

Global Burden of Disease Study preparing the systematic review for GBD 2010

The Vision Loss Expert Group's extension of the review to 2012
the findings: prevalence of vision loss by cause
global → Europe → UK

GBD 2010: The Lancet reports
Disability weights
DALYs and YLDs & Vision Loss

OUTPUTS/ DATA SHARING
Investing in Vision, Reference Indicators, etc



The Global Vision Database and future research (GBD2013 !)

Global Burden of Disease GBD study



Vision Loss Expert Group (coordination of 79 members): WHO collaboration (Serge Resnikoff)

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

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

What was there before? WHO estimates

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



Methods: Step 1 (of 5)

Accessed all published data (and some unpublished) data from population-based studies of VI and blindness from 1980 to 2012.

MEDLINE, EMBASE, WHOLIS: 14,908 abstracts → 1,334 articles reviewed
 Supplemented by MICRODATA from PI contact: eg. Blue Mts, Rotterdam, Pakistan, RAAB, RACSS studies

Data of **259** data sources extracted into database, disaggregated by age & sex, coverage, cause, pres/BCVA: 6500 datapoints.

Ref	Data Extracted	Country	Geographical Area	Study type	Urbanicity	Epoch Start	Epoch End	Population Description	Representativeness of population	Total Examined	Sample size
Zainal, M., K Fotis		Malaysia	National survey	Cross-sectional	Mixed	1996	1997	All civilian r	1	18027	69% respon
Zainal, M., K Fotis		Malaysia	National survey	Cross-sectional	Mixed	1996	1997	All civilian r	1	18027	69% respon
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Sampling Strategy	Rapid?	Visual Acuity method	Mydriasis ?	Cause Attribution	Study Comments	Quality Notes	Where in paper?	corrected diag code			
Stratified two	Convention	Presenting	Some Dilat	Causes of	Results from	Age range	Table 5	RE-DMOD-P + RE-DSEV-P + RE-DVB-P			
Stratified two	Convention	Presenting	Some Dilat	Causes of	Results from	Age range	Table 5	RE-DMOD-P + RE-DSEV-P + RE-DVB-P			



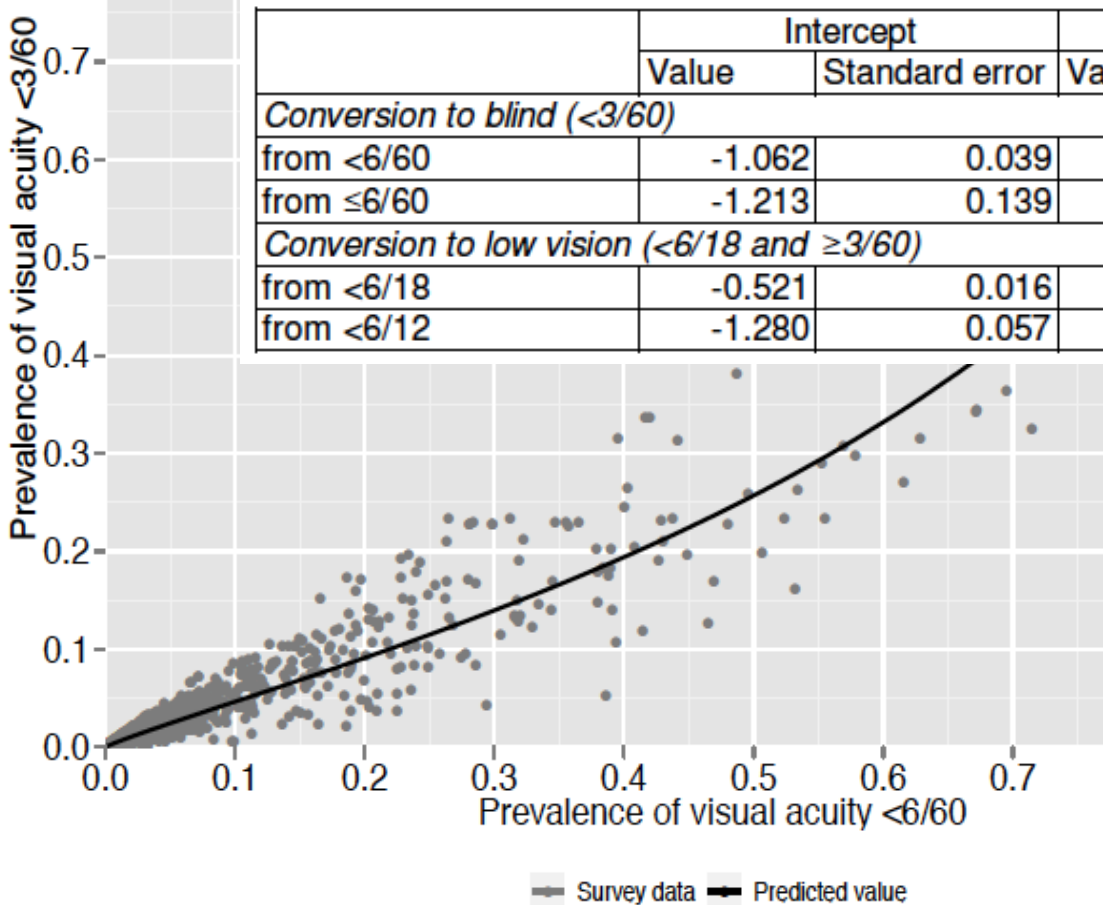
Step 2: Conversion to core definitions of VA

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 (<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 (<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:

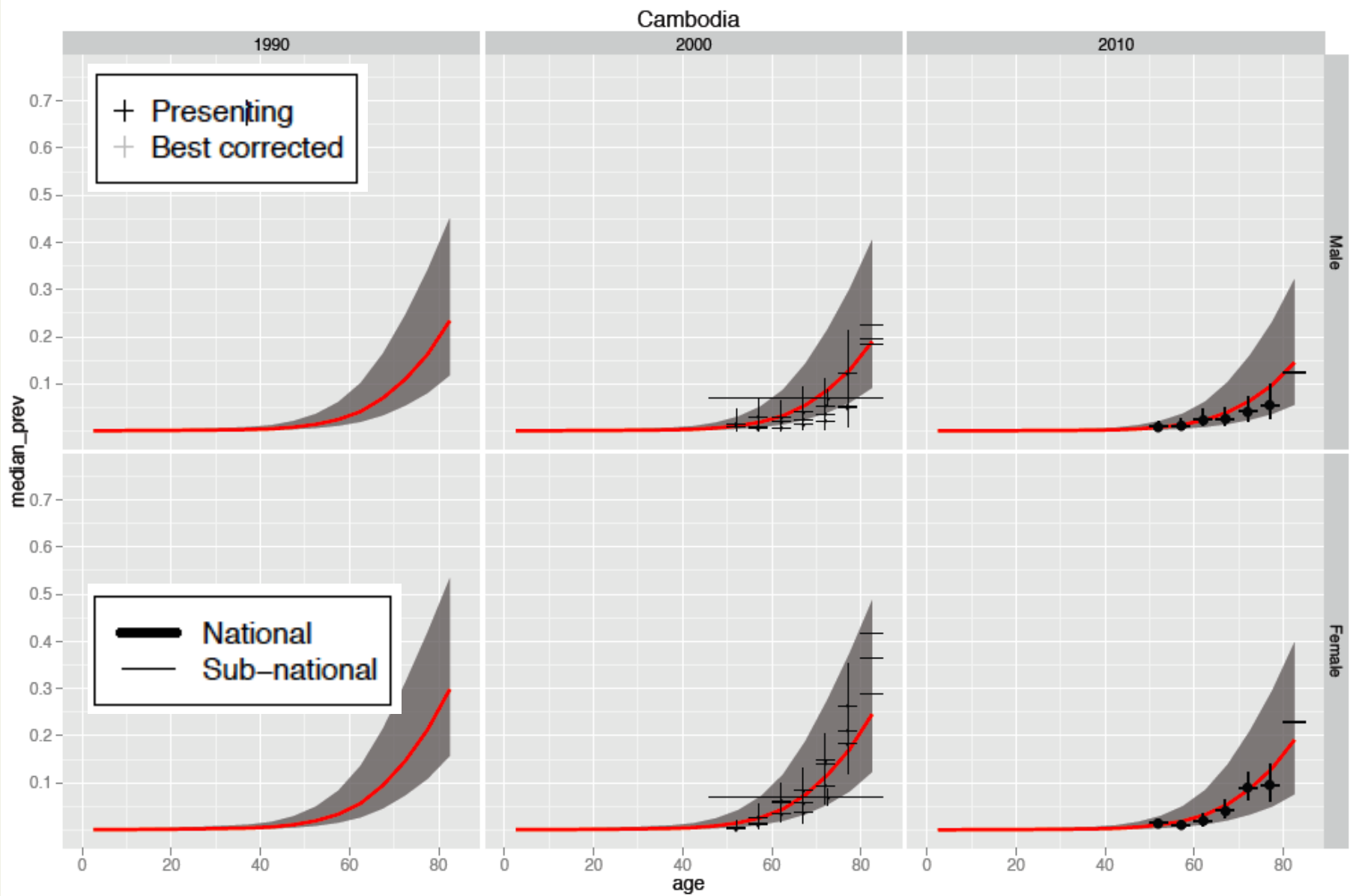
Data from other countries in: **same region**

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 **trends in prevalence of visual impairment**
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



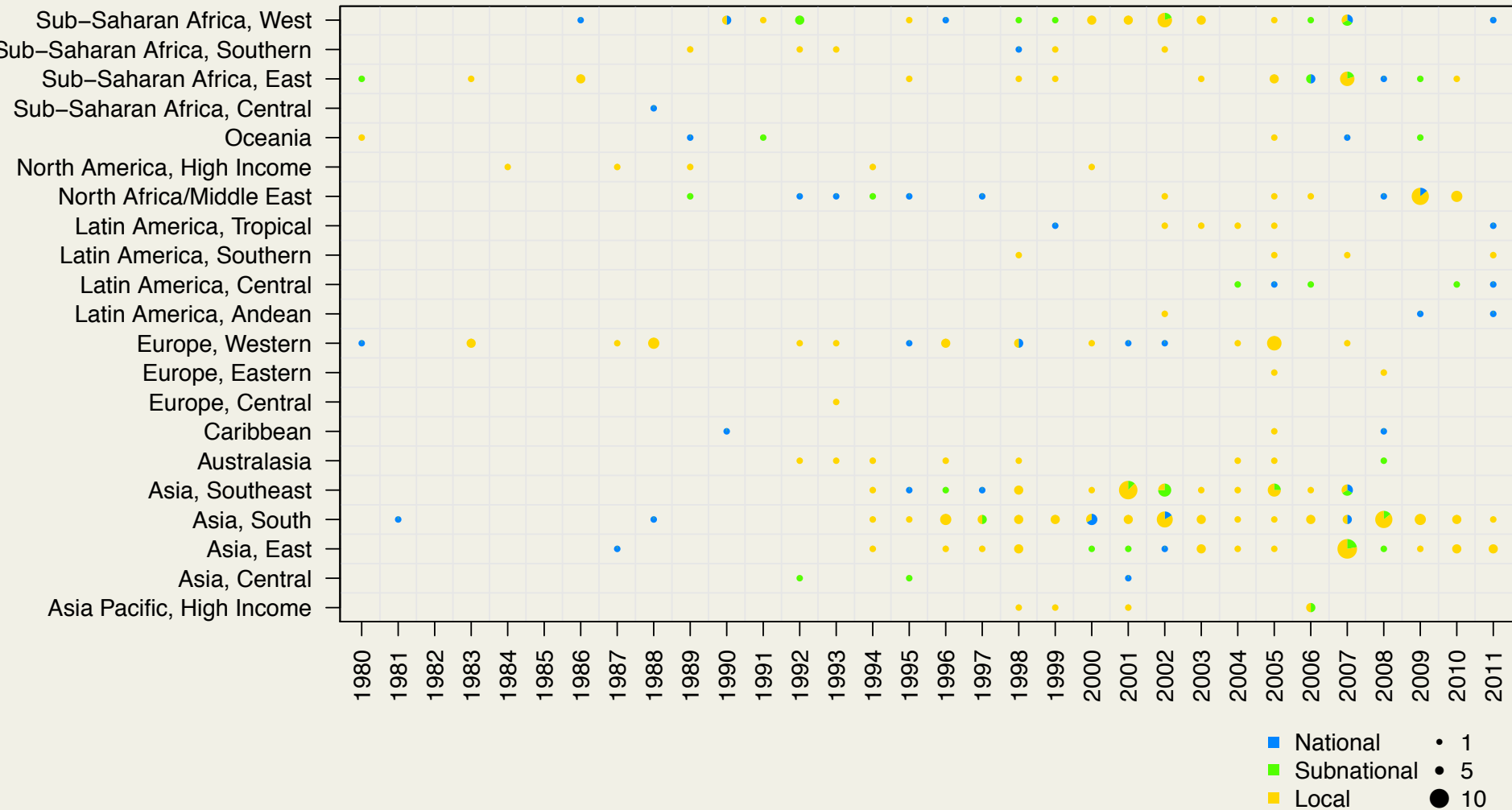
Severe VI

Moderate VI

Mild VI



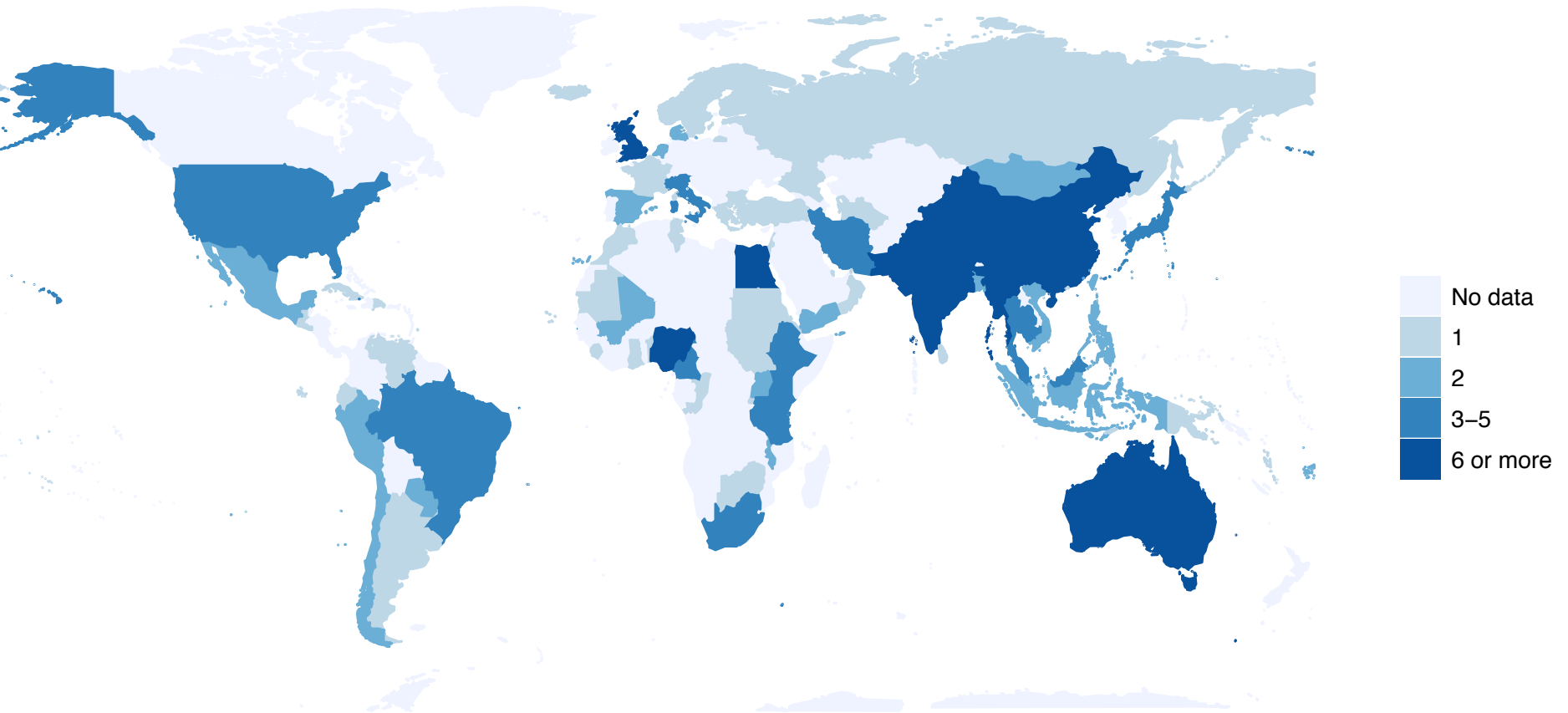
Results: Data Availability





Results: Data availability

Data sources identified

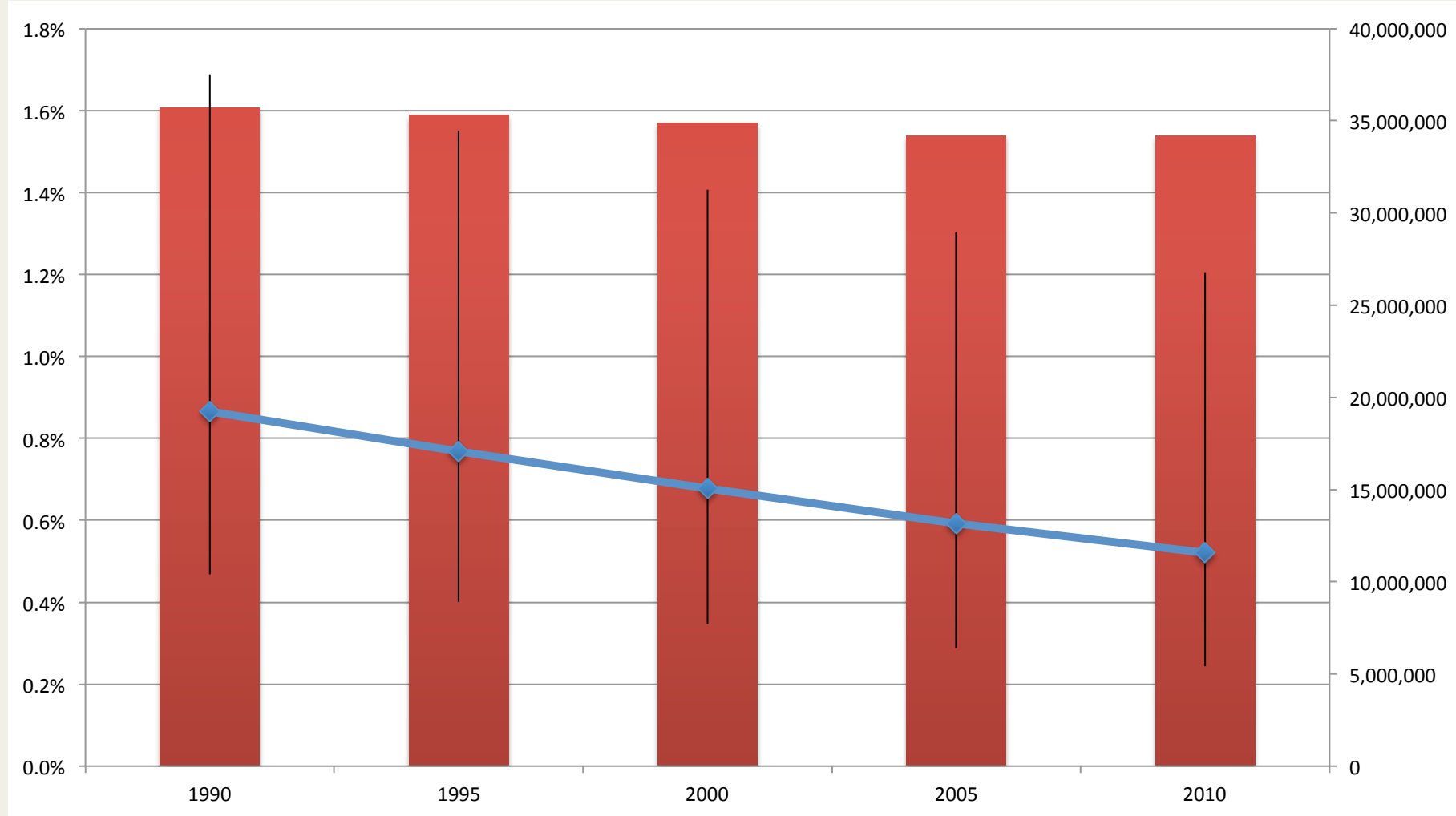




Global Burden: Blind

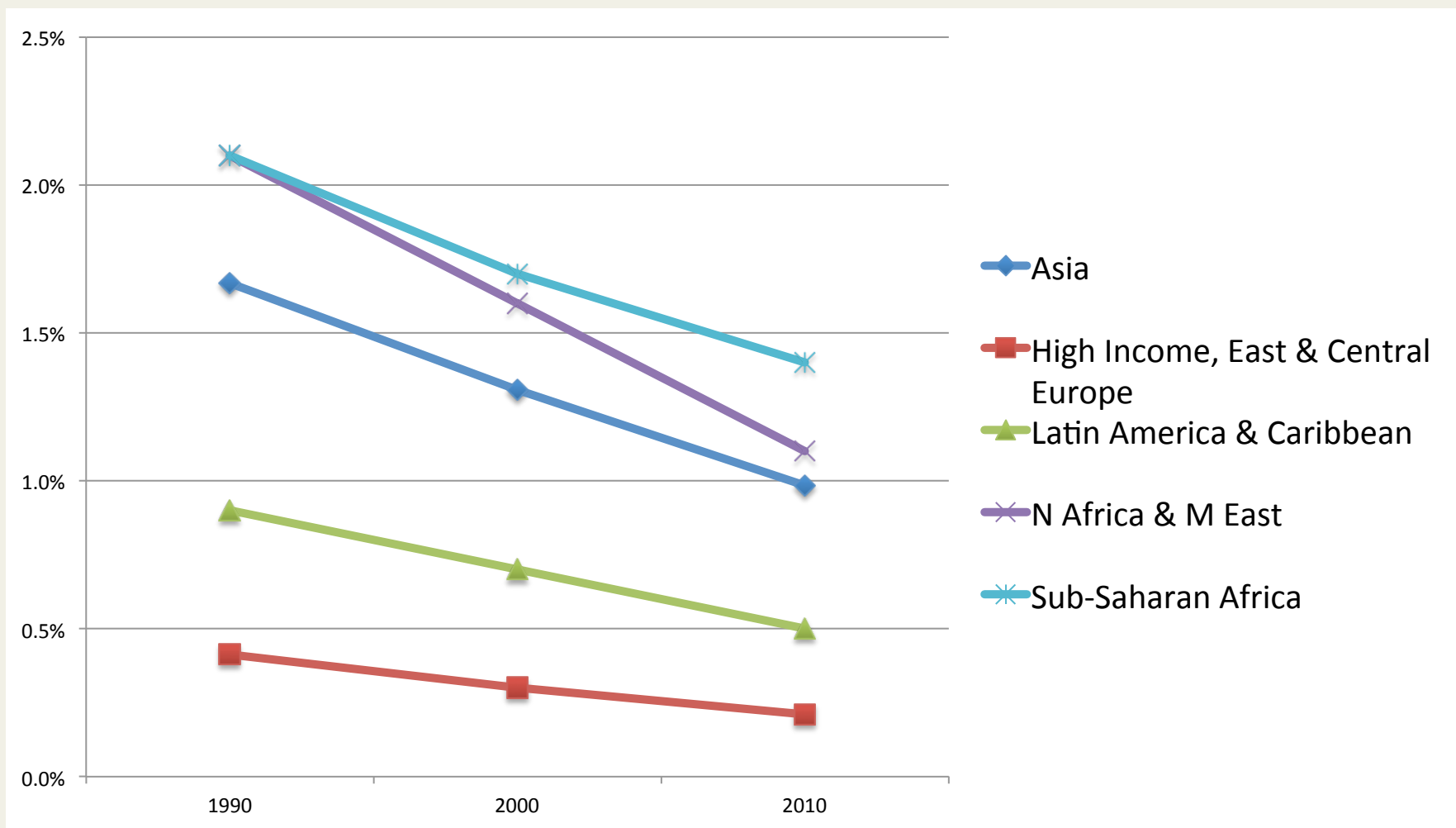
Age-stand. Prev.

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

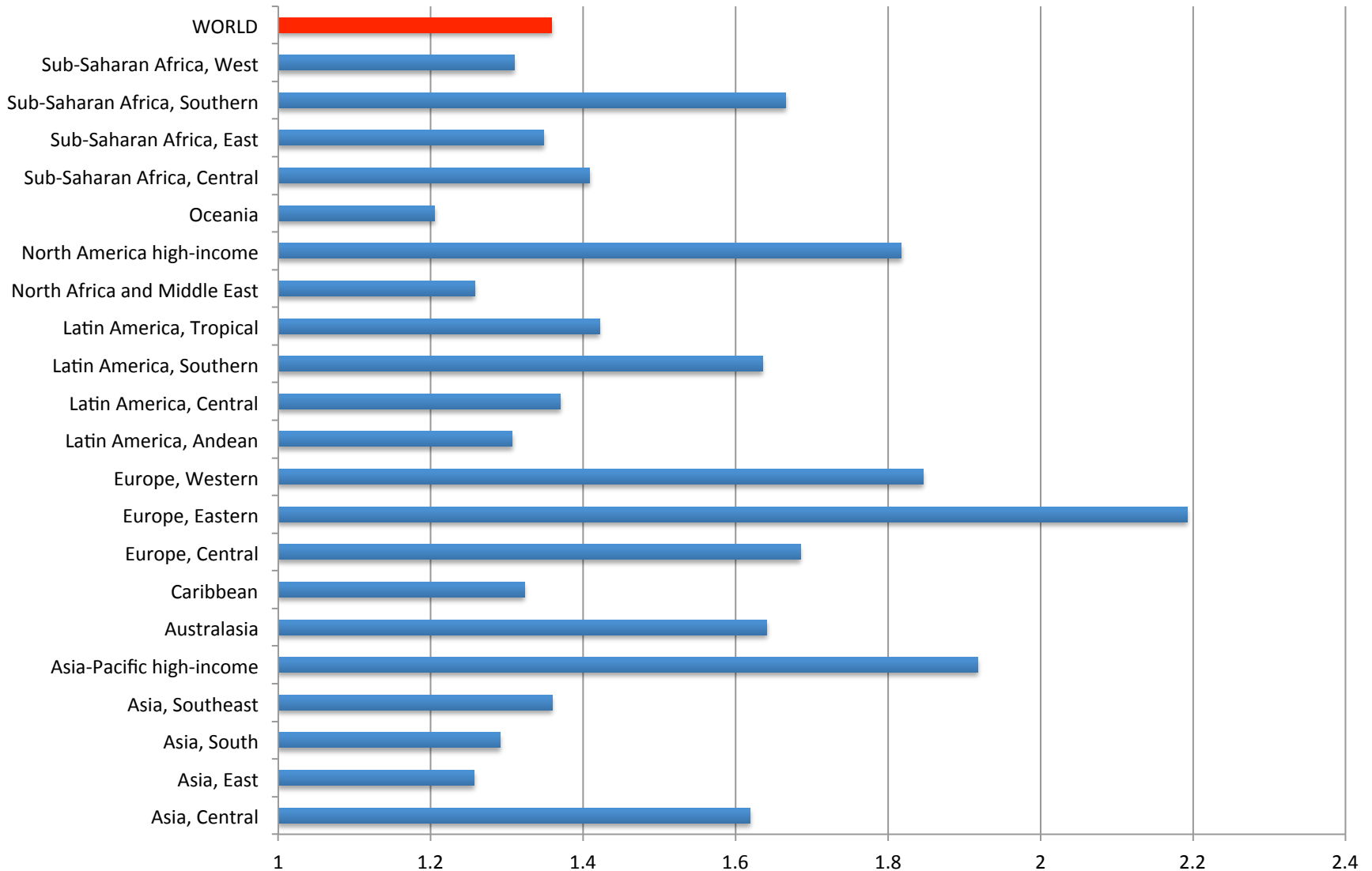
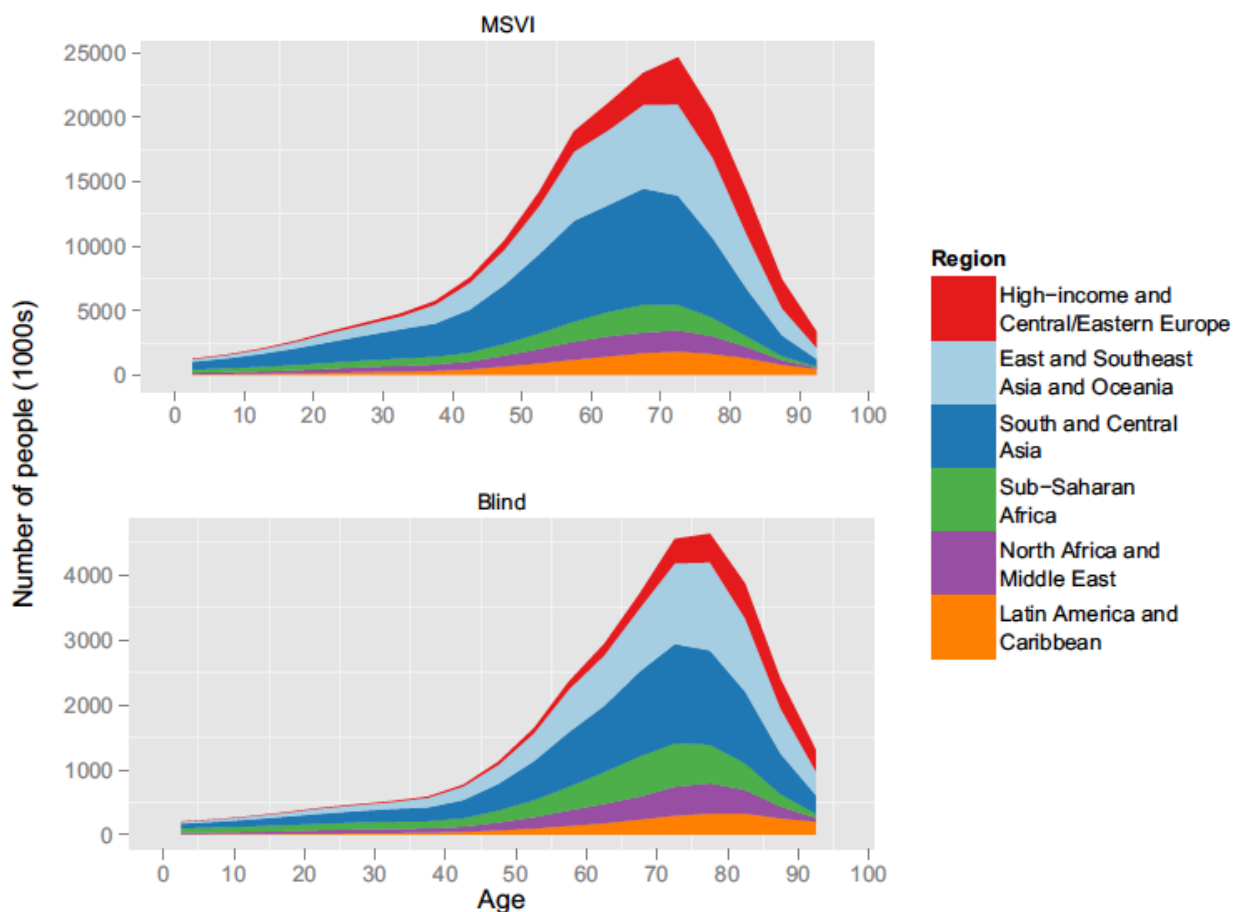


Table 4. Global Trends in Numbers of People Blind or Visually Impaired between 1990 and 2010 and the Change Attributable to Population Growth, Population Ageing, and Change in Age-Specific Prevalence of Blindness or Visual Impairment

	Blind	Moderate and Severe Vision Impairment
No. of persons in 1990 (millions)	31.8	172.0
No. expected with 2010 population, 1990 population age structure, and 1990 prevalence (millions)	41.4	223.9
No. expected with 2010 population, 2010 population age structure, and 1990 prevalence (millions)	50.9	268.0
No. of persons in 2010 (millions)	32.4	191.0
Percentage change from 1990 because of population growth	30%	30%
Percentage change from 1990 because of population ageing	30%	26%
Percentage change from 1990 because of change in age-specific prevalence	-58%	-45%
Percentage change from 1990 to 2010	2%	11%





Global Burden of Disease GBD study

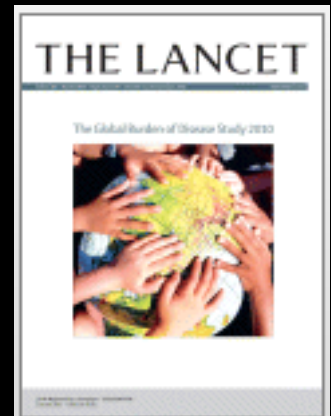


Principal findings reported in Lancet 2012 Special Issue

Co-authored by VERU

Royal Society launch

Department of Health UK think-tank: UK findings fast-tracked



Rise in DALY burden between 1990 and 2010:

Age-related Macular Degeneration	160	%
Glaucoma	113	%
Cataract	12	%

The Global Burden of Disease Project

- Global Burden of Disease (GBD) study aims to measure impact of ~200 causes of mortality and morbidity in terms of losses in population health
- GBD quantifies magnitude of different health problems in units of disability-adjusted life years (DALYs), which capture...
 - Lost years of life due to premature mortality (YLL)
 - Loss of healthy years due to living with non-fatal outcomes (YLD)

The Disability Adjusted Life Year (DALY)

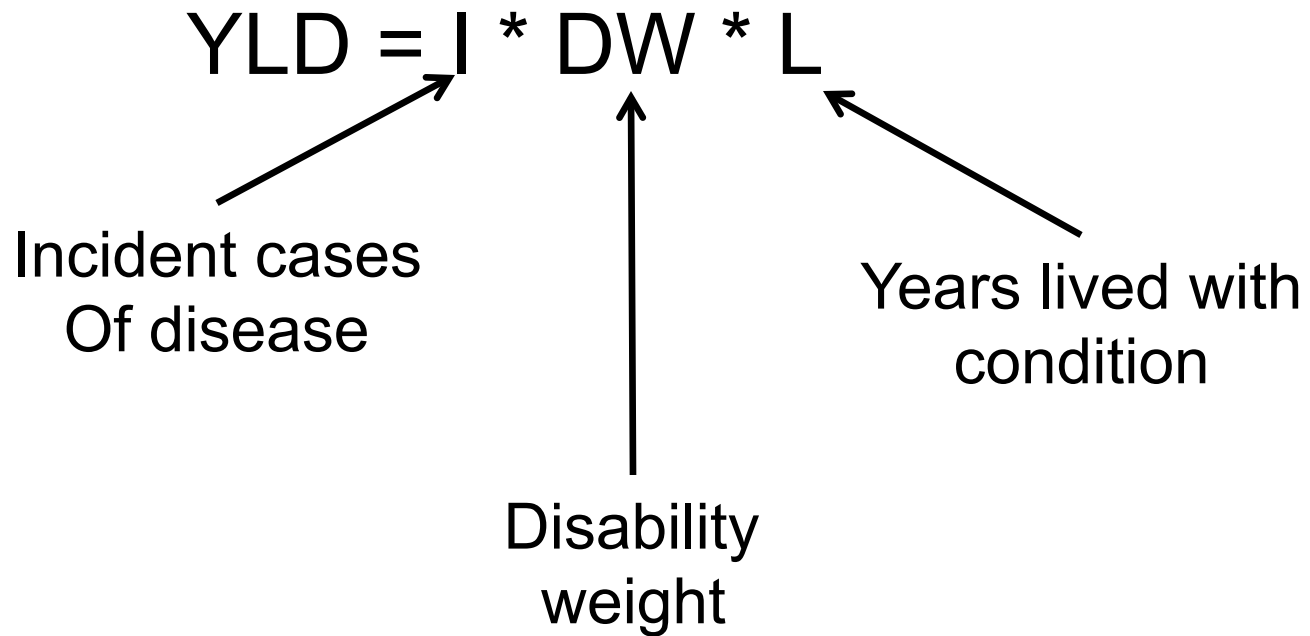
One DALY can be thought of as one lost year of "healthy" life. The sum...can be thought of as a measurement of the gap between current health status and...ideal health...

$$\text{DALY} = \text{YLL} + \text{YLD}$$

Life years lost to death

Life years lost to disability

Life Years Lost to Disability



Assigning Disability Weights 1996 vs. 2010

1996

- Set by expert panels
- 22 conditions weighted using the PTO
- Rest (> 200) set using a VAS

2010

- Base upon responses of community members
- All ~230 sequelae estimates

Study components

- Population-based surveys in 5 primary sites
 - Face-to-face interviews in Tanzania, Bangladesh, Indonesia, Peru
 - Telephone interview in random sample of US households
 - N = 2,500 per site
- Open-access Internet survey
 - Currently live, in English and Spanish (Mandarin coming soon).

<http://www.gbdsurvey.org>





Global Burden of Disease, Injuries, and Risk Factors Study Disability Weights Measurement Survey

Welcome

Thank you for participating in this survey. Your answers will provide crucial information that will greatly enhance the latest [Global Burden of Disease](#) study, which aims to measure the impact of different diseases, injuries, and risk factors on people's health worldwide. This research updates a groundbreaking study first published in 1993 that changed the way researchers and health experts around the world thought about global health priorities.

Who is healthier...

The survey will ask you to imagine different health outcomes and compare them to each other. For example: *"Imagine two different people – the first person is completely blind, and the second person is completely deaf. Who is healthier overall?"*

This information will help researchers understand how people think about different types of health problems. Your participation in this study is completely voluntary, and your responses will be anonymous. By participating in the study, you will contribute to an important effort to improve the understanding of global health problems.

This study is being led by the [Institute for Health Metrics and Evaluation](#) at the [University of Washington](#) in conjunction with [Harvard University](#), [Johns Hopkins University](#), the [University of Queensland](#), and the [World Health Organization](#).

The survey takes around 15 to 20 minutes to complete. We encourage you to share this survey link with others to help us collect a broad range of opinions.

Thank you again for taking part in this survey.



Start Survey



Measurement methods

- Basis for all survey assessments are brief *lay descriptions* of sequelae highlighting major functional consequences and symptoms
- Primary mode of eliciting responses is simple *paired comparison*:
 - Respondents hear (or read) two descriptions of hypothetical people with selected lay descriptions
 - Respondents indicate *which person is healthier*

Sample DWMC Scenario

Imagine having 10 years left to live, and living those ten years with the following health problems:

Constant pain and stiffness in the back and in legs, which makes it difficult to sit, stand, run and jump. With these problems, you would avoid bending, twisting and lifting things; would feel some loss of enjoyment in life, and would sleep poorly

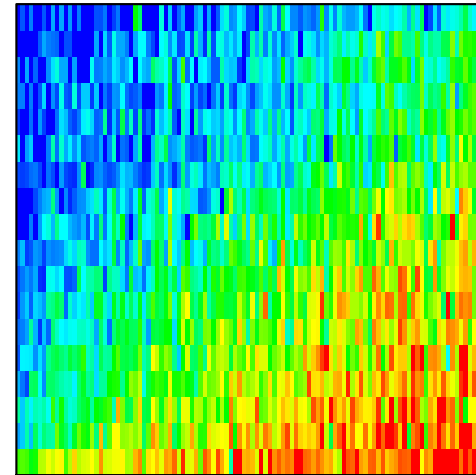
Or

Completely blind in both eyes

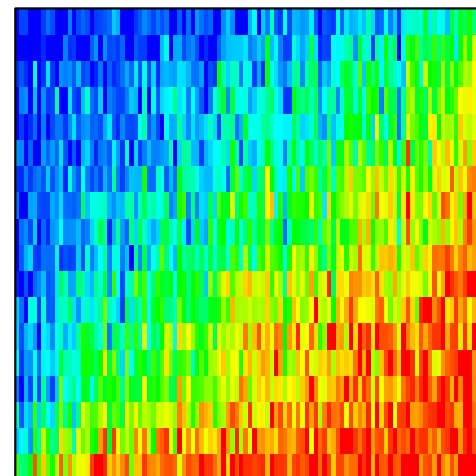
Results: comparison of household and web surveys

- Web respondents comprise non-random, highly educated, self-selected sample
- But, response probabilities are virtually indistinguishable from those in household surveys

Tanzania (N=2,604)



Web (N=2,600)



Fall in Disability Weight for Blindness

	1990	GBD 2010
Blindness	0.6	0.2
VI (sev/mod/mild)		0.19 / 0.03/ 0.004
Acute Low back pain	0.06	0.27



ELSEVIER

Health Policy

journal homepage: www.elsevier.com/locate/healthpol

Methodological note

Disability weights in the Global Burden of Disease 2010:
Unclear meaning and overstatement of international
agreement

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Lancet. 2013 Jan 5;381(9860):23. doi: 10.1016/S0140-6736(12)62081-9. Epub 2012 Dec 21.

Disability weights for vision disorders in Global Burden of Disease study.

Taylor HR, Jonas JB, Keeffe J, Leasher J, Naidoo K, Pesudovs K, Resnikoff S.

Comment in

Disability weights for vision disorders in Global Burden of Disease study - Authors' reply. [Lancet. 2

ARTICLE IN PRESS

Global Prevalence of Vision Impairment and Blindness

Magnitude and Temporal Trends, 1990–2010

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



OUTPUTS Publications

UK health performance: findings of the Global Burden of Disease Study 2010



Christopher J L Murray†, Michael A Richards, John N Newton, Kevin A Fenton, H Ross Anderson*, Charles Atkinson*, Derrick Bennett*, Eduardo Bernabé*, Hannah Blencowe*, Rupert Bourne*, Tasanee Braithwaite*, Carol Brayne*, Nigel G Bruce*, Traolach S Brugha*, Peter Burney*, Mukesh Dherani*, Helen Dolk*, Karen Edmond*, Majid Ezzati*, Abraham D Flaxman*, Tom D Fleming*, Greg Freedman*, David Gunnell*, Roderick J Hay*, Sally J Hutchings*, Summer Lockett Ohno*, Rafael Lozano*, Ronan A Lyons*, Wagner Marcenes*, Mohsen Naghavi*, Charles R Newton*, Neil Pearce*, Dan Pope*, Lesley Rushton*, Joshua A Salomon*, Kenji Shibuya*, Theo Vos*, Haidong Wang*, Hywel C Williams*, Anthony D Woolf*, Alan D Lopez, Adrian Davis

Summary

Background The UK has had universal free health care and public health programmes for more than six decades. Several policy initiatives and structural reforms of the health system have been undertaken. Health expenditure has increased substantially since 1990, albeit from relatively low levels compared with other countries. We used data from

Published Online
March 5, 2013
<http://dx.doi.org/10.1016/>

DATA SHARING

Health Economics

[http://www.hollows.org.au/
our-work/the-price-of-sight](http://www.hollows.org.au/our-work/the-price-of-sight)

Human capital investment
(World Economic Forum)

Global Indicators Project:
Monitoring progress in
elimination of avoidable
blindness

Investing in Vision –

*Comparing the costs
and benefits of
eliminating avoidable
blindness and visual
impairment*

The Fred Hollows
Foundation

February 2013

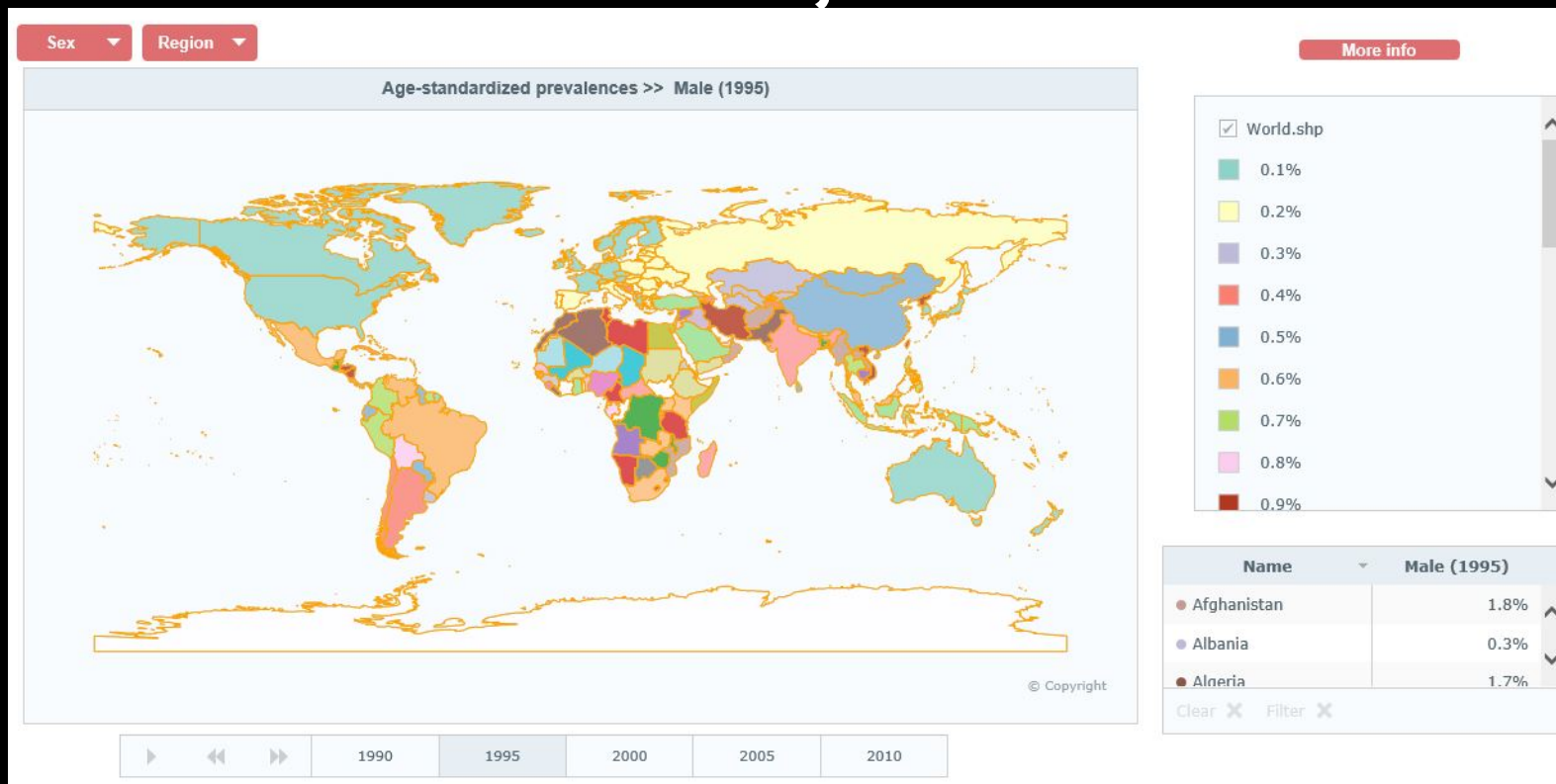


Global Vision Database

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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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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Vision Institute

