Potential lost productivity resulting from the global burden of uncorrected refractive error

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Objective To estimate the potential global economic productivity loss associated with the existing burden of visual impairment from uncorrected refractive error (URE).

Methods Conservative assumptions and national population, epidemiological and economic data were used to estimate the purchasing power parity-adjusted gross domestic product (PPP-adjusted GDP) loss for all individuals with impaired vision and blindness, and for individuals with normal sight who provide them with informal care.

Findings An estimated 158.1 million cases of visual impairment resulted from uncorrected or undercorrected refractive error in 2007; of these, 8.7 million were blind. We estimated the global economic productivity loss in international dollars (I$) associated with this burden at I$ 427.7 billion before, and I$ 268.8 billion after, adjustment for country-specific labour force participation and employment rates. With the same adjustment, but assuming no economic productivity for individuals aged ≥ 50 years, we estimated the potential productivity loss at I$ 121.4 billion.

Conclusion Even under the most conservative assumptions, the total estimated productivity loss, in $I, associated with visual impairment from URE is approximately a thousand times greater than the global number of cases. The cost of scaling up existing refractive services to meet this burden is unknown, but if each affected individual were to be provided with appropriate eyeglasses for less than I$ 1000, a net economic gain may be attainable.

Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

Introduction

Uncorrected refractive error (URE) for distance vision, including undercorrected refractive error in more economically developed countries, has recently been highlighted as the main cause of low vision globally and the second leading cause of blindness after cataract.[1] An estimated 153 million people had visual impairment (VI) from URE in 2004, and 8 million of them were blind.[1] The magnitude of this correctable burden of VI has been overlooked because epidemiological studies have tended to focus on "best corrected" sight rather than presenting visual acuity (VA).[2] Present estimates of the magnitude of URE include myopia (short-sightedness) and hypermetropia (far-sightedness),[3] but they do not include presbyopia (an age-related impairment of near vision), for which there are few data on prevalence or visual function.[1,4,5]

Refractive error is correctable with eyeglasses, contact lenses or laser surgery. In the absence of correction, distance vision impairment may limit function. There are many possible approaches to estimating the global economic productivity loss associated with URE. In this paper, conservative assumptions and national data are used to estimate the purchasing power parity-adjusted gross domestic product (PPP-adjusted GDP) loss for all individuals with impaired vision and blindness, and for individuals with normal sight who provide them with informal care. No such estimate has been reported previously.

Definitions

The term "visual impairment" previously encompassed "low vision" and "blindness", as defined in the *International statistical classification of diseases, injuries and causes of death, tenth revision* (ICD-10).[6] However, the ICD-10 definition focuses on "best corrected" VA and has historically overlooked people who have "presenting" VI as a result of URE.[4] Definitions are being revised for ICD-11, but publication is not anticipated until 2014.[7] Therefore, this paper adheres to current WHO definitions.[8] Specifically, "visual impairment" is defined as a presenting VA of less than 6/18; "moderate or severe visual impairment" (moderate/severe VI), as a presenting VA of less than 6/18 and equal to or better than 3/60 in the better eye; and "blindness", as a presenting VA of less than 3/60 in the better eye.

Methods

We combined the most recent population and economic data on the prevalence of URE in 2004 by WHO subregion, for all countries with epidemiological data previously reported by Resnikoff et al.[1,9] The WHO *Global burden of disease in 2002* report defines 14 subregions based on strata of child and adult mortality in the six WHO regions.[9] We made conservative assumptions about the economic impact of URE to derive estimates of economic productivity loss.

The reported age-specific prevalence for VI resulting from URE, by WHO subregion, has previously been estimated using meta-analytic techniques that are briefly reviewed here.[1] Sixty-eight population-based studies from 31 countries met the appropriate inclusion criteria, namely, having an adequate sample size, appearing in the published or unpublished literature between 1995 and April 2006, reporting the prevalence

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of both a presenting and a best-corrected VA of worse than 6/18 in the healthier eye, and including both subjective and objective refraction under cycloplegia where subjects included children 15 years of age and under. "Presenting VA" was defined as the VA in the better eye, tested with the subject's usual refractive correction. "Best-corrected VA" was also based on the better eye, with correction achieved by pinhole or refraction. "VI resulting from URE" was defined as a VA worse than 6/18 in the better eye that could be improved to 6/18 or better with refraction or a pinhole. The prevalence of URE was estimated as the difference between the prevalences of a presenting and a best-corrected VA worse than 6/18. Available age-specific data were used to derive prevalence estimates for the age groups 5–15, 16–39, 40–49 and ≥ 50 years. The prevalence of URE was assumed to be the same for subjects aged 5–15 and 16–39 years. Where data were not specifically available for those aged 40–49 years, a linear interpolation between the prevalence at the ages of 39 and 55 years was used. The age-specific prevalence data for each WHO subregion was based on a population and rural–urban distribution-weighted estimate from the available data. Resnikoff et al. found no evidence of VI resulting from URE in children younger than 5 years. The authors also reported the regional prevalence of blindness from URE in the population aged ≥ 50 years and 40–49 years, assuming that the number of cases was 5.13 times lower in the latter. They found no blindness from URE in people under 40 years of age and none in populations from the America's A subregion, subregions of the European Region or the Western Pacific's A subregion.[9] Table 1 displays the prevalence of VI in people aged 5–50+ years, and the prevalence of blindness in those aged ≥ 50 years and in the total population, by WHO subregion.

Table 1. **Prevalence of VI from URE by age group (years) and WHO region**

WHO region and subregion[a]	5–15 VI (%)[b]	16–39 VI (%)[b]	40–49 VI (%)[b]	≥ 50 VI (%)[b]	≥ 50 blind (%)[b]	Total population (millions)
African						
D	0.24	0.24	1.13	5.94	1.64	396.1
E						407.6
Americas						
A	1.00	1.00	1.60	3.60	NRB	334.5
B	0.55	0.55	1.20	4.76	0.30	489.3
D	0.70	0.70	1.81	4.86	0.75	78.7
Eastern Mediterranean						
B	0.55	0.55	1.20	4.76	0.95 (rural) 0.40 (urban)	151.2
D					0.95 (rural) 0.40 (urban)	167.8
European						
A	1.00	1.00	1.60	3.60	NRB	422.8
B	1.00	1.00	1.60	2.80	NRB	227.1
C					NRB	234.1
South-East Asia						
B	0.79	0.74	1.70	4.67	0.26	442.6
D (excluding India)	0.63	0.73	2.39	19.45	1.74	378.7
India	0.63	0.63	3.39	18.70	1.90	1 129.9
Western Pacific						
A	0.20	0.20	0.20	1.99	NRB	182.3
B (excluding China)	0.79	0.74	1.70	4.67	0.20	237.2
China	2.66	2.66	3.95	9.61	0.33 (rural) 0.20 (urban)	1 321.9
Global						**6 601.8**

NRB, no reported blindness; URE, uncorrected refractive error; VI, visual impairment.

[a] WHO subregions defined in WHO's *Global burden of disease in 2002* report.[9]

[b] Prevalence data adapted from Table 2 and Table 3 in Resnikoff et al.[1]

Age-specific population estimates in 5-year groupings for each country, from the mid-2007 United States Census Bureau's International Database (http://www.census.gov/ipc/www/idb/),[10] were used to estimate the total population in the age categories of 0–4, 5–15, 16–39, 40–49 and ≥ 50 years. Population data for Niue, Tokelau and the Cook Islands were not available and were taken instead from the United States' Central Intelligence Agency's *The world factbook* for Niue and Tokelau,[11] and from the national statistics office web site for the Cook Islands. Age-specific data for these places were imputed from the regional population structure (percentage in each age group) and the total population.

For each country, total cases of VI were calculated as the product of the number of people in each age group and the subregional age-specific prevalence, summed across age groups. In the WHO classification system, 36 countries or areas, with a total population of 52.3 million (< 1% of the global population), are officially "unassigned".[9] In this study, we assigned these countries or areas to a subregion based on geographic location and economic status. (A full list of the country assignments is available from the authors on request.) Additional blindness prevalence data were used to estimate cases of blindness within the total cases of VI in the groups aged 40–49 and ≥ 50 years.[1] These were subtracted from the total cases of VI in each country, and the remaining cases were assumed to have moderate/severe VI. For regions where blindness prevalence was reported separately for urban and rural areas, the population living in urban or rural areas in each country was used to calculate the estimated cases separately.[11] As no data were available on the prevalence of URE in children under 5 years of age, this group was excluded from the calculations.

Within each country, we assumed that every person aged 16 years or over with normal VA would produce the PPP-adjusted GDP per capita,[11] and that the product of this and a disability weight,[9] for either blindness or

Table 2. **Estimated total number of cases with VI, including blindness, and both unadjusted GDP loss and GDP loss adjusted for LFPR and ER, for each WHO subregion**

WHO region and subregion[a]	Total cases of VI (thousands)	Blind among cases (thousands)	Unadjusted GDP loss (millions I$)	LFPR	ER	Adjusted GDP loss (millions I$)	Ratio adjusted:unadjusted
African							
D	3 422.9	786.6	3 457.0	0.595	0.763	1 613.3	0.47
E	3 325.8	769.6	4 322.6	0.615	0.673	1 932.9	0.45
Total	6 748.7					3 546.2	
Americas							
A	6 081.7	0.0	71 960.8	0.642	0.923	43 942.1	0.61
B	6 782.2	318.3	20 511.3	0.647	0.872	11 925.4	0.58
D	1 018.3	96.0	1 604.3	0.553	0.873	773.7	0.48
Total	13 882.2					56 641.2	
Eastern Mediterranean							
B	1 631.3	125.9	5 529.9	0.485	0.706	2 602.0	0.47
D	1 817.5	175.7	2 215.7	0.446	0.666	854.5	0.39
Total	3 448.8					3 456.5	
European							
A	8 343.9	0.0	71 443.4	0.583	0.884	38 998.0	0.55
B	3 224.6	0.0	7 924.4	0.553	0.768	3 645.0	0.46
C	3 737.4	0.0	12 198.1	0.599	0.906	6 923.2	0.57
Total	15 305.9					49 566.2	
South-East Asia							
B	6 411.5	232.8	11 263.3	0.651	0.860	6 932.4	0.62
D	48 689.2	4 871.7	60 375.7	0.662	0.875	37 470.9	0.62
Total	55 100.7					44 403.3	
Western Pacific							
A	1 592.2	0.0	15 264.1	0.614	0.932	8 988.4	0.59
B	61 975.4	1 347.9	139 672.8	0.764	0.944	102 236.0	0.73
Total	63 567.6					111 224.4	
Global	**158 053.9**	**8 724.5**	**427 743.4**			**268 837.8**	

ER, population-weighted regional employment rate; GDP, gross domestic product; I$, international dollar; LFPR, population-weighted regional labour force participation rate; VI, visual impairment.

[a] WHO subregions defined in WHO's *Global burden of disease in 2002* report.[9]

moderate or severe VI, would equal the individual productivity loss for cases 16 years of age or over. The most recent available regional disability weights for "vision disorders, age associated and other" were 0.600 for blindness across all WHO regions, and they ranged from 0.244 to 0.282 by region for moderate/severe VI (previously termed "low vision" in the *Global burden of disease in 2002* report).[9] We assumed no personal economic productivity for cases 15 years of age or under. Additionally, we assumed that each person with VI would require some care from an adult with normal sight, who would thus lose productive time to that individual. We assumed a 10% productivity loss for the care of each person with blindness,[12] and a 5% productivity loss for the care of each person with moderate/severe VI. This produced an estimate of the "unadjusted GDP loss" within each country.

The unadjusted GDP loss was then adjusted by the labour force participation rate (LFPR) and the employment rate (ER) for each country.[13] Data were obtained from the most recent statistics in *The world factbook*.[11] Countries for which the LFPR was not available were assigned a population-weighted subregional average (total labour force divided by the total population aged > 15 years). Countries for which the unemployment rate was not available were assigned a population-weighted subregional average [1 − (sum of unemployed persons divided by the total regional labour force)]. A second, more conservative estimate, for the ER and LFPR-adjusted GDP loss was derived by assuming that individuals aged ≥ 50 years contribute no productivity to the economy, and by applying the disability weights to 16–49-year-olds only.

Results

Table 2 summarizes, by WHO subregion, the total number of cases of VI and the subset of cases of blindness, and presents the disability and care-associated productivity loss estimates, before and after adjustment for LFPR and ER. There were an estimated 158.1 million people with VI from URE in the 2007 population; of these, 8.7 million were blind. The Western Pacific's B subregion had the greatest case load (62.0 million cases), while South-East Asia's D subregion had 48.7 million cases. The total global productivity loss, in international dollars (I$), associated with this burden was I$ 427.7 billion (one thousand million) before, and I$ 268.8

billion after, adjustment by LFPR and ER. Almost half of the potential productivity loss was in the Western Pacific Region (I$ 111.2 billion). By comparison, the WHO African and the Eastern Mediterranean regions had fewer cases (6.7 and 3.4 million, respectively) and a resulting estimated productivity loss of only I$ 3.5 billion each. With a more conservative approach, in which individuals aged ≥ 50 years of age were assumed to have no economic productivity (i.e. disability weight × GDP per capita = 0), the total productivity loss was I$ 191.1 billion before and I$ 121.4 billion after adjustment. Table 2 also shows the ratio of the adjusted to unadjusted GDP loss, by WHO subregion. This reveals lower ratios in the Eastern Mediterranean's D subregion (0.39) and the African Region's E subregion (0.45), as a result of higher unemployment and a lower LFPR.

Table 3 shows the number of cases of VI from URE in each WHO subregion as a percentage of the total subregional population. The highest prevalence was in the Western Pacific's B subregion (3.98%) and South-East Asia's D subregion (3.23%), while the lowest was in the African Region (0.82–0.86%). The table also displays the regional adjusted GDP loss associated with VI from URE, under the assumption of economic productivity for those aged > 15 years as a percentage of the total GDP. This ranged from 0.86% of total PPP-adjusted GDP in the Western Pacific's B subregion to 0.14% in the Eastern Mediterranean's D subregion.

Table 3. **Cases of VI from URE as a percentage of total population, and estimated productivity loss as a percentage of total GDP, by WHO subregion**

WHO region and subregion[a]	Cases as a % of total population	% of total GDP lost[b]
African		
D	0.86	0.17
E	0.82	0.19
Americas		
A	1.82	0.30
B	1.39	0.25
D	1.29	0.21
Eastern Mediterranean		
B	1.08	0.16
D	1.08	0.14
European		
A	1.97	0.30
B	1.42	0.19
C	1.60	0.27
South-East Asia		
B	1.45	0.27
D	3.23	0.73
Western Pacific		
A	0.87	0.15
B	3.98	0.86
Global	**2.39**[c]	**0.25**[d]

GDP, gross domestic product; URE, uncorrected refractive error; VI, visual impairment.
[a] WHO subregions defined in WHO's *Global burden of disease in 2002* report.[9]
[b] GDP under the assumption of economic productivity, adjusted for population-weighted regional labour force participation rate and population-weighted regional employment rate.
[c] 2.39 = Total cases across all regions as a percentage of total world population.
[d] 0.25 = Total cost in international dollars (I$) for lost productivity due to URE, as a percentage of total world GDP in I$.

Discussion

By applying previously presented prevalence data to the 2007 world population by country, we estimated that VI resulting from URE, including blindness, affected 0.8 to 4.0% of the world's population in 2007, with an estimated cost to the global economy of I$ 268.8 billion after PPP adjustment.

The true cost of providing eyeglasses to meet this global burden is unknown. Eyeglasses are a low-cost intervention and, if we assume they are replaced at the rate of one pair every 3 years, an additional 53 million eyeglasses would be needed annually to address the current burden of URE – a figure comparable to previous estimates.[14] The direct cost of a vision test and pair of eyeglasses in the United States was estimated to be 139 United States dollars (US$) in 2000.[15] We have no reason to suppose that direct costs would be as high elsewhere, but when this rate is inflated to 2007 prices for reference, we calculate a global direct cost of approximately US$ 26 billion.[16] This is an order of magnitude less than the estimated cost to the global economy associated with URE. However, many less economically developed countries still lack basic infrastructure for distribution and training and have insufficient equipment and personnel to provide eyeglasses to those in need. Cost estimates that focus only on the direct cost of providing services conditional on existing infrastructure are thus likely to be a substantial underestimate of the true cost.

WHO's Western Pacific and South-East Asia regions have the greatest number of cases, both in absolute terms and as a percentage of the total population and the population in each age group. The African and Eastern Mediterranean regions have the least number of cases. One explanation is that the incidence of refractive error is lower for genetic and environmental reasons; heritability is an established risk factor for refractive error, and cross-sectional data reveal an association with higher educational attainment, near work and less outdoor activity.[17–20] Another explanation is that a higher case load occurs in regions with ageing populations and longer life expectancies because the prevalence of URE is greatest in those aged ≥ 50 years.

The distribution of cases by WHO region correlates with the distribution of cost in terms of lost productivity. The Western Pacific Region has the highest cost by a considerable margin, at I$ 111 billion dollars, equivalent to 0.86% of the regional GDP. In contrast, both before and after adjustment for LFPR and employment rate, the productivity cost in the African and Eastern Mediterranean regions is very small compared to that of other regions, at I$ 3.5 billion in both, equivalent to 0.18% and 0.15%

of the GDP, respectively. This reflects both the lower case load in the African and Eastern Mediterranean regions, and the generally lower income per capita in these regions.

Some of the assumptions and the disability adjustments we used seriously limit the estimates presented. The most recent disability weights were derived in 1990, and refractive error was not included as an independent disease state.[9] Thus, we had to use generic disability weights for "vision disorders, age related and other".[9] In addition, we applied the disability weights to two estimates of the GDP per capita, assuming that all individuals older than 16 years were either economically productive until death or until 49 years only, as there was a paucity of regional information on retirement ages. We also assumed, in the absence of published data, that all individuals with VI required some care from a person with normal vision, leading to a 5–10% loss of their productivity. Furthermore, the adjustment of GDP productivity by LFPR and ER assumed no direct cost to individuals over 15 years who were not in the formal labour force or who were unemployed. These individuals, especially in more agrarian societies, make important contributions to the production of goods and services in the household or in informal markets, which are not captured in monetized terms by the PPP-adjusted GDP. Therefore, the "true" cost of URE may be underestimated for countries with a higher unemployment rate or a lower LFPR. The regional population-weighted LFPR ranged from 0.764 in the Western Pacific B subregion to 0.446 in the Eastern Mediterranean D subregion, and the population-weighted regional ER ranged from 0.944 in the Western Pacific B subregion to 0.666 in the Eastern Mediterranean D subregion, further polarizing the estimated productivity loss difference between these regions. The accuracy of the adjustment was slightly limited by a lack of up-to-date information on ER and LFPR for some countries, mainly in Africa, although regional population-weighted averages were used to provide a reasonable approximation.

In recognition that our approach did not accurately value the cost to all people equally, we determined an upper estimate, of I$ 427.7 billion for the GDP productivity loss without adjustment for LFPR and ER, and low estimates of I$ 191.1 billion and I$ 121.4 billion (without and with adjustment for LFPR and ER, respectively), by assuming that individuals aged ≥ 50 years contribute no productivity to the economy. The range in cost estimates under these varying assumptions is likely to have captured the "true" productivity loss. The lowest adjusted estimate, which amounts to I$ 121.4 billion, is approximately one thousand times greater than the number of cases of VI resulting from URE in the world. This suggests that even under the most conservative assumptions, the global provision of eyeglasses would result in considerable savings per case treated and in a net benefit to the global economy.

The approach of using GDP per capita as a proxy for income to estimate the cost of a disease burden has several limitations. In focusing on the cost of URE to the national economy, it ignores costs to the individual in terms of functionality, quality of life and opportunities lost, and it assigns greater value to providing eyeglasses to individuals in higher income countries. Furthermore, it does not incorporate income inequality within a country. The aggregated GDP may thus mask inequity in access to health and vision services, and the reality that many consumer goods, including eyeglasses, may not be affordable to poorer sectors of any society. In support of this, blindness has been found to disproportionately affect individuals of lower income and educational status, and women.[21] However, the GDP income approach remains a valuable tool for contextualizing the magnitude of a disease burden, its potential impact on economic growth relative to other diseases and the potential value of intervention.

Conclusion

URE is a preventable cause of VI and a priority in the WHO Vision 2020 initiative to eliminate avoidable blindness.[22] Based on existing disability weights, the productivity loss estimates presented here suggest that the current burden of URE has a potentially greater impact on the global economy than all other preventable vision disorders.[13] However, the VI associated with URE is distance-dependent, rather than absolute, so the association between URE and disability may be more complex than for other causes of VI. Updated disability weights specific to URE in different WHO regions and subregions would provide valuable assistance in determining more accurate estimates of lost productivity. Furthermore, estimates of the global direct and indirect costs of scaling up existing refractive services to address URE are urgently needed. Although policy-makers will need to consider the potential economic productivity loss associated with URE within the broader framework of individual and societal costs, the estimates calculated in our study highlight the potential economic significance of this global burden. ■

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Résumé

Perte potentielle de productivité résultant de la charge mondiale de défauts de réfraction non corrigés

Objectif Estimer la perte potentielle de productivité économique dans le monde associée à la charge existante de déficiences visuelles dues à des défauts de réfraction non corrigés.

Méthodes Des hypothèses conservatrices et des données démographiques, épidémiologiques et économiques nationales ont été utilisées pour estimer la perte de produit intérieur brut ajusté en parité du pouvoir d'achat (PIB ajusté en PPA) pour l'ensemble des individus affectés d'une déficience visuelle ou aveugles et pour ceux jouissant d'une vue normale, qui leur dispensent des soins de manière informelle.

Résultats En 2007, on estimait à 158,1 millions le nombre de cas de déficiences visuelles résultant de défauts de réfraction non-corrigés ou sous-corrigés, parmi lesquels 8,7 millions d'aveugles. Nous avons évalué la perte de productivité économique mondiale en dollars internationaux (I $) associée à cette charge à I $ 427,7 milliards avant ajustement pour la participation à la force de travail du pays et pour les taux d'emploi et à I $ 268,8 milliards après cet ajustement. En pratiquant le même ajustement, mais en prenant pour hypothèse une productivité économique nulle pour les personnes de 50 ans et plus, nous avons estimé la perte de productivité potentielle à I $ 121,4 milliard.

Conclusion Même en se fondant sur les hypothèses les plus conservatrices, on estime que la perte de productivité, en dollars internationaux, associée aux déficiences visuelles résultant de défauts de réfraction non corrigés est approximativement mille fois plus élevée que le nombre mondial de cas de tels défauts. Le coût du passage à l'échelle supérieure des services de réfraction existants pour faire face à cette charge n'est pas connu, mais la délivrance d'une paire de lunettes appropriée pour moins de 1000 I $ à chaque personne affectée devrait se traduire par un gain économique net.

Resumen

Pérdidas potenciales de productividad como consecuencia de la carga mundial de errores de refracción no corregidos

Objetivo Estimar las pérdidas potenciales de productividad económica mundial asociadas a la actual carga de discapacidad visual por errores de refracción no corregidos (ERNC).

Métodos Se partió de supuestos prudentes y de datos demográficos, epidemiológicos y económicos de ámbito nacional para estimar las pérdidas de producto interno bruto ajustado por la paridad del poder adquisitivo (PIB ajustado por PPA) correspondientes a todas las personas con deterioro de la visión o ceguera, así como a las personas con visión normal encargadas de proporcionarles ayuda de manera informal.

Resultados En 2007, unos 158,1 millones de casos de discapacidad visual se debían a errores de refracción no corregidos o insuficientemente corregidos; de ellos, 8,7 millones correspondían a personas ciegas. La pérdida de productividad económica mundial en dólares internacionales (I$) asociada a esa carga de morbilidad se ha estimado en I$ 427 700 millones y en I$ 268 800 millones antes y después, respectivamente, de ajustar en función de la tasa de actividad y la tasa de empleo de cada país. Con esos mismos ajustes, pero suponiendo una productividad económica nula para las personas ≥ 50 años, estimamos que las pérdidas potenciales de productividad ascendían a I$ 121 400 millones.

Conclusión Incluso empleando los supuestos más prudentes, la pérdida total estimada de productividad asociada a los ERNC es, en dólares internacionales, unas mil veces mayor que el número mundial de casos. Se desconoce el costo que supondría la ampliación de los actuales servicios de errores de refracción para poder afrontar esa carga, pero si cada persona afectada recibiera gafas apropiadas por menos de I$ 1000 podría obtenerse un beneficio económico neto.

ملخص

الإنتاجية الممكن فقدانها بسبب العبء العالمي لأخطاء الانكسار غير المصحَّحة

الهدف: تقدير الفقدان المحتمل في الإنتاجية الاقتصادية العالمية، المرتبط بالعبء الحالي لاختلال الإبصار بسبب أخطاء الانكسار غير المصحَّحة.

الطريقة: استخدمت افتراضات تحفظية ومعطيات وطنية عن السكان والاقتصاد والإبيديميولوجيا لتقدير الفقدان في الناتج المحلي الإجمالي المصحح بما يتناسب مع القوة الشرائية، لجميع الأفراد المصابين باختلال الإبصار والعمى وللأفراد الذين يتمتعون بإبصار سوي ويقدمون للمصابين باختلال الإبصار والعمى الرعاية غير الرسمية.

الموجودات: في عام 2007 قدِّر عدد حالات اختلال الإبصار الناجمة عن أخطاء الانكسار غير المصححة أو الناقصة التصحيح بـ 158.1 مليون حالة، منها 8.7 مليون حالة عمى. وقد قدَّر الباحثون فقدان الإنتاجية الاقتصادية العالمية المرتبط بهذا العبء بـ 427.7 بليون دولار دولي قبل تصحيحه باحتساب معدلات إسهام القوى العاملة الخاصة بكل بلد ومعدلات العمالة بها، وبـ 268.8 بليون دولار دولي بعد ذلك التصحيح. كما قدَّروا الفقدان المحتمل للإنتاجية بعد التصحيح، ولكن بافتراض عدم وجود إنتاجية للأفراد الذين يزيد عمرهم عن أو يساوي 50 سنة بـ 121.4 بليون دولار دولي.

الاستنتاج: حتى عند استخدام الافتراضات الأكثر تحفظاً، فإن إجمالي الخسارة المقدرة في الإنتاجية بالدولار الدولي، والمرتبط بضعف البصر الناجم عن أخطاء الانكسار غير المصححة يربو على العدد العالمي من الحالات ألاف المرات. وان تكاليف النهوض بخدمات تصحيح الانكسار الموجودة حالياً للتصدي لهذا العبء غير معروفة، ولكن تقدير الباحثين يشير إلى أن تقديم النظارات الملائمة والتي لا تتجاوز 1000 دولار دولي لكل فرد يعاني من ضعف الإبصار قد يحقق مكاسب اقتصادية صافية.

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