Equity and blindness: closing evidence gaps to support Universal Eye Health

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Financial support
There are no funders to report for this submission

Statements
None of the authors have any proprietary interests or conflicts of interest related to this submission.
This paper has not been submitted or published elsewhere and it is not simultaneously being considered for any other publication.

Running head
Equity and Universal Eye Health

Word count
Abstract 250
Text 3412
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Abstract

Background


Methods

We reviewed the literature on health equity and the generation and use of evidence to promote equity, particularly in eye health. We describe the nature and extent of the equity-focused evidence to support and inform eye health programs on the path to universal eye health, and propose ways to improve the collection and reporting of this evidence.

Results

Blindness prevalence decreased in all regions of the world between 1990 and 2010, albeit not at the same rate or to the same extent. In 2010, the prevalence of blindness in West Africa (6.0%) remained 15 times higher than in high-income regions (0.4%); within all regions, women had higher prevalence of blindness than men. Beyond inter-regional and gender differences, there is little comparable data on the distribution of blindness across social groups within regions and countries, nor whether this distribution has changed over time. Similarly, interventions known to address inequity in blindness are few, and equity-relevant goals, targets and indicators for eye health programs are scarce.

Conclusion

Equity aims of eye health programs can benefit from the global momentum towards achieving UHC, and the progress being made on collecting, communicating and using equity-focused evidence.
Introduction

The VISION 2020 initiative was established with aims that included the reduction of the global prevalence of avoidable blindness, and its unequal distribution. This commitment to equity continues, with equity being a cross-cutting principle in the latest World Health Organisation (WHO) Action Plan: "Universal Eye Health: A Global Action Plan, 2014-2019", endorsed in Resolution 66.4 of the World Health Assembly in 2013\(^1\,^2\) (hereafter called the UEH Action Plan).

The recent Commissions on Social Determinants of Health (CSDH) and Global Governance for Health (CGGH) demonstrated that unfair distribution of power and resources, as well as global governance dysfunction, are the root causes of health inequality between population groups both between and within countries\(^3\,^4\). These root causes induce and maintain health inequalities, and can only be addressed through major political and social advances\(^3\,^4\).

Both the CSDH and CGGH emphasized that health systems have an important role to play in addressing health inequalities, despite solutions to the root causes lying beyond their control\(^3\,^4\). While health care interventions will never totally eliminate health inequalities, in the short term they are a promising entry point for equity-oriented initiatives to redress existing inequalities and prevent future inequalities\(^5\,^7\).

One such health initiative is the active promotion of Universal Health Coverage (UHC) which is defined as “people receiving quality health services that meet their needs without being exposed to financial hardship in paying for the services"\(^8\). Aligning actions with the principles of UHC provides the blindness prevention community with an opportunity to pursue equity aims within a framework being implemented by many health systems in low and middle income countries (LMICs).

Evidence for equity in eye health

Evidence-based practice is a core principle of the UEH Action Plan and few would argue against basing actions on sound research and proven interventions. In common with other health initiatives, blindness prevention in LMICs has consistently dedicated a larger portion of health equity research to
describing the magnitude and nature of health inequalities (the ‘problem space’), rather than exploring ways to address these (the ‘solution space’).6,7

This paper reviews the current evidence on equity and blindness. Strategies are then proposed—
drawing on relevant aspects of the health equity literature—that may enable future research to both inform and support the reduction of inequity within the UEH Action Plan. Our focus is on LMICs, which have the largest burden of blindness.

Methods
MEDLINE database searches were conducted by one author (JR) in an iterative manner during February—December 2014 as part of a literature review for a doctoral thesis. Articles were retrieved that related to health equity, evidence and eye-health in order to populate our themes of problem space evidence, solution space evidence, and indicators and monitoring. Search terms included “equity and blindness”, “universal eye health”, “health inequality analysis”, “universal health coverage and equity”, and “evidence and health equity”. Journal articles were retrieved and the reference lists of each article were reviewed to find additional articles. Potentially relevant WHO documents on prevention of blindness, social determinants of health, universal health coverage and universal eye health were also reviewed.

From the identified data sources, relevant information for each of the three themes was synthesised. Finally, specific insights proposed in the literature related to equity-focused evidence to support and inform eye health activities were summarised.

Definitions
Health inequality is defined as: “differences, variations, and disparities in the health achievements of individuals and groups”.12 The term encompasses differences in health status, access to care or outcomes between groups. Health inequity is widely considered to be “differences in health that are unnecessary, avoidable, unjust and unfair”.13 While health inequalities can be measured, health inequities cannot, because normative judgements of elements of its definition are required.12
To illustrate the difference between these two terms we can consider the example of the higher prevalence of cataract in people aged ≥50 years compared to those aged <50 years. This is certainly an inequality, but as cataract is a biological change that occurs with age regardless of social position, it is not inequitable in and of itself. The higher prevalence of blindness in women compared with men over and above biological differences, or the higher prevalence of trachoma in LMICs and indigenous populations of high income countries are different matters. It can be appreciated that such differences in health status reflect an unfair distribution of power and resources which could be considered avoidable, unfair and unjust, and therefore inequitable.

Measurement of health inequality can be considered as the metric to assess progress towards the goal of health equity. Throughout this paper, the term health inequality will be used when discussing measurable aspects of differences in health status, determinants and services. Health inequity will be used when referring to aspects of goals and aspirations related to these differences.

Results

Availability of data on eye health inequality

Population-based prevalence surveys have contributed extensive knowledge to the ‘problem space’ for eye health. The Global Burden of Diseases, Injuries and Risk Factors (GBD) Study Vision Loss Expert Group used 227 studies from 84 countries to calculate their 2010 estimates. In recent years, use of the standardised Rapid Assessments of Avoidable Blindness (RAAB) methodology has meant many more surveys have been undertaken in a broad range of locations, producing comparable results. In July 2015 information from 233 studies conducted in 73 countries since 1995 had been added to the online RAAB repository. Findings from these surveys have increased our understanding of the distribution of blindness throughout the world, and have provided population level information for programme planning. RAABs provide outcomes disaggregated by gender but rarely include data on other social factors such as place of residence or socioeconomic status.

Inequality across regions

At the global level there is evidence of the Inverse Care Law, which states that “the availability of good medical care tends to vary inversely with the need for it in the population served.” Bastawrous and Hennig used cartograms to demonstrate the inverse relationship between the global distribution
of blindness and the distribution of practicing ophthalmologists\textsuperscript{20}. This inverse relationship has also been shown for cataract blindness and cataract surgical coverage (CSC) against Human Development Index (HDI) rank, with higher levels of cataract blindness and lower CSC as HDI rank worsened\textsuperscript{21}.

The GBD study showed that blindness prevalence reduced in older adults (≥50 years) between 1990 and 2010, from 3.0\% (95\%CI 2.7–3.4\%) to 1.9\% (95\%CI 1.7–2.2\%)\textsuperscript{22}. Blindness prevalence decreased for both women and men in all regions of the world over this time, albeit not at the same rate or to the same extent\textsuperscript{23}. This meant in 2010 disparities in blindness prevalence persisted both between and within global regions: the prevalence of blindness in adults aged ≥50 years in West Africa (6.0\%) was 15 times higher than that of several high-income regions (0.4\%), and within all regions, women had a higher age-standardised prevalence of blindness than men\textsuperscript{22} (Figure 1).

**Inequality within countries**

Blindness surveys frequently present information on the prevalence gap between women and men, and increasingly data from primary studies are synthesised. From these syntheses we know that, compared to men, women have higher levels of blindness in all regions of the world\textsuperscript{14,22}, a higher prevalence of trachomatous trichiasis\textsuperscript{24}, and generally\textsuperscript{25,26}—but not universally\textsuperscript{27}—lower CSC (Table 1).

Beyond geographic and gender disparities such as those presented here, there is relatively little comparable data on the distribution of blindness among different social groups within regions and countries; and on whether, or in what ways, this distribution has changed over time. Occasionally surveys report on the gap for eye health indicators between urban and rural dwellers, and/or people who are literate or illiterate. The distribution of blindness across socioeconomic groups is rarely reported, largely due to the complexities of measuring socioeconomic status. Primary studies have, however, shown associations between poverty and higher prevalence of blindness, lower CSC, lower intraocular lens (IOL) implantation rate and lower spectacle coverage\textsuperscript{28-30}.

Perhaps the best multi-country data which demonstrates a relationship between vision status and a socioeconomic variable is that on self-reported poor vision in 57 countries from the World Health
Survey (2002-4)\textsuperscript{31}. Using wealth quintile as a measure of socioeconomic status, a wealth gradient was found, with the worst levels of self-reported poor vision in the poorest groups, and improvement at each higher level of wealth (Figure 2). Although this gradient was steeper in higher income countries, both higher and lower income countries exhibited the same trend. While care needs to be taken in interpreting self-reported vision data, this gradient is seen for many health outcomes in LMICs\textsuperscript{32,33}.

**Efforts to address eye health inequality**

*Indicators and targets*

The global target in the UEH Action Plan includes an assumption that policies will be delivered equitably (Table 2). Beneath the goal sit three objectives and six national indicators. Of these, only two indicators (prevalence and causes of blindness/vision impairment\[VI\] and CSC) include an equity component, in the form of a preference for disaggregation of data by age, gender, and place of residence\textsuperscript{2}.

*Implementation research*

Few studies have assessed the effectiveness of interventions which reduce inequalities in eye health in LMICs – the ‘solutions’. As an example, we know that cataract surgery is not only successful at restoring sight but is also highly cost-effective\textsuperscript{34,35}. Cataract surgery also improves quality of life\textsuperscript{36-38} and time use\textsuperscript{39}, and positively impacts on poverty alleviation\textsuperscript{37,38,40} and social status\textsuperscript{38}. But we still need a much better understanding of how to best address the unequal distribution of cataract blindness, including addressing barriers to accessing services, and improving the quality of outcomes experienced, especially by the disadvantaged.

Many strategies have been suggested to improve access to cataract services in LMICs. These include enhancing knowledge of eye disease and treatment options\textsuperscript{41}; addressing transport barriers (through financial assistance or provision of transport to hospital)\textsuperscript{42-44}; delivering outreach programs\textsuperscript{43,45}; providing counselling (for the family as well as the patient)\textsuperscript{41,44}; improving visual outcomes\textsuperscript{41} and patient satisfaction\textsuperscript{46}; setting a price for surgery within the family’s capacity and willingness to pay\textsuperscript{43,44}; enhancing systems of social support within communities and households\textsuperscript{41,43};
improving provider-patient communication\textsuperscript{42}; and sensitising service providers to the needs of disadvantaged groups\textsuperscript{47}. There are also examples of successful models of care in a given setting, such as the high quality, high volume, affordable services developed in India\textsuperscript{48} and replicated in other parts of South Asia.

Unfortunately few of these strategies have been comprehensively assessed so little evidence exists on their implementation and outcomes, nor on how they work in diverse settings, or differentially affect population subgroups. A valuable contribution to intervention research was made by Lewallen and Thulsiraj, when they considered which elements of the Indian model can be applied in other contexts such as sub-Saharan Africa\textsuperscript{49}. A recent review of systematic reviews to inform universal coverage of cataract services found no cataract-specific systematic reviews for inclusion\textsuperscript{50}. There are a small number of primary intervention studies that measured access to cataract services, and a selection of these are presented in Table 2.

A priority for UHC and an important area for reducing inequalities within UEH is strengthening financial protection. Research into financial protection for eyes services is limited, and models depend on the existing health system and socio-political context. Examples for cataract surgery include tiered-pricing in India\textsuperscript{51}, health insurance in China\textsuperscript{52} and the inclusion of cataract surgery in Brazil’s Unified Health System\textsuperscript{53}. The tiered-pricing model in India showed that where services were available at variable cost (free, subsidised, full fee), women were more likely to use free or subsidised services compared to paying services, whereas men were more likely to use paid services\textsuperscript{51}. Rural residents, people who were illiterate, and those who didn’t work outside of the home were also more likely to attend subsidised services or free camps compared to paying services\textsuperscript{51}. These findings indicate that financial protection is critical for reducing cataract blindness in the poor and socially disadvantaged, and an area in need of more attention.

**Discussion**

Since its inception the VISION 2020 initiative has expressed a commitment to the principle of equity. However, as the year 2020 draws near, insufficient evidence exists to assess progress towards equity in blindness prevention. It is clear from these results that in order to achieve the WHO vision of universal access to comprehensive eye care services\textsuperscript{2}, much more needs to be done to improve our
understanding of inequality in eye health in different settings, and how to redress it. Here we will reflect on the contribution monitoring can make to this understanding, before proposing ways to improve the collection and reporting of equity-focused evidence.

**Goals, targets and monitoring for Universal Eye Health**

To address inequalities we must set goals and targets, and monitor progress towards achieving them. The goal and targets of the UEH Action Plan do not include disadvantaged groups, but rather, assume ‘equity across all policies’ (Table 2). Two concerns arise. The first is that evidence does not support the assumption of equity. Many examples from other health sectors show that without special attention to the needs of the disadvantaged, inequality can increase when services expand. The second is that when goals are stated in terms of improvement in population averages rather than in terms of gains among disadvantaged groups, achievement is possible despite increasing inequality. UEH initiatives will be more likely to reduce inequity if global and national targets are established that include disadvantaged populations, such as those recently proposed for UHC: each component health service coverage indicator has an aggregate measure for the whole population, and an equity measure which reports coverage for selected social subgroups (such as gender, place of residence and socioeconomic status).

For goals and targets to be meaningful, information to track progress towards them must be readily available. The lack of equity-relevant targets and indicators in the UEH Action Plan may reflect reluctance to state targets for which very little data currently exists. The challenges of collecting reliable data in health information systems in LMICs are substantial. Rather than accept these as insurmountable barriers, a commitment to equity means ways need to be identified to routinely obtain the requisite information.

Insufficient data for analysis of inequality remains a problem in eye care. More equitable services could be planned if there was a more nuanced understanding of how inequality is patterned within countries. This has been the case for some health areas, where an exponential increase in data and corresponding enhanced understanding of health inequality was made possible through the collection of information to construct wealth indices during surveys such as the Demographic and Health...
Survey (DHS). Gender and blindness can be seen as an eye health example of “what is measured is what gets done”\textsuperscript{71}. Data is now commonly disaggregated by gender, so the evidence base on gender and blindness has expanded (Table 1) and, together with advocating to overcome these gender disparities\textsuperscript{72,73} and suggesting solutions\textsuperscript{44,74,75}, evidence has been instrumental in raising the profile of the problem. We need to continue this momentum for gender equity, doing more to ensure evidence is used in planning. We must also expand the approach to other social factors such as place of residence and socioeconomic status.

**How we can close the evidence gap**

In this section we suggest actions that could be taken to generate and use equity-focused evidence to support and inform blindness prevention activities at the global and national levels, as well as in the research field. We recognise that evidence is only one element required to promote equity and reduce inequalities in eye health. The following recommendations offer the foundation for a broader discussion of planning, advocating, implementing and evaluating equity initiatives to ensure progress towards achieving universal eye health.

**Action at the global level**

Global equity-relevant UEH goals and targets are needed, together with guidance on how national programs can set targets and monitor progress towards them, taking their individual circumstances into account\textsuperscript{7,76}.

Existing guidance and examples can be used to identify global and national health and social variables and metrics for use in inequality assessment\textsuperscript{66,69,70,77-81}. In the first instance, indicators in the current UEH Action Plan could be considered (blindness/VI, CSC, CSR, and eye care personnel), and later expanded to include other relevant aspects of inputs, processes, outputs, outcomes or impacts\textsuperscript{77}.

The PROGRESS acronym can be used to consider the range of socially stratifying factors that may be associated with each health indicator: *Place of residence; Race/ethnicity/ culture/ language; Occupation; Gender/sex; Religion; Education; Socioeconomic status; Social capital/ networks*\textsuperscript{82,83}.

Measures could include simple measures such as rate difference and rate ratio, as well as complex measures such as slope index of inequality and concentration index\textsuperscript{77}.
Equity could be incorporated into the ongoing development of global UEH research priorities—equity is not explicitly mentioned in VISION 2020’s ten research priorities, but could be incorporated into the majority of them. Intervention research should be promoted; and partnerships between researchers and program implementers strengthened.

Evidence-informed policy and planning for national prevention of blindness plans should be promoted, and relevant tools for health equity impact assessment could be adapted to assist the national planning process.

**Action at the country level (national prevention of blindness programs)**

At the national level, simple and sound objectives and targets could be established that include disadvantaged populations. Subsequently plans can be developed and progress monitored in relation to these modified objectives.

The health and social variables and health inequality metrics identified at the global level can be considered for appropriateness for eye health service monitoring in each national context. Where it has not yet occurred, eye care providers can advocate for cataract surgery numbers (disaggregated by social groups) to be added to national surveillance systems.

Evidence should be sought to inform the identification of vulnerable groups and service priorities, and to inform decisions regarding the development of appropriate interventions. Partnerships with relevant global actors could be formed to assist in building in-country research capacity.

**Action for researchers**

Researchers can address the current lack of equity-relevant evidence by advocating for its collection; adding appropriate PROGRESS variables to population-based surveys and intervention studies; measuring and reporting the distribution of effects across social groups, not just the population average; examining how different axes of social differentiation interact, overlap and cluster together to create inequality in different contexts; and exploring the feasibility of adding vision measurement to large global health studies.
Researchers can begin to balance research in the problem and solution spaces\textsuperscript{89} by undertaking more impact, process and outcome evaluations of policies and interventions\textsuperscript{78,87}. These can build on the studies shown in Table 3, and likely need to be multi-faceted to better address the complex range of barriers experienced. Successful interventions could be identified and evaluated, and requisite modifications determined before applying them in different contexts. Existing examples\textsuperscript{49,55} could be added to, drawing on insights on scaling up\textsuperscript{90} and knowledge transfer.

Research questions can be broadened from those of “what” and “how much” to “what works, for whom and in what circumstances”\textsuperscript{87,91}. This will require improvement in the consideration of context, which is essential in the translation of innovations from one location to another\textsuperscript{87,89}.

More and improved synthesis of existing data can be undertaken, including observational and qualitative studies\textsuperscript{87}. Beyond traditional systematic review methods, other synthesis methods may be useful. For example, evidence gap map synthesis can provide a visual overview of the existing evidence as well as user-friendly summaries of the studies included\textsuperscript{92}, and realist synthesis\textsuperscript{93} can answer the additional questions of how interventions work and in what context.

Researchers can more actively advocate for equity, and the use of evidence in addressing it – it is not sufficient to publish findings and expect them to be used. Researchers can enable equity-oriented decision-making by improving the way data are collected, processed and presented to be more useful to, and easily understood by, decision-makers\textsuperscript{9,16,68}.

Conclusion

The continuation of VISION 2020’s commitment to equity expressed in the latest UEH Action Plan is commendable. For this commitment to translate to reducing inequity in blindness, however, resolute effort from all stakeholders is required. This paper sought to place the issue of equity firmly on the blindness prevention agenda; and to promote an evidence-informed pursuit of universal eye health. Establishing equity-relevant goals, objectives, targets and indicators for UEH, and monitoring progress based on these, will help guide action. Asking the questions of “what works, for whom, and in what circumstances”\textsuperscript{87} when planning and evaluating interventions will ensure that the intervention is not only effective in the environment in which it is being implemented, but will also allow others to
determine the efficacy of the intervention in their own setting. Reinforcing equity objectives and identifying innovative responses to addressing inequity are essential to achieve universal eye health.

References


### Table 1: Evidence from systematic reviews on gender and eye health indicators

<table>
<thead>
<tr>
<th>First Author, Year</th>
<th>Details of study</th>
<th>Gender inequality reported</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blindness and moderate &amp; severe visual impairment (MSVI)</strong></td>
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</tr>
</tbody>
</table>
| Abou-Gareeb et al., 2001<sup>14</sup> | Meta-analysed individual participant data from 23 studies undertaken between 1980 and 1999. | Excess blindness in women compared to men (age-adjusted OR and 95%CI): 
Global OR 1.43 (95%CI 1.33–1.53) 
Africa OR 1.39 (95%CI 1.20–1.61) 
Asia OR 1.41 (95%CI 1.29–1.54) 
Industrialised countries 1.63 (95% CI 1.30–2.05) 
Overall, 64.5% of blind people were women. |
| Stevens et al., 2013<sup>22</sup> | Fitted hierarchical models to estimate age-standardised prevalence of blindness and MSVI for women and men aged ≥50 years for 190 countries in 21 geopolitical regions, using data from 227 studies in 84 countries from 1990 to 2012. | Disparity in blindness was highest in high-income regions (1.5 times higher in women compared to men); and lowest in Sub-Saharan African regions (1.11–1.13 times higher in women) and South Asia (1.26 times higher in women). MSVI was 1.1–1.2 times greater in women than in men in all regions. Globally in 2010, 60% of blind people and 57% of those with MSVI were women. |
| **Trachomatous trichiasis** | | |
| Cromwell et al., 2009<sup>24</sup> | Meta-analysed 24 studies from 12 countries undertaken between 1989 and 2008. | Trichiasis was statistically significantly higher in women compared to men in 17/24 studies. Overall women were more likely to have trichiasis compared to men OR 1.82 (95%CI 1.61–2.07). |
| **Cataract surgical coverage (CSC)** | | |
| Lewallen et al., 2002<sup>25</sup> | Meta-analysed CSC rates from 9 studies undertaken in LMICs between 1980 and 1999. | CSC was lower for women than men in all surveys. Overall women were less likely to have cataract surgery compared to men OR 0.67 (95%CI 0.60–0.74). Women accounted for 63% of cataract cases in the populations. If women had the same CSC as men, cataract blindness would be reduced by 12.5%. |
| Lewallen et al., 2009<sup>26</sup> | Meta-analysed CSC data from 23 studies undertaken in LMICs between 2000 and 2008. | CSC was lower for women than men in 21/23 surveys. Overall men were more likely to have cataract surgery compared to women OR 1.71 (95%CI 1.48–1.97). If women had the same CSC as men, cataract blindness and SVI would reduce by 11% in LMICs. |
| Carter et al., 2012<sup>27</sup> | Meta-analysed CSC data from 11 studies undertaken in Latin America between 1999 and 2009. | No statistically significant difference comparing CSC in women versus men. By eye: <6/18 OR 0.94 (95%CI 0.83–1.07); <3/60 OR 1.01 (95%CI 0.86–1.18). By person: <6/18 OR 0.94 (95%CI 0.77–1.15); <3/60 OR 1.12 (95%CI 0.78–1.63). |

MSVI=moderate and severe visual impairment; CSC=cataract surgical coverage; OR=odds ratio; CI=confidence interval; LMICs=low and middle income countries.
Table 2: Inequality considerations of the global target and national indicators in *Universal Eye Health: A Global Action Plan 2014-2019*

<table>
<thead>
<tr>
<th>Target/Indicator</th>
<th>Reference to inequality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global target</strong></td>
<td>“Equity across all policies” is included as an important assumption to reaching this goal.</td>
</tr>
<tr>
<td>“…reduction in prevalence of avoidable visual impairment by 25% by 2019 from the baseline of 2010”</td>
<td></td>
</tr>
<tr>
<td><strong>National indicators</strong></td>
<td></td>
</tr>
<tr>
<td>Prevalence and causes of visual impairment</td>
<td>Preferably disaggregated by age and gender.</td>
</tr>
<tr>
<td>Number of eye care personnel (#/million population)</td>
<td></td>
</tr>
<tr>
<td>Ophthalmologists</td>
<td>—</td>
</tr>
<tr>
<td>Optometrists</td>
<td>—</td>
</tr>
<tr>
<td>Allied ophthalmic personnel</td>
<td>—</td>
</tr>
<tr>
<td>Cataract surgical service delivery</td>
<td>Preferably disaggregated by age, gender, urban/rural.</td>
</tr>
<tr>
<td>CSR</td>
<td>—</td>
</tr>
<tr>
<td>CSC</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 3: Examples of strategies that worked or didn’t work to improve access to cataract surgery in LMICs

<table>
<thead>
<tr>
<th>First Author, Year</th>
<th>Location</th>
<th>Study design</th>
<th>Strategy</th>
<th>Summary of outcome(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategies that worked</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brilliant et al., 1991</td>
<td>Tamil Nadu, India</td>
<td>Controlled before-and-after study</td>
<td>4 education strategies and 4 economic strategies compared to a control group (all groups were offered free surgery).</td>
<td>14% of the control group accepted surgery. The provision of free surgery, transport and food produced significantly higher acceptance rates compared to the control group. The most effective intervention was counselling by a motivator who had received surgery, combined with the economic incentives (acceptance rate=33%).</td>
</tr>
<tr>
<td>Lewallen et al., 2005</td>
<td>Rural district in Kenya and Tanzania</td>
<td>Retrospective observational study</td>
<td>“Bridging strategies” between hospitals and communities.</td>
<td>Cataract surgical output increased four-fold over a two-year period in Tanzania with 83% uptake of surgery; and increased &gt;five-fold over a six-year period in Kenya, with 69% uptake.</td>
</tr>
<tr>
<td>Eliah et al., 2008</td>
<td>Two rural districts of Tanzania</td>
<td>Prospective observational study of two district programs</td>
<td>Applying VISION 2020 principles to planning and partnership.</td>
<td>Cataract surgical output increased two-to-threefold over a two year period in both locations.</td>
</tr>
<tr>
<td>Finger et al., 2011</td>
<td>Two districts of Tamil Nadu, India</td>
<td>Prospective observational study of 15 outreach camps</td>
<td>Regular outreach to the same location.</td>
<td>The district with regular outreach to the same location had a higher proportion of people accepting surgery compared to the district where the location changed (94.6% vs. 82.3%, P &lt; 0.001) and this remained significant on binary logistic regression.</td>
</tr>
<tr>
<td>Zhang et al., 2013</td>
<td>Shaanxi Province, China</td>
<td>Cluster-randomised control trial</td>
<td>4 intervention arms: 1. Informative reminder 2. Free surgery 3. Free surgery + reimbursement of transport 4. Free surgery + free transport.</td>
<td>Provision of free cataract surgery was twice as effective as giving patients an informative reminder to increase the uptake of cataract surgery (P=0.027). However, offering reimbursement of transport costs or provision of free transport had minimal added impact on uptake of cataract surgery.</td>
</tr>
<tr>
<td>Chen et al., 2015</td>
<td>Six provinces in rural China</td>
<td>Prospective, multicentre, observational study among 42 rural, county-level hospitals</td>
<td>Identifying factors that influence cataract surgical output.</td>
<td>Hospitals with outreach screening &gt;5000 people/year had a &gt;75% increase in CSR over the two years compared to other hospitals. Outreach screening &gt;5000 people/year was the only factor associated with increasing CSR compared to baseline over a two-year period in the multiple regression model; reducing patient dissatisfaction and having international non-government organisation support were associated with increasing CSR on simple regression; factors not associated with increasing CSR included per capita GDP, eye clinic volume, administration support, cost of surgery, skill of surgeon and postoperative vision.</td>
</tr>
<tr>
<td><strong>Strategies that didn’t work</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Kessy et al., 2007</td>
<td>Kilimanjaro region, Tanzania</td>
<td>Prospective cohort study</td>
<td>Promoting fee waiver from village leader for those too poor to pay for services.</td>
<td>Within five months of screening, 20% of those saying they were too poor to pay for surgery found the money (~US$13) after counselling; and 3% obtained a fee waiver from a village leader. Follow-up of a sub-sample of those who had not presented included providing them the fee waiver—only 22% used it.</td>
</tr>
<tr>
<td>Razafinimpanana et al., 2012</td>
<td>Sava region, Madagascar</td>
<td>Prospective observational study</td>
<td>Employing cataract case finders.</td>
<td>Only 25% of those referred by the case finders presented for surgery; greater distance to the hospital (and increased transport cost) was associated with not presenting for surgery.</td>
</tr>
<tr>
<td>Liu et al., 2012</td>
<td>Rural Guangdong Province, China</td>
<td>Cluster-randomised control trial</td>
<td>Educational video and counselling on cataract, cataract surgery and surgical cost.</td>
<td>Receiving the intervention was not associated with increased uptake of surgery: OR=1.11, 95%CI 0.67–1.84. Predictors of surgery acceptance included younger age, worse presenting vision, knowing that cataract can be treated surgically only, greater anticipated loss in income from hospitalisation, and greater house floor space per person.</td>
</tr>
</tbody>
</table>

OR=odds ratio; CI=confidence interval.
Figure legend

Figure 1: Prevalence of blindness in women and men aged ≥50 years across GBD regions in 2010
Graphed from data presented in Appendix B, Table B4 of Stevens et al, Ophthalmology, 2013, 120:2377-2384.

Figure 2: Self-reported poor vision by wealth quintile for lower- and higher-income countries, World Health Survey 2002-4
Pooled analysis of 37 low and low-middle income ("lower income") and 20 high and high-middle income ("higher income") countries from the World Health Survey (2002-4).
The graph shows the prevalence of blindness (%) for different regions and genders. The prevalence drops significantly as we move from Sub-Saharan Africa and the Middle East to more developed regions like North America and Australasia.

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The bar chart illustrates the prevalence of self-reported poor vision (%) for lower income and higher income countries across different wealth quintiles.

- **Lower income countries** show higher prevalence of self-reported poor vision in the lowest wealth quintile compared to higher wealth quintiles.
- **Higher income countries** demonstrate a lower prevalence of self-reported poor vision in the highest wealth quintile compared to lower quintiles.

**Wealth quintiles** range from **Highest** to **Lowest**, with corresponding prevalence rates indicated on the y-axis.