophth

Regional  
papers  
X 7

# 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**

Ref	ata Extract	Country	Geograph ical Area	Study type	Urbanicit y	Epoch Start	Epoch End	Populatio n Descripti on	Represen tativenes s of populatio n	Total Examined	Sample size
Zainal, M.,	K Fotis	Malaysia	National su	Cross-secti	Mixed	1996	1997	All civilian r	1	18027	69% respor
Zainal, M.,	K Fotis	Malaysia	National su	Cross-secti	Mixed	1996	1997	All civilian r	1	18027	69% respor
Zainal, M.	K Fotis	Malaysia	National su	Cross-secti	Mixed	1996	1997	All civilian r	1	18027	69% respor
Sampling Strategy	Rapid?	Visual Acuity method	Mydriasis ?	Cause Attributio n	Study Comment s	Quality Notes	Where in paper?	corrected diag code			
Stratified tw	Convention	Presenting	Some Dilate	Causes of	Results for	Age range	Table 5	RE-DMOD-P + RE-DSEV-P + RE-DVB-P			
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# www.globalvisiondata.org

## GLOBAL VISION DATABASE

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### 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>



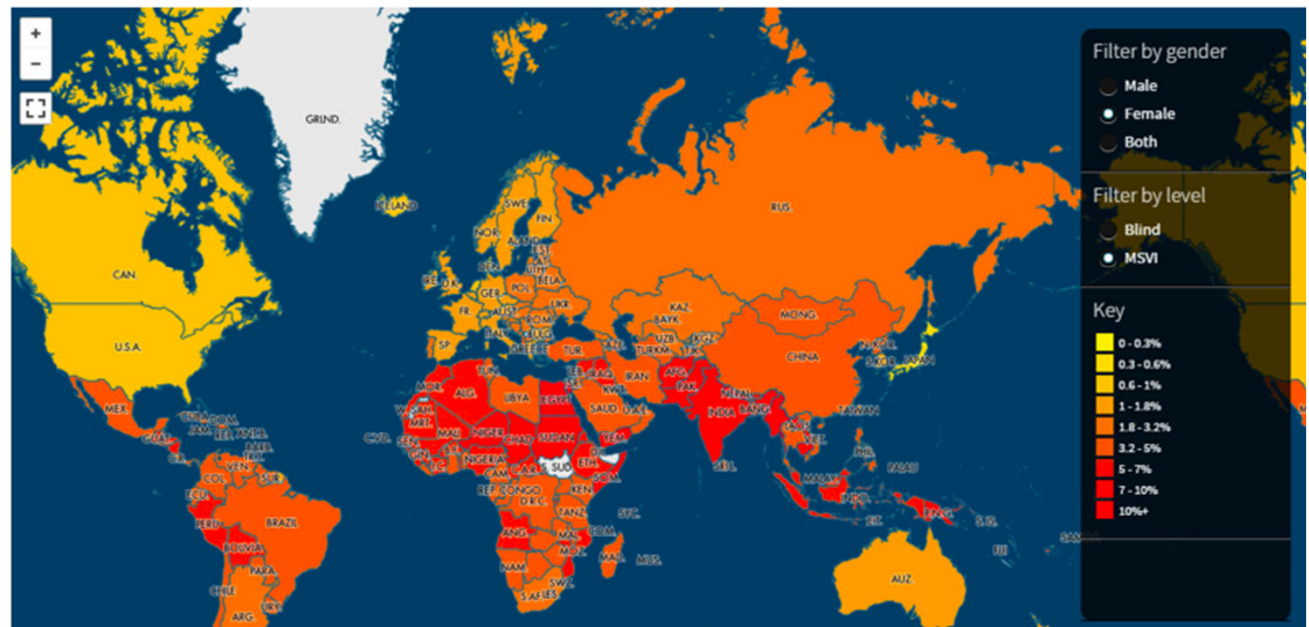
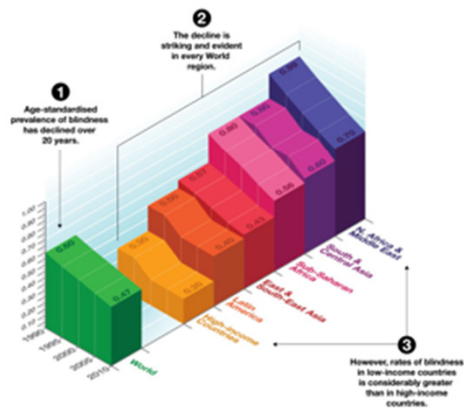
## GVD Maps

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.

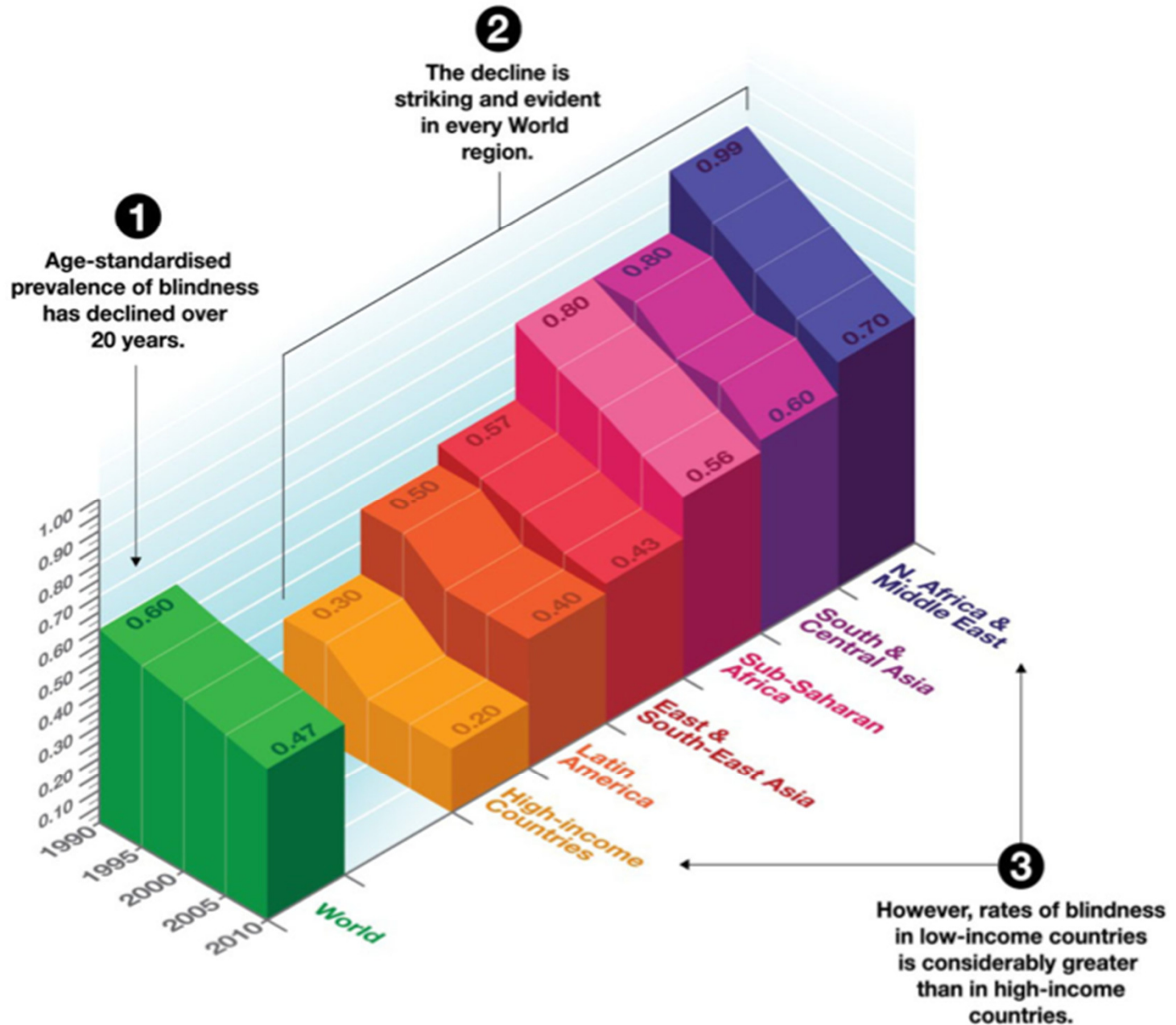
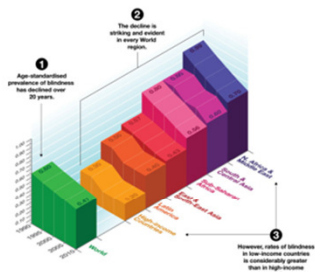
This database will soon be available as maps, visualizing its various aspects:

- 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)

### GVD Data: Key Insights



## GVD Data: Key Insights

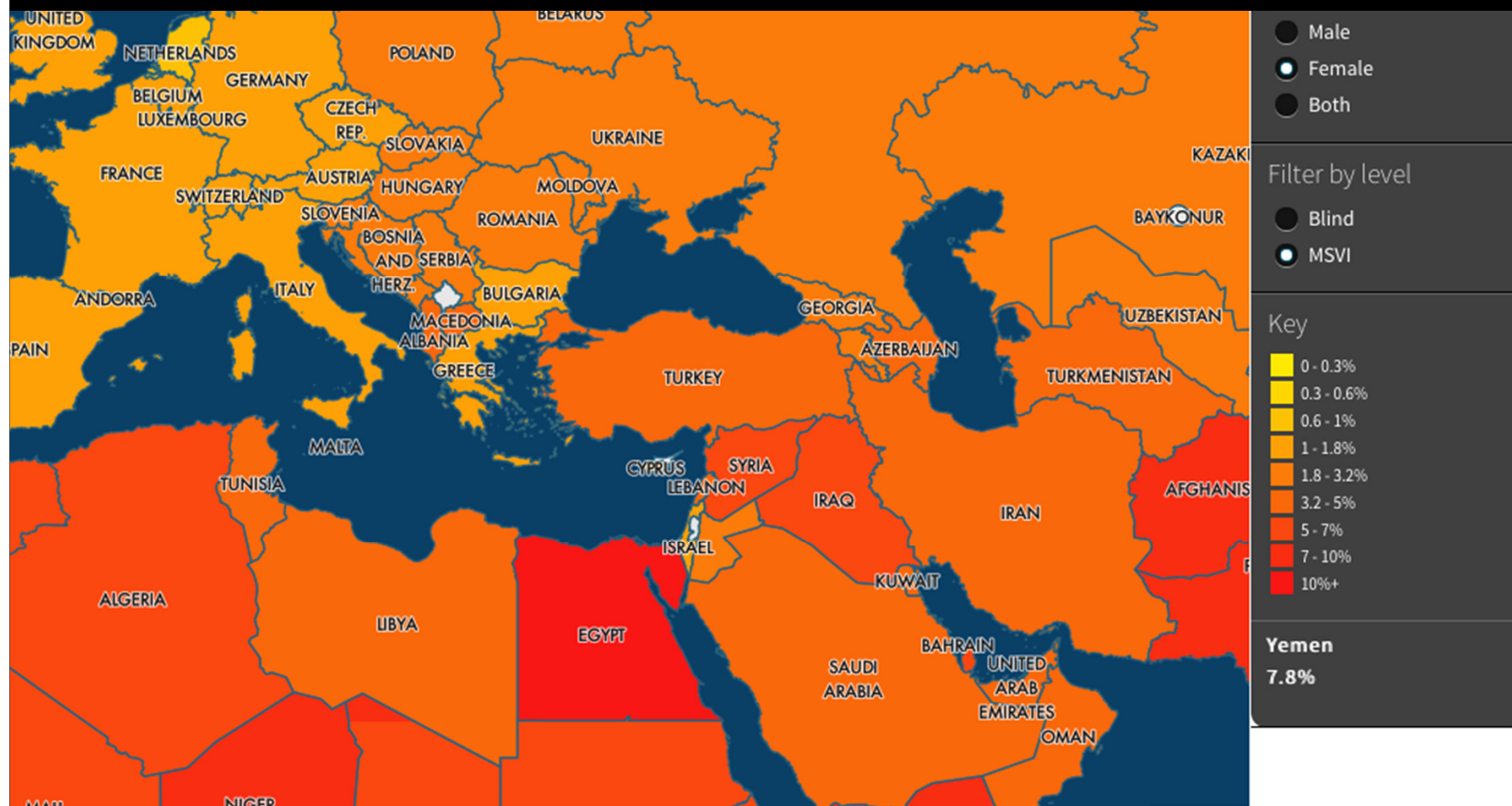


All ages









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

## *Funding*

Bill & Melinda Gates Foundation, Fight for Sight, Brien Holden  
Vision Institute





Spare slides



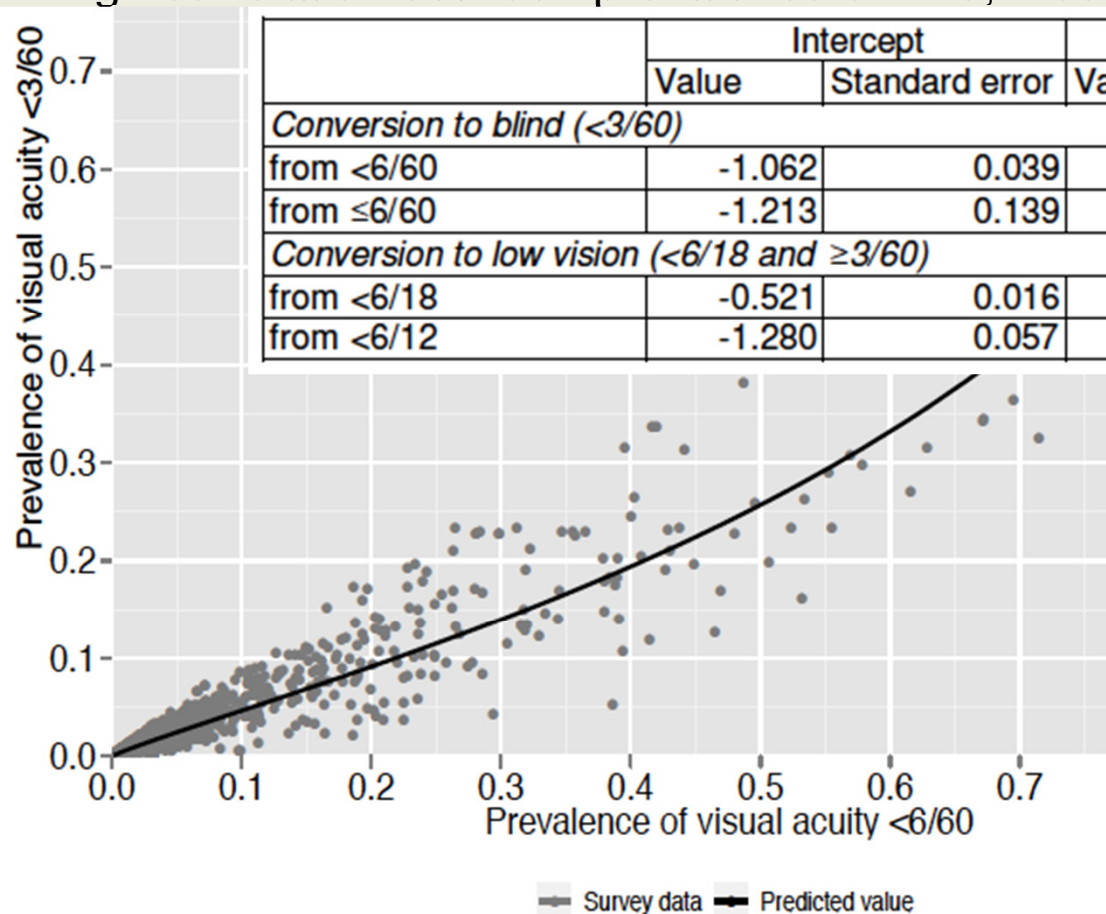
## Step 2: Conversion to core definitions of VA

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



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

**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

**age group**

**sex**

**country**

for

**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**

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





## 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**

for

**Blind**

**Low Vision**



Cambodia Eye Survey 1996- all ages-  
subnational

RACSS 2002- 50-99 yrs- Battambang subnational

RAAB 2007- 50-99- national

Relative Weight vs data from:

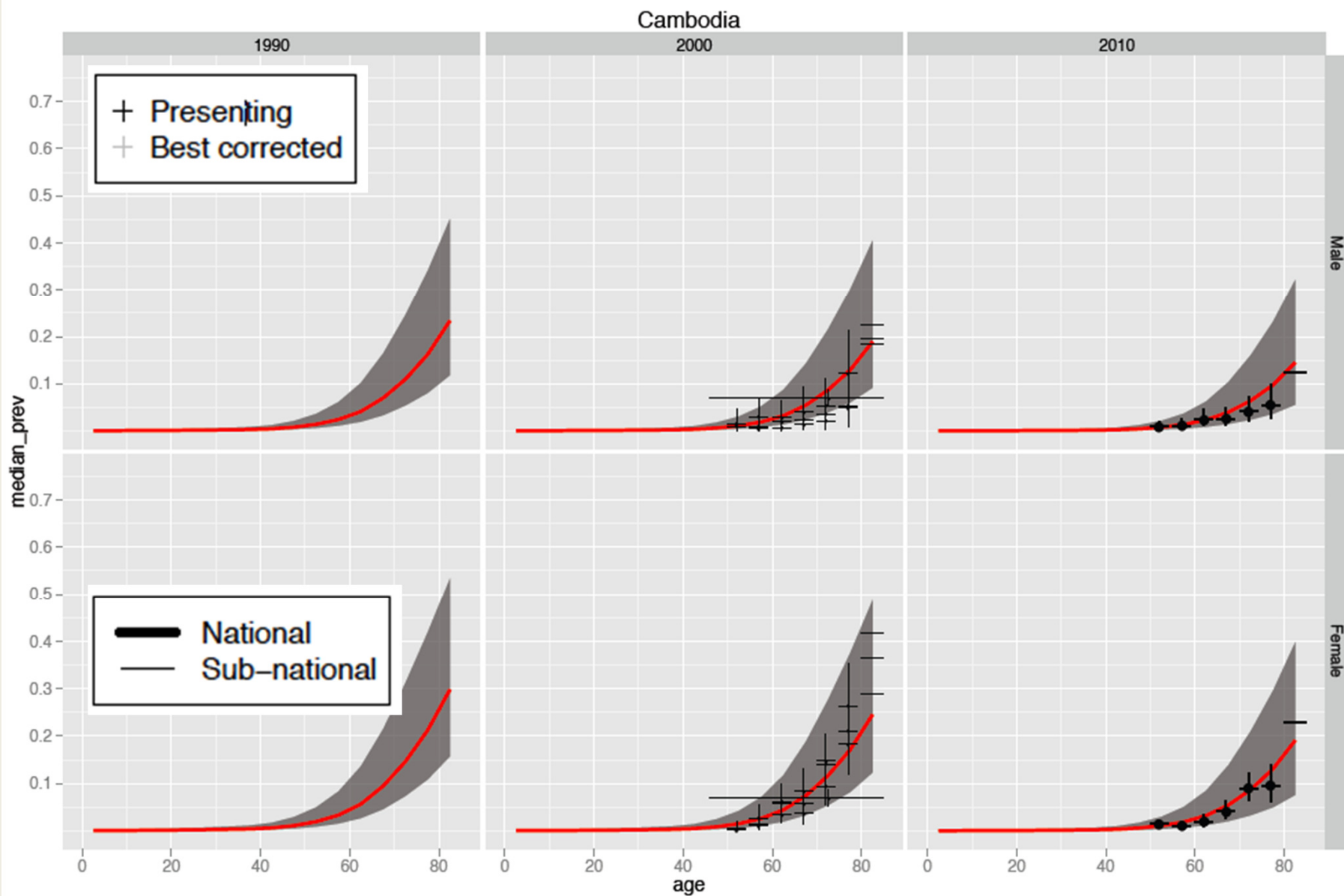
Data from other countries in: **same  
region**

**other regions**

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



# Cambodia: blindness



Hierarchical linear trends modelled over time for 4 world regions, allowing for:

**region-specific**

**gender-specific**

**age-specific**

**trends in prevalence of visual impairment**

(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**



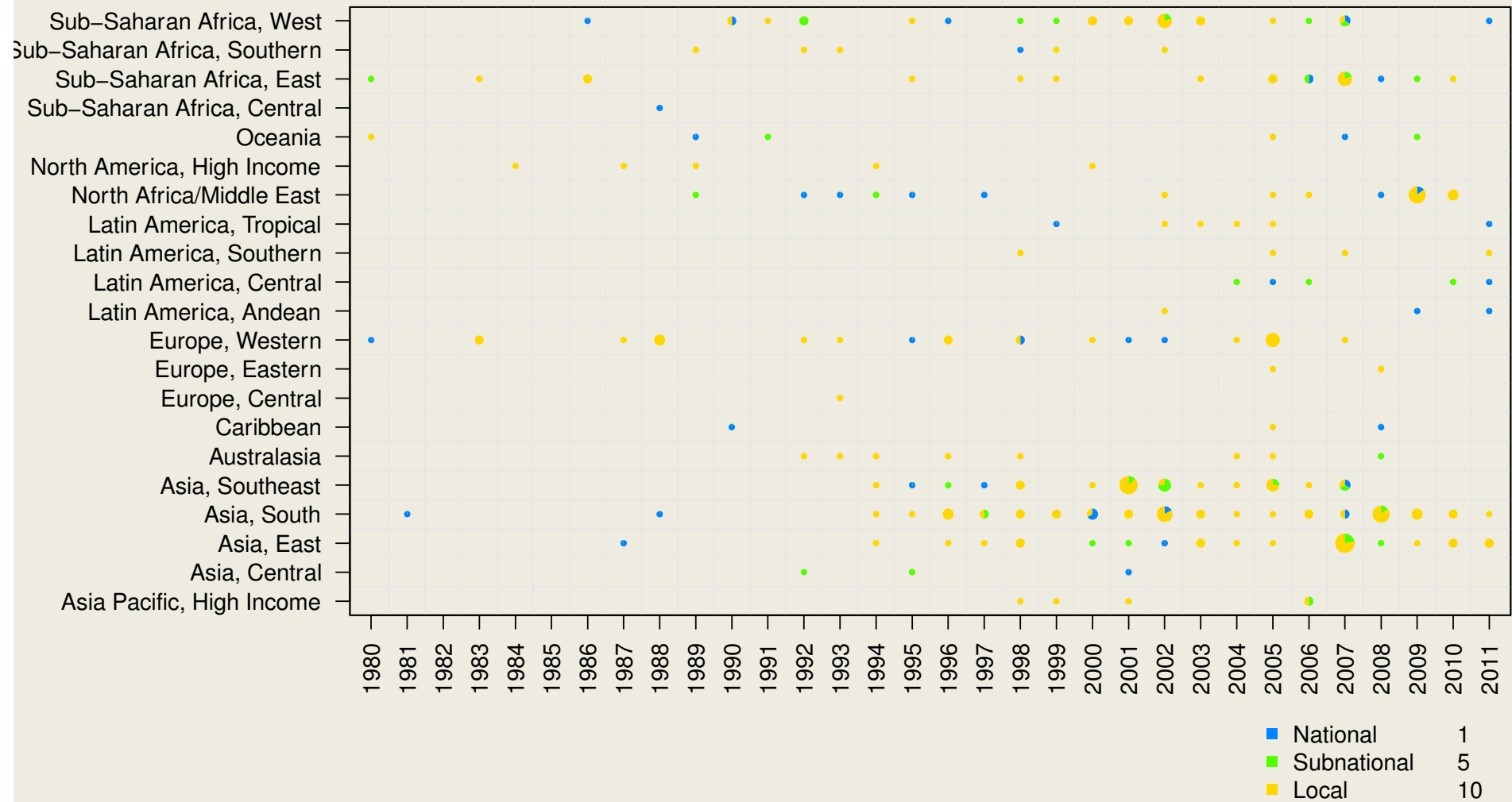
Severe VI

Moderate VI

Mild VI



# Results: Data Availability

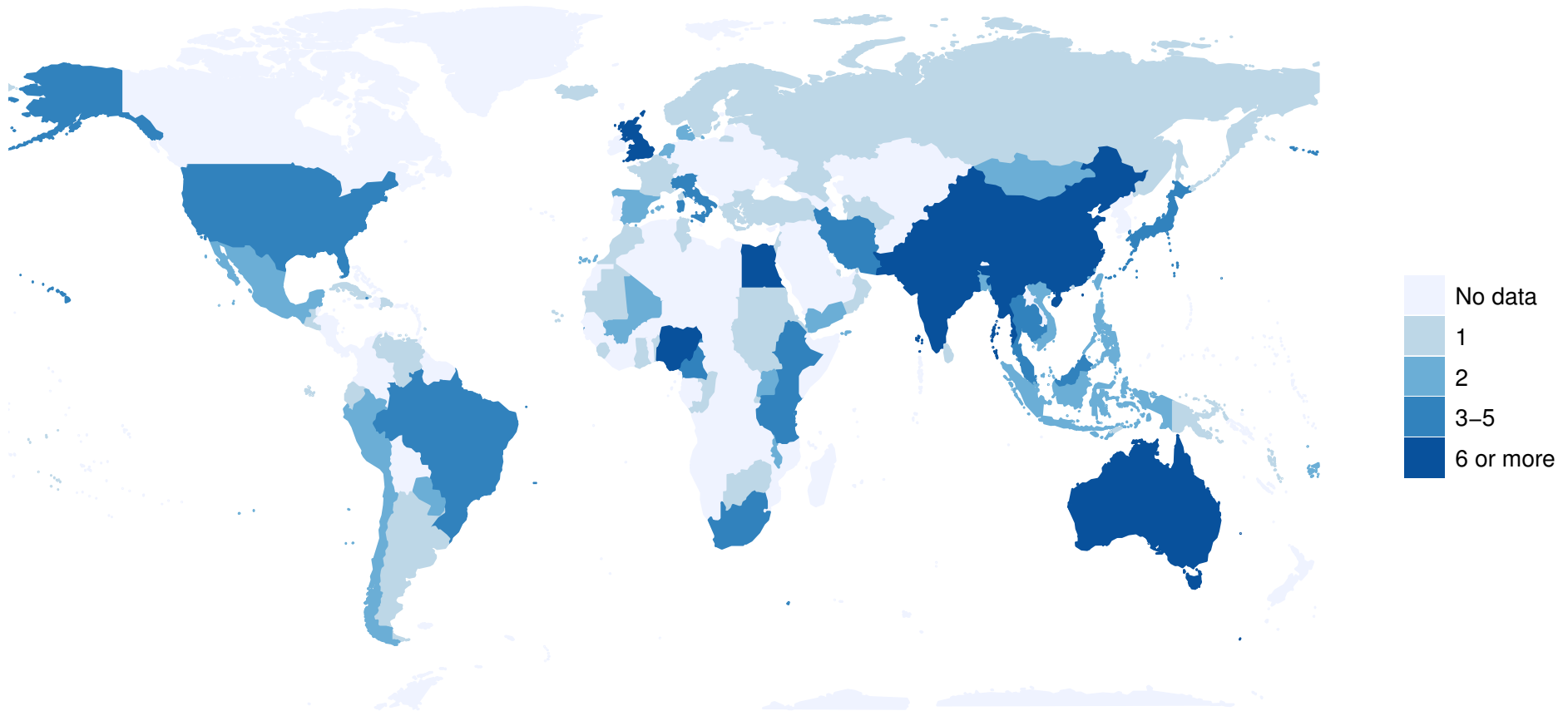






# Results: Data availability

Data sources identified

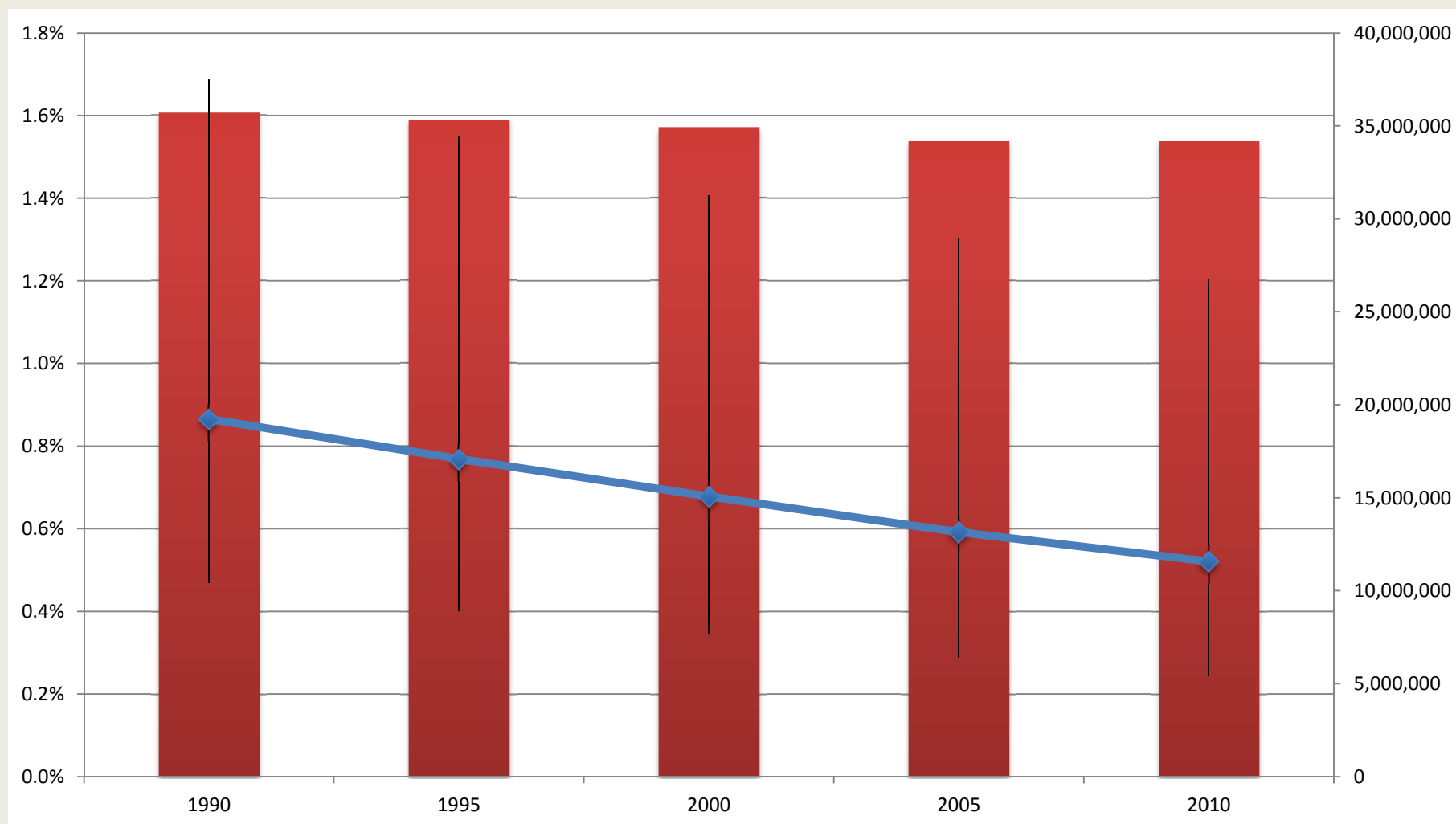




# Global Burden: Blind

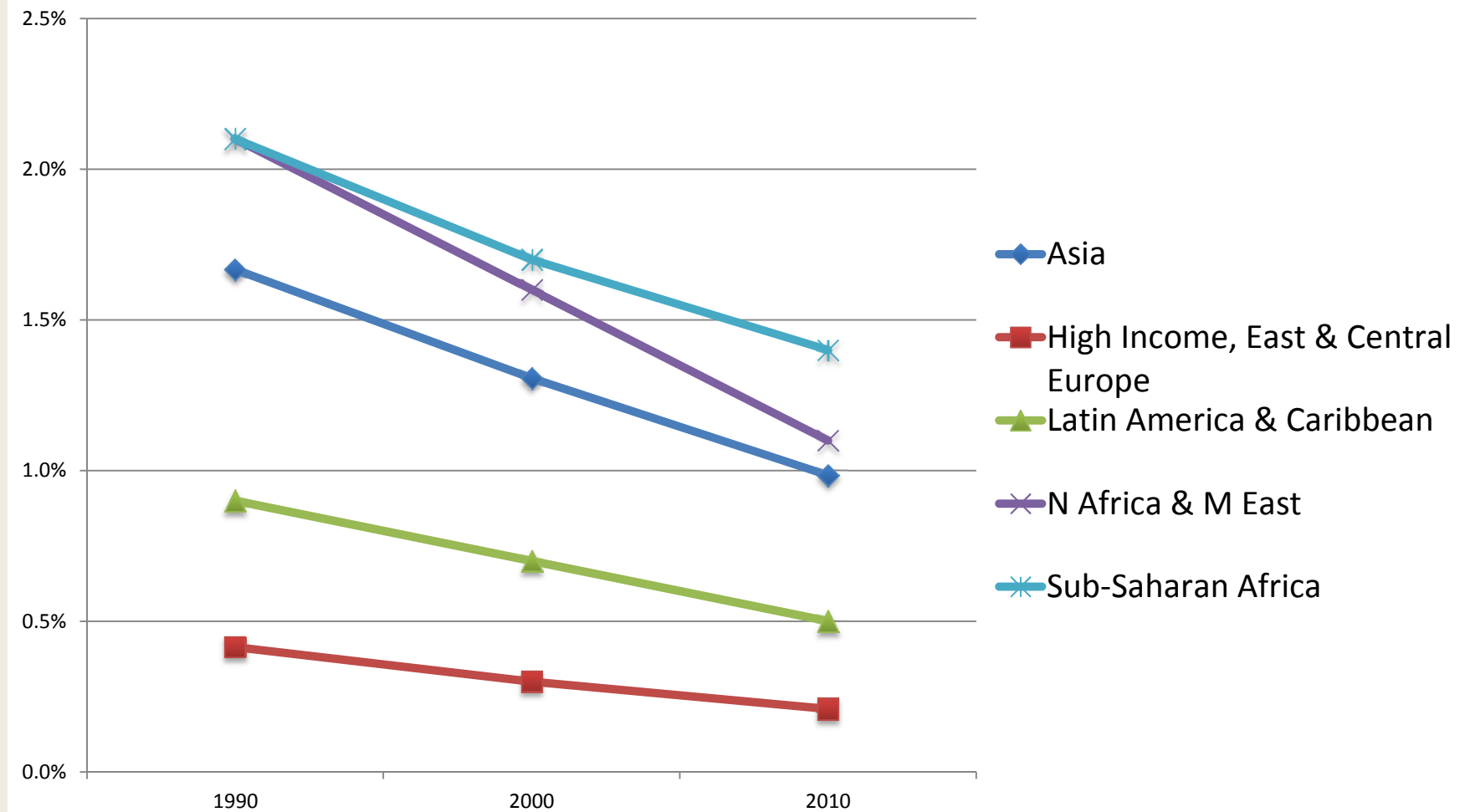
**Age-stand. Prev.**

**Number blind**



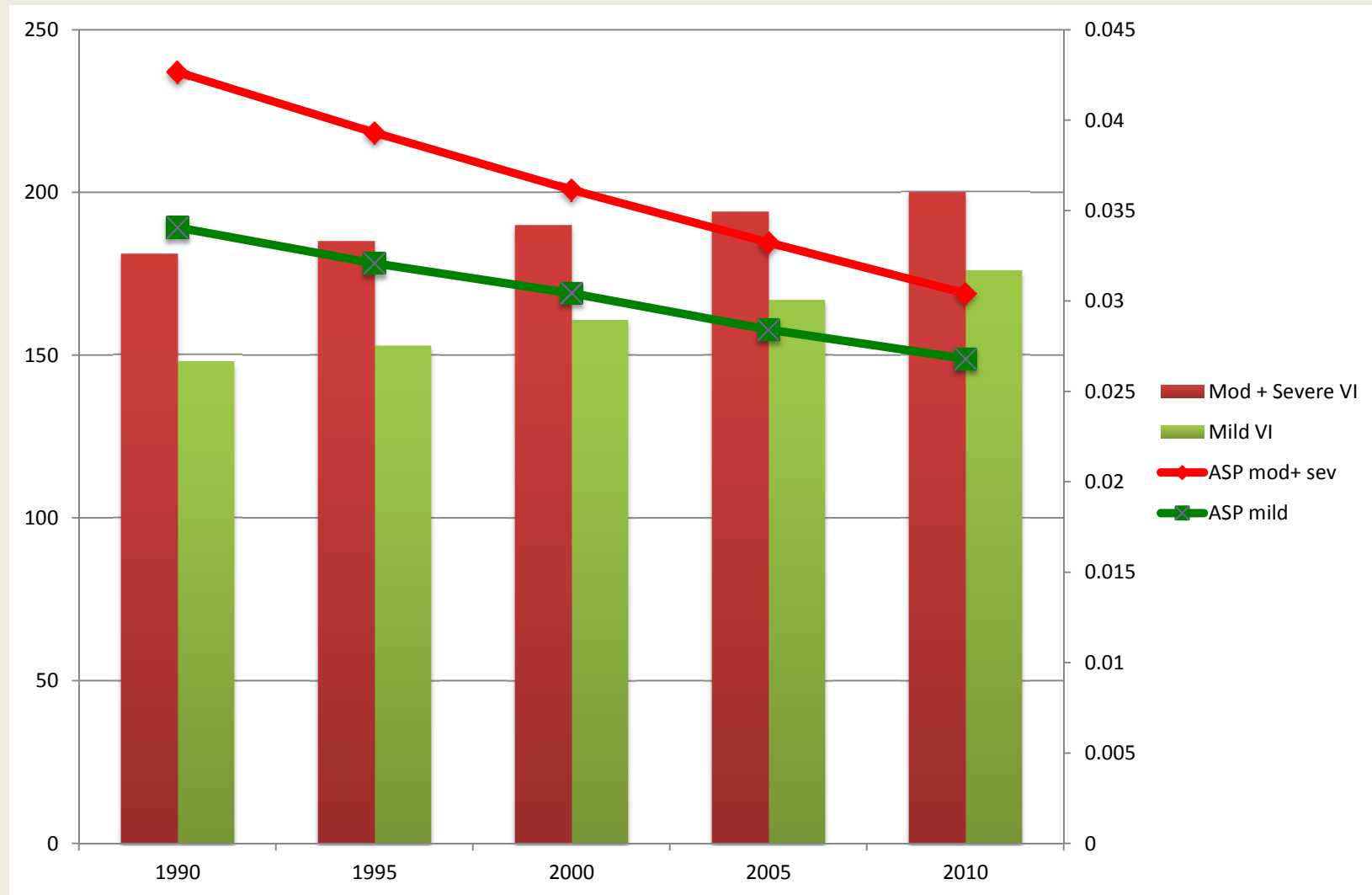


## Regional burden of BLIND age-standardised prevalence (all ages)





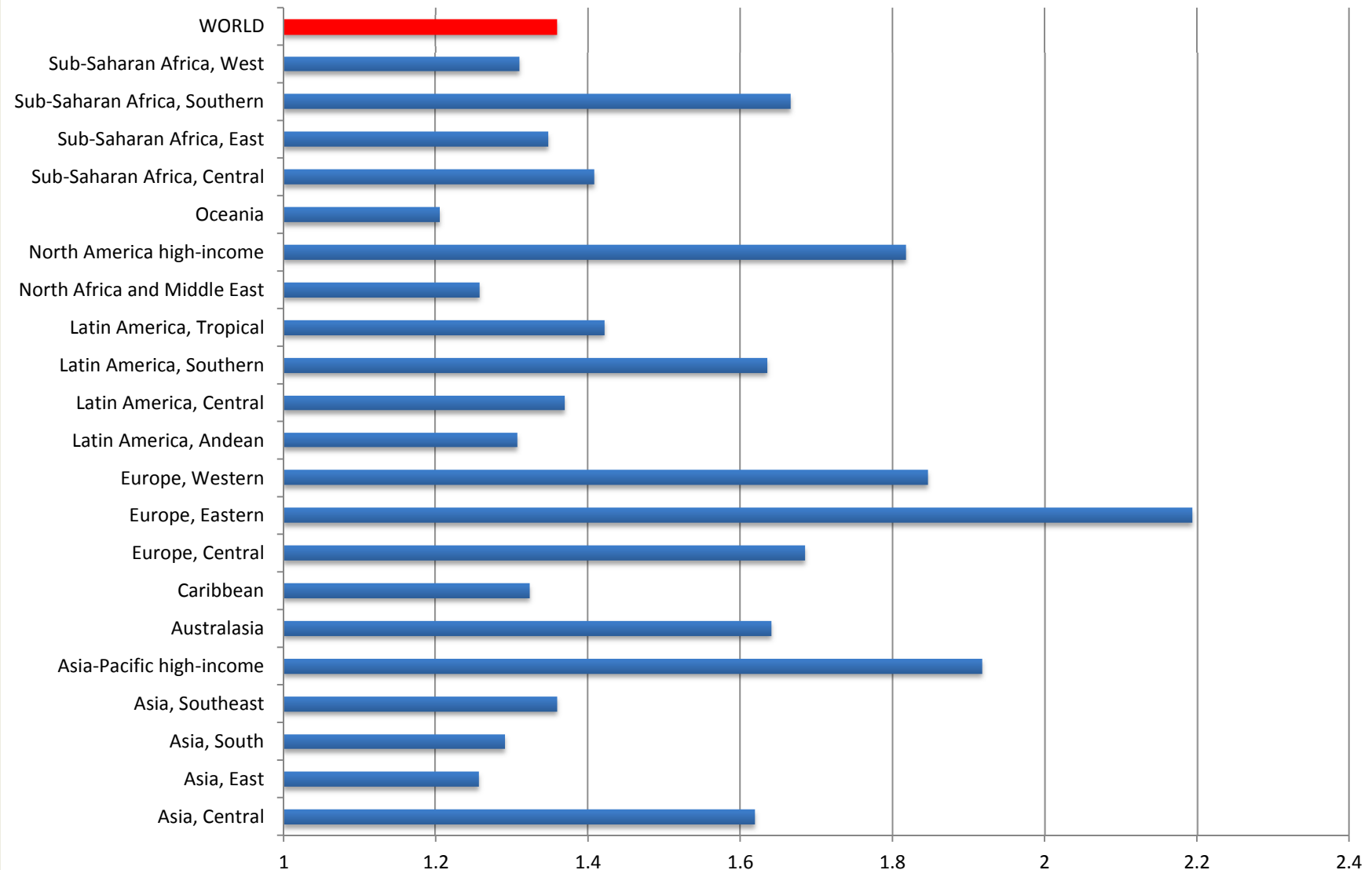
# Global Burden: Visual Impaired



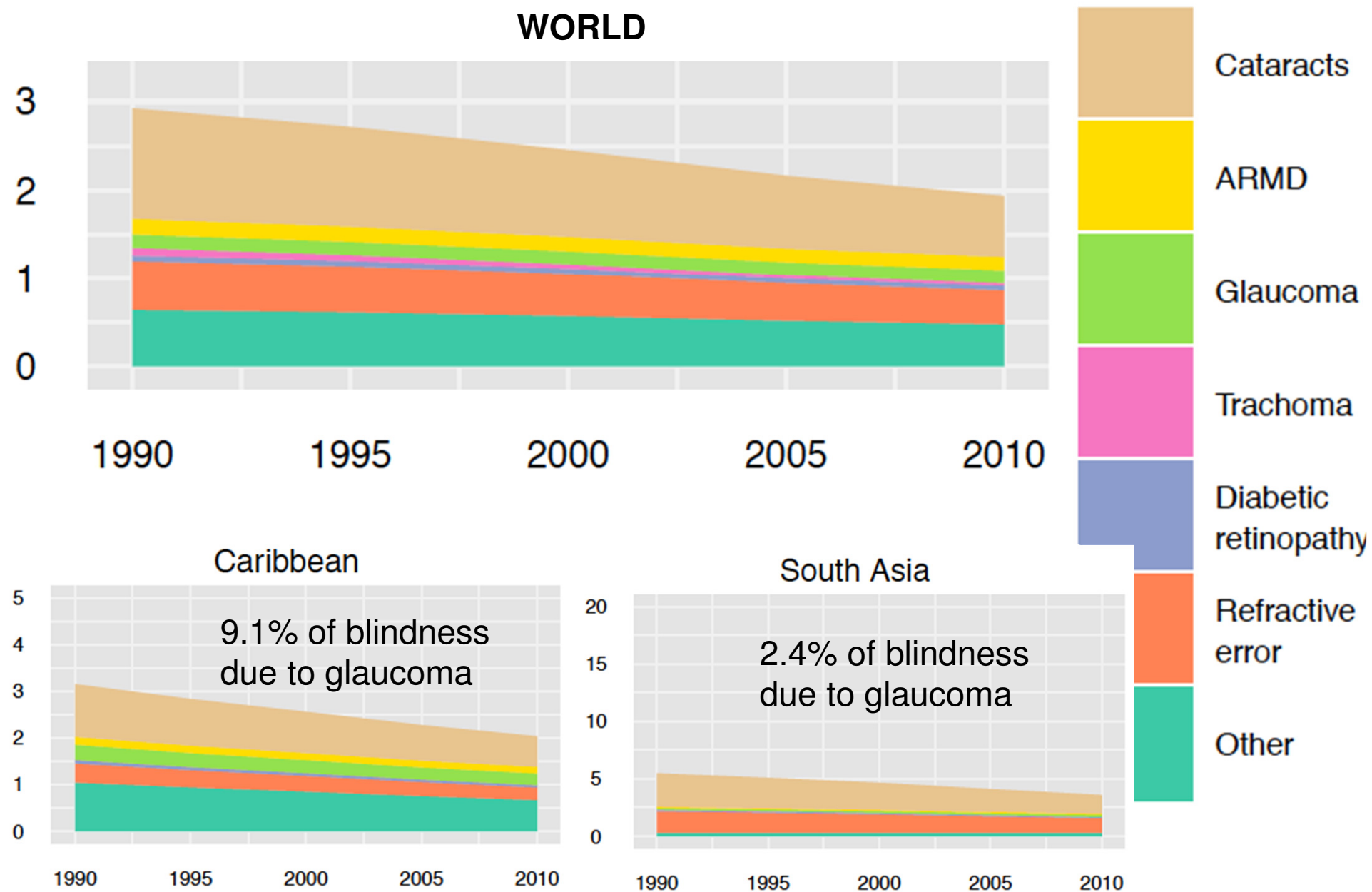




## More women are blind and visually impaired- Ratio F:M



## Prevalence of blindness by cause ( $\geq 50$ years)

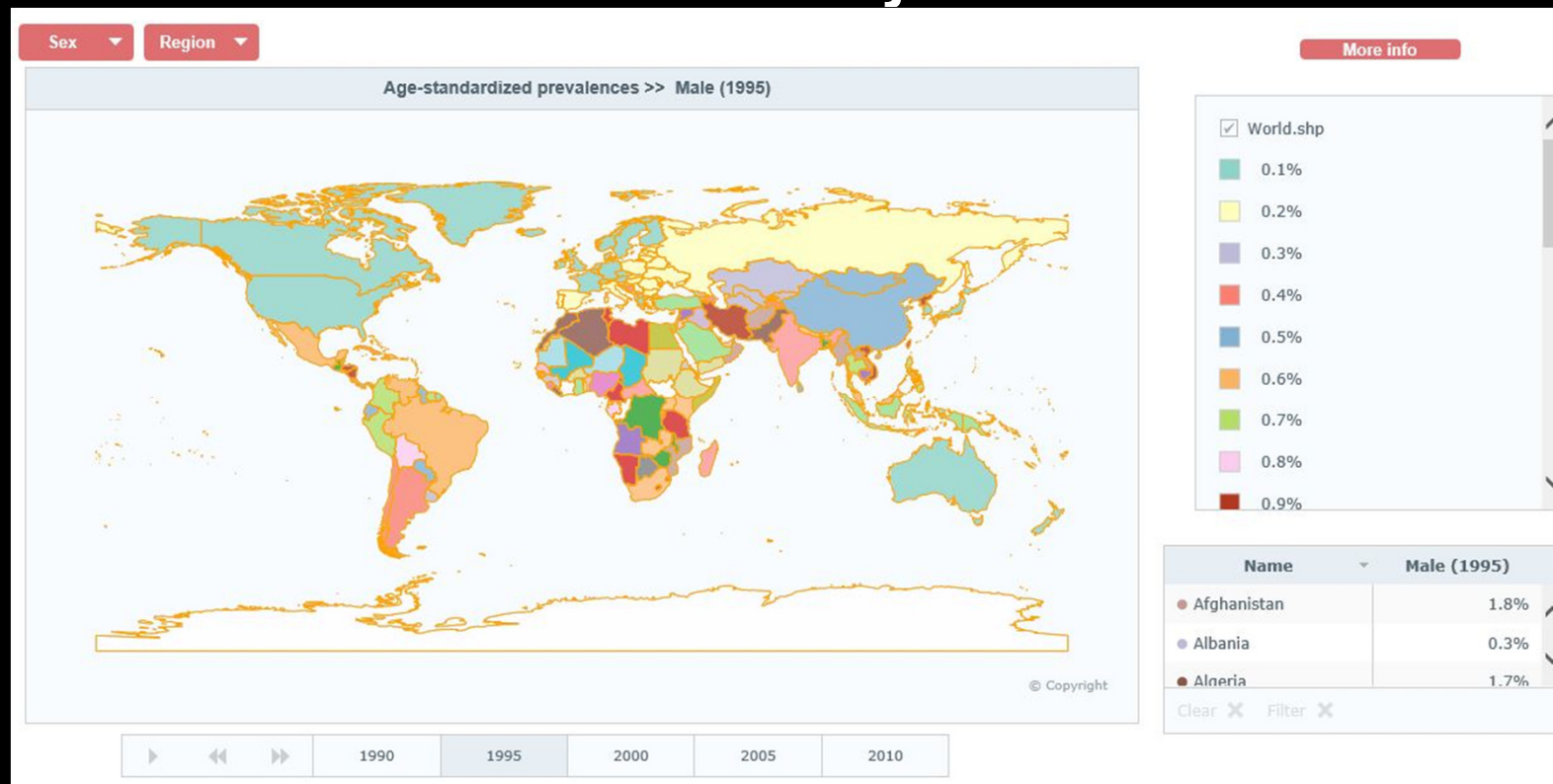


# Global Vision Database

## updates & maintenance

Aditi Das & Alex Silvester: GBD Fellows

## Visualisation Project



**Dissemination:** Governments, NGO's, professional societies, public.  
Policy decisions, resource allocation.

Brien Holden  
Vision Institute  
grant 2013-2018

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