Global Blindness: Who, What, Where, When, Why, and How Much

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Many thanks to Drs. Allen Foster, Rengaraj Venkatesh, and Geoff Tabin for help in the slides

see international

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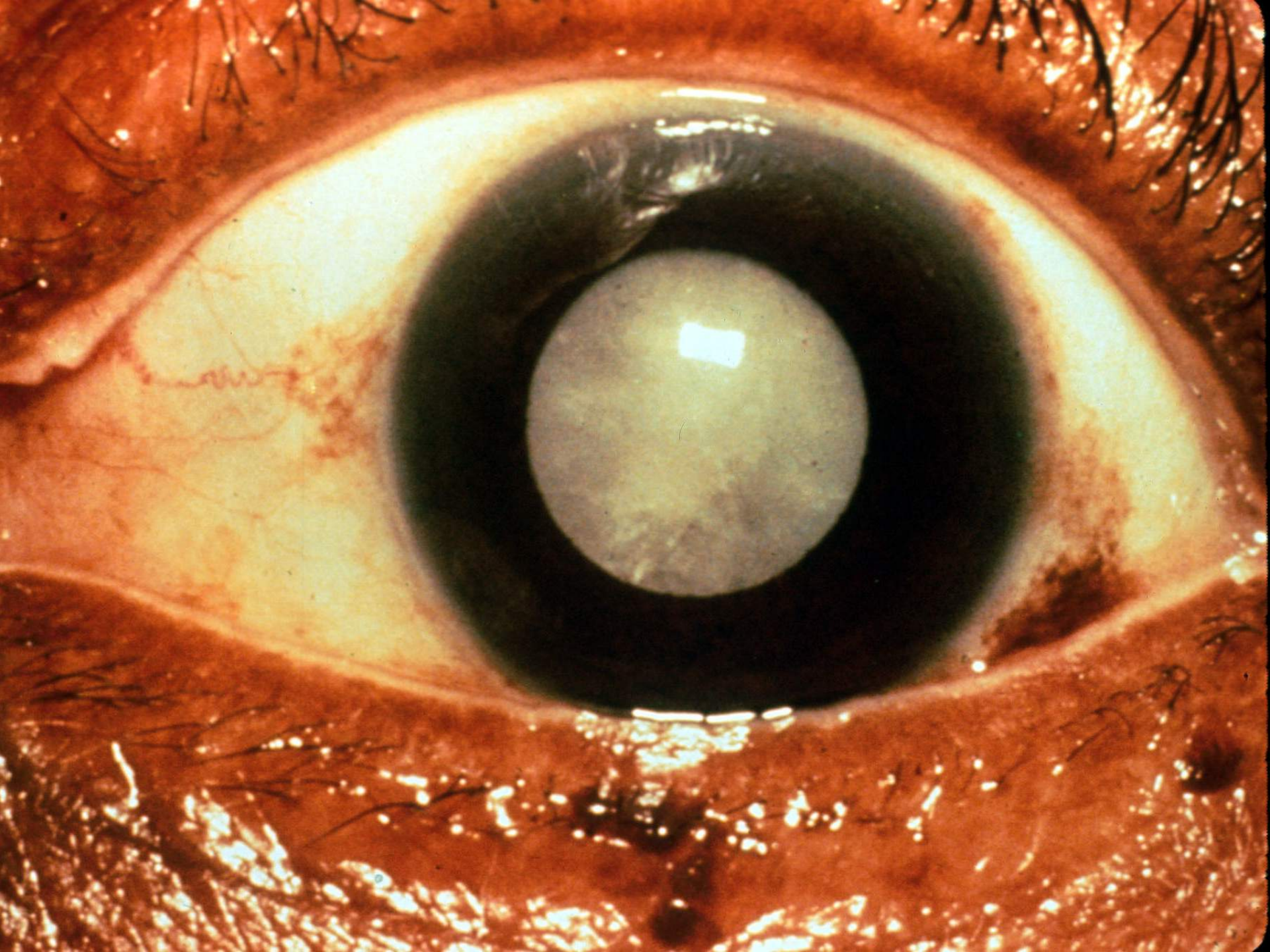
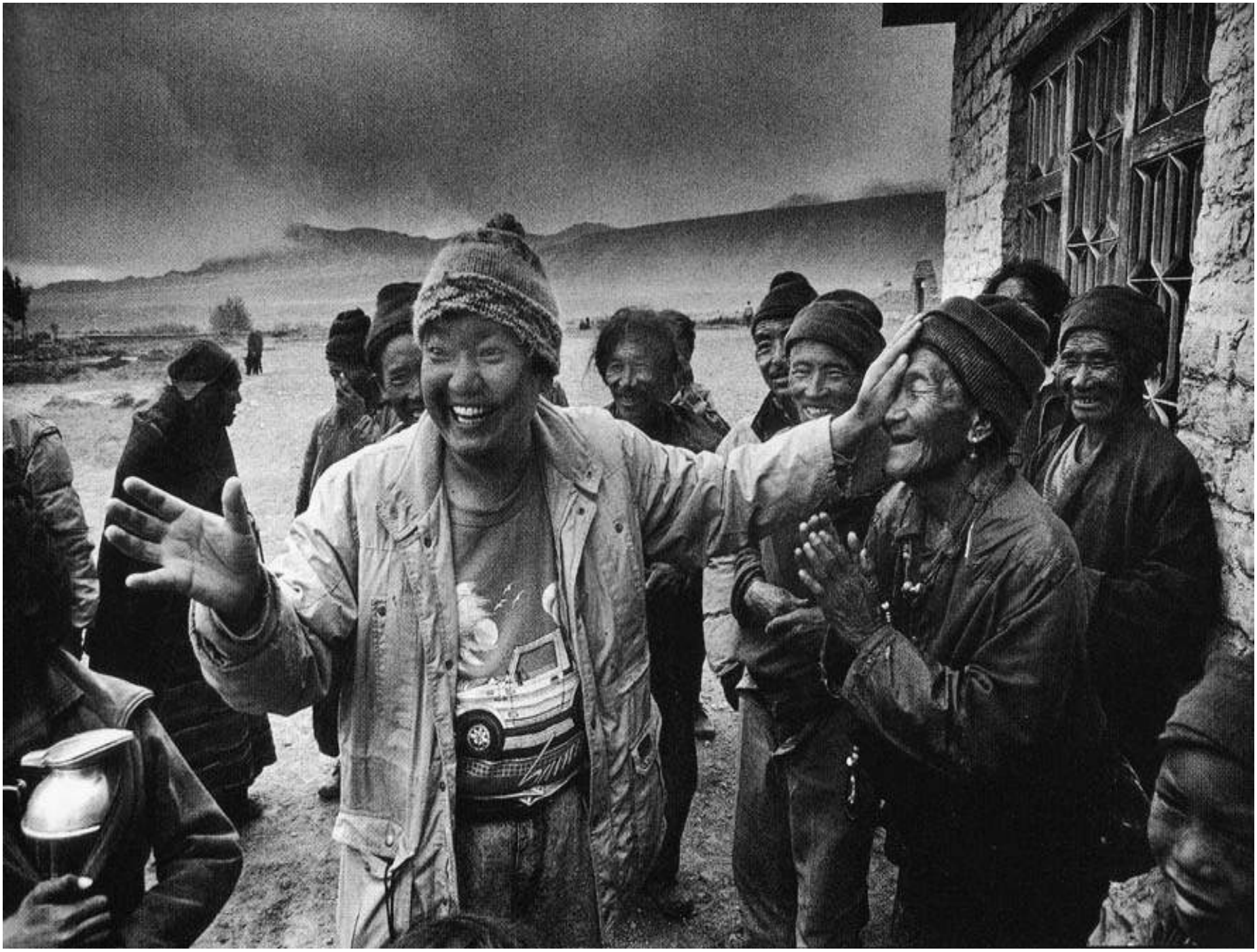
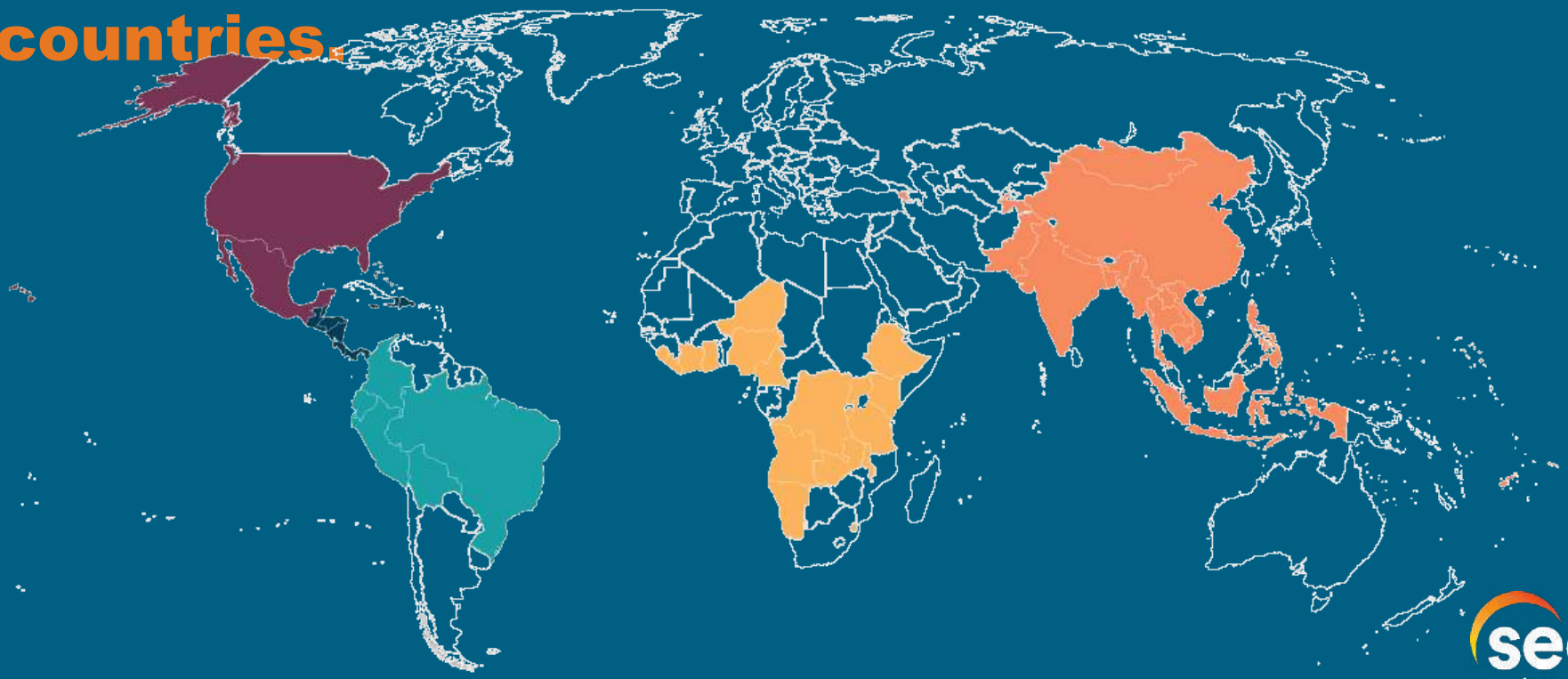




Each year, SEE conducts more than 200 sight-restoring programs in over 40 countries.



see international

- **A typical program lasts 5 days and provides 50-100 free surgeries to people without access to care.**
- **Patients are typically treated for cataracts, glaucoma, strabismus, and diabetic retinopathy.**
- **Clinics vary based on size of team, location, and types of cases.**
- **Require a host ophthalmologist at all of our sites for prescreening and post-op care.**
- **Medical supplies and equipment are donated by corporate sponsors & other SEE donors.**

see international

INTERNATIONAL PROGRAM OVERVIEW

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Armenia
Bahamas
Bangladesh
Belize
Bolivia
Cambodia
Cameroon
Colombia
Costa Rica
Dem. Rep. Of Congo
Dominican Republic
Ecuador
El Salvador
Fiji
Ghana
Guatemala
Haiti
Honduras
India
Ivory Coast
Jamaica
Kenya
Laos
Liberia
Malawi
Marshall Islands
Mexico
Micronesia
Mongolia
Myanmar
Namibia
Nicaragua
Niger
Nigeria
Pakistan
Palau
Panama
Peru
Philippines
Sierra Leone
Swaziland
Tajikistan
Tanzania
Uganda
Vanuatu
Zambia

see international

2017 PROGRAM LOCATIONS

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In 2017, we performed over 26,000 sight-restoring surgeries

In 2018, we performed over 40,000 sight-restoring surgeries

This year, we will restore sight to 100,000 people

Improving health worldwide

www.lshtm.ac.uk

HYGIENE
&TROPICAL
MEDICINE

- **Patients are being connected with doctors based on their individual needs.**
- **Over 2,300 volunteer hours from ophthalmologists, optometrists, surgical technicians, and other volunteers.**
- **Eye exam clinic in Texas has examined over 100 patients in its three years, and we have extended the program to South Dakota, Colorado, and partnered with California CareForce to examine over 1,960 patients.**

see international

U.S. PROGRAMS

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- **In order to ensure high quality care, we provide training for both our travelling ophthalmologists and in-country medical teams.**

- **Our primary focus is on Manual Small Incision Cataract Surgery (MSICS) which allows doctors to perform cataract surgeries with self-healing incisions that facilitate a quick recovery.**

- **Key training locations include Santa Barbara, New York, Philadelphia, London (UK), Kolkata (India), and Querétaro (Mexico).**

MANUAL SMALL INCISION CATARACT SURGERY (MSICS)

(MSICS) LEVEL I

- A one day course involving a didactic lecture and wet-lab.
- Under the supervision of SEE Faculty, participants work with pig and human tissue.
- CME units available Current locations: New York, New York; Philadelphia Pennsylvania; Santa Barbara, California; and London, United Kingdom.

(MSICS) LEVEL II

- Ideal for those who have already taken a Level I course and would like more hands-on experience.
- Work with experienced SEE Docs in these training courses.
- Current locations: Accra, Ghana; Kolkata and Siliguri, India; Querétaro, Mexico; Santo Domingo, Dominican Republic; and San Pedro Sula, Honduras.

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Vision 2020 Links Program USA

- Program present in the UK since 2004 at the International Center of Eye Health
- Present in the USA since 2018
- First Links Project USA: Rwandan International Institute of Ophthalmology (RIIO) and Wills Eye Hospital
  - Institution to Institution relationship to improve training and patient care
  - 3 year program based on the Needs Assessment and a shared Action Plan
  - Visiting and cross training for a new residency program
    - Wills Online Education at RIIO
    - RIIO residents visit Wills Eye
    - Wills Eye fellows/attendings visit RIIO

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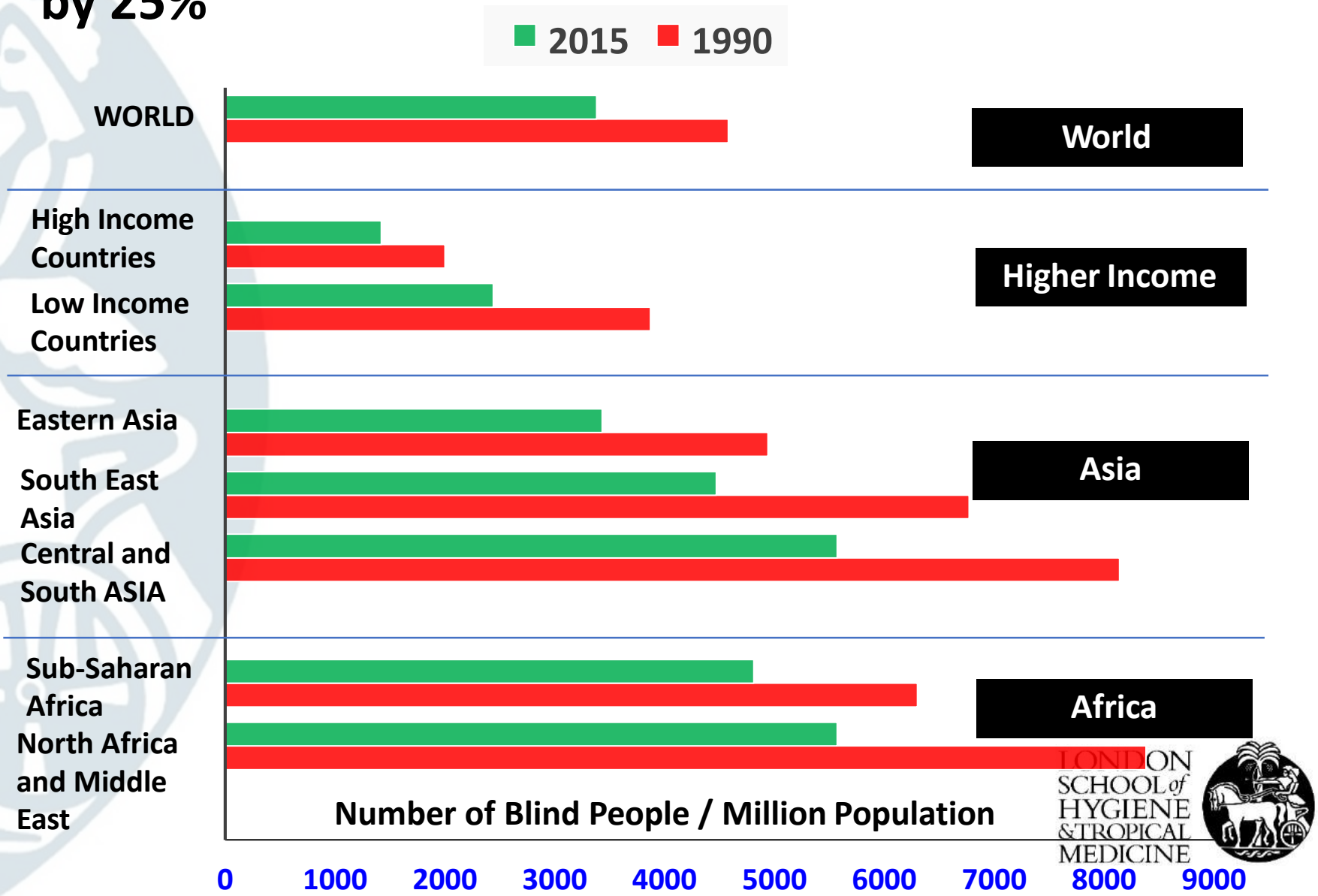
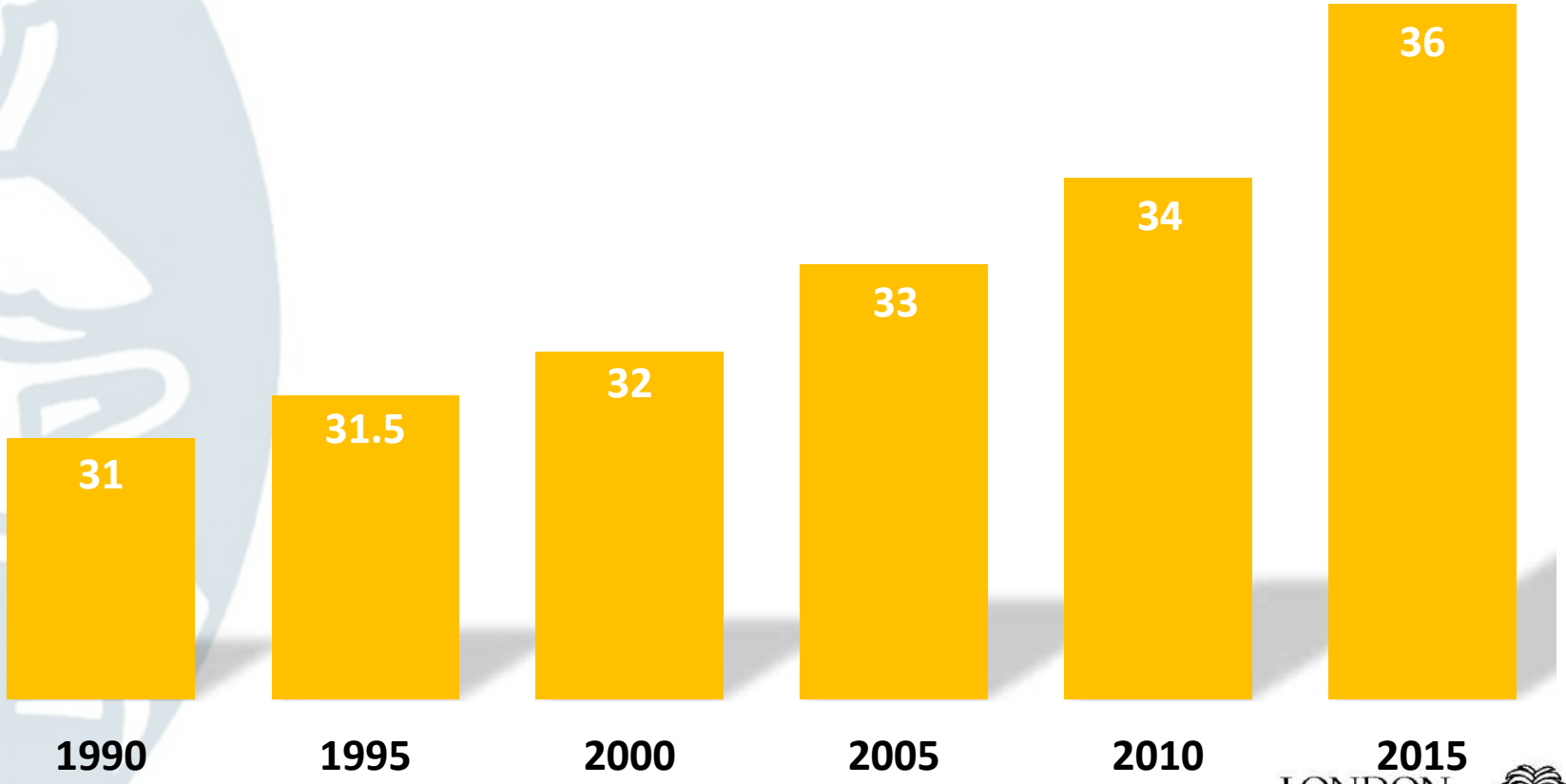
Definitions of Visual Loss and Advocacy: Translating WHO Grades of Vision into Real Life

Grade	From	To
	Blind: <20/400	NLP Cannot see light
	Severe VI:<20/200	20/400
	Mod VI:<20/60	20/200
	Normal: 20/20	20/60

Evidence of Success: Decrease in Prevalence by 25%



Evidence of Failure: Increase in actual number of blind (15%)



Vision Loss Expert Group: Global Burden of Disease: Community Eye Journal 2017

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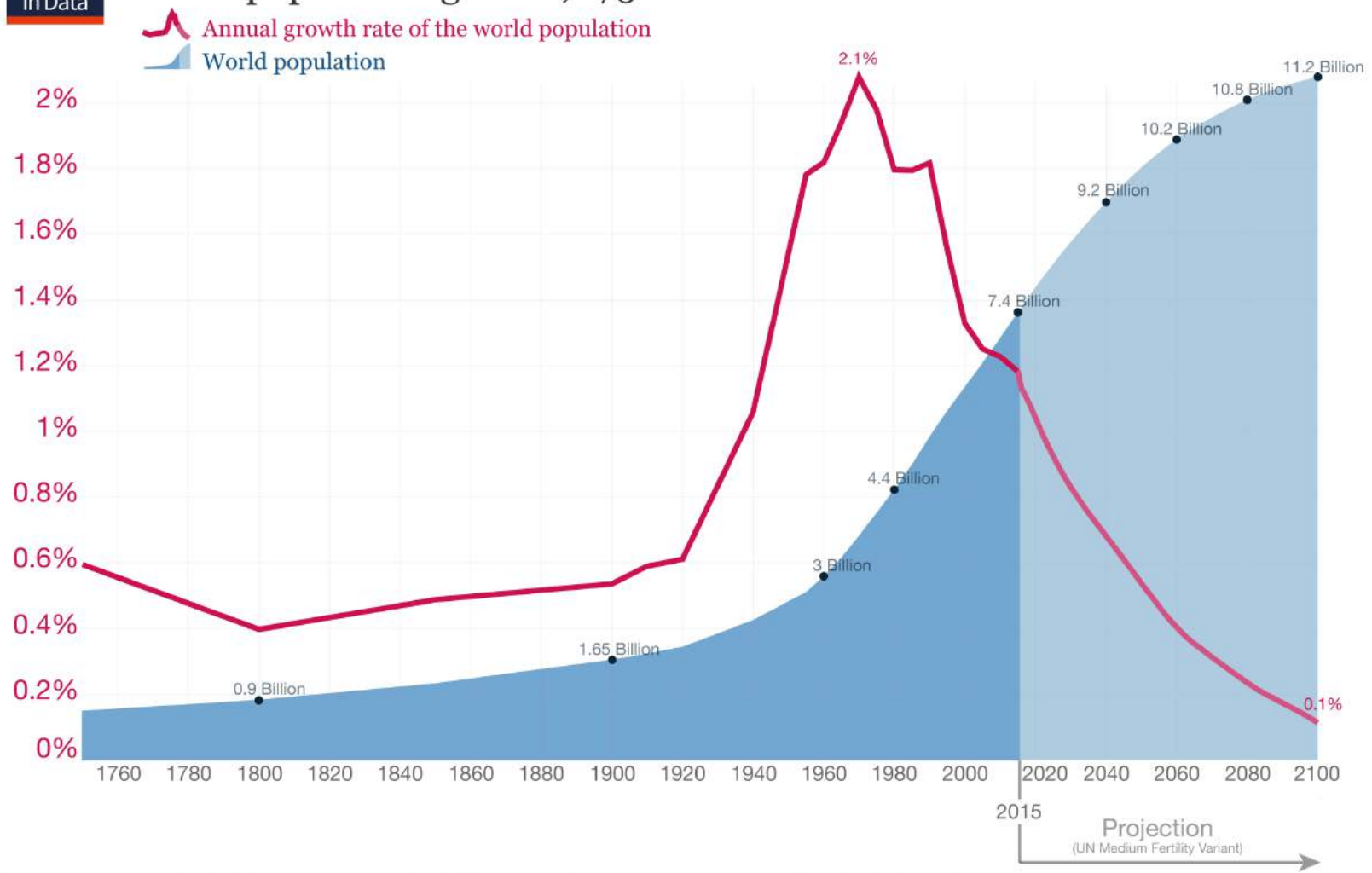
Our World in Data

World population growth, 1750-2100



Data sources: Up to 2015 OurWorldInData series based on UN and HYDE. Projections for 2015 to 2100: UN Population Division (2015) – Medium Variant.
The data visualization is taken from OurWorldinData.org. There you find the raw data and more visualizations on this topic.

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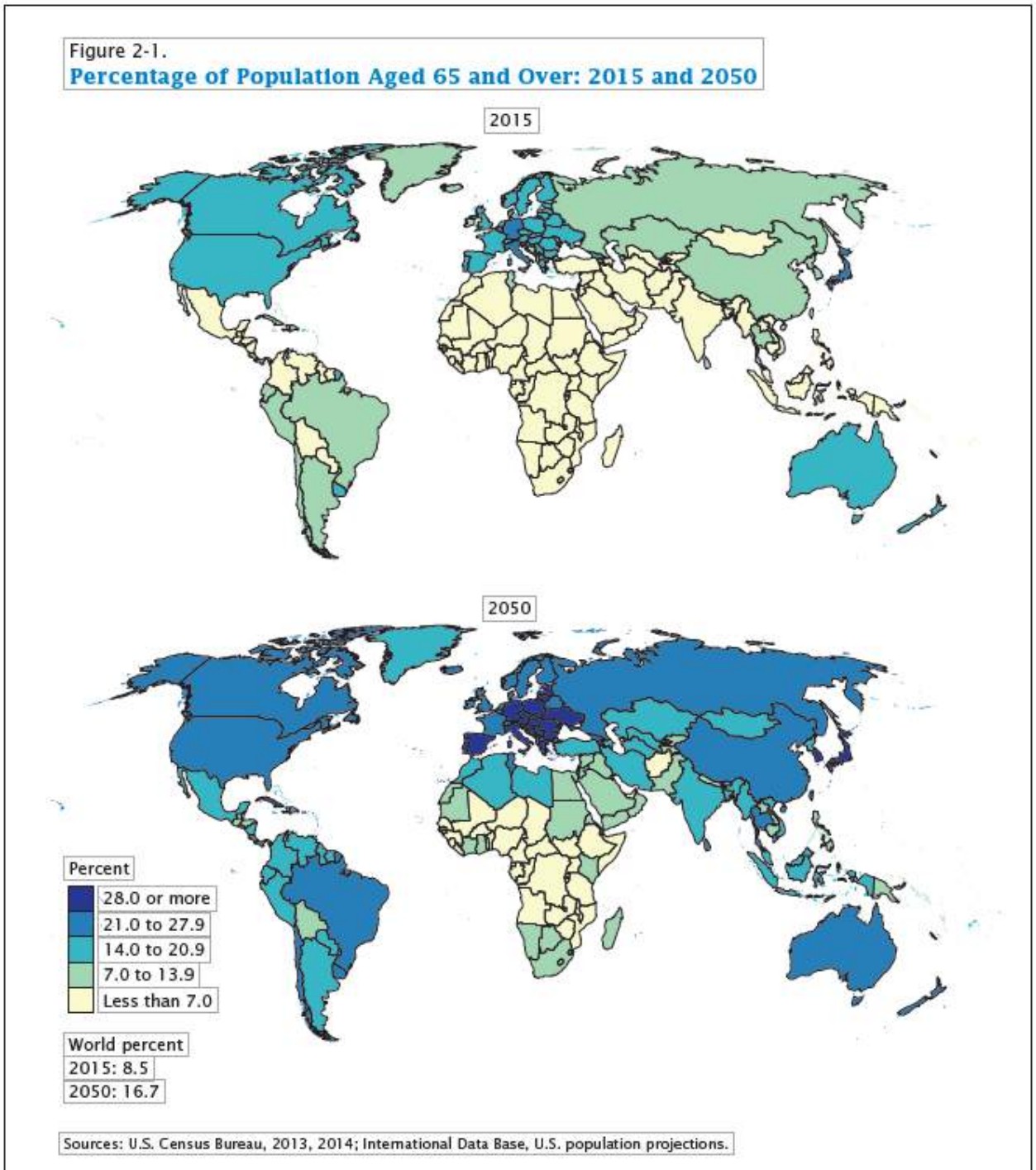

80% of blindness and visual impairment is in those over the age of 50

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IAPB Vision Atlas: How well did we tell the future in 1990 looking forward to 2015?

Table 7 – Actual numbers compared with predicted numbers

	Blind	MSVI
Actual number in 1990	31m	160m
Number expected in 2015 if prevalence rates had remained the same as in 1990	57m	286m
Actual number in 2015	36m	217m
Difference in number of people expected to be blind or MSVI in 2015 compared with actual number in 2015	21m	69m
Total difference in number of Blind + MSVI expected compared with actual	90m	

Thus, in the year 2015 there were some 21 million fewer people who were blind and 69 million fewer persons with MSVI than would have been expected – a total of 90 million fewer people experiencing visual impairment.

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Global Blindness and Visual Impairment 2015

36 Million Blind = Population of Canada (0.5%)

253 million with Moderate to Severe Visual Impairment = 4/5 of the population of the USA (3%)

Etiology of blindness

	Millions blind	Percentage
Cataract	**12.6**	**35**
Uncorrected Refractive Error	**7.4**	**21**
Glaucomas	**3.0**	**8**
ARMD	**2.0**	**5**
Corneal Opacity	**1.3**	**4**
Trachoma	**0.4**	**1**
Diabetic Retinopathy	**0.4**	**1**
Other	**8.9**	**25**
Total	**36.0**	**100**

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Etiology of Visual Impairment (20/70 to NLP)

	Millions	Percentage
Cataract	**65**	**26**
Uncorrected Refractive Error	**124**	**49**
Age Related Macula Degeneration	**10**	**4**
Glaucomas	**7**	**3**
Corneal Opacity	**4**	**2**
Diabetic Retinopathy	**3**	**1**
Trachoma	**2**	**1**
All Other causes	**37**	**14**

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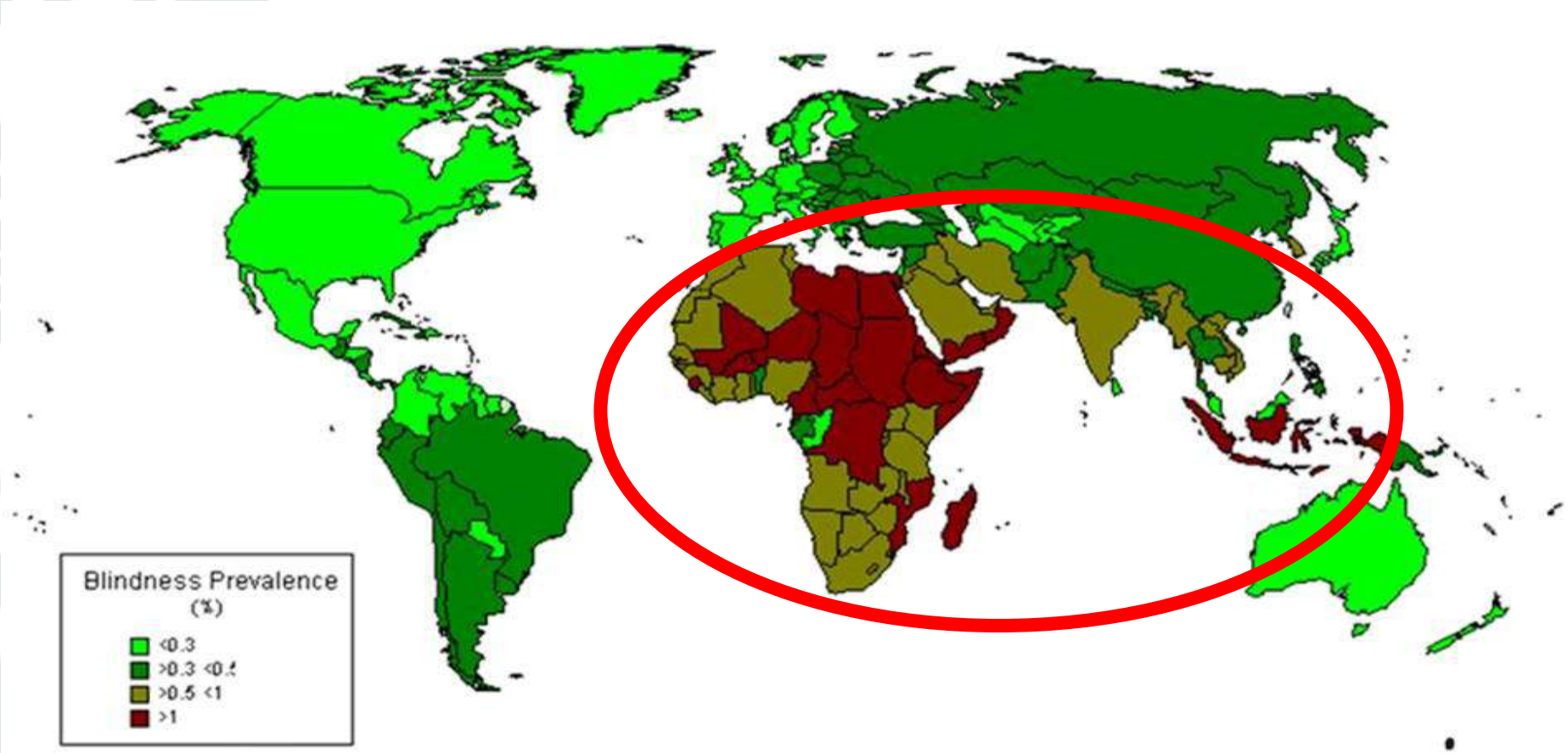
Blindness prevalence map- 90% of the world's blind live in the developing world



http://www.who.int/blindness/Vision2020_report.pdf

Pascolini, D. and S. P. Mariotti (2012). "Global estimates of visual impairment: 2010." Br J Ophthalmol 96(5): 614-618.

https://www.unmc.edu/eye/international/mission.html

WorldHealth Organization, www.who.int/blindness/datamaps/blindness.jpg

Resnikoff S, Pascolini D,Etya'ale D, et al. Policy and practice: global data on visualimpairment in the year 2002. *Bull World Health Organ.*2004;82:849.

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What happens when someone in a family goes blind in LMIC

- Quality of Life
- Early death (3 months in some studies, decreases lifespan by 1/3
- Increases all-cause & childhood mortality
- Less access to medical care
- Decrease in family income
- Increased rates of poverty
- Less education for the next generation
- Social isolation
- Anxiety/depression

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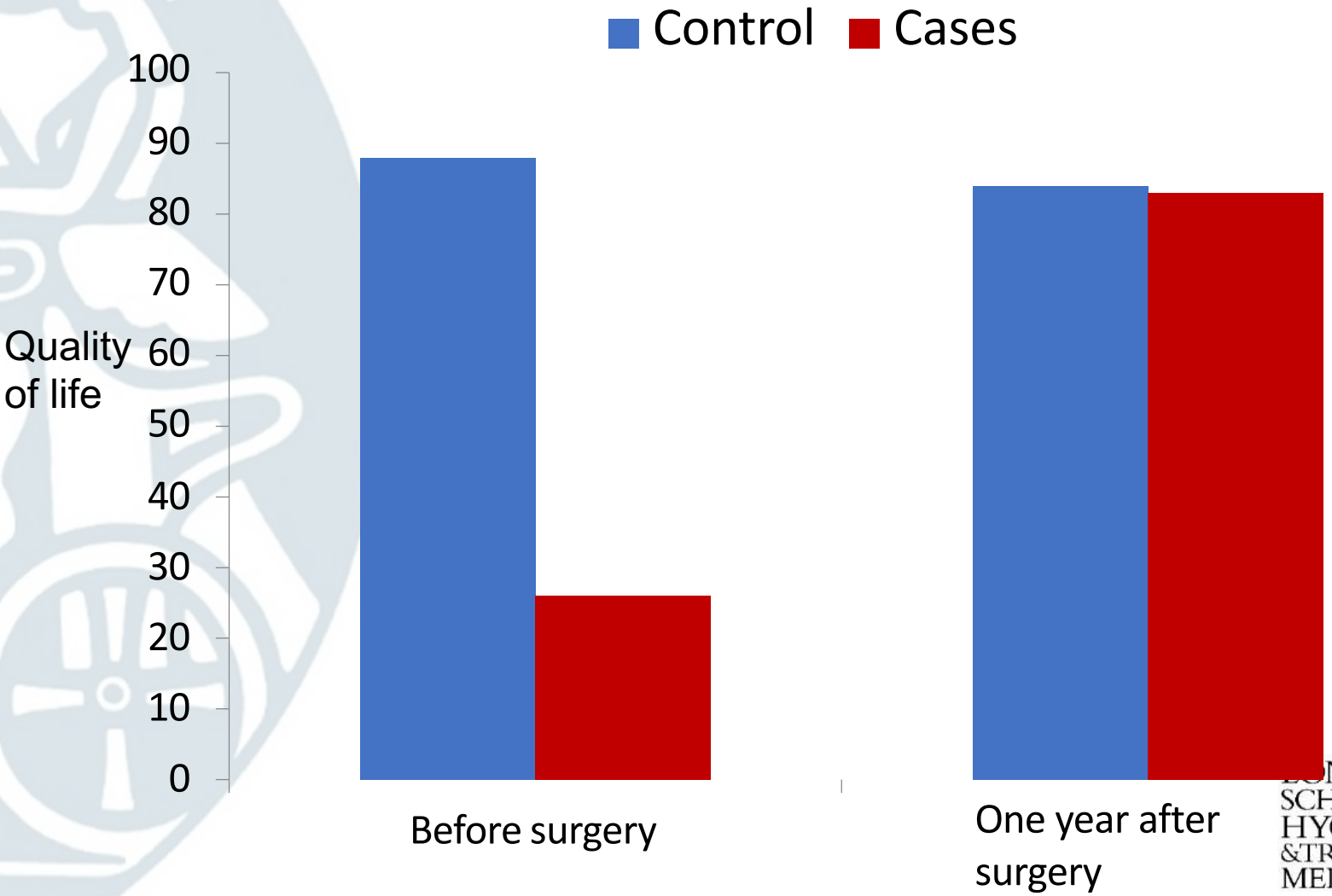
Quality of Life before and after Cataract Surgery



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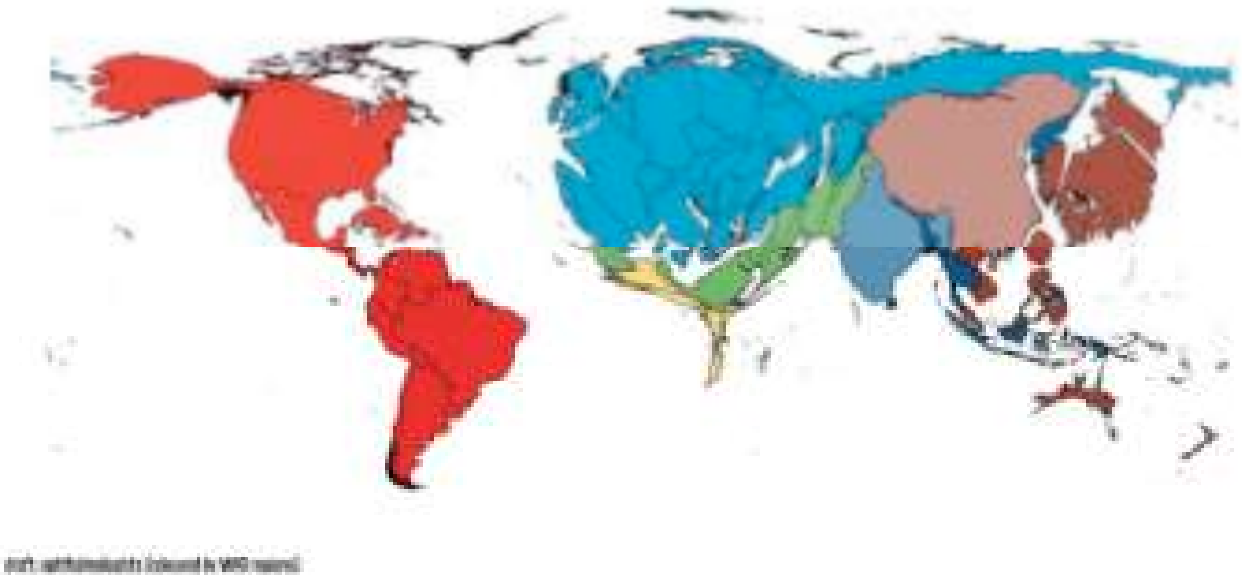
Cataract Impact Study: Hannah Kuper, Sarah Polack

Global Inverse Care Law- Where the Blind Are vs Where the Health Care Workers Are



Bastawrous, A; Hennig, BD (2012) The global inverse care law: a distorted map of blindness. The British journal of ophthalmology, 96 (10). pp. 1357-8. ISSN 0007-1161 DOI: 10.1136/bjophthalmol-2012-302088

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WHO recommendations

Eye Health Staff Per Million Population in Sub-Saharan Africa				
	Minimum required	Anglo 574m	Franco 281m	Luso 53m
Ophthalmologists	**4**	2.4	2.1	1
Optometrists	**10**	13	0.5	1
Ophthalmic allied staff	**10**	7	5	4

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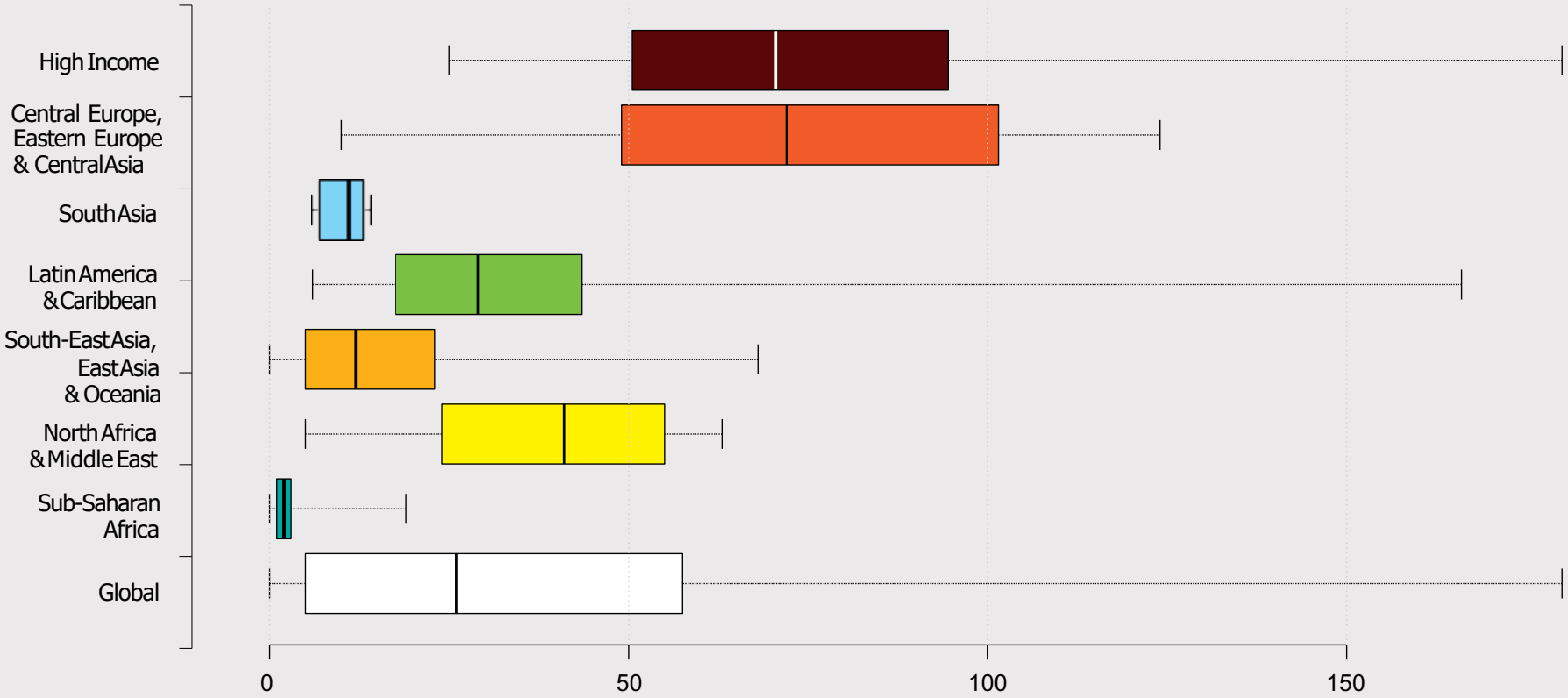
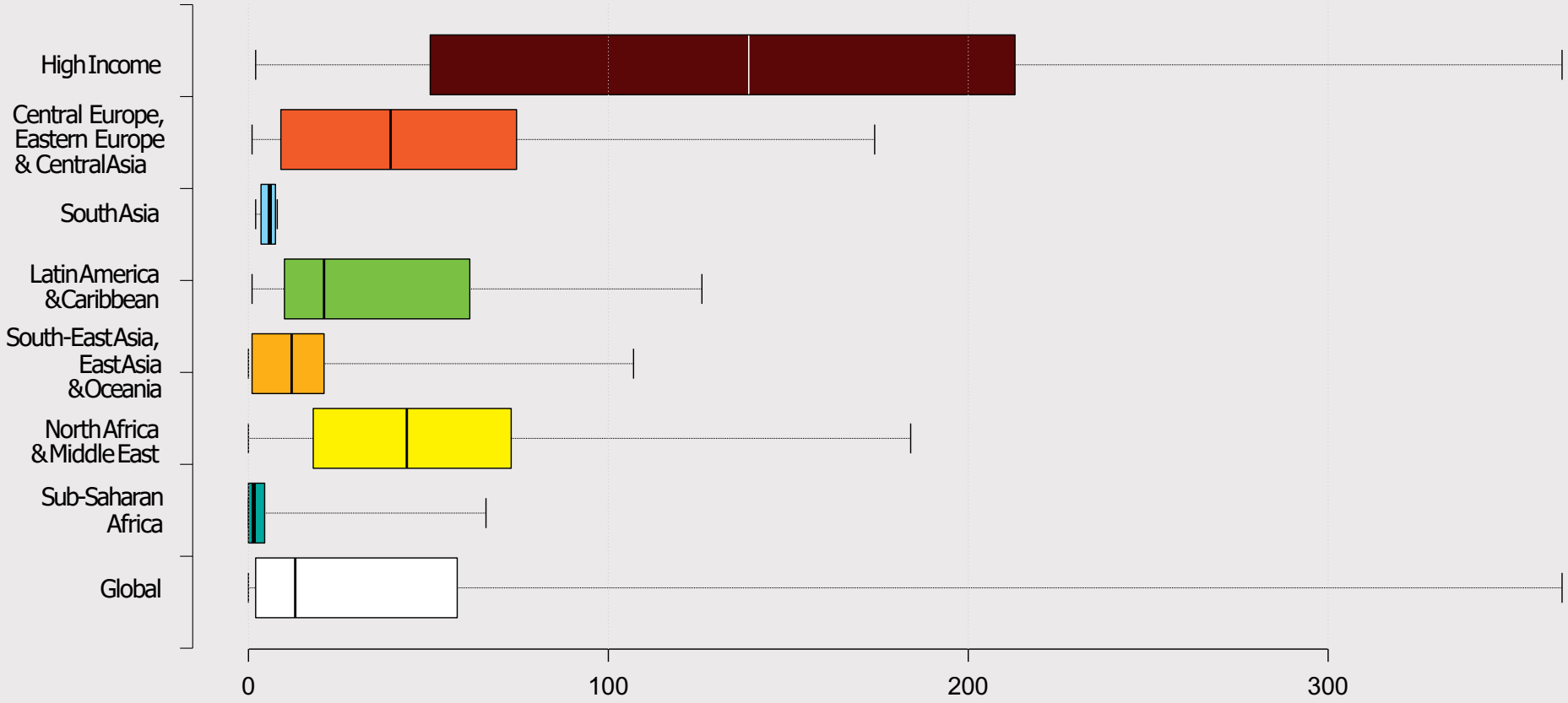
Number of Ophthalmologists per million population for the 191 countries for which data is available



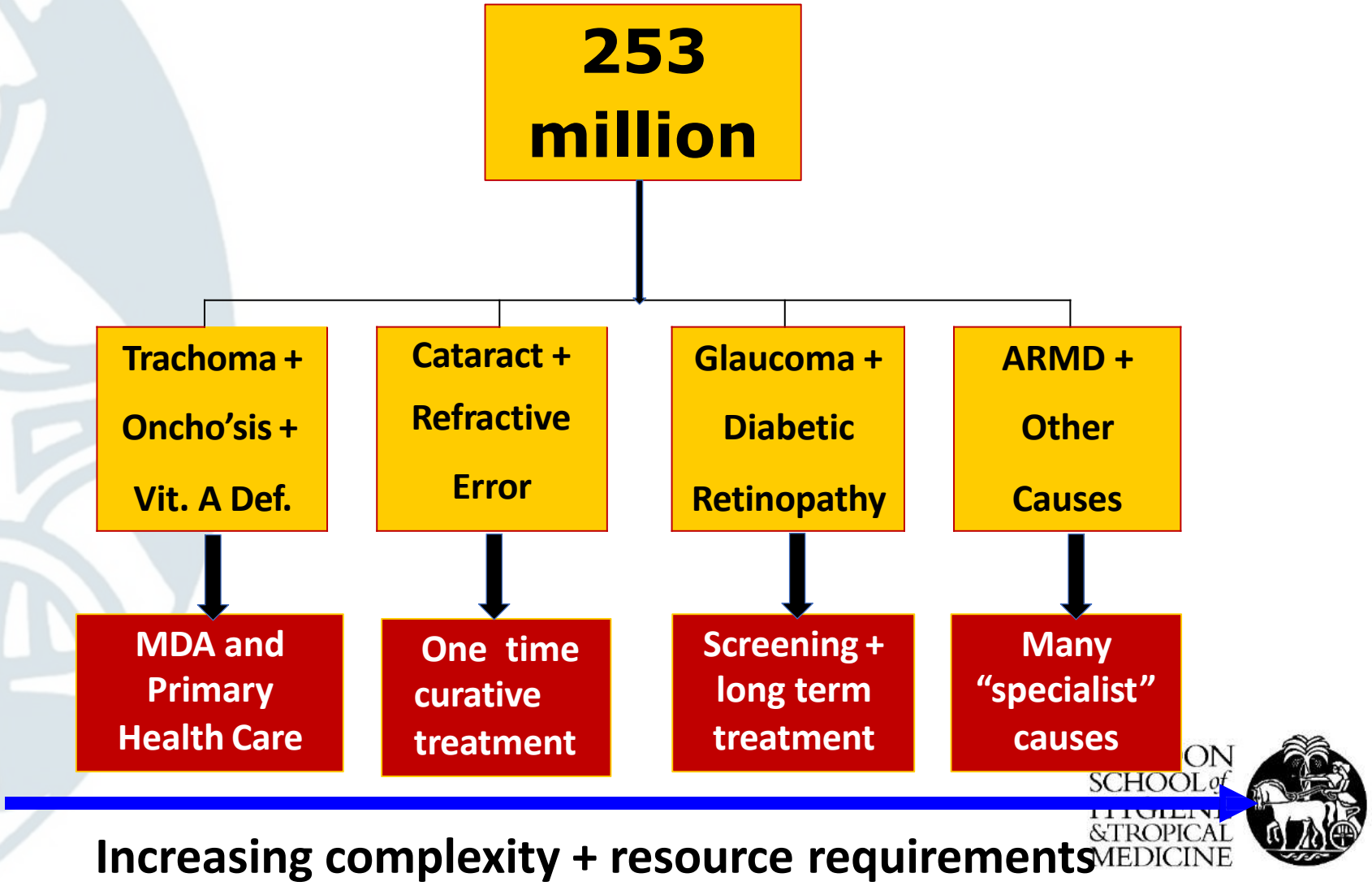
Data correct as at 12th Oct 2017

Number of Optometrists per million population for the 128 countries for which data is available



Data correct as at 12th Oct 2017

The treatment of visual impairment



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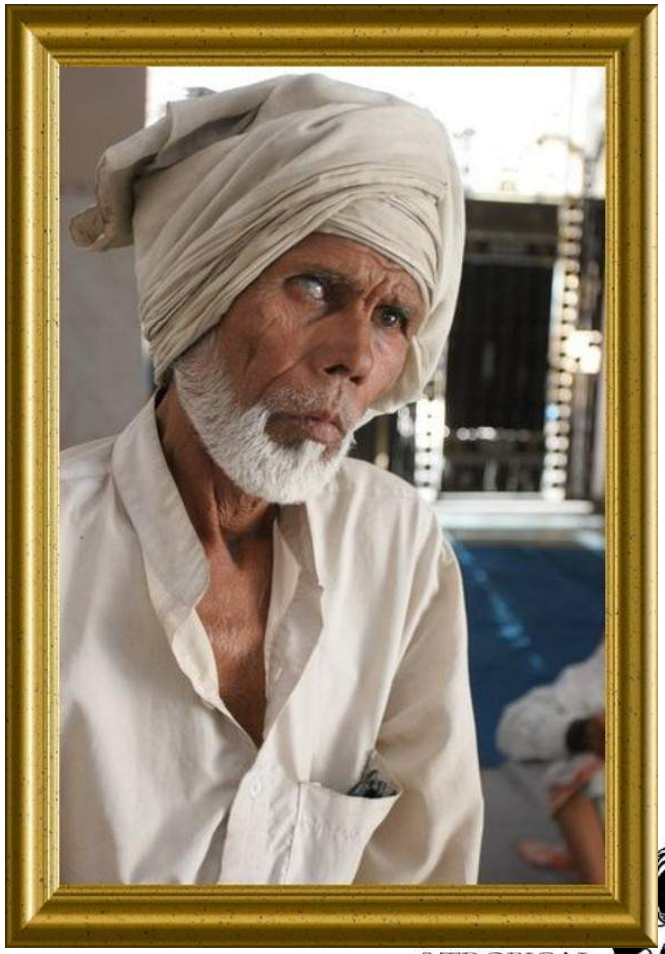
Challenges in Developing World by Dr. Rengaraj Venkatesh, Aravind Eye Care System

- Reducing the backlog of cataract
- Phaco machines are expensive to purchase & maintain
- Foldable IOL's are cost-prohibitive
- Shortage of ophthalmologists



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Cataract Blindness
What is Needed?

- Maximize surgeon productivity
- High volume, rapid surgery
- Effective for advanced cataracts
- Low complication rate
- Low cost (equipment, IOLs)

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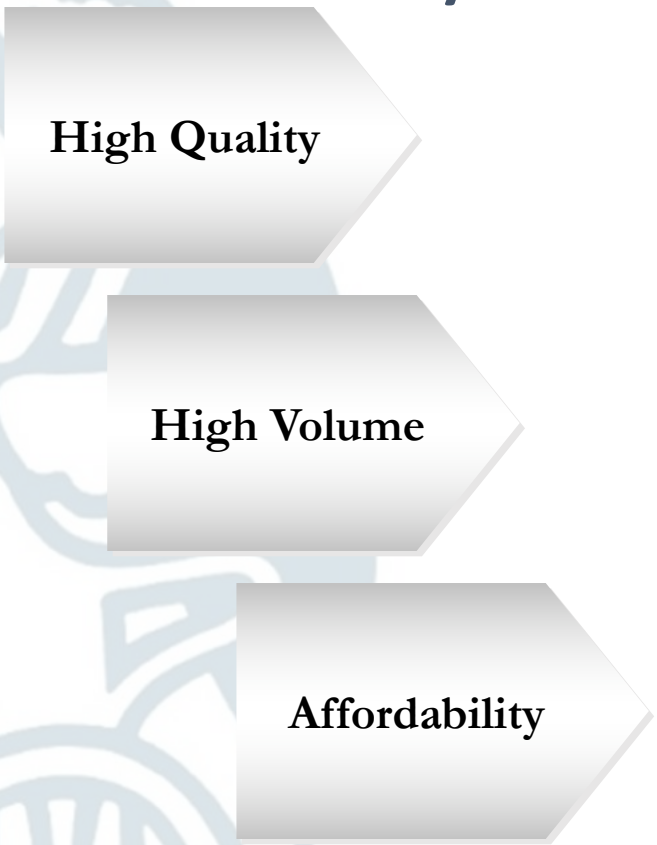
Aravind Eye Hospital Service Model



- Fee for service: 35% of patient care
- Free/Subsidized service: 65% of patient care
- Separate facilities for the paying and free patients

The patient chooses where to get his/her care. The care provided is of the same quality but the facilities provided are different based on the pricing.

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Private vs Non-Paying at Aravind

$ 200-$ 500 for Phaco with foldable lens

Air conditioning

Private rooms

etc.

Vs

$ 15 for MSICS with rigid IOL

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Patient Turnaround Time for MSICS

- Average patient turnover per surgeon per hour: 8 - 12 cases

- Total patient turnover per surgeon for 6 hours: 45 - 60 cases

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IAPB Vision Atlas

Table 1 – VLEG estimates for the global number of blind and MSVI persons – 1990 to 2050

Year	MSVI	Blind	Total
1990	160	31	191
1995	168	31	199
2000	176	32	208
2005	186	33	219
2010	199	34	233
2015	217	36	253
2020	237	39	276
2050	588	115	703

Global causes of blindness and distance vision impairment 1990–2020: a systematic review and meta-analysis Flaxman, Seth R Bourne, Rupert et al. The Lancet Global Health , Volume 5 , Issue 12 , e1221 - e1234

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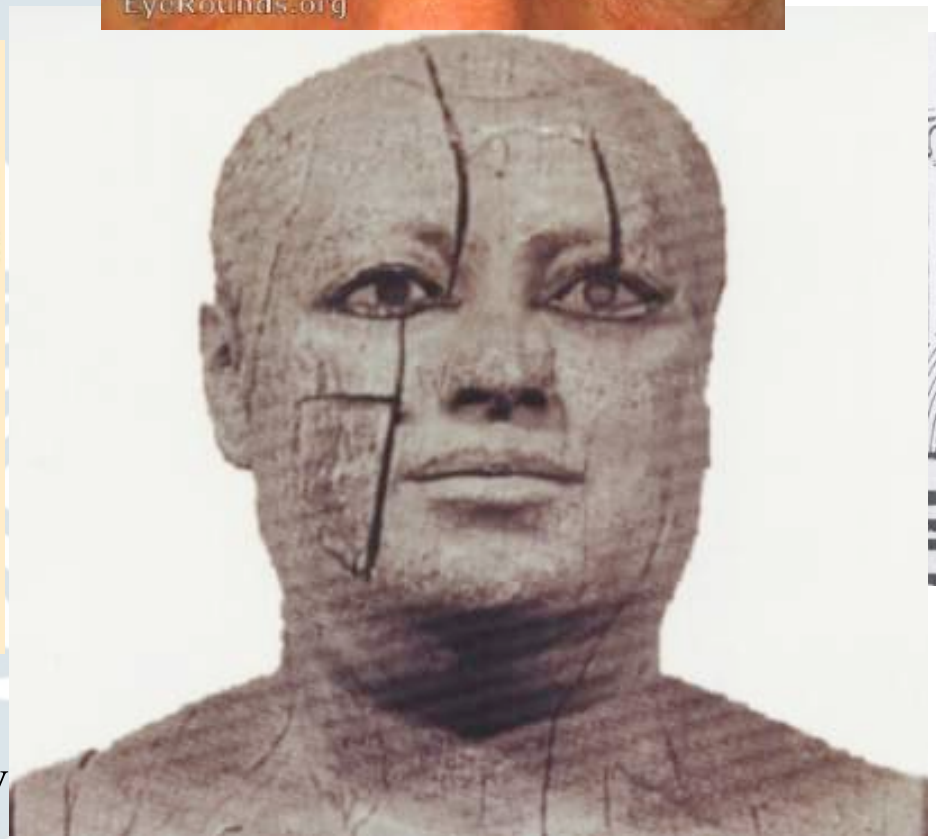

Improv

www.lshtm.ac.uk

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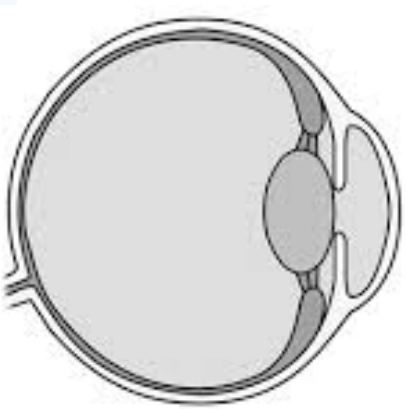
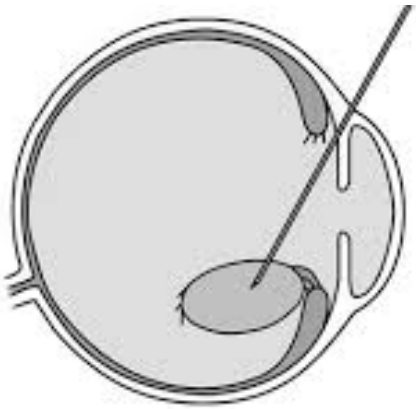
see international





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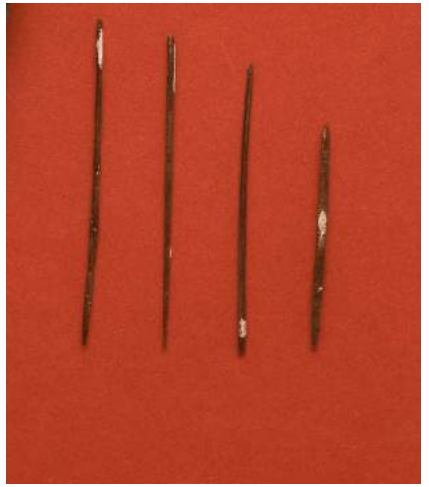
Couching – Still the competition in many parts of the world



Main Challenges

1. Population increases and more elderly people with visual loss

2. More complexity for treatment of diseases such as glaucoma, ARMD, DR, etc., not a one time curative treatment like refractive error or cataract

3. Inequitable distribution of inadequate resources

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Possible Solutions

1. Cataract services and spectacles can be financially self-sustaining

2. Non-doctors can be trained to do technical and surgical procedures

3. Mobile health and information technology can enable eye health staff

4. Increasing interest in global blindness

Online resources

- International Association for Prevention of Blindness

  https://iapb.org

- International Centre for Eye Health

  http://iceh.lshtm.ac.uk/

- Community Eye Health Journal

  http://iceh.lshtm.ac.uk/community-eye-health-journal/

- London School of Hygiene and Tropical Medicine Public Health for Eye Care

  https://www.lshtm.ac.uk/study/masters/public-health-eye-care

- World Health Organization

  http://www.who.int/blindness/en/

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Evidence of SICS

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cure blindness.ORG
Himalayan Cataract Project

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Literature categories

- Phacoemulsification vs. SICS
- Complication Rates
- Infection Rate
- Cost
- Visual Outcomes

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Phacoemulsification vs. SICS

Safety and Efficacy of Phacoemulsification Compared with Manual Small-Incision Cataract Surgery by a Randomized Controlled Clinical Trial

Six-Week Results

Parikshit M. Gogate, MS, FRCS (Edin),[1] Sucheta R. Kulkarni, DOMS,[1] S. Krishnaiah, MSc,[2] Rahul D. Deshpande, DOMS, DNB,[1] Shilpa A. Joshi, DOMS,[1] Anand Palimkar, MS,[1] Madan D. Deshpande, MS, DOMS[1]

Ophthalmology 2005;112:869–874 © 2005

- Masked randomized controlled clinical trial
- 400 eyes, 2 arms – phaco and MSICS
- Main outcome proportion of patients with visual acuity better to or equal to 20/60 at 6 weeks
- Phaco 81.08% vs MSICS 71.1% without spectacle correction (P=0.038)
- Phaco 98.4% and MSICS 98..4% with spectacle correction
- Astigmatism mode 0.5 D in phaco, 1.5 D in MSICS

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Low Complications for Advanced Cataracts

ARTICLE

Complication rates of phacoemulsification and manual small-incision cataract surgery at Aravind Eye Hospital

Aravind Haripriya, MD, David F. Chang, MD, Mascarenhas Reena, MS, Madhu Shekhar, MS

PURPOSE: To analyze the rate of intraoperative complications, reoperations, and endophthalmitis with phacoemulsification, manual small-incision cataract surgery (SICS), and large-incision extracapsular cataract extraction (ECCE).

SETTING: Aravind Eye Hospital, Madurai, India.

DESIGN: Retrospective cohort study.

METHODS: This study comprised consecutive cataract surgeries performed during a 12-month period. All surgical complications and endophthalmitis cases were tabulated and analyzed for each of 4 surgeon groups (staff, fellows, residents, visiting trainees). Within each surgeon group, complication rates with phacoemulsification, manual SICS, and ECCE were compared.

RESULTS: The surgical distribution was 20 438 (26%) phacoemulsification, 53 603 (67%) manual SICS, and 5736 (7%) ECCE. The overall intraoperative complication rate was 0.79% for staff, 1.19% for fellows, 2.06% for residents, and 5% for visiting trainees. Extracapsular cataract extraction had the highest overall rate of surgical complications (2.6%). The overall complication rate was 1.01% for manual SICS and 1.11% for phacoemulsification. However, the combined complication rate for trainees was significantly higher with phacoemulsification (4.8%) than with manual SICS (1.46%) ($P<.001$). The corrected distance visual acuity was better than 6/12 in 96% after phacoemulsification complications and 89% after manual SICS complications ($P<.001$). There were 27 cases (0.04%) of endophthalmitis but no statistical differences between surgical methods or surgeon groups.

CONCLUSIONS: For staff surgeons experienced with both phacoemulsification and manual SICS, intraoperative complication rates were comparably low. However, for trainee surgeons, the complication rate was significantly higher with phacoemulsification, suggesting that manual SICS may be a safer initial procedure to learn for inexperienced cataract surgeons in the developing world.

Financial Disclosure: No author has a financial or proprietary interest in any material or method mentioned.

J Cataract Refract Surg 2012; 38:1360–1369 © 2012 ASCRS and ESCRS

- Retrospective cohort study
- Analyzed rate of complications at Aravind Phaco, SICS, ECCE over 12 month period
- ECCE 2.6%
- Phaco 1.11%
- SICS 1.01%
- Endophthalmitis in 27 cases (0.04%) no difference in each group
- Trainees:
  - Phaco 4.8%
  - SICS 1.46%

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Low Complications for Advanced Cataracts

Int Ophthalmol (2010) 30:23–29
DOI 10.1007/s10792-008-9206-5

ORIGINAL PAPER

Manual small incision cataract surgery in a United Kingdom university teaching hospital setting

Ghee Soon Ang · Samantha Wheelan · Frank D. Green

- Retrospective audit over 3 years at UK training center
- 55 eyes
- Complication rate 1.8%
- 65% vision 20/40 or better with correction
- Post-operative astigmatism 1.40 D mean

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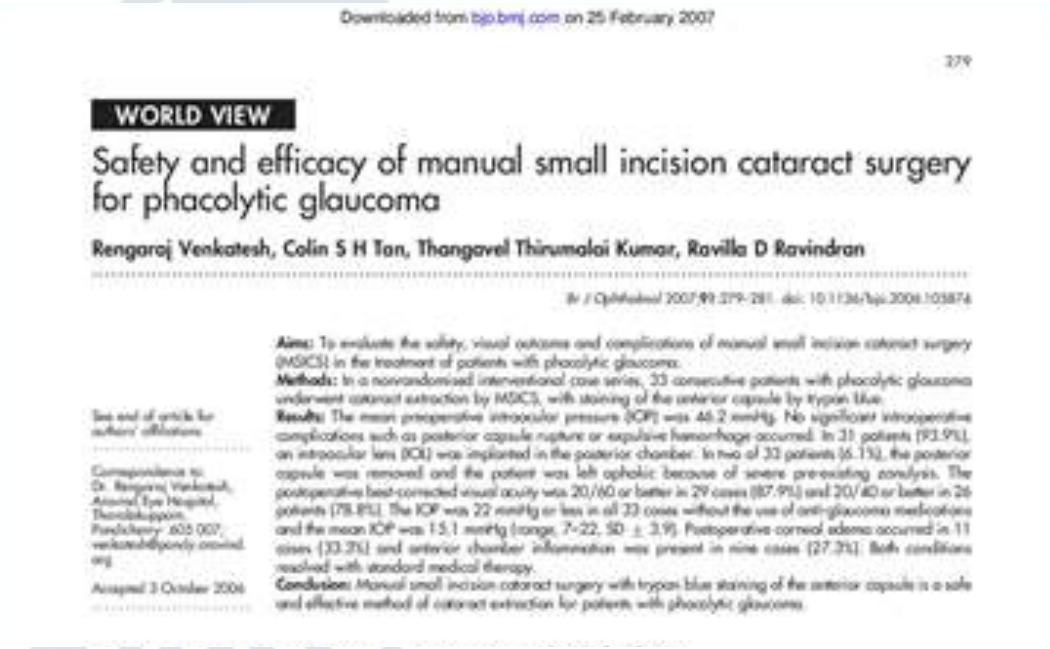
Low Complications for Advanced Cataracts



WORLD VIEW

Safety and efficacy of manual small incision cataract surgery for phacolytic glaucoma

Rengaraj Venkatesh, Colin S H Tan, Thangavel Thirumalai Kumar, Ravilla D Ravindran

Br J Ophthalmol 2007;91:279–281. doi: 10.1136/bjo.2006.103874

Aims: To evaluate the safety, visual outcome and complications of manual small incision cataract surgery (MSICS) in the treatment of patients with phacolytic glaucoma.
Methods: In a nonrandomised interventional case series, 33 consecutive patients with phacolytic glaucoma underwent cataract extraction by MSICS, with staining of the anterior capsule by trypan blue.
Results: The mean preoperative intraocular pressure (IOP) was 46.2 mmHg. No significant intraoperative complications such as posterior capsule rupture or expulsive haemorrhage occurred. In 31 patients (93.9%), an intraocular lens (IOL) was implanted in the posterior chamber. In two of 33 patients (6.1%), the posterior capsule was removed and the patient was left aphakic because of severe pre-existing zonulysis. The postoperative best-corrected visual acuity was 20/60 or better in 29 cases (87.9%) and 20/40 or better in 26 patients (78.8%). The IOP was 22 mmHg or less in all 33 cases without the use of anti-glaucoma medications and the mean IOP was 15.1 mmHg (range, 7–22, SD ± 3.9). Postoperative corneal edema occurred in 11 cases (33.3%) and anterior chamber inflammation was present in nine cases (27.3%). Both conditions resolved with standard medical therapy.
Conclusion: Manual small incision cataract surgery with trypan blue staining of the anterior capsule is a safe and effective method of cataract extraction for patients with phacolytic glaucoma.

See end of article for authors' affiliations

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Accepted 3 October 2006

- Nonrandomized interventional case series
- 33 patients with phacolytic glaucoma, all underwent SICS with trypan blue
- Mean pre-operative pressure 46.2
- 87.9% BCVA 20/60 or better

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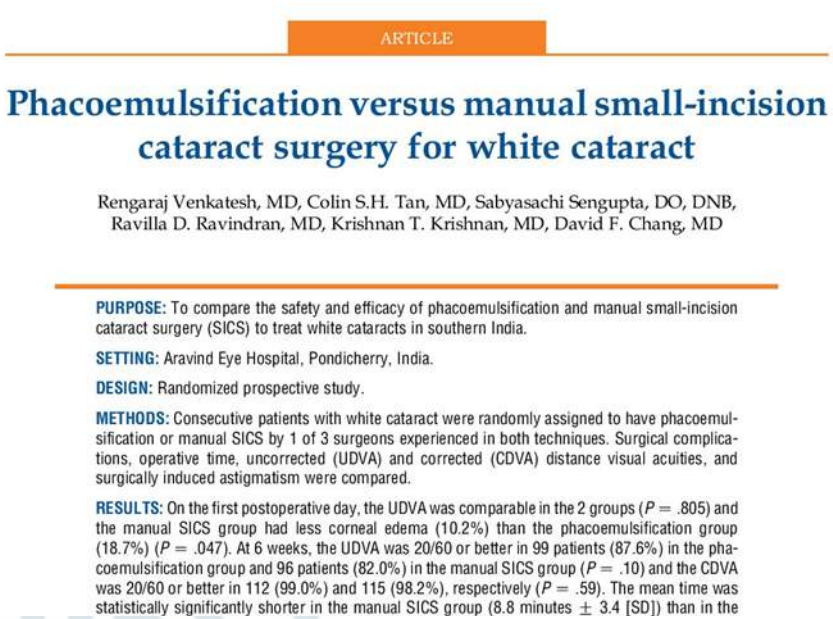
Low Complications for Advanced Cataracts



ARTICLE

Phacoemulsification versus manual small-incision cataract surgery for white cataract

Rengaraj Venkatesh, MD, Colin S.H. Tan, MD, Sabyasachi Sengupta, DO, DNB, Ravilla D. Ravindran, MD, Krishnan T. Krishnan, MD, David F. Chang, MD

PURPOSE: To compare the safety and efficacy of phacoemulsification and manual small-incision cataract surgery (SICS) to treat white cataracts in southern India.

SETTING: Aravind Eye Hospital, Pondicherry, India.

DESIGN: Randomized prospective study.

METHODS: Consecutive patients with white cataract were randomly assigned to have phacoemulsification or manual SICS by 1 of 3 surgeons experienced in both techniques. Surgical complications, operative time, uncorrected (UDVA) and corrected (CDVA) distance visual acuities, and surgically induced astigmatism were compared.

RESULTS: On the first postoperative day, the UDVA was comparable in the 2 groups ($P = .805$) and the manual SICS group had less corneal edema (10.2%) than the phacoemulsification group (18.7%) ($P = .047$). At 6 weeks, the UDVA was 20/60 or better in 99 patients (87.6%) in the phacoemulsification group and 96 patients (82.0%) in the manual SICS group ($P = .10$) and the CDVA was 20/60 or better in 112 (99.0%) and 115 (98.2%), respectively ($P = .59$). The mean time was statistically significantly shorter in the manual SICS group (8.8 minutes ± 3.4 [SD]) than in the

- Randomized prospective study at Aravind
- Compare the efficacy of phaco vs SICS for white cataracts
- 113 patients phaco; 117 SICS
- UCVA 20/60 or better 87.6% in phaco, 82.0% in SICS (P=0.1)
- BCVA 20/60 or better 99% phaco and 98.2% SICS (P=0.59)
- Posterior capsular rupture 2.2% phaco and 1.4% SICS (P=0.681),

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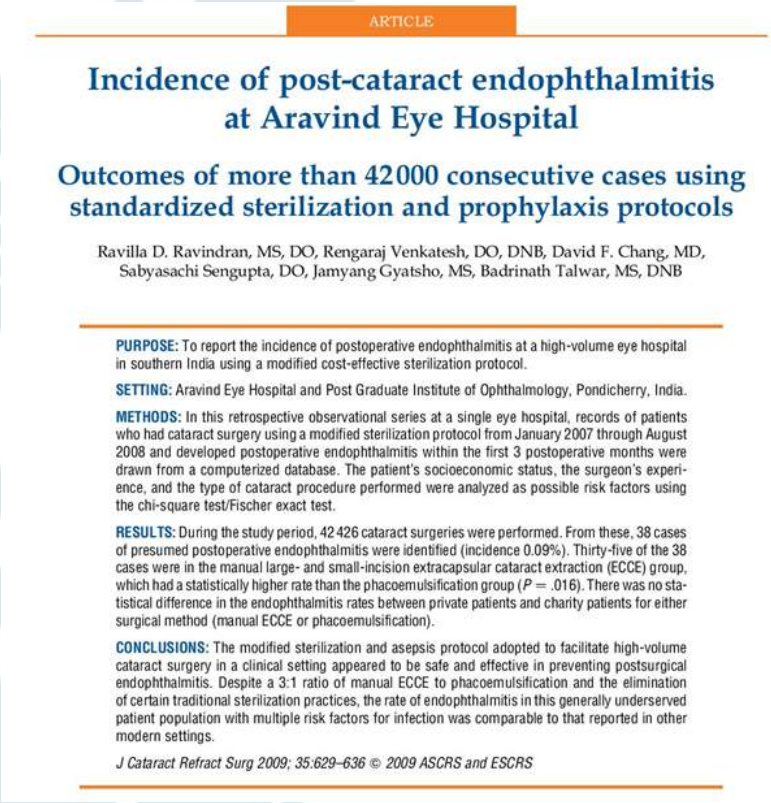
Low, Equivalent Infection Rate



ARTICLE

Incidence of post-cataract endophthalmitis at Aravind Eye Hospital

Outcomes of more than 42000 consecutive cases using standardized sterilization and prophylaxis protocols

Ravilla D. Ravindran, MS, DO, Rengaraj Venkatesh, DO, DNB, David F. Chang, MD, Sabyasachi Sengupta, DO, Jamyang Gyatsho, MS, Badrinath Talwar, MS, DNB

PURPOSE: To report the incidence of postoperative endophthalmitis at a high-volume eye hospital in southern India using a modified cost-effective sterilization protocol.

SETTING: Aravind Eye Hospital and Post Graduate Institute of Ophthalmology, Pondicherry, India.

METHODS: In this retrospective observational series at a single eye hospital, records of patients who had cataract surgery using a modified sterilization protocol from January 2007 through August 2008 and developed postoperative endophthalmitis within the first 3 postoperative months were drawn from a computerized database. The patient's socioeconomic status, the surgeon's experience, and the type of cataract procedure performed were analyzed as possible risk factors using the chi-square test/Fischer exact test.

RESULTS: During the study period, 42 426 cataract surgeries were performed. From these, 38 cases of presumed postoperative endophthalmitis were identified (incidence 0.09%). Thirty-five of the 38 cases were in the manual large- and small-incision extracapsular cataract extraction (ECCE) group, which had a statistically higher rate than the phacoemulsification group ($P = .016$). There was no statistical difference in the endophthalmitis rates between private patients and charity patients for either surgical method (manual ECCE or phacoemulsification).

CONCLUSIONS: The modified sterilization and asepsis protocol adopted to facilitate high-volume cataract surgery in a clinical setting appeared to be safe and effective in preventing postsurgical endophthalmitis. Despite a 3:1 ratio of manual ECCE to phacoemulsification and the elimination of certain traditional sterilization practices, the rate of endophthalmitis in this generally underserved patient population with multiple risk factors for infection was comparable to that reported in other modern settings.

J Cataract Refract Surg 2009; 35:629–636 © 2009 ASCRS and ESCRS

- Retrospective observational series at Aravind
- 42,426 consecutive cataract surgeries
- Standardized sterilization techniques
- Endophthalmitis rate 0.09% (38 total)
- 35 SICS and ECCE
- 3 Phaco (P=0.016)
- SICS/ECCE 3:1 to phaco
- Rate of endophthalmitis in underserved area similar to more modern areas of the world

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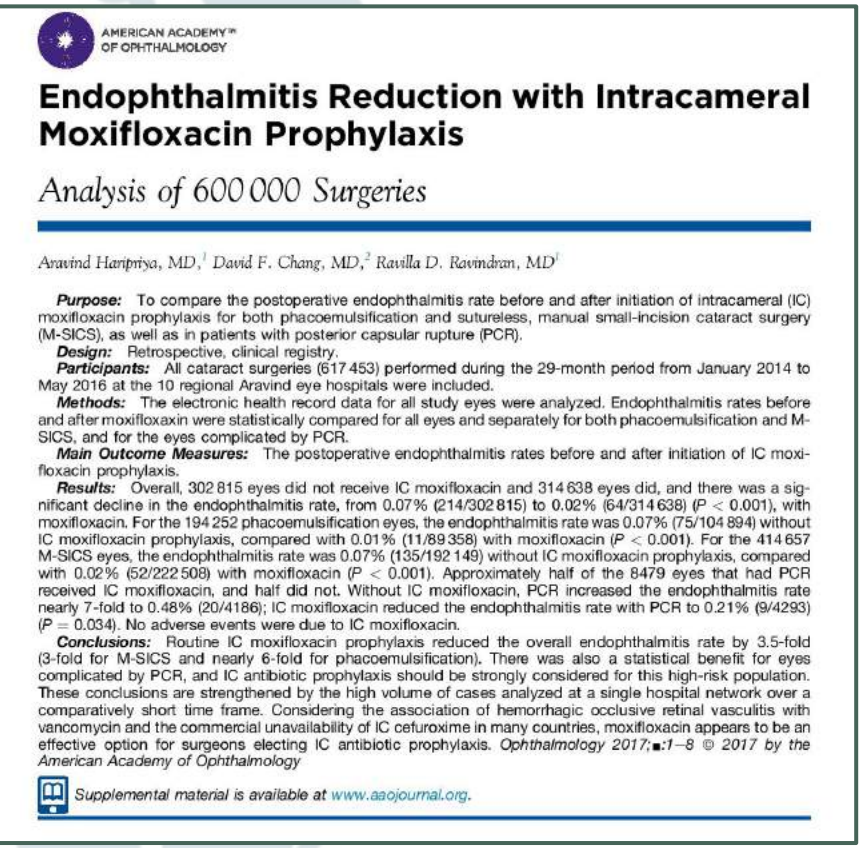
Low, Equivalent Infection Rate



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Endophthalmitis Reduction with Intracameral Moxifloxacin Prophylaxis

Analysis of 600 000 Surgeries

Aravind Haripriya, MD,[1] David F. Chang, MD,[2] Ravilla D. Ravindran, MD[1]

Purpose: To compare the postoperative endophthalmitis rate before and after initiation of intracameral (IC) moxifloxacin prophylaxis for both phacoemulsification and sutureless, manual small-incision cataract surgery (M-SICS), as well as in patients with posterior capsular rupture (PCR).

Design: Retrospective, clinical registry.

Participants: All cataract surgeries (617 453) performed during the 29-month period from January 2014 to May 2016 at the 10 regional Aravind eye hospitals were included.

Methods: The electronic health record data for all study eyes were analyzed. Endophthalmitis rates before and after moxifloxaxin were statistically compared for all eyes and separately for both phacoemulsification and M-SICS, and for the eyes complicated by PCR.

Main Outcome Measures: The postoperative endophthalmitis rates before and after initiation of IC moxifloxacin prophylaxis.

Results: Overall, 302 815 eyes did not receive IC moxifloxacin and 314 638 eyes did, and there was a significant decline in the endophthalmitis rate, from 0.07% (214/302 815) to 0.02% (64/314 638) ($P < 0.001$), with moxifloxacin. For the 194 252 phacoemulsification eyes, the endophthalmitis rate was 0.07% (75/104 894) without IC moxifloxacin prophylaxis, compared with 0.01% (11/89 358) with moxifloxacin ($P < 0.001$). For the 414 657 M-SICS eyes, the endophthalmitis rate was 0.07% (135/192 149) without IC moxifloxacin prophylaxis, compared with 0.02% (52/222 508) with moxifloxacin ($P < 0.001$). Approximately half of the 8479 eyes that had PCR received IC moxifloxacin, and half did not. Without IC moxifloxacin, PCR increased the endophthalmitis rate nearly 7-fold to 0.48% (20/4186); IC moxifloxacin reduced the endophthalmitis rate with PCR to 0.21% (9/4293) ($P = 0.034$). No adverse events were due to IC moxifloxacin.

Conclusions: Routine IC moxifloxacin prophylaxis reduced the overall endophthalmitis rate by 3.5-fold (3-fold for M-SICS and nearly 6-fold for phacoemulsification). There was also a statistical benefit for eyes complicated by PCR, and IC antibiotic prophylaxis should be strongly considered for this high-risk population. These conclusions are strengthened by the high volume of cases analyzed at a single hospital network over a comparatively short time frame. Considering the association of hemorrhagic occlusive retinal vasculitis with vancomycin and the commercial unavailability of IC cefuroxime in many countries, moxifloxacin appears to be an effective option for surgeons electing IC antibiotic prophylaxis. *Ophthalmology 2017;■:1–8 © 2017 by the American Academy of Ophthalmology*

Supplemental material is available at www.aaojournal.org.

- Retrospective clinical registry
- Compare rate of endophthalmitis before and after intracameral moxifloxacin
- 617,453 cataract surgeries 29 month period
- Decline in rate from 0.07% to 0.02% with moxifloxacin
- Phaco 0.07% to 0.01% (P=<0.001)
- SICS 0.07% to 0.02% (P=<0.001)
- Posterior capsular tear 0.48% to 0.21% (P=0.034%)

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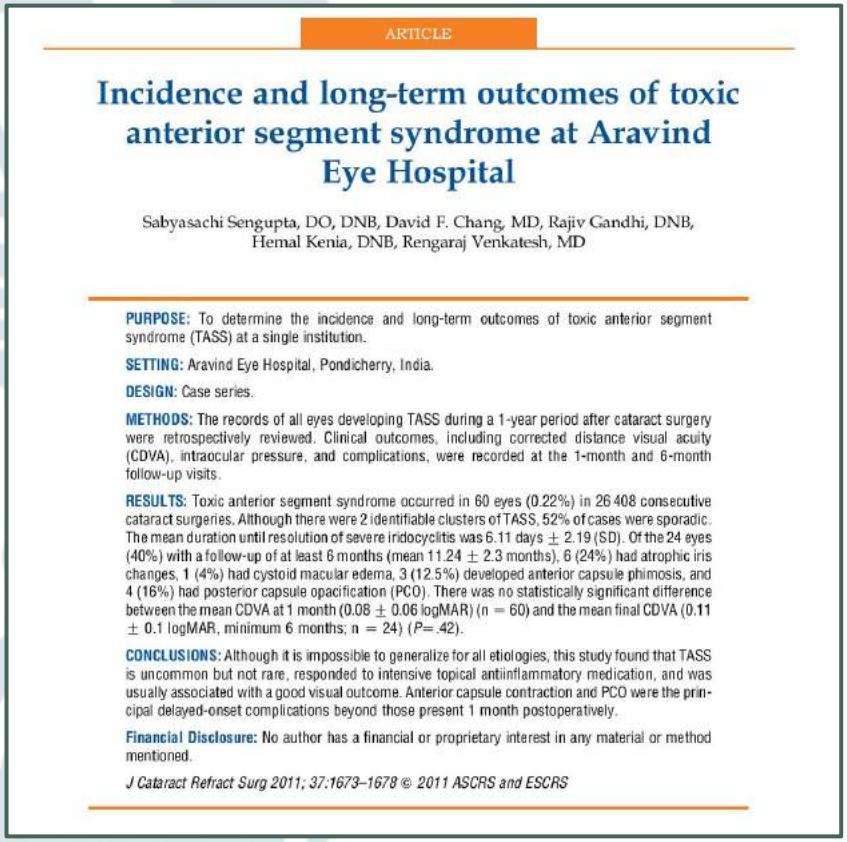
Low, Equivalent Infection Rate



ARTICLE

Incidence and long-term outcomes of toxic anterior segment syndrome at Aravind Eye Hospital

Sabyasachi Sengupta, DO, DNB, David F. Chang, MD, Rajiv Gandhi, DNB, Hemal Kenia, DNB, Rengaraj Venkatesh, MD

PURPOSE: To determine the incidence and long-term outcomes of toxic anterior segment syndrome (TASS) at a single institution.

SETTING: Aravind Eye Hospital, Pondicherry, India.

DESIGN: Case series.

METHODS: The records of all eyes developing TASS during a 1-year period after cataract surgery were retrospectively reviewed. Clinical outcomes, including corrected distance visual acuity (CDVA), intraocular pressure, and complications, were recorded at the 1-month and 6-month follow-up visits.

RESULTS: Toxic anterior segment syndrome occurred in 60 eyes (0.22%) in 26 408 consecutive cataract surgeries. Although there were 2 identifiable clusters of TASS, 52% of cases were sporadic. The mean duration until resolution of severe iridocyclitis was 6.11 days ± 2.19 (SD). Of the 24 eyes (40%) with a follow-up of at least 6 months (mean 11.24 ± 2.3 months), 6 (24%) had atrophic iris changes, 1 (4%) had cystoid macular edema, 3 (12.5%) developed anterior capsule phimosis, and 4 (16%) had posterior capsule opacification (PCO). There was no statistically significant difference between the mean CDVA at 1 month (0.08 ± 0.06 logMAR) ($n = 60$) and the mean final CDVA (0.11 ± 0.1 logMAR, minimum 6 months; $n = 24$) ($P = .42$).

CONCLUSIONS: Although it is impossible to generalize for all etiologies, this study found that TASS is uncommon but not rare, responded to intensive topical antiinflammatory medication, and was usually associated with a good visual outcome. Anterior capsule contraction and PCO were the principal delayed-onset complications beyond those present 1 month postoperatively.

Financial Disclosure: No author has a financial or proprietary interest in any material or method mentioned.

J Cataract Refract Surg 2011; 37:1673–1678 © 2011 ASCRS and ESCRS

- Case series at Aravind of all TASS cases over one year
- 60 TASS cases in 26,408 cataract surgeries
- 52% sporadic, rest were in 2 clusters

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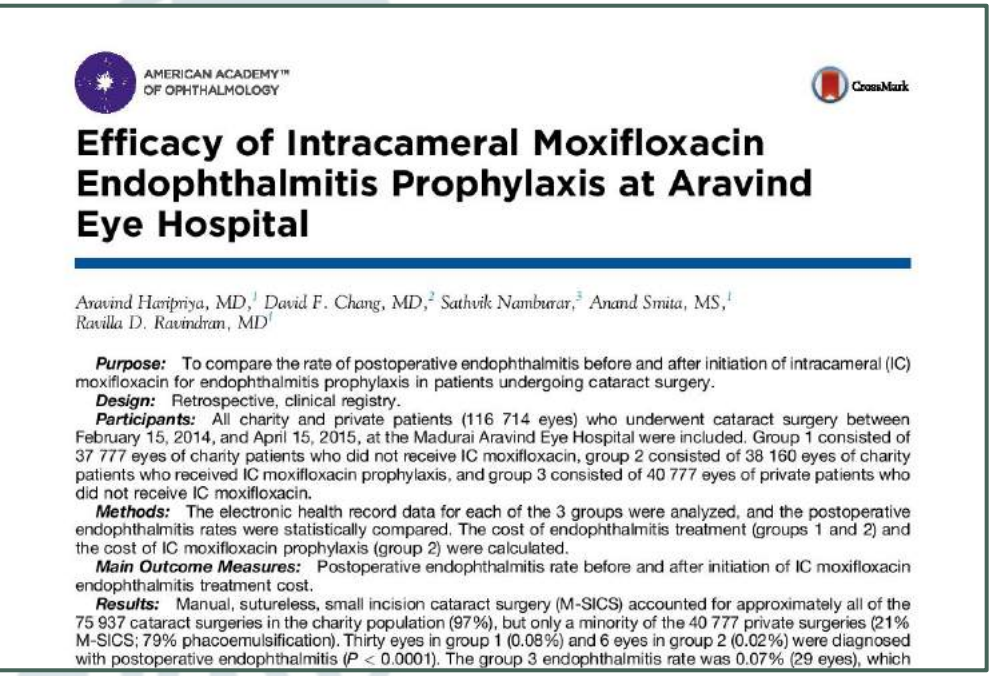

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Efficacy of Intracameral Moxifloxacin Endophthalmitis Prophylaxis at Aravind Eye Hospital

Aravind Haripriya, MD,[1] David F. Chang, MD,[2] Sathvik Namburar,[3] Anand Smita, MS,[1] Ravilla D. Ravindran, MD[1]

Purpose: To compare the rate of postoperative endophthalmitis before and after initiation of intracameral (IC) moxifloxacin for endophthalmitis prophylaxis in patients undergoing cataract surgery.

Design: Retrospective, clinical registry.

Participants: All charity and private patients (116 714 eyes) who underwent cataract surgery between February 15, 2014, and April 15, 2015, at the Madurai Aravind Eye Hospital were included. Group 1 consisted of 37 777 eyes of charity patients who did not receive IC moxifloxacin, group 2 consisted of 38 160 eyes of charity patients who received IC moxifloxacin prophylaxis, and group 3 consisted of 40 777 eyes of private patients who did not receive IC moxifloxacin.

Methods: The electronic health record data for each of the 3 groups were analyzed, and the postoperative endophthalmitis rates were statistically compared. The cost of endophthalmitis treatment (groups 1 and 2) and the cost of IC moxifloxacin prophylaxis (group 2) were calculated.

Main Outcome Measures: Postoperative endophthalmitis rate before and after initiation of IC moxifloxacin endophthalmitis treatment cost.

Results: Manual, sutureless, small incision cataract surgery (M-SICS) accounted for approximately all of the 75 937 cataract surgeries in the charity population (97%), but only a minority of the 40 777 private surgeries (21% M-SICS; 79% phacoemulsification). Thirty eyes in group 1 (0.08%) and 6 eyes in group 2 (0.02%) were diagnosed with postoperative endophthalmitis ($P < 0.0001$). The group 3 endophthalmitis rate was 0.07% (29 eyes), which

- Retrospective clinical registry
- Compare rate of endophthalmitis before and after intracameral moxifloxacin
- 116,714 eyes in 3 groups over 14 months
- Group 1 Charity patients without IC moxifloxacin
  - Endophthalmitis rate (0.08%)
- Group 2 Charity patients with IC moxifloxacin
  - Endophthalmitis rate (0.02%)
- Group 3 Private patients without IC moxifloxacin
  - Endophthalmitis rate (0.07%)

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More Cost Effective

Why Do Phacoemulsification? Manual Small-Incision Cataract Surgery Is Almost as Effective, but Less Expensive

Parikshit Gogate, MS, FRCS(Edin),[1] Madan Deshpande, MS, DOMS,[1] Praveen K. Nirmalan, DOMS, MPH[2]

Purpose: To compare the cost of phacoemulsification with foldable lenses with that of manual small-incision cataract surgery (SICS) in a hospital setting.

Design: Average cost comparision between 2 surgical techniques.

Participants: Four hundred patients and 4 surgeons.

Methods: A single masked randomized controlled clinical trial was conducted previously to compare safety and efficacy of the 2 techniques for rehabilitation of the cataract patient. The fixed-facility and recurrent (consumables) cost for phacoemulsification and SICS were calculated based on information collected at different sources using standard norms. Average cost per procedure was calculated by dividing the total cost by the number of procedures performed.

Main Outcome Measures: Average fixed-facility cost and average consumable cost for both the techniques.

Results: The average cost of a phacoemulsification surgery for the hospital was Indian rupees (Rs) 1978.89 ($42.10), and the average cost for a SICS surgery was Rs 720.99 ($15.34), of which Rs 500.99 ($10.65) was the fixed-facility cost common to both. Phacoemulsification cost was more because of the foldable lens used.

Conclusions: Phacoemulsification needs additional cost for the machine (depreciation), replenishment of parts, and annual maintenance contract. Manual SICS is far more economical than phacoemulsification. Its visual result is comparable with that of phacoemulsification and is as safe. *Ophthalmology 2007;xx:xxx © 2007 by the American Academy of Ophthalmology.*

- Cost comparison phaco vs SICS
- Fixed and recurrent costs (consumables) made and average calculated
- Phaco $42.10
- SICS $15.34
- Extra cost for phaco mainly foldable intraocular lens
- Also added cost due to phaco machine parts, maintenance, depreciation
- Authors prefer SICS due to similar outcomes and safety, lower cost

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More Cost Effective

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healthsciences
Ophthalmic Epidemiology
0928-6586/04/US$ 22.00

Ophthalmic Epidemiology
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Accepted 12 July 2004

Economic cost of cataract surgery procedures in an established eye care centre in Southern India

R. Muralikrishnan, MHM, MSc[1]
R. Venkatesh, MD[2]
N. Venkatesh Prajna, MD[2]
Kevin D. Frick, PhD[3]

Estimate direct and indirect costs of MSICS, Phaco, ECCE at Aravind

- Both for hospital and patient
- Average provider's cost
  - Phaco 25.55 USD
  - MSICS 17.03 USD
  - ECCE 16.25 USD

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REVIEW ARTICLE

Manual Small Incision Cataract Surgery: A Review

Rengaraj Venkatesh, MD, David F. Chang, MD,† Radhakrishnan Muralikrishnanþ, MHM, MSc,‡ Kenia Hemal, MBBS,* Pariskshit Gogate, MS, FRCS (Edin)§ and Sabyasachi Sengupta, DO, DNB¶*

TABLE 1. Percentage of Post-Operative Visual Outcomes of Phaco and MSICS

	UDVA						CDVA					
	Venkatesh et al[26] (at 6 wk)		Gogate et al[27] (at 6 wk)		Ruit et al[28] (at 6 mo)		Venkatesh et al[26] (at 6 wk)		Gogate et al[27] (at 6 wk)		Ruit et al[28] (at 6 mo)	
	Phaco	MSICS	Phaco	MSICS	Phaco	MSICS	Phaco	MSICS	Phaco	MSICS	Phaco	MSICS
6/6–6/9 (20/20 to 20/30)	45.1	36.4	36.8	31.6	53.7	31.5	92.0	83.8	77.8	85.6	94.4	88.9
6/6–6/18 (20/20 to 20/60)	42.5	45.3	44.3	38.5	31.5	57.4	7.1	14.5	20.5	12.8	3.7	9.2
6/24–6/60 (20/80 to 20/200)	11.5	16.6	18.4	28.9	14.8	11.1	0.9	1.7	1.1	1.6	1.9	1.9
<6/60	0.9	1.7	0.5	0			0	0	0.5	0		

UDVA, uncorrected distance visual acuity; CDVA, corrected distance visual acuity.

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Manual Small Incision Cataract Surgery: A Review

Rengaraj Venkatesh, MD, David F. Chang, MD,† Radhakrishnan Muralikrishnanþ, MHM, MSc,‡ Kenia Hemal, MBBS,* Pariskshit Gogate, MS, FRCS (Edin)§ and Sabyasachi Sengupta, DO, DNB¶*

TABLE 3. Surgically Induced Astigmatism of Phaco and MSICS (in Diopters)

	At 6 wk		At 6 mo	
Study	**Phaco**	**MSICS**	**Phaco**	**MSICS**
Venkatesh et al[26]	0.80	1.20	—	—
Gogate et al[27]	1.10	1.20	—	—
George et al[33]	0.77	1.17	—	—
Ruit et al[28]	—	—	0.70	0.88
Muralikrishnan et al[34]	1.10	1.12	1.11	1.33

TABLE 4. Surgically Induced Astigmatism of MSICS According to the Type of Tunnel Constructed (in Diopters)

Study	Follow-Up	Superior	Superotemporal	Temporal
Venkatesh et al[32]	6 wk	1.08	—	0.72
Kimura et al[35]	6 wk	1.41	1.02	—
Gokhale and Sawhney[12]	12 wk	1.28	0.20	0.37
Reddy et al[36]	12 wk	1.92	—	1.57

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Manual Small Incision Cataract Surgery: A Review

Rengaraj Venkatesh, MD, David F. Chang, MD,† Radhakrishnan Muralikrishnanþ, MHM, MSc,‡ Kenia Hemal, MBBS,* Pariskshit Gogate, MS, FRCS (Edin)§ and Sabyasachi Sengupta, DO, DNB¶*

TABLE 6. Mean Duration (in Minutes) of Phaco and MSICS

Study	Phaco	MSICS
Ruit et al[28]	15.5	9
Gogate et al[42]	15.5	8.5
Trivedy[31]	—	4.25
Venkatesh et al[26]	12.2	8.8
Venkatesh et al[30]	—	3.75
Balent et al[43]	—	4

mediate postoperative complications occurred in 2% and 12% of

TABLE 7. Provider's Cost in US Dollars of Phaco and MSICS

Study	Phaco	MSICS
Muralikrishnan et al[44]	25.55	17.03
Gogate et al[42]	42.10	15.34
Ruit et al[28]	70	15

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REVIEW ARTICLE

Manual Small Incision Cataract Surgery: A Review

Rengaraj Venkatesh, MD, David F. Chang, MD,† Radhakrishnan Muralikrishnanþ, MHM, MSc,‡ Kenia Hemal, MBBS,* Pariskshit Gogate, MS, FRCS (Edin)§ and Sabyasachi Sengupta, DO, DNB¶*

TABLE 5. Percentage of Intraoperative and Postoperative Complications Related to Phaco and MSICS

Complications	Study	Phaco			MSICS		
PCR	Venkatesh et al[26]	2.2			1.4		
	Gogate et al[27]	3.5			6.0*		
	Ruit et al[28]	1.85			0		
PCO at 6 mo	Ruit et al[28]	None	1+	2+	None	1+	2+
		85.4	14.6	0	56.5	26.1	17.4
Endothelial cell count	George et al[33]	4.21			5.41		

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EPIDEMIOLOGY

SECTION EDITOR: LESLIE HYMAN, PhD

Visual Outcomes and Astigmatism After Sutureless, Manual Cataract Extraction in Rural China

Study of Cataract Outcomes and Up-Take of Services (SCOUTS) in the Caring Is Hip Project, Report 1

Dennis S. C. Lam, MBBS, MD, FRCOphth, FHKAM(Ophth); Nathan G. Congdon, MD, MPH; Srinivas R. Rao, MD, FRCSEd; Hoi Fan, MBBS, MRCSEd, MMed(Ophth); Yinggeng Liu, MD; Lisham Zhang, MD; Xiaojiang Lin, MD; Kai Chen, PhD; Zhongwen Zhang, BA; Wenzhong Huang, MD; Zhongxia Zhou, MD; Chi Pui Pang, DPhil

Objective: To study the visual acuity and astigmatism of persons undergoing cataract extraction by local surgeons in rural China.

Methods: Visual acuity, keratometry, and refraction were measured 10 to 14 months postoperatively for all cataract cases during 4 months in Sanrao, China.

Results: Among 313 eligible subjects, 242 (77%) could be contacted, of whom 176 (73%) were examined. Of those who were examined, mean ±SD age was 69.3 ± 10.5 years, 66.5% were female, 35 had been operated on bilaterally at Sanrao, and 85.2% had a preoperative presenting visual acuity of 6/60 or worse. Presenting and best-corrected postoperative acuity in the eye that was operated on were 6/18 or better in 83.4% and 95.7%, respectively. Among 27 fellow eyes operated on elsewhere, 40.7% had a presenting acuity of 6/18 or better and 40.7% were blind ($P < .001$). Mean ±SD postoperative astigmatism did not differ between 211 eyes that were operated on (−1.13 ± 0.84 diopters) and 109 eyes that were not (−1.13 ± 1.17 diopters; $P = .27$). Presence of operative complications (8.3%) and older age were associated with worse vision; bilateral surgery was associated with better vision.

Conclusions: These results confirm the effectiveness of skill transfer in this setting, with superior outcomes to most studies in rural Asia and to eyes in this cohort operated on at other facilities.

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Author Affiliations:
Departments of Ophthalmology and Visual Sciences (Drs Lam, Congdon, Rao, Fan, and Pang and Mr Zhang) and Centre for Epidemiology and Biostatistics, School of Public Health (Dr Chen), The Chinese University of Hong Kong; Joint Shantou International Eye Centre of Shantou University and The Chinese University of Hong Kong, Shantou (Drs Lam, Congdon, Rao, Liu, Zhou, and Pang); and Sanrao Village Hospital, Sanrao, China (Drs Zhang, Lin, and Huang).

CHINA, A COUNTRY WITH nearly 24 000 ophthalmologists,[1] has among the lowest cataract surgical rates in Asia, at 446 cases per million population per year in 2004.[1] In recent years, approximately 550 000 cataract surgeries have been reported in China annually. This represents 24 cases per ophthalmologist, some 13% of patients requiring operations.[1] Lack of surgery for cataract remains the leading cause of blindness in population-based surveys.[2,3] Reasons for the low cataract surgical output include the fact that surgical fees often exceed what patients feel they are able to pay,[4] only half of Chinese ophthalmologists are trained to perform surgery,[1,4] and physicians are concentrated in cities,[5] while some 70% of Chinese individuals still dwell in rural areas.

An additional reason for low uptake of cataract surgical services has been poor outcomes, with 2 population-based studies in rural China reporting a prevalence of postoperative blindness of approximately 50% after cataract surgery.[1,6] The majority of eyes operated on in both studies had undergone intracapsular cataract extraction, with rates of pseudophakia varying from 8% to 39%. Many patients with aphakia were without spectacle correction.[1,6]

See also page 1546

In view of these statistics and the enormous number of people involved, there is a need to improve the availability and affordability of cataract surgery associated with a high proportion of good (visual acuity ≥ 6/18) visual outcomes. One of us (D.S.C.L.) has initiated Project Vision (the eye care component of Caring is Hip, a medical relief program supported by the Li Ka Shing Foundation), in which eye centers offering quality cataract surgery are established in rural China. Initial program inputs include modern equipment

- Retrospective clinical registry in rural China
- SICS surgery performed on 313 patients
- 83.4% UCVA better than or equal to 20/60
- 95.7 BCVA better than or equal to 20/60

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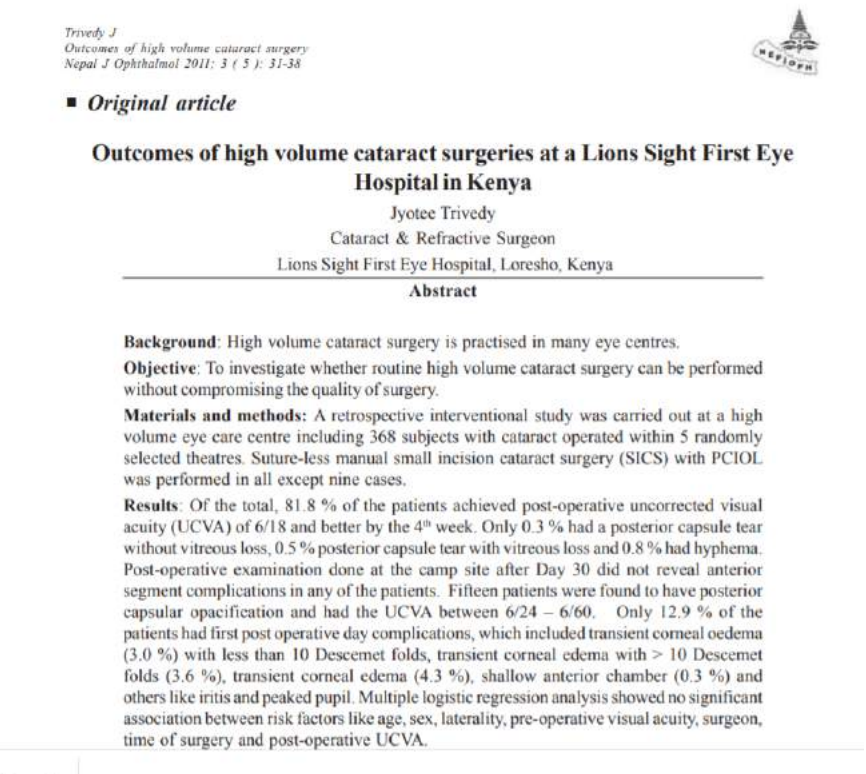

Trivedy J
Outcomes of high volume cataract surgery
Nepal J Ophthalmol 2011; 3 (5): 31-38

■ *Original article*

Outcomes of high volume cataract surgeries at a Lions Sight First Eye Hospital in Kenya

Jyotee Trivedy
Cataract & Refractive Surgeon
Lions Sight First Eye Hospital, Loresho, Kenya

Abstract

Background: High volume cataract surgery is practised in many eye centres.

Objective: To investigate whether routine high volume cataract surgery can be performed without compromising the quality of surgery.

Materials and methods: A retrospective interventional study was carried out at a high volume eye care centre including 368 subjects with cataract operated within 5 randomly selected theatres. Suture-less manual small incision cataract surgery (SICS) with PCIOL was performed in all except nine cases.

Results: Of the total, 81.8 % of the patients achieved post-operative uncorrected visual acuity (UCVA) of 6/18 and better by the 4th week. Only 0.3 % had a posterior capsule tear without vitreous loss, 0.5 % posterior capsule tear with vitreous loss and 0.8 % had hyphema. Post-operative examination done at the camp site after Day 30 did not reveal anterior segment complications in any of the patients. Fifteen patients were found to have posterior capsular opacification and had the UCVA between 6/24 – 6/60. Only 12.9 % of the patients had first post operative day complications, which included transient corneal oedema (3.0 %) with less than 10 Descemet folds, transient corneal edema with > 10 Descemet folds (3.6 %), transient corneal edema (4.3 %), shallow anterior chamber (0.3 %) and others like iritis and peaked pupil. Multiple logistic regression analysis showed no significant association between risk factors like age, sex, laterality, pre-operative visual acuity, surgeon, time of surgery and post-operative UCVA.

- Retrospective interventional study
- 368 eyes over 5 months
- UCVA 81.8% at 4th week
- 0.5% rate posterior capsular tear with vitreous loss

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Meta-analysis

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Meta-analysis to compare the safety and efficacy of manual small incision cataract surgery and phacoemulsification

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Abstract

Purpose: A systematic review and meta-analysis comparing the safety, efficacy, and expenses related to phacoemulsification versus manual small incision cataract surgery (SICS). **Methods:** PubMed, Cochrane, and Scopus databases were searched with key words manual SICS 6/18 and 6/60; astigmatism and endothelial cell loss postoperatively, intra- and post-operative complications, phacoemulsification, and comparison of SICS and phacoemulsification. Non-English language manuscripts and manuscripts not indexed in the three databases were also search for comparison of SICS with phacoemulsification. Data were compared between techniques for postoperative uncorrected and corrected distance visual acuity (UCVA and best corrected visual acuity [BCVA], respectively) better than 6/9, surgical cost and duration of surgery. The Oxford cataract treatment and evaluation team scores were used for grading intraoperative and postoperative complications, uncorrected near vision. **Result:** This review analyzed, 11 comparative studies documenting 76,838 eyes that had undergone cataract surgery considered for analysis. UCVA of 6/18 UCVA and 6/18 BCVA were comparable between techniques ($P = 0.373$ and $P = 0.567$, respectively). BCVA of 6/9 was comparable between techniques ($P = 0.685$). UCVA of 6/60 and 6/60 BCVA aided and unaided vision were comparable ($P = 0.126$ and $P = 0.317$, respectively). There was no statistical difference in: Endothelial cell loss during surgery ($P = 0.298$), intraoperative ($P = 0.964$) complications, and postoperative complications ($P = 0.362$). The phacoemulsification group had statistically significantly less astigmatism ($P = 0.005$) and more eyes with UCVA of 6/9 ($P = 0.040$). UCVA at near was statistically significantly better with SICS due to astigmatism and safer during the learning phase ($P = 0.003$). The average time for SICS was lower than phacoemulsification and cost <½ of phacoemulsification. **Conclusion:** The outcome of this meta-analysis indicated there is no difference between phacoemulsification and SICS for BCVA and UCVA of 6/18 and 6/60. Endothelial cell loss and intraoperative and postoperative complications were similar between procedures. SICS resulted in statistically greater astigmatism and UCVA of 6/9 or worse, however, near UCVA was better.

- 11 studies, 76,838 eyes
- No difference in UCVA and BCVA between phaco and SICS
- No difference in intraoperative or postoperative complications
- Phaco group had less astigmatism

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Cochrane Analysis

Manual small incision cataract surgery (MSICS) with posterior chamber intraocular lens versus phacoemulsification with posterior chamber intraocular lens for age-related cataract (Review)

Riaz Y, de Silva SR, Evans JR

- 1708 eyes with 8 trials
- BCVA at 6-8 weeks equal in 7 of 8 studies
- 3 studies (767/1708) showed UCVA better with phaco (95% CI 0.84 to 0.96)
- No difference in complications
- Conclusion: techniques are very similar, major advantage is cost (4:1)

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Summary

- 12.6 million blind from cataract mainly in the developing world whose quality of life of themselves and their family suffer
  - This numbers are projected to increase (around 115 million)
- There are not enough eye care workers where they are needed the most
- Decrease in the quality of life due to blindness from cataract can be restored with successful surgery
- SICS is compared to phaco:
  - Less expensive (20 USD)
  - Faster (5 minutes)
  - Similar complication rates (1-2%)
  - BCVA similar (90-95% 20/60 or better)
  - A little worse in UCVA due to SIA (10-20% 20/60 or better) (0.75 D to 1.5 D)

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