A research report on the School Health Integrated Programming activities in Bong County, Liberia

Sightsavers

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Abbreviations

EQ-5D-Y-3L	EuroQol 5-Dimension Youth version
Houl	Health-Related Quality of Life
OT	Ophthalmic technicians
QoL	Quality of Life
QALY	Quality-Adjusted Life Year
RE	Refractive Error
Sd	Standard deviation
SHIP	School Health Integrated Programming
VA	Visual Acuity
VAS	Visual Ana logué Scale
VI	Visual Impairment

Executive summary

This report presents the findings of a research study conducted as part of the School Health Integrated Programming (SHIP) extension in Bong County, Liberia. The SHIP initiative, implemented between 2018 and 2025, addressed uncorrected refractive errors among school-aged children through school-based vision screening and spectacle provision.

A prospective case-control study was conducted among 898 children at baseline. Children diagnosed with refractive errors and prescribed spectacles formed the case group, while children with normal vision served as controls. Data collection included the EQ-5D-Y-3L questionnaire, visual acuity assessment and information on school characteristics. Follow-up data collection was attempted six months later, but high attrition and loss of data due to quality issues meant that only baseline data could be analysed. The results showed that children prescribed spectacles reported a higher burden of problems across all five EQ-5D-Y-3L dimensions than children without a prescription, particularly in usual activities and mobility.

Children with poorer visual acuity also reported higher levels of difficulty across the EQ-5D-Y-3L dimensions. These associations were statistically significant across all five dimensions and suggest that declining visual acuity is linked to physical, functional and psychological challenges. In contrast, EQ visual analogue scale (EQ VAS) scores were similar between children with and without a spectacle prescription, and there was no statistically significant association between VAS score and either prescription status or visual acuity severity. This suggests that the EQ-5D-Y-3L dimensions were more informative than the VAS for understanding how visual impairment relates to children's health-related quality of life in this sample.

The findings suggest that school-based vision screening and spectacle provision could potentially improve children's perceived health and functioning in Bong County, as children identified with a need for spectacles stated lower health-related quality of life (HRQoL) at baseline. However, the failed follow-up data collection means that the study could not measure the impact of eyeglasses provision over time. The study supports the integration of eye health into school health programmes and highlights the need for improved logistics, compliance support and stronger follow-up systems to maximise programme impact.

Introduction

Unaddressed refractive errors are the main cause of visual impairment (VI) in developing countries. Children are a particularly vulnerable group when it comes to vision impairment and blindness. In low- and middle-income countries, 30%-72% of childhood blindness is avoidable and refractive error, which is easily correctable with spectacles, is the most common cause of bilateral VI. Uncorrected refractive error in childhood can influence development, education, and long-term well-being (1, 2).

The School Health Integrated Programming (SHIP) project screens school age children for health problems such as poor vision and distributes spectacles. After being trained by optometrists, teachers conduct basic vision screening using a tumbling “E” eye chart and then refer children to the mobile refraction teams if they fail the vision screening (vision worse than 6/9). The mobile refraction teams examine the children who failed the screening and, if required, the team provides spectacles or a prescription for pre-paid custom-made spectacles that are ordered and delivered to the child. Further details on the process are available in the SHIP guidelines (3). Teachers are also screened for visual impairment and teachers with presbyopia receive ready-made spectacles to improve their near vision and to promote the use of spectacles for children in the classroom.

From 2018 to 2022, the Ministry of Education and Ministry of Health of Liberia worked with Sightsavers to conduct annual/bi-annual screening and treatment of eye conditions among school-age children in four counties of Liberia (Bong, Grand Kru, Maryland, and Sinoe). The programme referred children to county health facilities for follow up, empowering teachers to conduct screening on students in school and provided on-site follow up for children with unaddressed refractive error. The project successfully screened 181,487 children and provided 1,176 spectacles (for 661 children and 515 teachers).

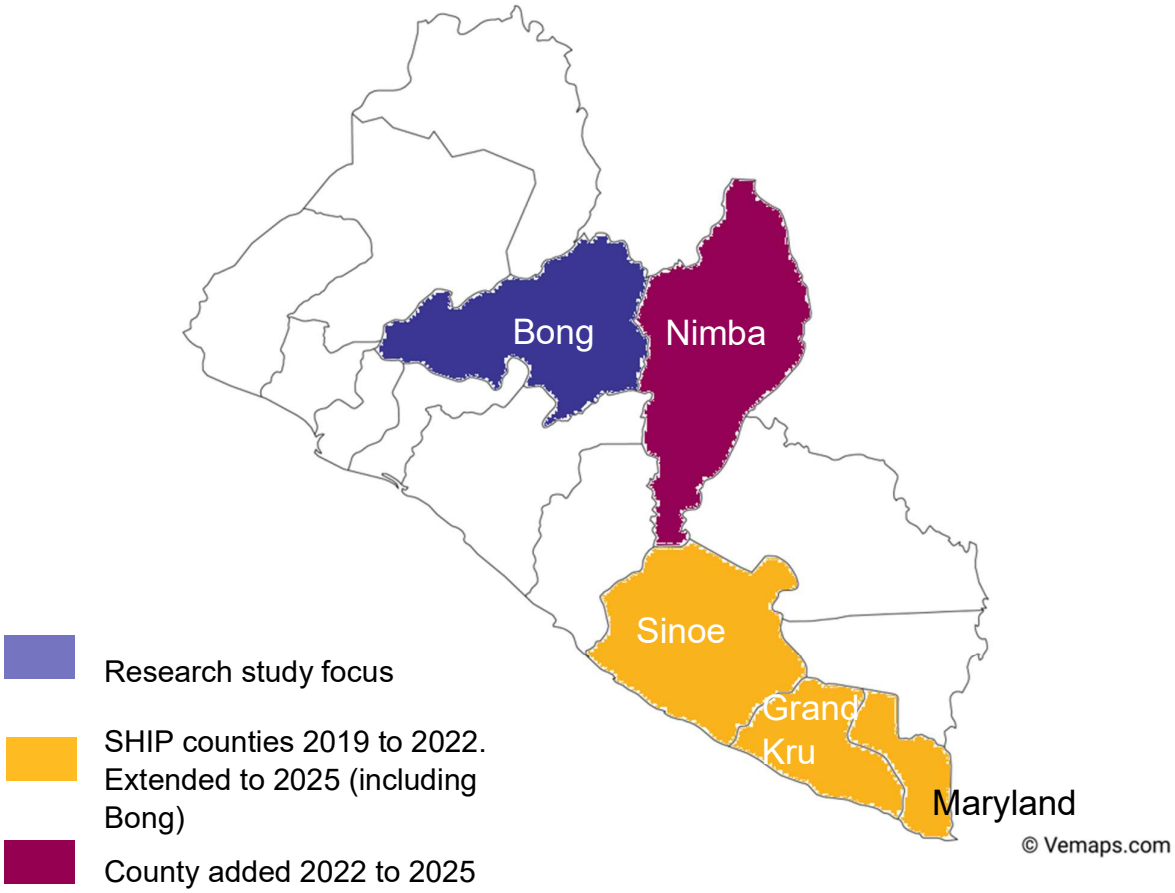
In 2022 it was agreed to extend the SHIP Liberia project until 2025, implementing the same activities in the same four counties and adding a fifth county, Nimba, but also incorporating social behaviour change (SBC) activities.

As part of the SHIP extension, a research study was included. The study aimed to evaluate the quality of life of school children with uncorrected refractive error in Bong County.

Methods

Study location

The Liberia SHIP project was conducted in four counties of Liberia (Bong, Grand Kru, Maryland, and Sinoe) from 2019 until 2022, and additionally in Nimba County from 2022 to 2025. The study on quality of life and spectacle use focussed on school children in Bong County (Figure 1).



Study context

The SHIP approach delivers basic vision screening by trained teachers using simple inexpensive screening kits. Children are referred to eye care professionals if they fail the vision screening test, or there are any abnormal clinical signs or symptoms (Figure 2). Teachers use tumbling E-charts at 10 feet distance in outdoor light. The importance of proper distance, lighting conditions and correct placing of a hand over the other eye during vision screening, are emphasized. Written guidelines summarizing the testing conditions, procedures and common pitfalls are provided to teachers to complete vision screening and to prepare a list of children with visual acuity less than or equal to 6/9 in either eye, or the presence of any visible ocular disorder noticed during screening. Near vision acuity is not specifically measured. However, near vision issues are screened (including hyperopia and binocularity) by asking children about symptoms of headaches and eye pain (related to near vision issues), as well as assessing the appearance of the eyes. A child with strabismus, amblyopia or near vision symptoms would be referred. All referred students are assessed by a mobile team of optometrists or optometric technicians, and children who require further assessment are referred to the nearest eye care unit or facility. The mobile team is comprised of optometric technicians, ophthalmic nurses and a spectacle dispenser, who visit schools soon after the initial teacher screening. Single vision ready to clip spectacles are provided immediately after the refraction for children who need spectacles and who meet specific prescribing guidelines; for children with more complex prescriptions, custom-made spectacles are procured and delivered to the schools one to two weeks later.

The research study did not interfere with the SHIP activities. The scope of the quality-of-life study was Bong County, where data collectors asked children the questionnaire right after the examination by the optical technician, depending on their vision outcome (see yellow frame in Figure 2). To meet the objective the QoL differences between children with uncorrected refractive error and those with, a control group was selected from children seeing at 6/9 in both eyes and a case group with children that received spectacles, as shown in Figure 2 (4, 5).

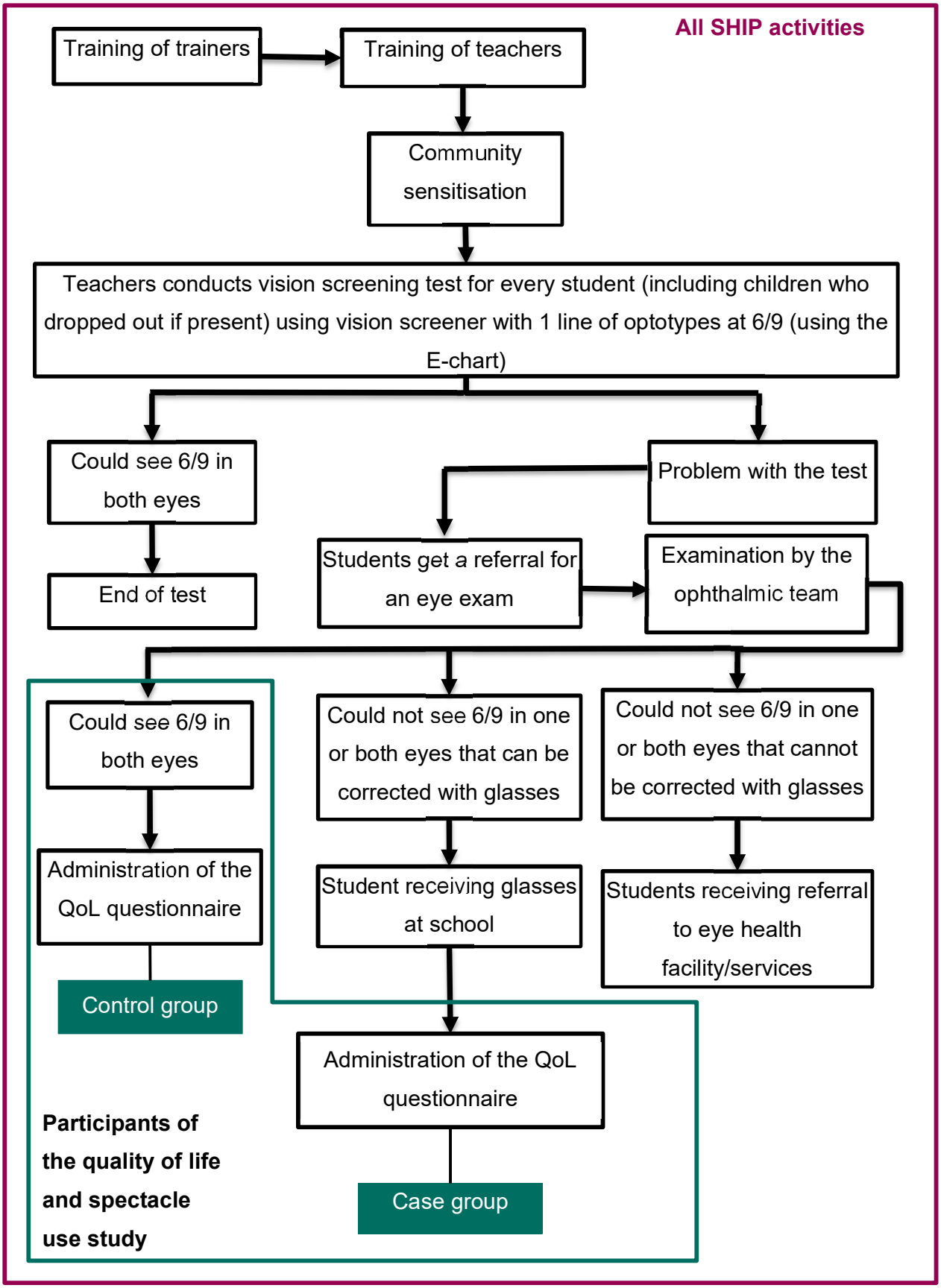


Figure 2: SHIP activities and study participant selection process

Study population

The population included in this study are all primary school children (aged from 6 to 12 years) and secondary school children (from 12 to 17 years) identified as having refractive errors and having been provided with corrective spectacles through the SHIP programme (Figure 2).

Inclusion criteria – case group:

- Be aged between 6 and 17 years (completed years);
- Be diagnosed with unaddressed refractive error and provided with spectacles;
- Child assent provided; and
- Parent/guardian consent provided.

Inclusion criteria – control group:

- Be aged between 6 and 17 years (completed years);
- No visual impairment diagnosed;
- Child assent provided; and
- Parent/guardian consent provided.

Exclusion criteria – all groups:

- Be aged under 6 or over 18 years (completed years); or
- Child assent refused; or Parent/guardian consent refused.

Sample size

Table 1: Demographic overview of public-school children in Bong (6)

County	Primary and secondary schools		Total students
	Males, n (%)	Females, n (%)	
Bong	64,709 (52%)	58,266 (48%)	122,975

Based on the expected enrolment figures (Table 1), and previous studies on eye care in Tanzania, we expect the utility, understood as the level of welfare of a child express in numerical measure, difference between children with unaddressed refractive error and children without visual impairment to be around 0.075 points (7-9). To observe a similar small effect, based on Cohen's guidelines, an expected population standard deviation of 0.375 has been selected, a two-sided confidence interval of 5% where $\alpha = 0.05$, for 80%

power, a 1:1 ratio to control group, a design effect of 1.5 to adjust for clusters (schools based on similar studies) and an estimated dropout rate of 25%, a sample size of 735 in each group was required (10-14).

Sampling method and participant selection

Every child identified with unaddressed refractive error was enrolled until the required sample size was reached. Because the prevalence of unaddressed refractive error was low, children with this condition were drawn from all classes in which eligible cases were found. For each child with unaddressed refractive error, an equal number of children without visual impairment were randomly selected from the same classes to form the control group.

Case group

Children receiving spectacles, as part of SHIP (see study context), were enrolled in the QoL evaluation. Figures 2 and 3 provide a summary of SHIP implementation and highlight the selection process for the QoL study.

Control group

Children referred by teachers during the vision screening test but with normal vision (see Figure 2) were randomly selected to match the number of children with unaddressed refractive error diagnosed and enrolled in the QoL survey, upon consent of parents or guardians. Children from the control group did not have a visual impairment.

Data collection process

In May 2025, school sensitization campaign was organised shortly ahead of the school eye screening and data collection. A data collector accompanied the mobile optometric technician teams going from school to school examining children referred by teachers upon consent from parents and assent from the child (Figure 2). At baseline, all children prescribed and/or provided with spectacles were asked (parental consent obtained days before) to participate in the QoL study. Children with no visual impairment were also asked in each school to participate. Each child enrolled into the case group and control group were included in the QoL study, other information such as gender and grade level was also collected (Appendix A).

Questionnaire

During baseline, all children identified with unaddressed refractive error (case group) and a sample of students who have good vision (control) were asked to answer the child-friendly EQ-5D-Y-3L tool. The tool was introduced by the EuroQol Group in 2009 and consists of two pages: the EQ-5D-Y-3L descriptive system and the EQ visual analogue scale (EQ VAS). The EQ-5D-Y-3L is a commonly used, preference-based measure designed to elicit health-related QoL among children, asking questions regarding mobility, looking after myself, doing usual activities, having pain or discomfort, and feeling worried, sad or unhappy (15-17). Each dimension has three response levels: no problems, some problems and a lot of problems. The respondent is asked to indicate his/her health state by selecting the most appropriate statement in each of the five dimensions. This answer results in a one-digit number that expresses the level selected for that dimension and that we call “utility”. Additionally, the EQ-VAS tool allows the child to self-rate their health on a scale from 0 to 100 using a vertical visual analogue scale where the endpoints are labelled “The best health you can imagine” and “The worst health you can imagine”. This tool was simple and quick to use so that children were rapidly interviewed and were able to go back to their classroom.

Baseline data was collected in May 2024 (see implementation plan, Figure 2) during the vision screening activity. Follow-up data, consisting of a questionnaire on compliance with prescribed spectacles and QoL, occurred six months after the vision screening but was not successfully conducted. Unfortunately, the attrition was too high for the follow-up data to be included in the analysis (around 80%). Therefore, only the baseline data have been analysed.

Data analysis

Data was collected using smart phones and a data collection software, CommCare. Four data collectors were hired among staff already working on the SHIP project and from relevant organisations (university, Sightsavers, etc.).

Descriptive statistics were generated to summarise participants’ baseline characteristics. Categorical variables such as sex, age, and severity of visual impairment were described using frequency distributions. Visual impairments were classified in seven categories as follow; 6/6, 6/9, 6/12, 6/18, 6/24, 6/36 and 6/60 or worse. Children with diagnosed “counting fingers” (CF) and “no perception of lights” (NPL) were included in the 6/60 or worse category

to balance the size of categories. Age was categorised in three groups, 8 to 12 years old, 13 to 15 years old and 16 years old and above

Quality of life (QoL) was initially examined descriptively using the five-dimension EQ-5D-Y-3L system. We then sought to generate a summary score derived from these five dimensions. Although the EuroQol Group provides a protocol for valuing EQ-5D-Y-3L health states and developing standard value sets to support international comparisons, no such value set was available for Liberia at the time of the study. To calculate utilities, we therefore applied the Indonesian value set, selected because it represents a comparable lower-middle income context, in this analysis called EQindex (18). At the time of the study, no value sets were available for sub-Saharan Africa or any low-income countries.

Analysis was carried out using Excel and STATA v.19.5 (19, 20). To answer the first question on whether uncorrected refractive error ("prescription") is associated with sex, age group or lower HRQoL (including VAS), association between variables was tested. The association between spectacle prescription and categorical variables (sex, age group and the five EQ-5D-Y-3L dimensions) was assessed using Pearson's chi-square tests. The association between spectacles prescription and VAS score (continuous variable) was assessed using logistic regression. The analysis also tested a potential association between higher percentage of problems reported among the five dimensions (dichotomised), with the severity of children's visual impairment, using chi-square tests. Finally, a linear regression was used to compare the mean VAS per visual impairment severity group, to observe if children with more sever visual impairment tend to report a lower health state.

Results

A total of 1,012 children were recruited at baseline across 227 schools. Following ophthalmic team examinations, 377 children were confirmed to have refractive errors (RE) and required spectacles, while 635 children with normal vision were enrolled in the comparison group (Figure 4). Consent was not obtained from 3 children (2 non-consent from parents and 1 non-consent from the child).

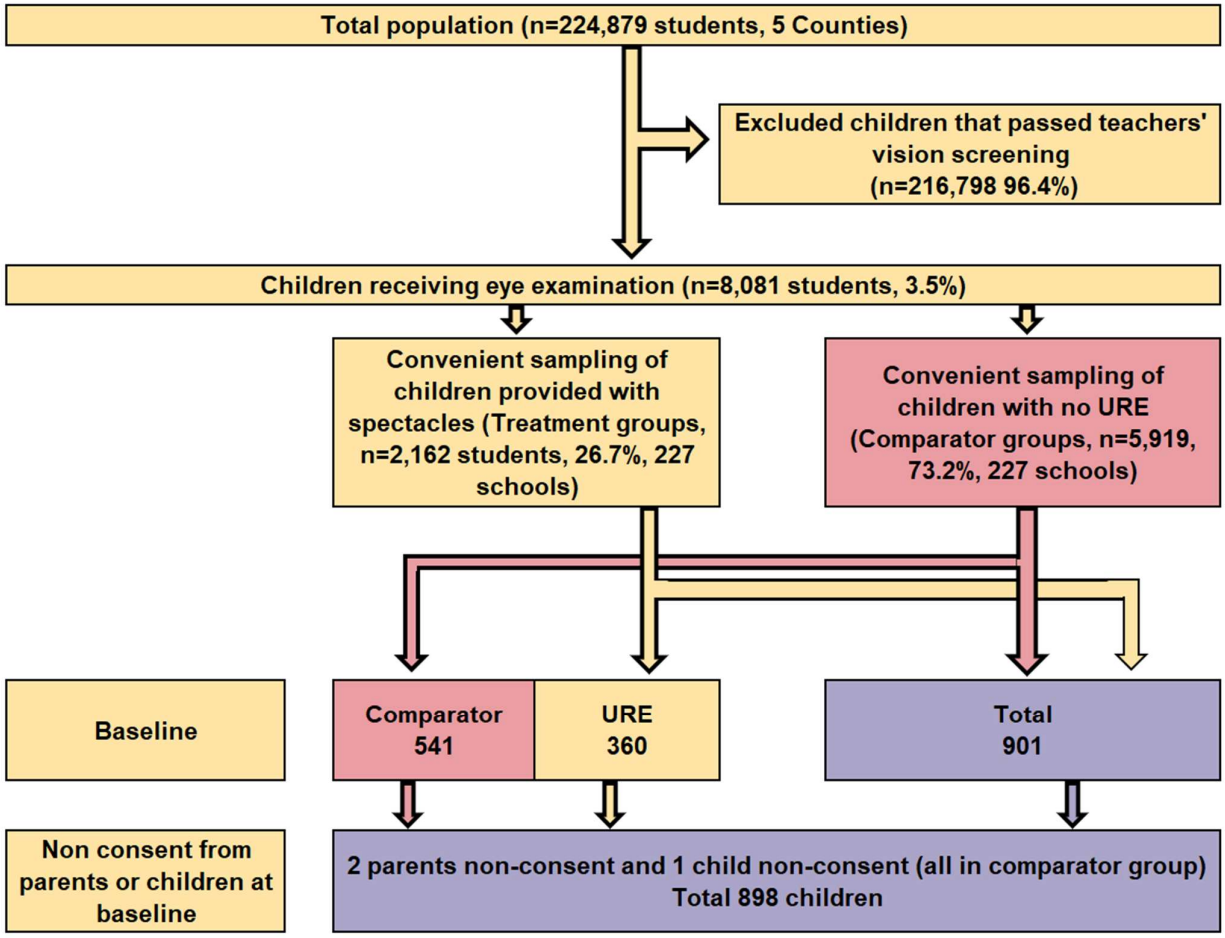


Figure 3: Participants diagram

After dataset cleaning, a total of 898 school-aged children were kept and assessed at baseline (Table 2). The sample comprised 401 males (44.7%) and 497 females (55.3%). Participants were categorised in three age groups: 39.9% were aged 8–12 years, 29.0% were 13–15 years, and 31.2% were aged 16 years or older. In terms of educational level, 66.0% were enrolled in Grades 1 to 6, 21.7% in Grades 7 to 9, and 12.2% in Grade 10 or above. Visual acuity in the worst-seeing eye was available for 896 children, with the majority (62.5%) presenting with normal acuity (6/6). Mild impairments were observed in 18.8% (6/9) and 7.8% (6/12), while 13.1% had acuity worse than 6/12, including 0.6% with counting fingers vision and 0.6% with no perception of light.

Table 3 presents the association between spectacle prescription status and demographic and HRQoL characteristics. There was no evidence of an association between spectacle prescription and sex (χ^2 p=0.283). In contrast, prescription status differed significantly across age groups (χ^2 p<0.001), with, as expected, a higher proportion of prescribed children in the oldest age group (≥16 years: 40.8%) compared with younger groups. Significant associations were also observed between prescription status and all five EQ-5D dimensions. Children with a spectacle prescription were more likely to report at least some problems with mobility (31.6% vs. 11.9%), self-care (27.4% vs. 14.1%), usual activities (36.9% vs. 13.6%), pain or discomfort (51.4% vs. 40.5%), and worry or anxiety (40.5% vs. 25.8%) than children without a prescription (all p≤0.001). Mean VAS scores were similar between groups (76.7 [SD 17.9] among prescribed children versus 75.0 [SD 18.0] among those without a prescription), and logistic regression provided no evidence of an association between VAS score and spectacle prescription status (p=0.163).

Table 2: Characteristics of children participating at baseline

	Summary
Number	898
Sex	
Male	401 (44.7%)
Female	497 (55.3%)
Age group	
8-12	358 (39.9%)
13-15	260 (29.0%)
>=16	280 (31.2%)
Grade group	
Grade 1 to 6	593 (66.0%)
Grade 7 to 9	195 (21.7%)
Grade >=10	110 (12.2%)
Glasses prescription	
Yes	360 (59.9%)
No	538 (40.1%)
Visual acuity (worst eye)	
Missing	2 (0.2%)
6/6	561 (62.5%)
6/9	169 (18.8%)
6/12	70 (7.8%)
6/18	33 (3.7%)
6/24	21 (2.3%)
6/36	29 (3.2%)
6/60 or worse (incl. CF and NPL)	13 (1.4%)

Table 3: Association test of prescription with sex, age, EQ dimensions and VAS

	No prescription	Prescribed	Test (χ^2)
N (%)	538 (60.0%)	358 (40.0%)	
Sex			
Male	248 (46.1%)	152 (42.5%)	0.283
Female	290 (53.9%)	206 (57.5%)	
Age group			
8-12	251 (46.7%)	107 (29.9%)	<0.001
13-15	153 (28.4%)	105 (29.3%)	
>=16	134 (24.9%)	146 (40.8%)	
Mobility			
No problem	474 (88.1%)	245 (68.4%)	<0.001
At least some problems	64 (11.9%)	113 (31.6%)	
Self-care			
No problem	462 (85.9%)	260 (72.6%)	<0.001
At least some problems	76 (14.1%)	98 (27.4%)	
Usual activities			
No problem	465 (86.4%)	226 (63.1%)	<0.001
At least some problems	73 (13.6%)	132 (36.9%)	
Pain			
No problem	320 (59.5%)	174 (48.6%)	0.001
At least some problems	218 (40.5%)	184 (51.4%)	
Worry			
No problem	399 (74.2%)	213 (59.5%)	<0.001
At least some problems	139 (25.8%)	145 (40.5%)	
VAS (mean)	74.989 (18.048)	76.693 (17.899)	0.163*

*Logistic regression

The cross-tabulations, figure 5, reveal a consistent pattern: children with poorer VA report higher levels of difficulty across all five dimensions of functioning and well-being. For example, among those with VA 6/6, only 12.7% reported mobility problems, compared to 33.7% in the 6/9 group and 30.8% in the 6/60 or worse group. Similar trends are observed for self-care, usual activities, pain, and worry, with the proportion of children reporting problems increasing as VA worsens. Notably, the percentage of children reporting difficulty with usual activities rises from 13.7% in the 6/6 group to over 30% in the most impaired VA categories.

Statistical tests confirm these associations are significant (Appendix B). Pearson chi-squared tests for each domain show p-values well below 0.05, indicating that the distribution of reported problems varies meaningfully across VA subgroups. The strongest association is seen in usual activities ($\chi^2 = 73.11$, $p < 0.001$), followed by mobility ($\chi^2 = 51.42$), worry ($\chi^2 = 35.38$), self-care ($\chi^2 = 30.69$), and pain ($\chi^2 = 16.05$). These findings suggest that declining visual acuity is not only linked to physical limitations but also to emotional and social challenges, underscoring the broader impact of vision loss on children's quality of life.

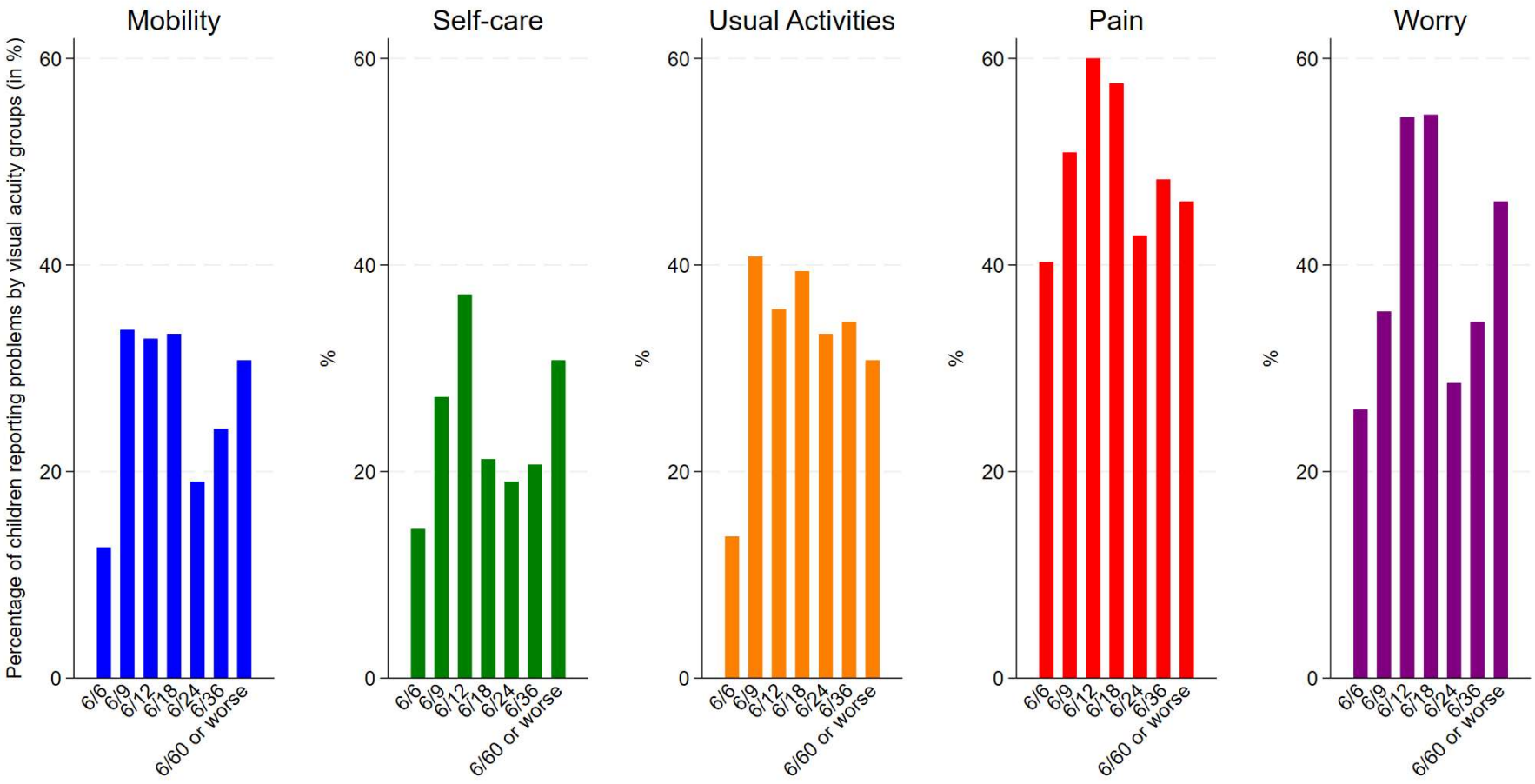


Figure 4: Percentage of children reporting problems in each dimension of EQ-5D-3L-Y by visual acuity group

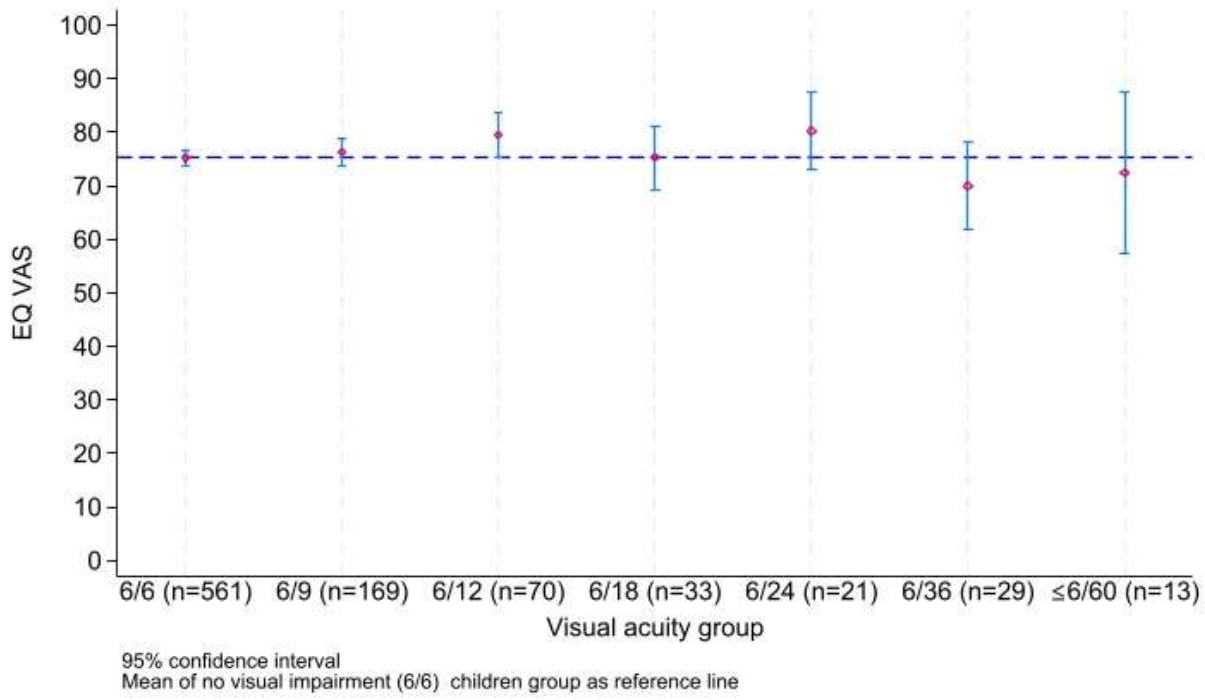


Figure 5: EQ VAS by visual acuity groups (n=896, p-value>0.05)

Figure 6 illustrates the relationship between visual acuity status and EQ VAS scores, stated by children. Each visual acuity group is represented by a red diamond indicating the mean VAS score, with vertical blue lines showing the 95% confidence intervals. While the children in the 6/24 group had the highest average score, the confidence intervals for other groups overlap substantially, suggesting no statistically significant differences across categories, aligning with the regression results, which showed a non-significant overall association between visual acuity and VAS scores (p = 0.2035). The dashed horizontal line marks the mean score of the 6/6 group, serving as a visual benchmark against which other groups are compared. Although some groups, such as 6/12 and 6/24, appear to have slightly elevated scores, the wide confidence intervals indicate considerable uncertainty, reinforcing the conclusion that visual acuity alone may not strongly predict perceived health status in this sample.

Discussion and conclusions

This study provides important insights into the potential impact of school-based vision screening and spectacle provision on children's quality of life in Bong County, Liberia. While the results from the follow-up data collection could not be interpreted due to very high attrition, and loss of data, the findings suggest that children who needed glasses also experience and stated a lower health-related quality of life (HRQoL).

Indeed, at baseline, children prescribed spectacles reported a higher burden of problems across all five EQ-5D-Y-3L dimensions than children without a prescription (Table 3). The largest absolute differences were observed for usual activities and mobility where 36.9% of children with a prescription reported at least some problems with usual activities compared with 13.6% of children without a prescription, while 31.6% versus 11.9% reported problems with mobility and similar patterns were observed for the other dimensions. These differences were statistically significant across all five dimensions, suggesting that children identified as needing spectacles had poorer health-related quality of life profiles at the time of screening.

The pattern of responses is consistent with the interpretation that unaddressed refractive error may be associated with functional limitations extending beyond visual symptoms alone (2). In particular, the higher prevalence of reported problems with usual activities may reflect difficulties in classroom participation, reading from the board, schoolwork, play, or other daily tasks requiring visual function and the higher reporting of mobility problems may indicate that reduced vision affects children's confidence or ability to move around safely in school and community settings.

When results were examined by visual acuity group, poorer visual acuity was generally associated with a higher proportion of children reporting problems in EQ-5D-Y-3L dimensions, (Figure 5 and Appendix B). However, the relationship was not strictly linear across all visual acuity categories (Figure 5 and Appendix B). Some categories with poorer acuity had lower reported problem levels than adjacent categories, which may reflect small numbers in the more severe visual acuity groups, variability in children's responses, or differences in adaptation and support. These findings should therefore be interpreted as evidence of an overall association between poorer visual acuity and worse dimension-specific HRQoL.

In contrast to the EQ-5D-Y-3L descriptive dimensions, EQ VAS scores did not show evidence of a statistically significant association with spectacle prescription status or visual

acuity severity (Figure 6). Mean VAS scores were similar among children with and without a prescription, at 76.7 and 75.0 respectively, and logistic regression did not indicate a significant association between VAS score and prescription status. Likewise, mean VAS scores varied across visual acuity groups, but confidence intervals overlapped and the overall association was not statistically significant.

This divergence between the five dimensions and the VAS could indicate that children's self-rated health is less sensitive to vision related limitations than specific functional and psychological (pain or worry) domains. The VAS asks children to summarise their overall health on a single scale, and responses may be influenced by broader perceptions of health, adaptation to visual difficulties, expectations, or limited familiarity with abstract rating scales, especially for younger children (17, 21). By contrast, the EQ-5D-Y-3L dimensions ask about concrete aspects of daily functioning and wellbeing, which may better capture the specific consequences of uncorrected refractive error. Indeed, the VAS is, in our sample as in other study, strongly associated with pain and worry (both p=0.000), the dimension-level findings therefore appear more informative than the VAS for understanding how visual impairment relates to children's health-related quality of life (21).

A key limitation of this study is the failed follow-up data collection with high attrition and loss of data due to quality which limited the impact measurement of eyeglasses provision.

However, this study indicates that school-based vision screening and spectacle provision could potentially improve children's perceived health and functioning in Bong County, as children identified with a need for spectacles have stated lower HRQoL. Overall, the results support continued investment in integrated school-health approaches in Liberia, provided that logistical and compliance challenges are addressed to maximise programme impact.

References

1. Burton MJ, Ramke J, Marques AP, Bourne RRA, Congdon N, Jones I, et al. The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. The Lancet Global Health. 2021;9(4):e489-e551.

2. Pirindhavellie G-P, Yong AC, Mashige KP, Naidoo KS, Chan VF. The impact of spectacle correction on the well-being of children with vision impairment due to uncorrected refractive error: a systematic review. BMC Public Health. 2023;23(1):1575.

3. Sightsavers; Partnership for Child Development (PCD) BHVI, London School of Hygiene and Tropical medicine (LSHTM). SHIP, Guidelines for School-based Eye Health Programs. 2016.

4. Lewallen S, Courtright P. Epidemiology in practice: case-control studies. Community eye health. 1998;11(28):57-8.

5. Levin KA. Study design V. Case–control studies. Evidence-Based Dentistry. 2006;7(3):83-4.

6. Education EMISotMo. Liberia Education Statistics Report 2021-22. Monrovia, Liberia: Ministry of Education; 2023.

7. World Health Organization Regional Office for A. Annual School Census 2021–2022: Final Report. Brazzaville: World Health Organization Regional Office for Africa; 2022.

8. Griffiths UK, Bozzani FM, Gheorghe A, Mwenge L, Gilbert C. Cost-effectiveness of eye care services in Zambia. Cost Eff Resour Alloc. 2014;12(1):6.

9. Sherman Folland ACG, Miron Stano. The Economics of Health and Health Care. New York: Routledge; 2017.

10. Sullivan GM, Feinn R. Using Effect Size-or Why the P Value Is Not Enough. J Grad Med Educ. 2012;4(3):279-82.

11. Overall JE, Tonidandel S, Starbuck RR. Rule-of-thumb adjustment of sample sizes to accommodate dropouts in a two-stage analysis of repeated measurements. International journal of methods in psychiatric research. 2006;15(1):1-11.

12. 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. British Journal of Ophthalmology. 2008;92(1):19-24.

13. Gustavson K, von Soest T, Karevold E, Røysamb E. Attrition and generalizability in longitudinal studies: findings from a 15-year population-based study and a Monte Carlo simulation study. BMC Public Health. 2012;12(1):918.

14. Imran A. Khan DLA, Natasha Graham, Megha Bharadwa, Bachir Sarr, Thomas Engels, Guillaume Trotignon, Liesbeth Roolvink, Nigussie Geletu Dejene, Getrude Ananse-Baiden, Maresa Pitt. School Health Integrated Programming (SHIP) Extension. World Bank, the Global Partnership for Education (GPE) , Sightsavers, the Partnership for Child Development, Imperial College London; 2018.

15. Hsu CN, Lin HW, Pickard AS, Tain YL. EQ-5D-Y for the assessment of health-related quality of life among Taiwanese youth with mild-to-moderate chronic kidney disease. Int J Qual Health Care. 2018;30(4):298-305.

16. Palacios-Cartagena RP, Adsuar JC, Hernández-Mocholí M, Carlos-Vivas J, Barrios-Fernández S, Garcia-Gordillo MA, et al. Health-Related Quality of Life Norm Data of the Peruvian Adolescents: Results Using the EQ-5D-Y. Int J Environ Res Public Health. 2021;18(16).

17. Kreimeier S, Greiner W. EQ-5D-Y as a Health-Related Quality of Life Instrument for Children and Adolescents: The Instrument's Characteristics, Development, Current Use, and Challenges of Developing Its Value Set. Value Health. 2019;22(1):31-7.

18. Fitriana TS, Roudijk B, Purba FD, Busschbach JJV, Stolk E. Estimating an EQ-5D-Y-3L Value Set for Indonesia by Mapping the DCE onto TTO Values. PharmacoEconomics. 2022;40(2):157-67.

19. StataCorp. Stata Statistical Software: Release 19.5. College Station, TX: StataCorp LLC; 2026.

20. Microsoft C. Microsoft Excel for Microsoft 365 MSO (Version 2605, Build 16.0.20026.20166, 64-bit). Redmond, WA, USA: Microsoft Corporation; 2026.

21. Åström M, Rolfson O, Burström K. Exploring EQ-5D-Y-3L Experience-Based VAS Values Derived Among Adolescents. Applied health economics and health policy. 2022;20(3):383-93.

Appendices

Appendix A - Questionnaire

PART A.1 - Socio-demographic questions (For baseline)

Questions to be answered by interviewer:

1. Did parent(s) consent to the quality of life and compliance survey?
    1. Yes
    2. No
2. Did the child assent to the quality of life and compliance survey?
    1. Yes
    2. No

Questions to be answered by the child:

3. What is your full name?
4. What's the name of your school?
5. What grade are you in?
    1. Grade 1
    2. Grade 2
    3. Grade 3
    4. Grade4
    5. Grade 5
    6. Grade 6
    7. Grade 7
    8. Grade 8
    9. Grade 9
    10. Grade 10
    11. Grade 11
    12. Grade 12
6. During your last standard exam, what was your overall score? (**Asked if Q5 is equal to = 3, 6, 9 or 12)**
7. What was the average score of your last term? (**Not asked if Q5 is equal to = 3, 6, 9 or 12**

8. Where do you live? (Town, sector, or village name)
9. Age of the child (in years)
10. Sex of the child
    1. Female
    2. Male
11. Do you know your parents or guardian's phone number?

Questions to be answered by the interviewer from vision screening register.

12. After the screening, was the child prescribed with spectacles?
    1. Yes, spectacles prescription was given
    2. No spectacles required

PART A.2 – EQ-5D-Y-3L (For baseline)

INTRODUCTION

(Note to interviewer: please read the following to the child.)

We are trying to find out what you think about your health. I will explain what to do as I go along, but please stop me if you do not understand something or if things are not clear to you. There are no right or wrong answers. We are interested only in what you think.

First, I am going to read out some questions. Each question has a choice of three answers. Please tell me which answer best describes your health TODAY.

Do not choose more than one answer in each group of questions.

(Note to interviewer: first read all three options for each question. Then ask the child to choose which one applies to him/herself. Repeat the question and options if necessary. Mark the appropriate box under each heading. You may need to remind the child regularly that the timeframe is TODAY.)

EQ-5D DESCRIPTIVE SYSTEM

Questions to be answered by the child:

13. First, I would like to ask you about WALKING ABOUT (MOBILITY). Would you say that:
    1. You have no problems walking about?
    2. You have some problems walking about?
    3. You have a lot of problems walking about?
14. Next, I would like to ask you about LOOKING AFTER YOURSELF. Would you say that:
    1. You have no problems washing or dressing yourself?
    2. You have some problems washing or dressing yourself?
    3. You have a lot of problems washing or dressing yourself?
15. Next, I would like to ask you about DOING USUAL ACTIVITIES, for example, going to school, hobbies, sports, playing, doing things with family or friends. Would you say that:
    1. You have no problems doing your usual activities?
    2. You have some problems doing your usual activities?
    3. You have a lot of problems doing your usual activities?
16. Next, I would like to ask you about HAVING PAIN OR DISCOMFORT. Would you say that:

1. You have no pain or discomfort?
2. You have some pain or discomfort?
3. You have a lot of pain or discomfort?

17. Finally, I would like to ask you about FEELING WORRIED, SAD OR UNHAPPY. Would you say that:
    1. You are not worried, sad or unhappy?
    2. You are a bit worried, sad or unhappy?
    3. You are very worried, sad or unhappy?

EQ-5D VAS

Now, I would like to ask you to say how good or bad your health is TODAY. I would like you to picture in your mind a vertical line that is numbered from 0 to 100.

(Note to interviewer: if interviewing face-to-face, please show the child the VAS line.) 100 at the top of the line means the best health you can imagine. 0 at the bottom of the line means the worst health you can imagine. I would now like you to tell me the point on this line where you would put your health TODAY.

(Note to interviewer: mark the line at the point indicating the child's health today.)

18. THE CHILD'S HEALTH TODAY =

Thank you for taking the time to answer these questions.

Appendix B: Observation and association test of EQ-5D by visual impairment severity

	6/6	6/9	6/12	6/18	6/24	6/36	6/60 or worse	Test (χ^2)
N	561 (62.6%)	169 (18.9%)	70 (7.8%)	33 (3.7%)	21 (2.3%)	29 (3.2%)	13 (1.5%)	
Mobility								
No problem	490 (87.3%)	112 (66.3%)	47 (67.1%)	22 (66.7%)	17 (81.0%)	22 (75.9%)	9 (69.2%)	<0.001
At least some problem	71 (12.7%)	57 (33.7%)	23 (32.9%)	11 (33.3%)	4 (19.0%)	7 (24.1%)	4 (30.8%)	
Self-care								
No problem	480 (85.6%)	123 (72.8%)	44 (62.9%)	26 (78.8%)	17 (81.0%)	23 (79.3%)	9 (69.2%)	<0.001
At least some problem	81 (14.4%)	46 (27.2%)	26 (37.1%)	7 (21.2%)	4 (19.0%)	6 (20.7%)	4 (30.8%)	
Usual activities								
No problem	484 (86.3%)	100 (59.2%)	45 (64.3%)	20 (60.6%)	14 (66.7%)	19 (65.5%)	9 (69.2%)	<0.001
At least some problem	77 (13.7%)	69 (40.8%)	25 (35.7%)	13 (39.4%)	7 (33.3%)	10 (34.5%)	4 (30.8%)	
Pain								
No problem	335 (59.7%)	83 (49.1%)	28 (40.0%)	14 (42.4%)	12 (57.1%)	15 (51.7%)	7 (53.8%)	0.013
At least some problem	226 (40.3%)	86 (50.9%)	42 (60.0%)	19 (57.6%)	9 (42.9%)	14 (48.3%)	6 (46.2%)	
Worry								
No problem	415 (74.0%)	109 (64.5%)	32 (45.7%)	15 (45.5%)	15 (71.4%)	19 (65.5%)	7 (53.8%)	<0.001
At least some problem	146 (26.0%)	60 (35.5%)	38 (54.3%)	18 (54.5%)	6 (28.6%)	10 (34.5%)	6 (46.2%)	