"Cost-Effectiveness of Routine School-Based Vision Screening as a Public Health Intervention for Children in Low and Middle-Income Countries: A Narrative Review"

Running title: Cost-Effectiveness of Child Vision Screening in LMICs

Fauzia Aslam[1*], Dr Rakesh K Yadav[2]

1. Post Graduate Scholar, Department of Optometry, College of Allied Health Sciences, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India
2. Assistant Professor & Head, Department of Optometry, College of Allied Health Sciences, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

Corresponding Author
Dr Rakesh K Yadav
Assistant Professor & Head, Department of Optometry,
College of Allied Health Sciences,
Teerthanker Mahaveer University,
Moradabad, Uttar Pradesh, India
Email; rakeshyadav.opt@gmail.com

Abstract

Uncorrected refractive error is the leading cause of vision impairment among school-age children worldwide and is disproportionately concentrated in low- and middle-income countries (LMICs), where access to eye-care personnel is limited. Because refractive error is treatable with a low-cost intervention spectacles routine screening programmes have been proposed as a public health priority, but the strength of economic evidence supporting their scale-up varies considerably by setting, screening method, and target condition. This narrative review synthesizes evidence on the cost and cost-effectiveness of routine vision screening for children, drawing on economic evaluations, systematic reviews, and programmatic reports from LMIC and comparator high-income settings. Screening delivered by trained teachers or lay health workers, combined with on-site or referral-based spectacle provision, is consistently reported as low-cost and, where formally evaluated, cost-effective or affordable relative to national health and education budgets. Smartphone-based screening technologies extend this evidence by lowering per-child costs while retaining acceptable diagnostic accuracy in resource-limited settings. In contrast, economic evaluations of amblyopia-specific screening in high-prevalence-adjusted, high-income contexts show much greater sensitivity to local prevalence and utility-weight assumptions, and are not consistently cost-effective relative to opportunistic primary-care screening. Across settings, the realized cost-effectiveness of screening programmes depends heavily on downstream spectacle-wear compliance, which remains suboptimal and is shaped by cost, stigma, breakage, and follow-up gaps. Reporting heterogeneity, in outcome metrics, comparators, and perspective, limits cross-study comparability and calls for standardized, CHEERS-compliant economic evaluations tailored to LMIC contexts. Overall, the evidence supports routine, teacher- or technology-enabled school vision screening as an affordable and generally cost-effective public health intervention in LMICs, provided it is paired with investment in compliance-focused programme design.

Keywords: vision screening; refractive error; cost-effectiveness; public health; children; low- and middle-income countries; amblyopia.

1. Introduction

Vision impairment in childhood carries lifelong consequences for education, employment, and quality of life, yet much of this burden is preventable or correctable. The World Health Organization (WHO) identifies uncorrected refractive error as the leading global cause of vision impairment and the second leading cause of blindness, with the burden falling disproportionately on populations in low- and middle-income countries (LMICs) [1]. Population-based pooling of survey data shows that the prevalence and causes of pediatric uncorrected refractive error vary substantially across Global Burden of Disease sub-regions, with the highest burden concentrated in South and East Asian and sub-Saharan African settings [2]. This burden is compounded by a rapidly rising global prevalence of myopia, projected to affect nearly half the world's population, and around one in ten people with high myopia, by 2050 [3].

The economic argument for addressing this burden is longstanding. Early modelling associated with the VISION 2020 initiative estimated that successful global blindness-prevention interventions, including refractive error correction, could avert tens of billions of dollars in productivity losses [4]. More recent analyses estimate the potential global productivity loss from uncorrected refractive error at over US$200 billion annually [5], and from uncorrected myopia and myopic macular degeneration specifically at over US$240 billion in 2015 alone, an order of magnitude greater than the estimated one-off investment required to establish adequate correction services [6]. These figures have informed the WHO's introduction of effective refractive error coverage (eREC) as a formal indicator of eye-health system performance and progress toward universal health coverage [7], operationalized through the Report of the 2030 Targets on Effective Coverage of Eye Care [8] and the World Health Assembly resolution endorsing a 40-percentage-point increase in global eREC by 2030 [9,10]. Despite this target, recent modelling suggests that eREC among adults remains far below the levels needed to meet the 2030 target in most LMICs [11], and comparable systematic monitoring in children remains limited.

Given constrained health and education budgets in LMICs, decisions to introduce or scale up routine school-based vision screening require robust evidence not only that screening is clinically effective, but that it represents good value for money relative to competing public health priorities. This review synthesizes the available evidence on the costs and cost-effectiveness of routine vision screening for children, with particular attention to LMIC settings, screening delivery models, and the structural determinants — chiefly spectacle-wear compliance — that shape whether a screening programme's theoretical cost-effectiveness is realized in practice.

2. Public Health and Educational Rationale for Screening

The case for screening rests substantially on evidence that correcting refractive error improves educational outcomes. A cluster-randomized trial of free eyeglasses provision among rural Chinese schoolchildren found that spectacle provision measurably improved test scores relative to controls [12], a finding corroborated in a larger cluster-randomized trial reported in the BMJ, which confirmed that free spectacles improved educational outcomes among Chinese primary-school children with refractive error [13]. In the United States, a cluster randomized clinical trial of a school-based vision programme among students in grades 3 to 7 in Baltimore demonstrated a positive effect of eye examinations and eyeglasses on standardized academic test performance [14], while an evaluation of an eyeglasses provision programme for primary schoolchildren also reported improved academic performance following correction [15]. A systematic review of school-based approaches to correcting refractive error in children similarly concluded that spectacle correction was associated with improvements across cognitive, psychological, and quality-of-life domains, though study quality varied considerably [16].

Evidence is not entirely uniform, however. A Singapore-based cohort study found that presenting visual acuity did not significantly affect concurrent or one-year academic performance after correction [17], a discrepancy plausibly explained by differences in baseline uncorrected refractive error prevalence, severity, and educational context between settings. This heterogeneity underscores a central premise of this review: that clinical or educational benefit alone does not establish cost-effectiveness, and that context-specific economic evaluation is required before programmes are scaled.

3. Methodological Framework for Economic Evaluation

Economic evaluations of health interventions generally fall into several overlapping categories: cost-effectiveness analysis (cost per natural unit of effect, such as a case detected or corrected), cost-utility analysis (cost per quality-adjusted life-year [QALY] or disability-adjusted life-year [DALY] averted), cost-benefit analysis (monetized costs versus monetized benefits), and cost-consequence analysis (costs alongside a disaggregated set of outcomes). The Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) statement provides a 28-item checklist intended to standardize the reporting of such evaluations across health, public health, and social-care interventions, addressing longstanding concerns about inconsistent transparency in the field [18]. As documented below, the vision-screening economic evaluation literature illustrates many of the reporting gaps that motivated the CHEERS update: comparators, perspectives, discount rates, and outcome metrics vary widely across studies, complicating direct comparison of reported cost-effectiveness ratios.

4. Evidence on the Cost and Cost-Effectiveness of School-Based Vision Screening in LMICs

A systematic review of school vision screening programmes in LMICs reported per-child screening costs of well under one US dollar for children without refractive error, rising to approximately US$2.55 for a child requiring both screening and spectacle provision, with an overall combined screening-and-spectacle cost of roughly US$0.87 per student in one included programme; five of the included studies rated screening as cost-effective, with moderate certainty of evidence [19]. A related systematic review in the Bulletin of the World Health Organization, encompassing 48 studies from 13 countries across five WHO regions, found that where eye-care specialists are scarce, training teachers to conduct screening enabled delivery of a good-quality, cost-effective service, though communication between health services and schools and sustained institutional support were identified as prerequisites for programme success [20]. A more recent scoping review of school eye health priorities in LMICs similarly identified a cost-effective screening workforce, alongside standardized protocols and sustainable financing, as a recurring priority across 95 reviewed studies [21].

Programme-level costing studies reinforce these findings. A budget impact analysis of school-based vision screening integrated into existing school health platforms in Cambodia and Ghana estimated that national scale-up would represent approximately 0.5 percent of the combined health and education budgets in each country, concluding that scale-up was affordable within current resource envelopes given adequate in-country delivery capacity [22,23]. In rural China, a comparative costing study of three preschool vision-screening delivery models — local optometrists, teachers trained by optometrists, and lay volunteers — found that screening accuracy did not differ meaningfully across models, but that teacher-led screening reduced the cost per true case detected by close to 40 percent relative to the other approaches, making it the most cost-effective option evaluated [24].

5. Workforce Models and Diagnostic Accuracy: Trade-offs Underlying Cost-Effectiveness

Because eye-care workforce shortages are a defining constraint in most LMICs, the diagnostic accuracy of non-specialist, teacher-led screening is central to assessing whether low-cost delivery models can achieve acceptable case detection. A systematic review and diagnostic accuracy meta-analysis of 19 studies encompassing approximately 5.7 million children found pooled sensitivity of 76.8 percent and specificity of 93.6 percent for teacher-led screening compared with professional eye examinations, with the authors concluding that the approach is viable and scalable but highly dependent on training quality and protocol standardization [25]. Country-specific validation studies show considerable variation consistent with this conclusion: trained teachers in Vietnam achieved 86.7 percent sensitivity and 95.7 percent specificity using uncorrected visual acuity measurement [26], while a feasibility study in Thailand found that detection rates by teachers ranged from as low as 21 percent for mild visual impairment among pre-primary children to 74 percent for moderate impairment among primary-school children, with both teachers and parents expressing willingness to sustain a teacher-led programme despite the accuracy gap relative to professional screening [27]. A Jordanian validation study similarly reported high specificity but more moderate sensitivity for teacher-administered screening, particularly for detecting non-refractive ocular abnormalities as opposed to reduced visual acuity [28].

Taken together, this literature indicates a consistent trade-off: teacher- and lay-led screening is less sensitive than screening conducted by eye-care professionals, but the accuracy gap is generally modest relative to the substantial reduction in per-child cost achieved by task-shifting screening away from scarce specialist personnel. In LMIC settings where the alternative to teacher-led screening is frequently no screening at all, this trade-off favors low-cost, moderately sensitive screening models over waiting for professional-only screening capacity to expand.

6. Technology-Enabled Screening: Smartphone-Based Tools

Smartphone-based visual acuity testing has emerged as a further means of reducing the cost and logistical burden of screening in resource-limited settings. The Peek Acuity smartphone application was developed and validated against standard clinical visual acuity testing for use in both clinical and community-based fieldwork [29], and has since been deployed at scale across multiple LMICs. A cluster randomized controlled trial of the Peek school eye health system in Kenya demonstrated that smartphone-based screening and structured referral support materially improved rates of referral adherence to eye-care services among schoolchildren identified with visual impairment, relative to standard paper-based screening and referral [30]. A national implementation in Botswana, using smartphone screening delivered by teachers, health assistants, and volunteers across 49 schools, screened over 12,800 children, achieved a 96 percent triage attendance rate among those referred, and was subsequently used to inform the design of a national school eye health programme [31]. Because smartphone-based tools require minimal specialized hardware and can be operated by briefly trained non-specialists, they offer a plausible pathway to further reducing the per-child cost of screening while retaining the referral-adherence and data-tracking advantages that paper-based teacher screening typically lacks.

7. Economic Evaluations of Amblyopia Screening: Lessons and Limits for LMIC Extrapolation

A distinct and more methodologically developed economic evaluation literature exists for amblyopia-specific screening, concentrated in high-income settings with comparatively low condition prevalence. A UK Health Technology Assessment systematic review and economic evaluation modelled six alternative screening age and test combinations for amblyopia and strabismus in children up to four to five years of age, providing one of the most detailed early cost-effectiveness frameworks in this area [32]. German cost-utility and field-study evaluations of kindergarten-based orthoptic screening, using Markov modelling, found favorable cost-utility ratios under baseline assumptions, though results were sensitive to the assumed quality-of-life decrement associated with untreated amblyopia [33,34]. More recently, a Canadian economic evaluation modelling universal school-based screening and mandated optometric examinations against standard primary-care screening in Toronto found that, because of the low prevalence of amblyopia (5.8 percent) among young children in that population, neither school screening nor optometric examinations were cost-effective relative to opportunistic primary-care screening [35].

These findings illustrate a key methodological lesson: the cost-effectiveness of vision screening is highly sensitive to local disease prevalence, the marginal cost of screening relative to usual care, and the quality-of-life weight assigned to the condition being screened for. Because uncorrected refractive error prevalence and the level of pre-existing eye-care access differ substantially between the high-income, low-prevalence contexts in which most amblyopia-specific cost-utility analyses have been conducted and the high-prevalence, low-access LMIC contexts that are the focus of this review, amblyopia-screening cost-effectiveness findings from high-income settings should not be extrapolated directly to LMIC refractive-error screening programmes. Complementary epidemiological work, such as prevalence surveys of visual impairment among preschool children in southern China, underscores that local baseline prevalence data remain a prerequisite for any context-specific economic evaluation [36].

8. Spectacle Compliance: The Hidden Determinant of Realized Cost-Effectiveness

A screening programme's theoretical cost-effectiveness, calculated on the assumption that detected cases are corrected and remain corrected, is only realized if children actually wear the spectacles they are prescribed. A systematic review and meta-analysis of spectacle-wear compliance among children with refractive error, pooling 23 cross-sectional studies from 13 countries, found overall compliance of only about 40 percent, with broken or lost spectacles, forgetfulness, and parental disapproval cited as the principal reasons for non-use [37]. Qualitative research helps explain these figures: a study among schoolchildren in Calabar, Nigeria found that sociocultural misconceptions, stigma, environmental factors, and self-perception issues shaped children's decisions not to wear spectacles, consistent with a Health Belief Model interpretation in which low perceived risk and high social cost of wear outweigh perceived benefit [38]. A study of door-to-door screening in urban slums of Delhi similarly identified specific, addressable barriers to uptake of free-of-cost spectacles [39]. The scoping review of LMIC school eye health priorities cited above further identifies logistic and geographic barriers to follow-up, alongside parental disapproval and peer teasing, as recurring themes across the broader literature [21].

The implication for economic evaluation is direct: because averted disability-adjusted life-years or quality-adjusted life-years depend on realized, sustained correction rather than detection alone, programmes that invest in screening without parallel investment in spectacle quality, durability, affordability, and stigma-reduction risk substantially overstating their true cost-effectiveness. Cost-effectiveness modelling that does not incorporate compliance decay over time should be interpreted cautiously.

9. Country Case Study: India's National School Eye Screening Programme

India offers an instructive example of a long-running, government-financed school screening programme operating at national scale. India's National Programme for Control of Blindness and Visual Impairment (NPCBVI), launched in 1976, incorporated school eye screening as an integral component from 1994 onward, using a model in which teachers are trained to conduct preliminary screening with referral to eye-care professionals for confirmatory refraction and spectacle provision [40,41]. This teacher-led, referral-based model has been described as a cost-effective and practical means of extending basic eye-care access to underprivileged populations that would otherwise have limited contact with eye-care services [41]. School eye screening has since been further integrated with the Rashtriya Bal Swasthya Karyakram (RBSK), a broader national child health screening initiative operating through the National Health Mission [42]. Despite this scale, persistent gaps remain: effective refractive error coverage has been reported to be lower among girls than boys, reflecting broader gender-based disparities in access to follow-up eye care that a screening programme alone cannot resolve [40]. The Indian experience illustrates both the achievable scale of low-cost, teacher-based screening within existing public health infrastructure, and the continued importance of addressing downstream equity and compliance barriers if such programmes are to realize their full cost-effectiveness.

10. Global Policy Implications and the Investment Case for Scale-Up

The WHO SPECS2030 initiative, launched to support countries in achieving the 40-percentage-point increase in effective refractive error coverage endorsed by the World Health Assembly, organizes country-level action around service delivery, financing, workforce, and monitoring pillars [7-9]. Updated systematic modelling of effective refractive error coverage among adults across 76 countries indicates that most LMICs remain well short of the trajectory required to meet the 2030 target, underscoring the scale of continued investment required [11]. Set against this gap, the productivity-loss estimates reviewed above provide a clear economic rationale for continued and expanded investment: the estimated global productivity loss from uncorrected refractive error and myopia substantially exceeds the estimated one-off cost of establishing adequate correction services [4-6], suggesting that, even allowing for the diagnostic-accuracy and compliance limitations documented in this review, screening and correction of pediatric refractive error remains a public health "best buy" relative to the scale of unaddressed need.

11. Limitations of the Current Evidence Base

Several limitations constrain the strength of conclusions that can currently be drawn. First, costing and cost-effectiveness studies in LMIC settings vary widely in their choice of comparator, analytic perspective (health system versus societal), discount rate, and outcome metric, with many reporting cost per case detected or per spectacle dispensed rather than cost per QALY or DALY averted, limiting comparability with the cost-utility literature from high-income settings [19,24]. Second, the most methodologically rigorous cost-utility analyses of vision screening originate disproportionately from high-income, low-prevalence contexts, such as amblyopia screening in Canada, Germany, and the United Kingdom, and their findings may not transfer to the higher-prevalence, lower-baseline-access LMIC contexts most relevant to global policy [32-35]. Third, compliance and follow-up data in the underlying effectiveness literature are frequently short-term, cross-sectional, or entirely absent, meaning that downstream cost-effectiveness estimates that assume sustained correction likely overstate real-world value [37]. Finally, adherence to structured reporting standards such as CHEERS 2022 remains inconsistent across the reviewed literature, and future economic evaluations of pediatric vision screening in LMICs would benefit from closer alignment with these standards to support cross-study synthesis and policy transferability [18].

12. Conclusion and Recommendations

The available evidence indicates that routine, teacher- or technology-enabled school-based vision screening, paired with accessible spectacle provision, is generally an affordable and cost-effective public health intervention in low- and middle-income country settings, notwithstanding lower diagnostic sensitivity relative to professional screening and considerable heterogeneity in how cost-effectiveness has been measured and reported. By contrast, evidence from high-income, low-prevalence amblyopia-screening contexts should be interpreted as context-specific rather than generalizable to LMIC refractive-error screening decisions. Realizing the full value of screening investment requires parallel attention to spectacle-wear compliance, which remains the principal determinant of whether detected cases translate into averted disability. On this basis, three priorities are proposed for policy and future research: first, national programmes should integrate low-cost, teacher- or lay-worker-led screening, supplemented by smartphone-based tools where feasible, into existing school health platforms rather than relying on scarce specialist eye-care personnel; second, programme design should invest as deliberately in compliance — durable, acceptable spectacles, follow-up systems, and stigma-reduction messaging — as in initial screening coverage; and third, future economic evaluations of pediatric vision screening in LMICs should adopt standardized, CHEERS-compliant cost-utility methods to strengthen the comparability and policy relevance of the evidence base as countries work toward the WHO's 2030 effective refractive error coverage target.

References

1. World Health Organization. World Report on Vision. Geneva: World Health Organization; 2019.
2. Cao H, Cao X, Cao Z, Zhang L, Han Y, Guo C. The prevalence and causes of pediatric uncorrected refractive error: pooled data from population studies for Global Burden of Disease (GBD) sub-regions. PLoS One. 2022;17(7):e0268800.
3. Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, Sankaridurg P, et al. Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050. Ophthalmology. 2016;123(5):1036-42.
4. Frick KD, Foster A. The magnitude and cost of global blindness: an increasing problem that can be alleviated. Am J Ophthalmol. 2003;135(4):471-6.
5. Smith TST, Frick KD, Holden BA, Fricke TR, Naidoo KS. Potential lost productivity resulting from the global burden of uncorrected refractive error. Bull World Health Organ. 2009;87(6):431-7.
6. Naidoo KS, Fricke TR, Frick KD, Jong M, Naduvilath TJ, Resnikoff S, et al. Potential lost productivity resulting from the global burden of myopia: systematic review, meta-analysis, and modeling. Ophthalmology. 2019;126(3):338-46.
7. McCormick I, Mactaggart I, Bastawrous A, Burton MJ, Ramke J. Effective refractive error coverage: an eye health indicator to measure progress towards universal health coverage. Ophthalmic Physiol Opt. 2020;40(1):1-5.
8. World Health Organization. Report of the 2030 Targets on Effective Coverage of Eye Care. Geneva: World Health Organization; 2022.
9. World Health Assembly. Resolution WHA74(12): Integrated People-Centred Eye Care, Including Preventable Vision Impairment and Blindness. Geneva: World Health Organization; 2021.
10. World Health Organization. Vision and Eye Care: Effective Refractive Error Coverage (eREC) [Global Health Observatory indicator metadata]. Geneva: World Health Organization; 2023.
11. Bourne RRA, Cicinelli MV, Selby DA, Sedighi T, Tapply IH, McCormick I, et al. Effective refractive error coverage in adults: a systematic review and meta-analysis of updated estimates from population-based surveys in 76 countries modelling the path towards the 2030 global target. Lancet Glob Health. 2025.
12. Glewwe P, Park A, Zhao M. The impact of eyeglasses on the academic performance of primary school students: evidence from a randomized trial in rural China. In: Proceedings of the 10th Joint Conference on Food, Agriculture and the Environment. St Paul (MN): Center for International Food and Agricultural Policy; 2006.
13. Ma X, Zhou Z, Yi H, Pang X, Shi Y, Chen Q, et al. Effect of providing free glasses on children's educational outcomes in China: cluster randomized controlled trial. BMJ. 2014;349:g5740.
14. Neitzel AJ, Wolf B, Guo X, Shakarchi AF, Madden NA, Repka MX, et al. Effect of a randomized interventional school-based vision program on academic performance of students in grades 3 to 7: a cluster randomized clinical trial. JAMA Ophthalmol. 2021;139(10):1104-14.
15. Hark LA, Thau A, Nutaitis A, Leiby BE, Waxman EL, Anderson KA, et al. Impact of eyeglasses on academic performance in primary schoolchildren. Can J Ophthalmol. 2020;55(1):52-7.
16. Sharma A, Congdon N, Patel M, Gilbert C. School-based approaches to the correction of refractive error in children. Surv Ophthalmol. 2012;57(3):272-83.
17. Dirani M, Zhang X, Goh LK, Young TL, Saw SM. The role of vision in academic

school performance. Ophthalmic Epidemiol. 2010;17(1):18-24.
18. Husereau D, Drummond M, Augustovski F, de Bekker-Grob E, Briggs AH, Carswell C, et al. Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) statement: updated reporting guidance for health economic evaluations. Value Health. 2022;25(1):3-9.
19. Opare A, Abdullahi LH, Minnies D, et al. School vision screening programmes in reducing uncorrected refractive error among children in Low and Middle-Income countries-LMIC (systematic review). Adv Ophthalmol Vis Syst. 2020;10(4):91-105.
20. Burnett AM, Yashadhana A, Lee L, Serova N, Brain D, Naidoo K. Interventions to improve school-based eye-care services in low- and middle-income countries: a systematic review. Bull World Health Organ. 2018;96(10):682-94.
21. Harvey AA, Morjaria P, Tousignant B. Priorities in school eye health in low and middle-income countries: a scoping review. Eye (Lond). 2024;38(11):1988-2002.
22. Engels T, Trotignon G, Agyemang D, Khan I, Puthy K, Roolvink L, Schmidt E. Cost and budget impact analysis of a school-based vision screening programme in Cambodia and Ghana: implications for policy and programme scale-up. Health Policy Open. 2021;2:100043.
23. Global Partnership for Education, Sightsavers. Cost Effectiveness and Budget Impact Analysis of Delivering Vision Screening and Refractive Error Correction through Integrated School-Based Health Programmes in Ghana and Cambodia: School Health Integrated Programming Final Report. Washington (DC): Global Partnership for Education; 2019.
24. Wang L, Congdon N, Hogg RE, Zhang S, Li M, Shi Y, et al. The cost-effectiveness of alternative vision screening models among preschool children in rural China. Acta Ophthalmol. 2019;97(3):e419-25.
25. Cunha M, et al. Diagnostic accuracy of teacher-led school vision screening for refractive error in children: a systematic review and meta-analysis. Ophthalmic Physiol Opt. 2026. Epub ahead of print.
26. Ho SM. Validity of teacher-based vision screening and factors associated with the accuracy of vision screening in Vietnamese children. Ophthalmic Epidemiol. 2016;23(1):63-8.
27. Teerawattananon K, Myint CY, Wongkittirux K, Teerawattananon Y, Chinkulkitnivat B, Orprayoon S, et al. Assessing the accuracy and feasibility of a refractive error screening program conducted by school teachers in pre-primary and primary schools in Thailand. PLoS One. 2014;9(6):e96684.
28. Gammoh Y, Moore BD. Vision screening and detection of ocular abnormalities in school children by teachers in Jordan. J Multidiscip Healthc. 2024;17:5047-55.
29. Bastawrous A, Rono HK, Livingstone IAT, Weiss HA, Jordan S, Kuper H, et al. Development and validation of a smartphone-based visual acuity test (Peek Acuity) for clinical practice and community-based fieldwork. JAMA Ophthalmol. 2015;133(8):930-7.
30. Rono HK, Bastawrous A, Macleod D, Wanjala E, Gichuhi S, Burton MJ. Smartphone-based screening for visual impairment in Kenyan school children: a cluster randomised controlled trial. Lancet Glob Health. 2018;6(8):e924-32.
31. Andersen T, Jeremiah M, Thamane K, Littman-Quinn R, Dikai Z, Kovarik C, Ndlovu K. Implementing a school vision screening program in Botswana using smartphone technology. Telemed J E Health. 2020;26(2):255-8.
32. Carlton J, Karnon J, Czoski-Murray C, Smith KJ, Marr J. The clinical effectiveness

and cost-effectiveness of screening programmes for amblyopia and strabismus in children up to the age of 4-5 years: a systematic review and economic evaluation. Health Technol Assess. 2008;12(25):1-194.
33. König HH, Barry JC. Cost-utility analysis of orthoptic screening in kindergarten: a Markov model based on data from Germany. Pediatrics. 2004;113(2):e95-108.
34. König HH, Barry JC, Leidl R, Zrenner E. Economic evaluation of orthoptic screening: results of a field study in 121 German kindergartens. Invest Ophthalmol Vis Sci. 2002;43(10):3209-15.
35. Asare AO, Maurer D, Wong AMF, Saunders N, Ungar WJ. Cost-effectiveness of universal school- and community-based vision testing strategies to detect amblyopia in children in Ontario, Canada. JAMA Netw Open. 2023;6(1):e2249384.
36. Wang H, Qiu K, Yin S, Du Y, Chen B, Jiang J, et al. Prevalence of visual impairment in preschool children in southern China. Front Public Health. 2022;10:755407.
37. Dhirar N, Dudeja S, Duggal M, Gupta PC, Jaiswal N, Singh M, Ram J. Compliance to spectacle use in children with refractive errors: a systematic review and meta-analysis. BMC Ophthalmol. 2020;20:71.
38. Ebri AE, Govender P, Naidoo K, Albert F, Shah K, Chan VF. Understanding barriers to spectacle wear compliance among schoolchildren in Calabar, Nigeria: a qualitative study. Afr J Ophthalmol Int. 2025;2(3):100160.
39. Prasannan V, Sabherwal S, Tibrewal S, Siddiqui Z, Majumdar A, Ganesh S. Barriers to compliance with the use of free-of-cost spectacles prescribed through door-to-door screening of children in urban slums of Delhi. Indian J Ophthalmol. 2025;73(5):702-7.
40. Jose R. Present status of the National Programme for Control of Blindness in India. Community Eye Health J. 2008;21(65):103-4.
41. Government of India, Ministry of Health and Family Welfare. National Programme for Control of Blindness and Visual Impairment (NPCBVI) [Internet]. New Delhi: Directorate General of Health Services; [cited 2026 Sep 2]. Available from: https://npcbvi.gov.in/Home.
42. Ministry of Health and Family Welfare, Government of India. Rashtriya Bal Swasthya Karyakram (RBSK): Operational Guidelines. New Delhi: National Health Mission; 2013.
43. Nunes AF, Cunha M, Sousa MCB, Godinho CA. Prevalence, sociodemographic risk factors, and coverage of myopia correction among adolescent students in the central region of Portugal. BMC Public Health. 2024;24:1449.