Study Identification

Official Title of the study: PRISSM (Perfecting Refraction in India with Superior Service Models): A Cluster-randomized Controlled Trial of Three Models of School-based Spectacle Service Delivery in India

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Brief Title: Perfecting Refraction in India with Superior Service Models (PRISSM)

Study Status

Record Verification: June 2019

Study Start: July 2019 [Anticipated]

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Study Completion: June 2020 [Anticipated]

Sponsor/Collaborators

Sponsor: Sun Yat-sen University

Responsible Party: Principal Investigator

Principal Investigators: Prof Nathan Congdon and Ms Priya Adhisesha Reddy

Affiliation: Queen's University Belfast

Collaborators:

1. Aravind Eye Hospital, Madurai
2. PBMA's H.V. Desai Eye Hospital, Pune
3. Sadguru Netra Chikitsalaya, Chitrakoot
4. Orbis International
5. Dr. D.Y. Patil Medical College, Hospital & Research Centre, Pune

Study Description

Brief Summary:

Some programs do the screening, refraction testing and provision of spectacles to children entirely in the school setting ("School Model"). One strength of such programs are that most children at school who need spectacles get them. However, sustainability is poor, because spectacles cannot be sold in many schools and there may be too few refractionists to cover all schools in most countries. Other programs provide vision screening at schools, but refer children who fail vision screening to nearby facilities for refraction and distribution/sale of spectacles ("Referral Model"). This model's strengths include lower demand on refractionists and opportunities for the spectacles to be sold. However, a disadvantage is that most of the referred children do not attend the specialist facility. One way to improve this might be to enhance the Referral Model and a recent USAID review by Priya Reddy and Ken Bassett showed that involving teachers in vision screening and family counseling significantly increases children's use of spectacles. Therefore, at 141 schools in India, involving over 42,300 children (assuming a minimum of 300 children/school), the investigators will study an "Improved Referral Model," with strong teacher involvement, to investigate the potential benefits of combining the lower costs of the "Referral Model" with the high uptake of the "School Model". The investogators will also assess the effects of allowing parents to purchase enhanced spectacles, rather than having their child use the free spectacles. Children will be randomized by school to the "School Model," "(Improved) Referral Model" or the "(Improved) Referral Model + Cost Recovery (sale of "upgrade spectacles" alongside ofering free spectacles. The main study outcome will be program cost-effectiveness, defined as the program cost per child identified with correctable refractive error, who receives spectacles, and wears them at an un-announced visit 3 month after distribution. Profit on spectacles sold in the "Referral + Cost Recovery" group will be subtracted from the program costs in this study group. The groups will be compared, with and without adjustment for baseline characteristics.

Detailed Description:

Background

Need: The leading cause of vision impairment among children in India, and in the world more widely, is an uncorrected refractive error (URE). For example, the population-based Refractive Error Studies in Children (RESC) studies found that 61% of vision impairment in rural children[1] and 89% in urban children[2] in India was due to URE, and that as few as 10% of rural and 35% of urban children who need spectacles actually had them.[1,2,3] The impact of this shortfall in service delivery is highlighted by recent randomized trials in Asia showing that provision of spectacles significantly improves children's educational outcomes,[4] and the shortcoming in India is particularly important because India has the highest number children of any other country.[5]

Potential impact: This trial has the potential to impact on at least two of the Sustainable Development Goals (SDG) of the United Nations. Although interventions to prevent myopia, such as topical anti-muscarinic therapy[6] and increased time outdoors[7], show much promise, they are not yet ready for large-scale use. Until then, school vision programs remain the principle tool to address the problem of URE in India and elsewhere, and thereby improving children's access to high-quality education (SDG #4) and helping to address unequal access of girls to healthcare services affecting vision (SDG #5).[8] In fact, the Indian government and many private entities are already taking a very active role in school vision screening. Since the onset of the Sarva Shiksha Abhiyan (Education for All)

program in 2002, many millions of children have undergone school vision screening, but refraction and spectacles distribution has been limited and much more could be done to help. To sustain and expand these efforts, more cost-effective approaches are needed.

Problems with current models: Many non-governmental organization (NGO) and government spectacle distribution programs in India and elsewhere use school-based vision screening, refraction and provision of spectacles. This is particularly true in poorer, rural or other under-served areas. The greatest strength of such programs is that they deliver refractive services and spectacles to a large proportion of children requiring them when school attendance rates are high. However, sustainability is problematic: these programs usually deliver spectacles for free, because their sale is not permitted in many schools. Further, this model is very demanding on resources, because refractionists must travel to numerous schools in their catchment area. Finally, it has been suggested that long-term compliance with spectacle wear may be higher when families make at least some contribution to spectacle costs, although evidence for this assertion is lacking.[9]

Alternatively, other programs, particularly those in urban or better-served areas, may provide vision screening at schools, but then refer children and families failing to screen to a nearby facility for refraction and distribution or sale of spectacles. The strength of this model is that it is less demanding of resources (refractionists remain at their base facility rather than being directly involved in outreach screening) and spectacle sales at medical facilities are often more acceptable than sales in schools. Therefore, this model may be more sustainable. However, program experience and research [10] have shown up to two-third of the referred children/families do not attend the facility that they are referred to.

Potential superiority of optimized Referral Models and improvements for vulnerable children: Recent evidence from a review by Reddy and Bassett[11,12] and trials by Congdon[13] suggest that various strategies which increase involvement of teachers in the screening process (parent-teacher meetings; short message service (SMS), phone call, or handwritten notes in the students diary from teachers to families who do not complete referrals) can significantly increase the proportion of families following up for care at an outside eye care facility. Therefore, this cluster randomized trial will test an "optimized" model of distribution of spectacles, maximizing teacher involvement, to determine whether this approach can achieve comparable service uptake to fully school-based models at a greater level of cost-effectiveness. High-quality, trial-based evidence that showed that optimized Referral models are both low-cost and high-coverage may provide a strong stimulus to scale up refractive service programs in India and other low-middle income countries (LMICs). These programs can benefit millions of low-income children not currently receiving refractive services, thus improving their access to classroom learning.

This trial will compare two general screening methods: 1. School model and 2. Referral Model. A "Cost model", which is builds on the Referral model but includes the sale of spectacles, will also be included, as a third randomized group. In the School model, refraction occurs at the school and spectacles are given to children at the school, which may yield a higher rate of compliance, but is more expensive and may not be sustainable. On the other hand, the Referral model, where the children are referred to be screened at the vision center or service center may have lower compliance but be less expensive and more likely to be sustainable. This study examines the hypothesis that greater teacher involvement in screening and follow up can improve the compliance of children and families with the examination at the service center in the Referral model. For this reason, the main outcome of the trial is cost-effectiveness (amount spent per child who receives spectacles that improve his/her vision, and which are worn at an un-announced examination three months after distribution). If the teacher intervention can improve compliance in the Referral model,

it will most likely be the more cost-effective model. If the teacher's intervention doesn't increase compliance in the Referral model, then the School model is likely to be the most cost-effective. Because money invested in school screening is wasted when families do not comply with referral to the Vision Centre in the Referral model, compliance with a referral will be the most important determinant of our main cost-effectiveness outcome.

Experimental plan Population: School children in the 6th to 10th grades (11-15 years of age) at public and private, rural and urban schools with a minimum of 300 students and covered by the Orbis India REACH (Refractive Error Among CHildren) program, including those located nearer and further from Vision Centers, which will serve as the principle eye care facilities in the study.

Eligibility: Enrolment criteria: Children in randomly-selected 6th to 10th grades in selected schools with presenting visual acuity (that is, wearing spectacles if spectacles are owned at baseline) <= 6/9.6 (0.2 LogMAR) in either eye. Children who already own spectacles will be requested to bring their spectacles on the day of screening, and children whose vision with existing spectacles meets study criteria will be eligible. Exclusion criteria: Parents returning the form indicating they do not wish their child to participate; no Vision Center within 50 km of the child's home (a rare occurrence in the REACH network). If the child is incapable of completing visual acuity screening in both eyes for any reason.

Sample size: At a refractive error prevalence of 3%, with minimum of 300 children/school, 95% of children receiving spectacles in the School Model, 40% of children wearing them in both the School Model and Referral Model groups at un-announced 3 month visits, a cost of US$1.30 per child screened in the School Model and US$0.80 in the Referral Model (all assumptions based on REACH Program data), if 58.5% of families accept referral to receive refraction and spectacles in the Referral Model, this would reach the same cost-effectiveness as the School Model. A total of 141 schools (47 in each of three groups) across three participating hospitals would be sufficient to detect significantly better cost-effectiveness of the Referral Model if 65% of families accept referral for refraction/spectacles, which is the target in our hypothesis; with a power of 90%, an alpha-error of 0.05, and an intracluster correlation coefficient (ICC) (a measure of how similar children are to one another within schools: "clustering") of 0.20.

Randomization: An independent statistician having no contact with participants will generate the randomization sequence using a computer system that is inaccessible until after the school has agreed to join the trial. Schools will be stratified into two groups as Public and private. The schools in each stratified group will be randomly assigned to either the intervention (referral models) or control group (school model) in a 1:1:1 ratio with a block size of three to ensure balance. After randomization, the schools and the children in them will not be masked to their allocated intervention but staff assessing data for the main outcome will not know a child's group assignment.

Data to be acquired at baseline: Child: Age, gender, spectacles ownership, presenting and best corrected visual acuity in both eyes; refractive error in both eyes; distance of child's home from nearest Vision Center; brief spectacle attitude questionnaire; brief family Socio-Economic Status (SES) questionnaire[15]. Teacher: Brief questionnaire on attitudes and knowledge towards spectacles. Program: Survey of all program costs for screening and distribution for each model. Our cost-effectiveness analysis will be from the Program rather than the societal perspective, but the investigators will capture travel cost info from a 1% sample of randomly-selected children/families and capture information about teacher time spent in meeting with parents, sending notes to parents and encouraging children to wear spectacles in a 1 % random sample of Referral group teachers, in order to perform a sensitivity analysis of the impact of including these costs. Regarding programs costs, in the School model, where the optometrist team does the screening at school, the program

cost will be calculated by taking the cost of the primary and secondary screening, cost of the spectacles, and cost of delivering them. In the Referral model, the investigators will include the cost of primary screening, secondary sreening at the vision centres and the cost of spectacles. In the Cost recovery model, the cost recovered by selling the spectacles (difference between retail price and cost of spectacles to the hospital) will be subtracted from the program cost. School: Urban versus rural, public versus private, size of the school, SES of community, and distance of the school from nearest Vision Center.

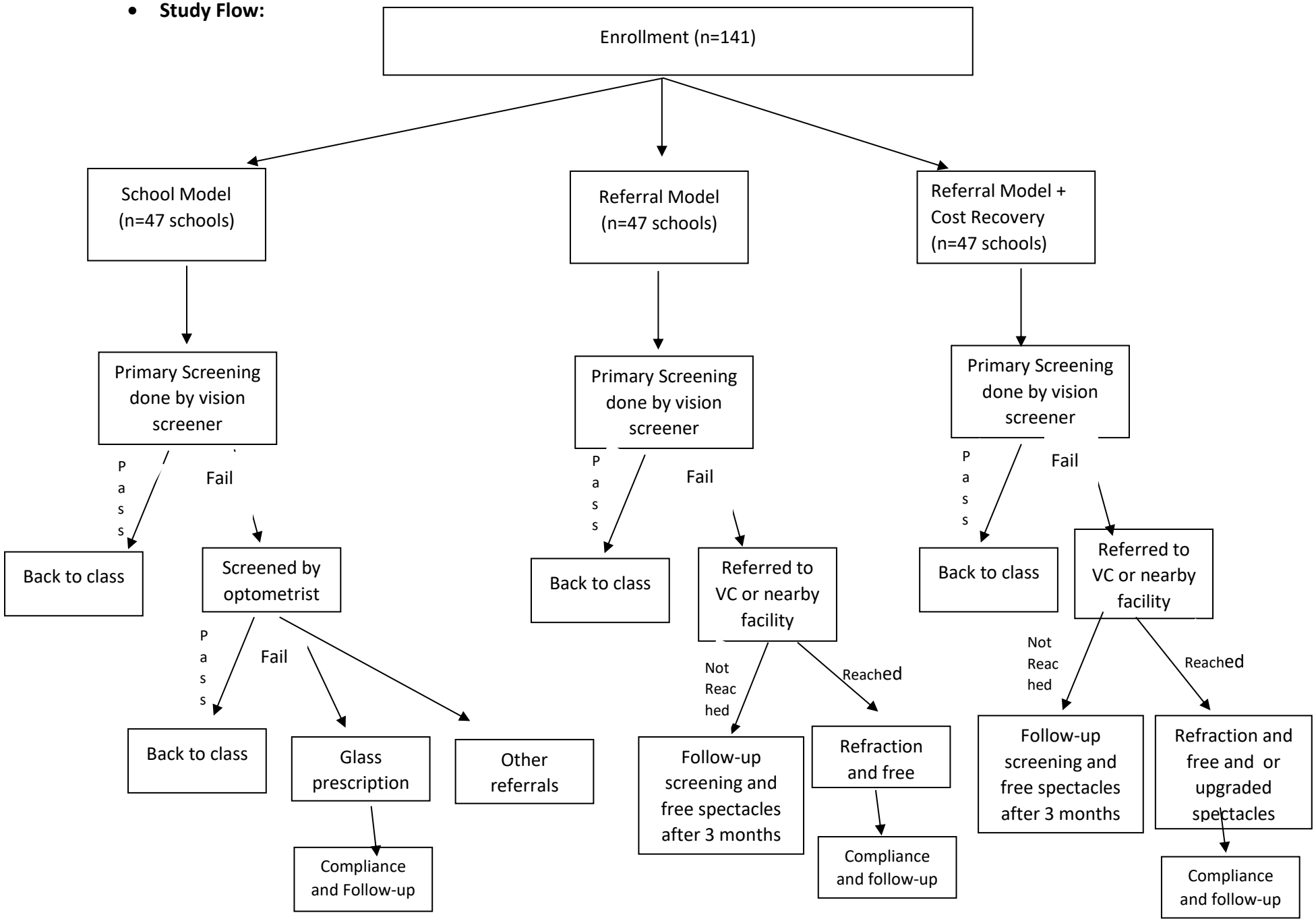
Follow-up schedule and follow-up data: Self-reported and observed spectacle wear to be ascertained at an un-announced follow-up at school 3 months after distribution of spectacles. Additionally, the following the data for the Referral groups will be collected from the referral centre and verified from the children in a random sample of 10% of children: Did they visit the referral centre? Did they receive free spectacles? Did they elect to purchase upgrade spectacles? (in the Cost Recovery group). Children in the Referral groups not having received spectacles at the referral centres will receive them now, and so their visual acuity with spectacles and refractive power in each eye will be measured and recorded.

Data collection: An experienced project coordinator will be responsible for data collection and follow-up. The project coordinator will be thoroughly trained on the completion of the data collection forms.

Data Management Plan: The baseline data will be entered and stored in the database ("Reachsoft"), which is password protected. Other data for the study will be collected and entered by an external data entry operator and sent to the project manager to store it in a password-protected system. The collected data will be analyzed in de-identified fashion by the study statistician in India.

A copy of the final study data will be shared with Queen's University Belfast (QUB) under the data sharing and protection outlined in a Memorandum of Understanding. The final dataset will be stored in the QUB database under QUB custody. The study team will have access to the data for research and analyses purposes only. Data will be stored for 5 years after the end of the study.

- **Study Flow:**


Enrollment (n=141)
School Model (n=47 schools)
Referral Model (n=47 schools)
Referral Model + Cost Recovery (n=47 schools)
Primary Screening done by vision screener
Primary Screening done by vision screener
Primary Screening done by vision screener
Pass
Fail
Back to class
Screened by optometrist
Pass
Fail
Back to class
Glass prescription
Other referrals
Compliance and Follow-up
Pass
Fail
Back to class
Referred to VC or nearby facility
Not Reached
Reached
Follow-up screening and free spectacles after 3 months
Refraction and free
Compliance and follow-up
Pass
Fail
Back to class
Referred to VC or nearby facility
Not Reached
Reached
Follow-up screening and free spectacles after 3 months
Refraction and free and or upgraded spectacles
Compliance and follow-up

Data Analytic Plan: Data will be analysed using STATA 15. The primary and secondary outcomes will be compared between the three randomized groups using an intention to treat approach with and without adjustment for the baseline child, school and teacher factors listed above. Our primary outcome is cost-effectiveness (cost per child identified needing spectacles, who gets and is still wearing them 3 months later). The investigators have two hypotheses about this primary outcome:

Primary hypothesis: The improved Referral model which involves teachers contacting families will sufficiently improve uptake that this Referral model will be more cost-effective than the School model.

Proposed analysis: Cost per child identified needing spectacles (program perspective, as above), who gets and is still wearing them 3 months later, compared between School and Referral model.

Secondary hypothesis: Cost recovery from the Referral + Cost Recovery Model will make this more cost-effective than either of the other models.

Proposed analysis: Cost per child identified needing spectacles, who gets and is still wearing them 3 months later, compared between the Referral + Cost Recovery and other groups.

The investigators will also do a stratified analysis comparing the main outcome between groups at each of the 3 participating hospitals. Additional stratified analyses / balancing of the main outcome between groups wil be done for public versus private schools and rural versus urban schools.

The investigators will be using Latent class regression analysis and Finite mixture models to analyze the main outcome.

Monitoring: A dedicated Project Manager, Ms. Priya Reddy, will be responsible for the overall planning, implementation, coordination, and monitoring and evaluation in the project. She will recruit a local project assistant at each site to coordinate all activities at the community level and at the base hospital and Vision Centers; ensure that appropriate planning is done for organizing and implementing screening activities; and coordinate availability of trained manpower, equipment, and facilities. Ms. Reddy will interact with Orbis India Project Managers for the REACH program.

Research advisors Congdon, Gogate, and Bassett each has decades of familiarity with refractive error research in children, and all have engaged in multiple research projects in India. Additionally, Congdon has worked with Orbis since 2009 and is now its Director of Research.

Ethical considerations: Ethical approval has been received from two of the partners in India and Queen's University Belfast and will be sought from the additional partner. In the two Referral model groups, children who need to go to the facility to get spectacles but do not do so within the three-month period will receive free spectacles at closeout, so that no child requiring treatment will be left untreated.

Conditions

Conditions: Childhood Refractive Error

Keywords: Child, refractive error, myopia, school screening, cost effectiveness, India

Study Design: Cluster-randomised, investigator-masked trial

Study Type: Interventional

Primary Purpose: To determine the most cost-effective approach to school-based vision screening and spectacles delivery in India . Health Services Research

Study Phase: N/A

Interventional Study Model: Parallel Assignment

Randomization, Interventions: This is a cluster randomized trial, with eligible children allocated to the intervention that their school was randomized to receive. This will be one of the following three:

School Model (47 schools): Vision screening will be carried out by the vision screeners; refraction will be done at the schools by refractionists; and children who need them will be given free spectacles at the school within two weeks.

Referral Model (47 schools): Vision screening carried out by the vision screeners; and children are referred to nearby Vision Center/ secondary center for refraction and delivery of free spectacles. Teachers will contact families not presenting for follow-up care and for spectacle compliance through SMS, phone call and notations in the school diary.

Referral Model + Cost Recovery (47 schools): Vision screening carried out by the vision screeners; children referred to Vision Center for refraction and delivery of spectacles with an option to purchase "upgrade spectacles" (which was shown to be appealing to families in the recent PRICE study[14]. These spectacles have scratchproof coatings and designs selected to appeal to local children. Teachers will contact families not presenting for follow-up care through SMS, phone call and notations in school diary.

Number of Arms: 3

Masking: Single (Investigator)): Investigators assessing the components of the main study outcome will be masked to the study group assignment of the school.

Staff assessing data for the main outcome will be masked to a child's group assignment.

Allocation: Randomized

Enrollment: 141 schools [Anticipated]

Arms and Interventions

Experimental: School Model

Vision screening will be carried out by the vision screeners; refraction will be done at the schools by refractionists; and children who need them will be given free spectacles at the school within two weeks.

Experimental: Referral Model

Referral Model (47 schools): Vision screening carried out by the vision screeners; and children are referred to nearby Vision Center/ secondary center for refraction and delivery of free spectacles. Teachers will contact families not presenting for follow-up care and for spectacle compliance through SMS, phone call and notations in the school diary.

Experimental: Referral Model + Cost Recovery

Referral Model + Cost Recovery (47 schools): Vision screening carried out by the vision screeners; children referred to Vision Center for refraction and delivery of spectacles with an option to purchase "upgrade spectacles" (which was shown to be appealing to families in the recent PRICE study[14]. These spectacles have scratchproof coatings and designs selected to appeal to local children. Teachers will contact families not presenting for follow-up care and for spectacle compliance through SMS, phone call and notations in school diary.

Outcome Measures

Primary Outcome Measure:

Program cost-effectiveness

Program cost per child identified with correctable refractive error, who receives spectacles and wears them at an un-announced visit 3 month after distribution. Income from sales of spectacles in the "Referral + Cost Recovery" group will be subtracted from the program costs. The groups will be compared, with and without adjustment for baseline characteristics.

[Time Frame: 13 months]

Secondary Outcome Measures:

Proportion of children receiving spectacles who are wearing them at the time of un-announced 3-month follow-up

Purchase rates of upgrade spectacles in the Referral + Cost Recovery Group

Teacher and student reports of rates of teacher interventions in the two Referral groups (contact of parents to complete referral, encouraging children to wear spectacles)

Baseline visual acuity with spectacles

Refractive power of spectacles

[Time Frame: 12 months]

Eligibility

Minimum Age: 10 Years

Maximum Age: 15 Years

Sex: All

Gender Based: No

Accepts Healthy Volunteers: No

Criteria:

Inclusion Criteria:

Eligibility: Enrolment criteria:

- Children in randomly-selected 6th to 10th grades in selected schools with presenting visual acuity (that is, wearing spectacles if spectacles are owned at baseline) <= 6/9.6 (0.2 LogMAR) in either eye.
- Children who already own spectacles will be requested to bring their spectacles on the day of screening, and children whose vision with existing spectacles meets study criteria will be eligible.
- Entry into the trial only requires that a child fail vision screening, which is assessed in the same way for all three randomized groups.

Exclusion Criteria:

- Parents returning the form indicating they do not wish their child to participate;
- no Vision Center within 50 km of the child's home (a rare occurrence in the REACH network).
- If the child is incapable of completing visual acuity screening in both eyes for any reason.

References

Citations:

1. Dandona R, Dandona L, Srinivas M, Sahare P, Narsaiah S, Muñoz SR, Pokharel GP, Ellwein LB. Refractive error in children in a rural population in India. Invest Ophthalmol Vis Sci. 2002;43(3):615-22. PubMed ID: 11867575
2. Murthy GV, Gupta SK, Ellwein LB, Muñoz SR, Pokharel GP, Sanga L, Bachani D. Refractive error in children in an urban population in New Delhi. Invest Ophthalmol Vis Sci. 2002;43(3):623-31. PubMed ID: 11867576
3. Gogate P et al. Spectacle compliance in secondary school children in rural Pune district. Ind J Ophthalmol 2013;61:6-11
4. Ma X, Zhou Z, Yi H, Pang X, Shi Y, Chen Q, Meltzer ME, le Cessie S, He M, Rozelle S, Liu Y, Congdon N. Effect of providing free glasses on children's educational outcomes in China: cluster randomized controlled trial. BMJ. 2014;349:g5740. doi: 10.1136/bmj.g5740. PubMed ID: 25249453
5. How many children are there in India? http://www.childlineindia.org.in/child-in-india.htm
6. Pineles SL, Kraker RT, VanderVeen DK, Hutchinson AK, Galvin JA, Wilson LB, Lambert SR. Atropine for the Prevention of Myopia Progression in Children: A Report by the American Academy of Ophthalmology. Ophthalmology. 2017;124(12):1857-66. doi: 10.1016/j.ophtha.2017.05.032. Epub 2017 Jun 29. Review. PubMed ID: 28669492
7. Xiong S, Sankaridurg P, Naduvilath T, Zang J, Zou H, Zhu J, Lv M, He X, Xu X. Time spent in outdoor activities in relation to myopia prevention and control: a meta-analysis and systematic review. Acta Ophthalmol. 2017;95(6):551-66. doi: 10.1111/aos.13403. Epub 2017 Mar 2. Review. PubMed ID: 28251836

8. United Nations. The Sustainable Development Goals Report. 2016. http://www.un.org/sustainabledevelopment/sustainable-development-goals/
9. Wedner S, Masanja H, Bowman R, Todd J, Bowman R, Gilbert C. Two strategies for correcting refractive errors in school students in Tanzania: randomised comparison, with implications for screening programmes. Br J Ophthalmol. 2008;92(1):19-24. PubMed ID: 18156372
10. Congdon N, Li L, Zhang M, Yang A, Gao Y, Griffiths S, Wu J, Sharma A, Lam DS. Randomized, controlled trial of an educational intervention to promote spectacle use in rural China: the see well to learn well study. Ophthalmology. 2011;118(12):2343-50. doi: 10.1016/j.ophtha.2011.06.016. PubMed ID: 21889800
11. Reddy P, Bassett, K. Visual acuity screening in schools: A systematic review of alternate screening methods. Cogent Medicine, 2017. doi:10.1080/2331205X.2017.1371103
12. Reddy P, Veena K, Thulasiraj R, Fredrick M, Venkatesh R, Sengupta S, Bassett K. Vision screening by teachers in southern Indian schools: testing a new "all class teacher" model. Ophthalmic Epidemiol. 2015;22(1):60-5. doi: 10.3109/09286586.2014.988877. PubMed ID: 25495755
13. Yi H, Zhang H, Ma X, Zhang L, Wang X, Jin L, Naidoo K, Minto H, Zou H, Lu L, Rozelle S, Congdon N. Impact of Free Glasses and a Teacher Incentive on Children's Use of Eyeglasses: A Cluster-Randomized Controlled Trial. Am J Ophthalmol. 2015;160(5):889-96.e1. doi: 10.1016/j.ajo.2015.08.006. PubMed ID: 26275472
14. Wang X, Congdon N, Ma Y, Hu M, Zhou Y, Liao W, Jin L, Xiao B, Wu X, Ni M, Yi H, Huang Y, Varga B, Zhang H, Cun Y, Li X, Yang L, Liang C, Huang W, Rozelle S, Ma X. Cluster-randomized controlled trial of the effects of free glasses on purchase of children's glasses in China: The PRICE (Potentiating Rural Investment in Children's Eyecare) study. PLoS One. 2017;12(11):e0187808. doi: 10.1371/journal.pone.0187808. PubMed ID: 29161286
15. Kolenikov S, Angeles G. Socioeconomic status measurement with discrete proxy variables: Is principal component analysis a reliable answer? Review of Income and Wealth. 2009;55(1):128-65