

## Social inequalities in blindness and visual impairment: A review of social determinants

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Health inequities are related to social determinants based on gender, socioeconomic status, ethnicity, race, living in a specific geographic region, or having a specific health condition. Such inequities were reviewed for blindness and visual impairment by searching for studies on the subject in PubMed from 2000 to 2011 in the English and Spanish languages. The goal of this article is to provide a current review in understanding how inequities based specifically on the aforementioned social determinants on health influence the prevalence of visual impairment and blindness. With regards to gender inequality, women have a higher prevalence of visual impairment and blindness, which cannot be only reasoned based on age or access to service. Socioeconomic status measured as higher income, higher educational status, or non-manual occupational social class was inversely associated with prevalence of blindness or visual impairment. Ethnicity and race were associated with visual impairment and blindness, although there is general confusion over this socioeconomic position determinant. Geographic inequalities and visual impairment were related to income (of the region, nation or continent), living in a rural area, and an association with socioeconomic and political context was suggested. While inequalities related to blindness and visual impairment have rarely been specifically addressed in research, there is still evidence of the association of social determinants and prevalence of blindness and visual impairment. Additional research should be done on the associations with intermediary determinants and socioeconomic and political context.

**Key words:** Visual impairment, blindness, inequality, social class, income, educational status, gender and ethnic groups

Health inequity refers to differences or inequalities in health among social groups that are unnecessary, avoidable, unfair, and intolerable.<sup>[1]</sup> These inequalities are related to social determinants based on gender, socioeconomic status, ethnicity, race, living in a specific geographic region, or having a specific health condition. Inequality, poverty, exploitation, violence, and injustice are causes of illness and death of the poor and marginalized.<sup>[2]</sup> However, instead of focusing solely on reducing global poverty to improve health equity, greater attention should be given to improving the socioeconomic conditions of global society.<sup>[3]</sup>

Health inequalities can be reproduced at any level associated with the effect of the relative versus absolute socioeconomic position of individuals and patterning of the social gradient in health.<sup>[4]</sup> Indeed, there is a common social gradient across global society – the lower the socioeconomic position of an individual, the poorer is their health.<sup>[5]</sup> Social determinants of health are structured along three major levels: structural determinants focusing on socioeconomic and political context (governance, macroeconomic policies, social policies, public policies, and culture and social values); socioeconomic position structural determinants (class, power, prestige, and discrimination); and intermediary determinants.<sup>[5,6]</sup>

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In this review, we examine how the socioeconomic factors of gender, income, education, occupation, and ethnicity/race related to an individual's social position influence visual impairment and blindness. A review on socioeconomic status and blindness<sup>[7]</sup> was published 10 years ago, which focused only on blindness, even though there are six times as many people with visual impairment. However, previous literature usually did not discuss how social inequalities influenced visual health. There is literature on visual impairment and blindness that stratified outcomes on income, education, employment status, social class, gender, and race/ethnicity. Geopolitical area is also considered to have an influence on the socioeconomic and political context. The goal of this article is to provide a current review to understand how inequities based on socioeconomic determinants of health influence prevalence of visual impairment and blindness.

### Materials

Literature was searched on PubMed using combinations of the following two groups of keywords: Ocular outcome (visual impairment, blindness, cataract, diabetic retinopathy, glaucoma, eye health, eye care, ophthalmology, and prevalence) and structural determinants of socioeconomic position (socioeconomic status, social class, income, educational status, gender, poverty areas, ethnic groups, race, inequality, disparity, inequity, and access). Causes of blindness and visual impairment were included as key words to capture publications that produce secondary results on visual impairment or blindness. The search included original population-based studies, reviews, and meta-analysis from 2000 to 2011 in the English and Spanish languages. There were no other limitations specified. There were 565 publications found: 101

for gender, 53 for income, 42 for education, 12 for social class, 109 for inequality, 109 for socioeconomic factor, and 95 for race/ethnicity. A total of 312 publications were found for visual impairment and 253 for blindness prevalence outcomes. Three reviewers independently examined the title and the abstract of each article, classifying the articles in six fields: gender, income, education, employment status and social class, geographic, and race/ethnicity. Full text and tables of all the articles that had results on visual impairment or blindness outcomes were reviewed. Two inclusion criteria were evaluated: (1) present empirical findings related to outcomes of prevalence of visual impairment or blindness in population-based studies on adult populations and; (2) a gender, income, educational level, employment status and social class, or race stratifying measure. A manual search of the references of these studies, an additional 16 articles were identified. Given that publication dates included in the review range from 2000 to the present, when the articles found in this review did not fill the gap on the knowledge previously documented additional material was sought from study references and literature collections conducted in earlier years by the authors.

## Results

A table has been generated that summarizes the literature review of publications in the last 12 years. A total of 23 studies were found that stratified the results of prevalence of blindness or visual impairment with the structural social determinants of health: gender, income, educational level, employment status, social class, and ethnicity/race [Table 1].

Although important inequalities in the prevalence of blindness and sex have been reported, no gender review has been published.<sup>[8]</sup> A meta-analysis conducted by Abou-Gareeb ten years ago found that women accounted for nearly two-thirds of the population with blindness.<sup>[6]</sup> After age adjustment, the overall odds ratio (OR) of blind women to men was remarkably consistent by geographical area, being 1.39 for Africa, 1.41 for Asia, and 1.63 for industrialized countries. Research continued to highlight this gender inequity with respect to blindness and visual impairment.<sup>[9,10]</sup> Later studies on the prevalence of visual impairment and blindness reported a prevalence ratio of more than 1.5 for women in high-income countries, which is surprisingly higher than in low-income countries.<sup>[11-14]</sup>

Women generally have a longer life expectancy than men. Since many eye diseases are age-related, we would expect women to have a higher burden of visual impairment and blindness.<sup>[6]</sup> However, even after age adjustment, inequities still persisted.<sup>[15]</sup>

Access to the health care system was an intermediary determinant and played a role in exposure and vulnerability.<sup>[6]</sup> Through the analysis of women's access to services, differences between countries at low, middle, and high levels of the Human Development Index (HDI) were observed.<sup>[16]</sup> In high HDI countries such as the United States (US), Australia, and Germany, women reported more visits to the eye care specialist.<sup>[17-20]</sup> All age groups of women in the US had better ocular health care utilization than men for all three racial/ethnic groups.<sup>[21]</sup> No differences in eye care service utilization were found between men and women in the middle HDI countries of Asia, such as Oman, and similar access to cataract surgical

services was noted in Latin America.<sup>[22,23]</sup> In the low HDI countries of Africa and Asia, access to cataract surgical services was lower for women compared with men.<sup>[13,24-29]</sup> Reasons for not seeking eye care showed different gender patterns for people with some visual impairment; "no need" was the main reason for men and "cost/insurance" for women in the US.<sup>[30]</sup> Indirect costs of service was a more relevant barrier for women in Ethiopia.<sup>[31]</sup> Attitudinal differences in seeking health care were also suggested as reasons to explain gender differences in access to eye health care services.<sup>[17,32]</sup>

Studies in France and the US showed that people with low vision had less income.<sup>[33,34]</sup> In low HDI countries, such as Kenya, the Philippines, and Bangladesh, multivariate analyses showed that case participants were consistently poorer than controls when assessed using three different measures of poverty even after adjustment for health and social support indicators.<sup>[35]</sup> Only one article evaluated risk of blindness and individual income and found that low income was associated with blindness in India.<sup>[36]</sup> Visual impairment, even unilateral, was associated with household income (>\$75,000 a year) in the US, and both high rates of blindness and visual impairment were found in the elderly of the US.<sup>[37-39]</sup>

Increased risk for visual problems was documented in the impoverished neighborhoods with the worst economic indicators in the US and Australia (we must bear in mind, however, that these data are relatively old).<sup>[40,41]</sup> In addition, the prevalence of blindness and visual impairment was higher in low-income countries when compared with high-income countries.<sup>[42]</sup> There was also a gradient between the gross domestic product (GDP) of a country and its prevalence of blindness.<sup>[43]</sup>

Although only a few articles addressed the association of blindness or visual impairment with income, the results were consistent in that lower income was associated with visual problems. Not one article, analyzed in this review, stratified association of income with visual outcomes by sex.

Lower levels of education were associated with higher prevalence of visual impairment in Australia, Taiwan, and the US, as well as blindness in the US, India, and China.<sup>[38,39,44-47]</sup> In 1991, a reverse association with years of education and prevalence of visual impairment and blindness was observed, and prevalence increased at a much faster rate when illiteracy in India, Pakistan, Nigeria, and the US was taken into consideration.<sup>[34,38,39,44,48,49]</sup> A higher association with the level of education was found for bilateral (as compared with unilateral) visual impairment in the US.

Reasons for not seeking eye care in the US were based on educational level, with "no need" as the main reason for the highly educated and "cost/insurance" for the lower educated. However, highly educated individuals (32%) still reported "cost/insurance" as a reason for not seeking eye care, although this factor decreased among the high-income population (22%).<sup>[28]</sup>

People with visual impairment in Europe were at higher risk of not having a paid job, being unemployed, suffering from permanent disability, belonging to a manual social class (with less job satisfaction), having less opportunity to develop new skills, having less recognition for their work, and having an inadequate salary.<sup>[50]</sup> In France, individuals without visual

**Table 1: Selected articles on social determinants of health and visual impairment or blindness**

Reference	Country/ Place	Design	Social determinant of health	Key findings
Abou-Gareeb I <i>et al.</i> , 2001 <sup>[8]</sup>	Worldwide	Meta-analysis	Sex and gender	Women have a higher prevalence of age-adjusted blindness in all continents, slightly increased in developed countries.
Fouad D <i>et al.</i> , 2004 <sup>[32]</sup>	Egypt	Cross-sectional study population-based survey	Level of education Gender and employment	Educational and employment status were significant associated with blindness in adults in this setting. Successfully combating blindness in the Nile Delta of Egypt will require gender sensitive efforts aimed at timely and effective utilization of eye care services.
Brezin AP <i>et al.</i> , 2005 <sup>[33]</sup>	France	Cross-sectional data from the national health survey	Income and employment status	Subjects with blindness had fewer paid activities than subjects with no visual problems. Monthly household incomes were lower for subjects with low vision and blindness than for subjects with no visual problems.
Frick KD <i>et al.</i> , 2007 <sup>[34]</sup>	United States	Cross-sectional and elaboration	Income	Individuals with visual impairment have less income.
Kuper H <i>et al.</i> , 2008 <sup>[35]</sup>	Kenya, Bangladesh, Philippines	Case-control study	Expenditure per capita	Individuals with visual impairment had lower per capita expenditures (PCE). The visually impaired were more likely to have low PCE, even after adjustment for health and social support indicators.
Dandona L, <i>et al.</i> , 2001 <sup>[36]</sup>	India	Cross-sectional study with interview and ocular evaluation	Income	Individual low income was associated with blindness.
Wilson CJ <i>et al.</i> , 2008 <sup>[37]</sup>	United States	Cross-sectional data from the health and nutrition survey	Income, level of education and race	Visual impairment (even unilateral) was associated with individual income and level of education. A dose-response effect was observed. Nonsignificant association was found for Hispanics and African Americans compared with Whites.
Bailey RN <i>et al.</i> , 2006 <sup>[39]</sup>	United States	Cross-sectional data from BRFSS survey	Level of education and income	Educational status and income were significant associated with visual impairment
Ho VH <i>et al.</i> , 2001 <sup>[43]</sup>	Worldwide	Epidemiologic data from WHO and economic data from UN	Income	A trend exists between the gross domestic product (GDP) of a country and its prevalence of blindness.
Liu JH <i>et al.</i> , 2001 <sup>[44]</sup>	Taiwan	Cross-sectional study with ocular evaluation	Educational status and employment status	Higher education level was associated with a decrease in visual impairment. No relation was found between visual impairment and sex or employment status.
Jadoon MZ <i>et al.</i> , 2006 <sup>[48]</sup>	Pakistan	Cross-sectional data from the Pakistan National Blindness and Visual Impairment survey	Level of education	Educational status was associated with presenting visual acuity of <6/60. Subjects who had attended primary school were 60% less likely to have acuity of <6/60 than were subjects who had never been to school.
Dandona R <i>et al.</i> , 2001 <sup>[7]</sup>	Worldwide	Review	Income, level of education and region	Income, level of education, and region are associated with blindness.
Ryskulova A <i>et al.</i> , 2008 <sup>[45]</sup>	United States	Cross-sectional data from the national health survey	Educational level	Prevalence of visual impairment and blindness are associated with educational level. Cataracts, glaucoma, and diabetic retinopathy but not macular degeneration were more prevalent in those with less than a high school degree. A dose-response effect of educational level is observed.
Murthy GV <i>et al.</i> , 2005 <sup>[46]</sup>	India	Cross-sectional study with ocular evaluation	Income and employment status	Individual low income and not working were associated with blindness.
Zheng Y <i>et al.</i> , 2011 <sup>[62]</sup>	Singapore	Cohort study	Level of education	Visual impairment is associated with illiteracy.
Salomao SR <i>et al.</i> , 2008 <sup>[85]</sup>	Brazil	Cross-sectional study	Level of education	Prevalence of blindness is higher in individuals without schooling

Contd...

**Table 1: Contd...**

Reference	Country/place	Design	Social determinant of health	Key Findings
Song W <i>et al.</i> , 2010 <sup>[47]</sup>	China	Cross-sectional study with ocular evaluation	Level of education	Prevalence of blindness is higher in individuals without education and a dose response effect is observed with level of education.
Entekume G <i>et al.</i> , 2011 <sup>[49]</sup>	Nigeria	Cross-sectional study with ocular evaluation	Educational level	Illiteracy was associated with low vision.
Stang A <i>et al.</i> , 2003 <sup>[20]</sup>	Germany	Cross-sectional data from the national health survey	Social class, and employment status	Prevalence rates of visual disturbances are higher among people of higher social status.
Mojon-Azzi SM <i>et al.</i> , 2010 <sup>[50]</sup>	Europe	Cross-sectional data from the European Survey (SHARE)	Employment, Job satisfaction	Persons with lower levels of eyesight were, less satisfied with their jobs, had less freedom to decide, less opportunity to develop new skills, less recognition for their work, and lower salary.
Rahi JS <i>et al.</i> , 2009 <sup>[52]</sup>	Britain	Cohort study	Social class and employment status	Children of manual social class fathers at the moment of birth were associated with increased risk of visual impairment
Varma R <i>et al.</i> , 2010 <sup>[53]</sup>	United States	Longitudinal	Race/ethnicity	Incidence of VI in Hispanics was higher than that reported in non-Hispanic white persons
Landers J <i>et al.</i> , 2010 <sup>[54]</sup>	Australia	Cross-sectional not representative	Race/ethnicity	Bilateral visual impairment and blindness were more prevalent in indigenous Australians.

problems had a chance of having a paid job five times greater than that of blind people and twice than those with low vision.<sup>[30]</sup> In India, people without work had twice the risk of visual impairment.<sup>[44]</sup>

The concept of *social class* derived from occupation was also associated with health indicators. For coding social class, each individual was assigned to their occupation, and each occupation was assigned to one of the six social classes. The first three corresponded to nonmanual workers, and the last three to manual workers. Social class based on occupation integrated the level of training required for a job, income, and the level of responsibility.<sup>[51]</sup>

In Britain, the risk of poor vision was associated with social class (unskilled manual workers). For each increment in social class grade on a scale of I through V, the risk of poor vision increased by 28%, with a prevalence of 1.9% in social class I (professional) and 5% in social class V (unskilled manual workers). Additionally, children with manual social class fathers at the moment of birth had an increased risk of far and near visual impairment at adulthood.<sup>[52]</sup> However, prevalence of low vision and blindness for workers was similar to that of the unemployed in the US.<sup>[37]</sup>

After adjusting for age and socioeconomic position, no association with visual impairments was found among Hispanics, African Americans, and Caucasians in the US.<sup>[34]</sup> However, Hispanics had a higher incidence of visual impairment than that reported in non-Hispanic White persons and the highest reported in a population-based study in the US.<sup>[53]</sup> In Australia, bilateral visual impairment and blindness were found to be four to seven times more frequent in the indigenous population.<sup>[54]</sup> However, it is often difficult to evaluate the prevalence of visual impairment or blindness that might be truly inherent in a racial or ethnic population

in addition to the social determinants that a specific racial group were exposed to due to low socioeconomic position and marginalization.

Many studies in the US, but not all, showed no significant differences between ethnic or racial minorities when compared with Caucasian populations, although differences were not always adjusted for socioeconomic position variables.<sup>[52,55,56]</sup>

Geographic inequalities were found among continents, countries, and regions within a country.<sup>[57]</sup> In 2000, Africa and India bore the highest prevalence of blindness, followed by the rest of Asia, China, and Latin America.<sup>[40]</sup> However, Asia led the burden of disability-adjusted life years (DALYs), and cataract was the principal cause of blindness with 95% of the burden in low-income countries.<sup>[58]</sup> Other studies showed that 87% of the visually impaired and 90% of blind people lived in low-income countries but differences in prevalence persisted between countries in the same region or continent and were inversely correlated with GDP per capita of each country.<sup>[40,41,59,60]</sup>

In France, geographic inequalities were also found between regions within the country for age-adjusted visual impairment and blindness prevalence.<sup>[61]</sup> Geographic inequalities were found after occupational social class adjustment, and they were evident for age-adjusted low vision between regions of Nigeria.<sup>[45]</sup> Differences in the prevalence of visual impairment were similarly found for five states in the US.<sup>[62]</sup> In Singapore, an ecologic effect of socioeconomic determinants of the community was found to have an independent association with visual impairment, even when considering individual socioeconomic determinants.<sup>[62]</sup> In Canada, ecologic research found that prevalence of blindness registration correlated with medium household income of districts after evaluating the five geopolitical regions of the country. However, when the model did not consider geopolitical region, medium

household income was not statistically correlated. Those results suggested that the geopolitical region played a role in blindness independent of district income. Moreover, income derived from government transfer payments had a negative correlation with blindness registration prevalence.<sup>[63]</sup>

## Discussion

The review produced four main findings: (1) women had a higher prevalence of visual impairment and blindness, which was not fully explained by age or by access to services, (2) socioeconomic status measured as higher income, higher educational status, or nonmanual occupational social class was inversely associated with prevalence of blindness or visual impairment, (3) ethnicity and race were associated with visual impairment, although other social determinants of health can be associated, and (4) geographic inequalities and visual impairment (of the region, nation or continent) were observed to be related to income, and living in a rural area. An association with socioeconomic and political context was additionally suggested.

Results bearing the evidence of the association between socioeconomic position determinants and prevalence of visual impairment and blindness were found in this review, even if this relationship has rarely been addressed in research (23 articles in the last 12 years). However, the effect of an individual's socioeconomic position on his/her health may not be only direct, but may also emerge from intermediary determinants that remain, pending investigation.<sup>[4]</sup> Possible social determinant pathways that lead to the social gradient should be explored.<sup>[3]</sup> Future research should be done measuring how exposure or vulnerability explain the pattern of inequalities regarding a specific social stratification such as educational level or income.

A few articles analyzed in this review, upon publication, were categorized as social determinant(s) of health, although the tag was an intermediary factor mostly related to accessibility of services. Additionally, some of the articles considered only psychosocial factors, which are related to occupational health and environmental factors, as determinants for producing inequalities. Although psychosocial consequences of socioeconomic inequality were an important intermediary determinant, interpretation of links between socioeconomic status and health must begin with the structural causes of inequalities.<sup>[4]</sup> An "ecosocial" approach is a needed consideration to better understand the mechanism of how differences are produced by integrating social and biological factors in a dynamic, historical, and ecological perspective.<sup>[64]</sup> A possible effect of the first level of social determinants of health—the determinants of socioeconomic and political context—might be considered for future research, since the few results produced thus far consistently suggested this concept.<sup>[58,60]</sup>

Perceived gender discrimination by women was associated with their poor health outcomes.<sup>[65]</sup> A greater awareness of gender discrimination behaviors could explain differences between the outcomes of men and women if the slightly increased gender inequalities in prevalence are confirmed for high-income countries versus low-income countries. In addition, gender discrimination patterns affected the decision-making authority, which not only influenced

access to services, but also, differences in psychosocial and environmental risk exposure.<sup>[66]</sup> Further research is necessary. Women also accumulated more working hours than men, and their additional domestic chores negatively affected their health.<sup>[67]</sup> This could also influence risk of diabetic retinopathy, glaucoma, and cataract if those health issues were related to stress.<sup>[68]</sup> More research is needed to identify if perceived gender discrimination, decision-making authority, and working hours are associated with gender inequalities in blindness and visual impairment. A study performed in Saudi Arabia, a country with significant gender discrimination, found an extremely high gender inequality of visual impairment between men and women attending primary care (lower for women), and there was lower registration for government allowances provided for blindness in Kuwait.<sup>[69,70]</sup>

It is worthy to note that with other pathologies, women generally put less therapeutic effort in seeking treatment with regard to organ transplants, coronary problems, emergency treatments, and pharmaceutical spending.<sup>[71-75]</sup> More research would be needed to assess if there are gender differences in therapeutic efforts regarding ophthalmological procedures, and if so, whether those differences could explain why women, despite having had more access to a specialist in high-income countries, had higher prevalence of blindness and visual impairment than men.

Sex differences in the distribution of pathologies that cause blindness and visual impairment were not broadly described.<sup>[76,77]</sup> (It should be clarified that sex refers to the biological construct/characteristics, whereas gender is a social construct concerning behaviors, roles, and interactions between men and women.) Genetic, hormonal, and other biological factors associated with ocular pathologies could lead women to greater risk of blindness and visual impairment. Reporting sex-stratified data in publications could allow more accurate knowledge on gender inequalities. However, biological factors cannot be considered alone.<sup>[78]</sup>

Income, educational level, and social class measure socioeconomic position and act in similar, although not equal, ways to produce visual impairment and blindness. More research should be done to understand performance and how influences vary in relation to visual outcomes. Although only a few articles addressed the association of blindness or visual impairment and income, the results consistently showed correlation between lower income and higher risk for visual problems. However, even when considering that women were at a significantly greater risk of developing visual impairment or blindness, none of the articles analyzed in this review stratified association of income and visual outcomes by sex. There were more articles that disaggregated the prevalence of visual impairment and blindness according to level of education, rather than income. Educational level was associated with knowledge and awareness of eye conditions and eye care services and poor behavior toward eye care, but education might have a different effect than income in seeking eye care when needed.<sup>[79]</sup> However, more research is needed to identify whether lack of knowledge and poor behavior explains this association or if other socioeconomic factors can be implicated. Complex behavior in seeking and receiving eye care services may be embedded in socioeconomic determinants, and more research needs to be done to confirm those findings.<sup>[80-82]</sup>

The father's social class at time of birth of an individual had a direct effect on that individual's embodiment of social class and affected middle-age risk of developing visual impairment.<sup>[51]</sup> However, more research is required for measuring the direct or reverse effect of blindness and socioeconomic position, as well as the role of gender.

While many studies demonstrated that ethnic or racial groups have a different prevalence of visual impairment, often due to specific eye diseases, it can be difficult to ascertain how much was intrinsic to the race or ethnicity and how much was associated to socioeconomic position or the lack of eye care for various reasons. More sophisticated research will be needed to determine this conclusion.

Eye care inequities exist in a variety of ways around the world. While some studies suggested that eye care access is a major barrier even in the presence of national health care systems, substantial numbers of subjects did not utilize services where they were available.<sup>[37,53,83]</sup> In these instances, the lack of education and perhaps more importantly, the lack of basic literacy and/or knowledge of eye diseases provide some explanation.<sup>[84]</sup> Poverty by itself or combined with educational factors (social deprivation) is also another reason why many patients cannot access services.

As a final note to the discussion, a limitation of the review was that most of the publications were not correctly tagged with adequate keywords when searching for inequalities. As a recommendation, it would be important that future publications should be classified in terms of inequities or social determinants in order to facilitate knowledge-sharing of work that has already been produced.

More research and interpretation needs to be done to better understand the social and biological mechanisms that produce the social inequalities patterns in the prevalence of blindness and visual impairment. Publications, even those not focused on inequalities, should stratify and interpret findings separately by sex and socioeconomic status to provide better understanding of gender inequalities. Associations with determinants of socioeconomic and political context should be further explored.

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