

Uganda: Potential Cost of a National School Eye Health Program

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April 2023

Among children, visual impairment is a common form of disability, including in Uganda. During the formative years of a child's life, most learning occurs through vision. Children with visual impairment who lack access to vision correction are at a disadvantage for both schooling and learning. When visual impairment is severe, they may drop out of school. Even if they remain in school, they may learn less. Without treatment, some children may become blind. A relatively simple intervention to tackle visual impairment is for teachers to be trained to conduct vision screenings and comprehensive eye examinations. Children requiring eyeglasses can then be provided with such pairs of glasses in schools. For children requiring more advanced care, referral to healthcare professionals can be done. This brief introduces readers to the basics of school eye health and provides back-of-the-envelope estimates of the potential cost of a national school eye health program in Uganda.

Guidance is available to implement school eye health programs

The eye care community of practice has coalesced around a set of best practices for school-based eye health interventions for children, or school eye health (International Agency for the Prevention of Blindness, 2018). Guiding principles emphasize (1) engagement of school leadership and teachers, (2) close collaboration between ministries of health and education, (3) integration into the Ministries inclusive education or school eye health programs, (4) an educational component for teachers and parents on eye health and treatment, and (5) referral systems to connect children to advanced care. In practice,



Background: This brief was prepared for a KIX Africa 19 Hub national policy dialogue in Uganda with a focus on inclusive education. KIX (Knowledge and Innovation Exchange) Africa 19 contributes to education systems strengthening in African anglophone countries by bridging the gap between research and policy making. With support from the Global Partnership for Education and Canada's International Development Research Center, KIX Africa 19 is managed by UNESCO IICBA.

Key findings: This brief provides tentative estimates for the cost of a national school eye health program in Uganda based on unit cost estimates in Uganda and other countries.

- The eye care community of practice has coalesced best practices for school-based eye health interventions or school eye health, with guiding principles available among others from the International Agency for the Prevention of Blindness.
- In practice, school eye health consists of three major activities: (1) School-based vision screening; (2) School-based comprehensive eye exams and referrals for more serious conditions; and (3) Eyeglasses delivery and other care. Teachers can safely and effectively prescreen children for vision problems on-site in schools.
- Uganda has experience with school eye health, but implementation has not been at scale in part for budgetary reasons. There is today an opportunity to implement a national program with donor funding, yielding major benefits for children.
- Depending on the assumptions for the estimation, the overall cost of a national program could range from US\$6.2 million to US\$22.5 million over a few years, with lower costs when teacher training for school eye health is embedded in a larger training program and only public schools are targeted for the program.
- After the initial implementation, a few years later the program would need to be implemented again in the same schools, although costs could be lower then, building on the training and awareness raised in the first wave of implementation.

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Basic Vision Screening in schools: In most cases, two teachers per school can be trained to conduct basic vision screenings for an entire school (larger schools may require additional teachers to be trained). Trainers equip teachers with the capacity to determine whether a child has healthy eyes and proper vision, or whether s/he will need to be seen by an eye health professional. Teachers do not diagnose or prescribe treatments but learn to understand an array of disorders and make referrals for further examination by eye health professionals. They can also be provided with general eye health education so that they may share this information with students and their families.

Comprehensive Eye Examinations in schools or other locales: Children who fail the basic vision screening should be examined by eye health professionals within the local health system who have the necessary competencies to refract children. Eye examinations can either be conducted on-site in schools, or at an eye care facility. School based eye examinations have advantages as they tend to increase the proportion of children who obtain the care they require and may lead to higher rates of acceptance of eyeglasses. However, referral to local eye care providers should be made if: (1) A child has visual acuity below 6/60 in either eye even if due to a correctable refractive error; (2) A child's visual acuity does not improve to normal in both eyes with refraction; (3) A child requires cycloplegic refraction¹. In addition, no child with low vision or who is blind should be referred directly to low vision services, special education, or rehabilitation without being assessed by an ophthalmologist.

Eyeglasses Delivery: While some children require fully customized glasses, over 80 percent of children needing glasses can have their vision corrected with ready-made or ready-to-clip glasses within a matter of minutes. These pairs of glasses can be procured at low cost (and in some cases obtained for free) to address vision problems where no astigmatism is present, but each eye requires a different corrective lens. Dispensing ready-to-clip glasses requires stocking a range of lenses and frames that can be assembled on-site to provide a customizable, low-cost alternative to individually made glasses from optical laboratories. For children with more complex prescriptions customized eyeglasses need to be procured and provided.

¹This could be due to the cornea not being transparent; the pupil not being round and black; one eye turning inwards or outwards (strabismus); eye(s) being red with discharge (conjunctivitis or allergy); or a white patch being on the conjunctiva (Bitot's spot).

A national school eye health programs would be affordable in Uganda

Uganda has extensive experience with school eye health programs with several NGOs having worked with the Ministries of Education and Health to set up programs in various parts of the country. However, while there is sufficient expertise in Uganda to implement school eye health programs at scale, this has not yet been done in part for budgetary reasons. There is today a unique opportunity to implement a national program with donor funding. To assess the potential cost of such a program, this brief provides back-of-the-envelope estimations. These estimations are tentative and more refined analysis could be conducted later.

Unit costs per student

The simplest way to provide back-of-the-envelope estimates of the cost of a national school eye health program is to multiply a unit cost by the number of children benefitting. Unit costs can be suggested based on experiences in Uganda as well as international experiences. Not that the unit costs provide below do not include the cost of procuring eyeglasses because many NGOs benefit from donations of ready-made or ready-to-clip glasses. This could however also be the case for a national program for Uganda, as explained below.

- DCP3 (with eyeglasses included): School eye health is considered a cost-effective approach for identifying and helping children with vision problems. In the third edition of Disease Control Priorities, Bundy et al. (2018) estimate the cost of school-based vision screenings and glasses provision at US\$3.6 per child who benefits.
- Published articles: Engels et al. (2021) estimate the cost of programs at US\$2.1 per child in Cambodia and US\$2.9 per child in Ghana. In India, an older study by Frick et al. (2009) suggests a cost of screening of US\$0.64 (this would be higher now given inflation), with an additional cost of US\$12.13 to examine and fit the children who need eyeglasses with spectacles in school (the cost was higher in health facilities).
- East Africa: In a communication with the authors, the Brian Holden Vision Institute Foundation suggested that unit costs could range from US\$1.20 to US\$1.40 per child today, based on a program implemented a few years ago in East Africa, including Uganda. Costs based on data provided to the authors by Light for the World in Uganda are higher, but they include more activities than simply screening and referrals. Overall, costs depend on the level of sustainable capacity already established in a country. When the eye health care infrastructure is functional, trained, and localized prior to the school screening starting, costs tend to be lower.

- Liberia: In a recent program, unit costs ranged from US\$1.04 to US\$3.43 per county, with differences mostly due to the number of students reached in each county. The average cost per student screened overall was US\$1.91 (Smith and Wodon, 2023).

To indicate the types of costs included in these types of estimations, Table 1 provides more detailed estimates for Liberia. There are however ways to reduce unit costs, including by embedding teacher training for school eye health in broader training programs that teachers may already receive and are funded separately. In Table 1, if the cost of teacher incentives and teacher training were not included in the total cost (because the school eye health training would be embedded in larger separately funded programs), the unit cost for Liberia would fall from US\$1.91 to US\$1.20, a 37 percent reduction from the base.

Based on experiences in Uganda and other contexts, it seems reasonable to consider a unit cost of US\$1.5 to US\$2.0 per child screened in a country like Uganda when teacher training is standalone. Applying the 37 percent reduction from the base in the unit cost for an embedded training, the unit cost could be of the order of US\$0.94 to US\$1.26 per student. Note that this assumes that most pairs of eyeglasses would be donated (100 million spectacles donated by EssilorLuxottica through its OneSight EssilorLuxottica Foundation

may be accessible; this amount far exceeds the number of glasses that Uganda would need). For close to 90 percent of children needing glasses, ready-to-clip glasses such as those donated by the Foundation would be sufficient. Only a small share of students with visual impairment need custom-made spectacles that could be produced in Kampala affordably given the small quantities involved (in Kenya customized glasses cost about US\$25 per pair; in Uganda unit costs seem to be higher, but should still be affordable under a national school eye health program as relatively few students would need customized glasses).

Table 1: Examples of Costing for School Eye Health Programs – Liberia Counties, US\$

	Montserrado	Margibi	Bomi	GCM	Total	Total (embedded)
Community outreach	7,215	4,812	2570.96	2747	17,345	17,345
Eye examinations by OTs	10,080	2,470	3825	3825	20,200	20,200
Incentives for teachers	2,428	6,750	-	-	9,178	-
Inception meeting	4,575	3,360	1870	2600	12,405	12,405
Master trainer/DEO training	1,996	1,060	5931	6528.89	15,516	15,516
Coordination, M&E, data	7,830	10,772	1,340	6,748	26,690	26,690
Procurement	3,842	250	680	740	5,512	5,512
Teacher training	23,800	10,000	18485	20315	72,600	-
Treatment & referral	3,674	979	-	-	4,653	4,653
Screening kits + forms	4,591	4,956	6,988	8,213	24,748	24,748
Learning meeting	2,700	3,500	2,200	2,200	10,600	10,600
Grand Total	72,731	48,909	43,889	53,918	219,447	137,669
Number of students screened	70,161	14,257	14,504	15,802	114,724	114,724
Average cost per student	1.04	3.43	3.03	3.41	1.91	1.20

Source: Smith and Wodon (2023).

Number of students in school

The latest data on the number of pupils in primary and secondary education in Uganda on the website of the Ministry of Education and Sports appear to be for 2016/17 with 8.66 million students in primary school and 1.13 million students in secondary school. The latest estimates available on the website of the UNESCO Institute for Statistics are for 2017, with a similar order of magnitude (8.84 million students in primary school, and 1.43 million in secondary school). Estimates from the 2019/20 Uganda National Household Survey are slightly larger at 9.4 million students in primary school and 1.8 million in secondary school (these estimates are based on a sample and therefore have standard errors). Schools were closed for two years due to the COVID-19 pandemic and some students may not have returned. On the other hand, population growth should lead to an increase in students over time, as could gains in enrollment post-COVID. Overall, it seems reasonable to base cost estimations on a target of about 11 million students that could be reached in primary and secondary schools nationally. However, if the program were implemented in public schools only as a start, the number of students to reach would be smaller, as shown in Table 2.

Table 2: Number of Students by School Type, 2019/20

Type of school	Primary	Secondary	Total
Government	5,884,055	727,380	6,611,435
Private	3,342,836	1,065,876	4,408,712
NGO/religious	131,992	44,152	176,144
Other	26,140	7,701	33,841
Total	9,385,023	1,845,109	11,230,132

Source: Authors' estimation based on data from the Uganda UNHS 2019/20.

Note: Many faith-based schools such as most Catholic or Protestant schools are publicly funded, hence are considered as Government schools in the survey.

Potential cost for a national program

Table 3 provides estimates of aggregate costs under different assumptions, namely with or without embedding teacher training for school eye health programs in larger trainings, and for public schools as well as all schools. The overall cost of a national program ranges from US\$6.2 million to US\$22.5 million. Given the frequency needed for screening, this is a cost over a few years. Ideally, children should be screened every few years. Screenings at intervals of two years are ideal, but three years or even four years when budgets are tight could be considered. After the initial implementation, a few years later the program would therefore need to be implemented again in the same schools, although costs could then be lower by building on the training and awareness raised in the first implementation. Note again that the costs do not include spectacles that could be received as a donation. The program could be phased in, targeting first districts with a higher prevalence of visual impairment among children (as estimated with census data). Costs could also be slightly lower given economies of scale in implementing a national program.

Table 3: Aggregate Cost of a National School Eye Health Program in Uganda (US\$ million)

	Standalone teacher training	Teacher training embedded
Public schools only		
Lower bound	9.9	6.2
Upper bound	13.2	8.3
All schools		
Lower bound	16.8	10.6
Upper bound	22.5	14.1

Source: Authors' estimation.

Takeaways

Children with visual impairment are at a disadvantage for both schooling and learning. A simple intervention to tackle visual impairment is for teachers to be trained to conduct vision screenings and comprehensive eye examinations. Children requiring eyeglasses can then be provided with such pairs of glasses in schools. For children requiring more advanced care, referral to healthcare professionals can be done. This brief provides tentative estimates for the cost of a national school eye health program in Uganda. Depending on the assumptions for the estimation, the overall cost of a national program could range from US\$6.2 million to

US\$22.5 million over a few years, with lower costs when teacher training for school eye health is embedded in other training programs and only public schools are targeted. The program could target first districts with a higher prevalence of visual impairment among children as estimated with census data. After the initial implementation, a few years later the program would need to be implemented again, although costs could be lower building on the training and awareness raised in the first wave of implementation.

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