THE PRICE OF EXCLUSION:
DISABILITY AND EDUCATION

LOOKING AHEAD: VISUAL IMPAIRMENT AND SCHOOL EYE HEALTH PROGRAMS

QUENTIN WODON, CHATA MALE, ADA NAYIHOUBA, AND ELIZABETH SMITH

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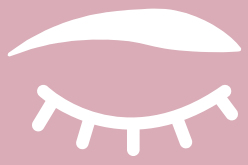

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BACKGROUND TO THIS SERIES

More than one billion people may experience some form of disability. Of those, up to one in five may experience significant disabilities. Individuals with disabilities have on average worse socioeconomic outcomes than those without disabilities. They often have poorer health, lower levels of employment and earnings, and higher poverty rates. In developing countries, the prevalence of disability and its impacts on a wide range of development outcomes are typically larger.

Children with disabilities are especially at a disadvantage in terms of school enrollment, educational attainment, and learning. This is especially the case in low income countries and sub-Saharan Africa, the region on which this note focuses where disability gaps in educational attainment are increasing and affordability and other constraints lead many children with disabilities to never enroll in school or drop out prematurely. They also often learn less while in school. Ensuring that these children have the same opportunities as other children is a challenge, but also an opportunity, in that inclusive education may bring benefits to all children, and not only those with disabilities.

Awareness of the need for inclusive education systems is increasing. The United Nations Convention on the Rights of Persons with Disabilities has been ratified by 177 countries. It calls for full integration of persons with disabilities in societies. Several targets in the Sustainable Development Goals are related to disabilities, including with respect to inclusive education. However, at the country level, and especially in low and middle-income countries, resources are often lacking to effectively promote inclusive education.

This note is part of a series on The Price of Exclusion: Disability and Education prepared as part of a broader work program on children with disabilities that benefited from funding from USAID and from the Trust Fund for Statistical Capacity Building at the World Bank. The series documents gaps in education outcomes between children with and without disabilities. It also showcases examples of programs and policies and lessons from the literature on how to improve inclusion in education systems.

KEY MESSAGES

Visual impairment is one of the most common disabilities for children – yet the vast majority of cases of vision impairment in children can be corrected simply with a pair of eyeglasses. Children with visual impairment who lack access to vision correction are often at a disadvantage in terms of school enrollment, educational attainment, and learning. When visual impairment is severe, children may never enroll in school or drop out. But even when children remain in school, visual impairment may contribute to lack of learning when vision correction services are lacking. For example, without eyeglasses, children with visual impairment may not be able to properly see what a teacher is doing in the classroom or what she is writing on the blackboard. In low income countries, schoolwork focuses around teachers and information written on blackboards, which puts children with uncorrected vision impairment at a disadvantage. In addition, even children with minor vision problems can have difficulty seeing the blackboard clearly because many classrooms do not have adequate lighting or electricity, so that dark rooms exacerbate the problem. Children with visual impairment who do not have eyeglasses may have trouble taking notes and they may not absorb the same amount of information as their peers without vision problems, or are doing so more slowly and laboriously.

Inclusive education is about ensuring access, participation, and achievement for all students, with teachers playing a key role in making this happen (UNESCO, 2017). Teachers must have pedagogical skills to facilitate inclusion and serve as catalyst for innovation that can benefit all learners in the classroom. In the specific case of visual impairment, teachers play a key role in implementing school-based eye health interventions for children, or school eye health programs. Indeed, one of the most straightforward interventions to tackle visual impairment is to screen children in schools and provide eyeglasses to the children who need them, as well as more advanced care for the children who require such care. Unfortunately, most children in developing countries have never received a vision screening in school or elsewhere because they live in communities with limited eye care options.

The challenge of achieving inclusive education for children with visual impairment is massive, but conversely, the opportunities that inclusive education through school eye health programs could provide are major as well.

This note is part of a larger program at the World Bank to promote inclusive education. It was written to inform World Bank task managers as well as external audiences about the challenges that visual impairment represents for schooling and learning, and the solutions that can be brought to bear. The note provides an analysis of gaps in educational outcomes for children with visual impairment in comparison to children without disabilities. Four main educational outcomes are considered: whether children ever enroll in school, are literate, complete their primary education, and perform well while in school as measured by international student assessments. The note shows that the potential impacts of visual impairment on educational outcomes are substantial even if they are often smaller than for other types of disabilities. School eye health programs could make a major difference, but such programs are rarely implemented. How such programs could be implemented and the benefits that they could provide is discussed. The potential cost of the programs is also documented based on a survey of leading non-governmental organizations involved in school eye health. Key findings are as follows.

ENROLLMENT IN SCHOOL, PRIMARY SCHOOL COMPLETION, AND LITERACY

- **For children with visual impairment, it is not their disability as such that is restricting schooling and learning. Rather, it is the lack of accommodations, including through vision screening, the provision of eyeglasses, accessible material for the blind, teacher support, and other related factors that lead to disability gaps in educational attainment, literacy, and achievement.**

- **Completion rates at the primary level for children without disabilities have increased substantially over the last few decades. Similar gains have been observed for children with visual impairment. Yet gaps between both groups have remained over time. Due to lack of vision correction interventions, children with visual impairment are on average across countries about four percentage points less likely to ever start school, complete primary education, and be literate, although there are differences among others by gender as well as between regions (and of course between countries).**

- The trends related to disability gaps between children with visual impairment and children without disabilities are different from what emerges from a comparison of all children with disabilities and all children without disabilities. For all children with disabilities combined, gaps in educational attainment and literacy due to insufficient interventions towards inclusive education appear to have increased over time. The gaps also tend to be larger for children with other disabilities than for children with visual impairment. Therefore comparatively, children with visual impairment have fared better over time than children with other types of disabilities. But the persistent gaps versus children without disabilities and the fact that myopia, the leading cause of vision impairment in children, is on the rise globally suggests that much remains to be done. In East and West Africa especially, where access to quality eye care for children is extremely limited, myopia prevalence could increase sevenfold and fivefold, respectively, from 2000 to 2050.

- Using regression analysis, the marginal effects of exclusion associated with visual impairment suggest findings that are similar to the results from simple statistical comparisons. This suggests that gaps for children with visual impairment are indeed likely due to exclusion related to visual impairment as opposed to other (observable) characteristics of children with visual impairment.

- After controlling for other factors affecting educational outcomes, the average reductions at the margin for children with visual impairment in the probabilities of ever enrolling in school, completing primary schooling, and being literate are estimated at 5.0 points, 5.0 points, and 6.1 points respectively in sub-Saharan African countries. Average effects are of a similar order of magnitude for other countries at 5.5 points, 6.2 points and 7.3 points, respectively.

- The effects on education outcomes of exclusion related to visual impairment are often of a similar order of magnitude to the effects of other child or household characteristics. For example, the effect of a visual impairment is similar to that of the quintile of wealth of the child's household.

PERFORMANCE IN SCHOOL, SCREENING FOR VISUAL IMPAIRMENT, AND ACCESS TO EYEGLASSES

- Among children who are in primary school, children self-reporting seeing difficulties, a proxy for visual impairment, tend to do worse on standardized mathematics and reading tests in all but one of ten countries from francophone Africa that participated in the latest PASEC assessment.

- The negative impact associated with difficulty seeing clearly (and the lack of vision correction interventions to remedy those difficulties) is confirmed in regression analysis after controlling for a wide range of other factors that affect student performance on PASEC. The loss associated with difficulty seeing clearly is at up to two percent of mean performance. This is larger than the effects of other important variables included in the regression analysis. When students suffer from both seeing and hearing difficulties, negative effects on student performance are larger.

- While slightly more than one in four teachers mention that medical check-ups for students are in place in their school, the proportions are much lower for screening tests to identify students with visual or hearing impairment. As a result, across the 10 PASEC countries, only 4.8 percent of students in grade 2 and 7.3 percent of students in grade 6 are likely to have received vision screenings. This suggests that school eye health programs remain very rare in the region.

- The likelihood of benefitting from provision of vision screenings and comprehensive eye exams screening is low across the board, but it is much lower for children in rural areas and children from the bottom socio-economic quintiles. Children in the top quintile are almost three times as likely to be screened than children in the bottom two quintiles.

- Since difficulty seeing clearly in the classroom is only a proxy for visual impairment, only some children mentioning difficulties are affected by visual impairment, but all students with eyeglasses do mention such difficulties. Students in the higher socio-economic quintiles and in urban areas are more likely to have eyeglasses, suggesting that the needs

of children in poorer areas and from households in poverty are not being met. In addition, the likelihood of having eyeglasses is not affected by eye screening programs in schools, suggesting that only providing referrals may not be effective.

CHARACTERISTICS OF SUCCESSFUL SCHOOL EYE HEALTH PROGRAMS

- The low coverage of school eye health programs in PASEC countries in francophone Africa is symptomatic of a broader problem in much of sub-Saharan Africa. Yet experiences are available to suggest that countries at various income levels can implement national school eye health programs. Case studies for a low income county (Liberia) and a middle income county (Botswana), suggest how national school eye health programs can be successfully implemented.

- Guiding principles for school eye health programs emphasize (1) engagement of school leadership and teachers, (2) active collaboration between ministries of health and education, (3) integration of inclusive education and school eye health into the Ministries, (4) an educational component for teachers and parents on eye health and treatment, and (5) referral systems to connect children to advanced care. It is important to stress the active involvement of parents and other family members who can play a role in ensuring appropriate usage of of glasses obtained through school eye health programs.

- In practice, school eye health programs include three main activities: (1) School-based vision screening which can safely and effectively be done by teachers with minimal training; (2) School-based eye exams and referrals for more serious conditions; and (3) Eyeglasses delivery.

- Among children with visual impairment, over 80 percent of those needing glasses can normally have their vision corrected with ready-made or ready-to-clip glasses within a matter of minutes. For children with more complex prescriptions customized eyeglasses need to be procured and provided.

COST OF SCHOOL EYE HEALTH PROGRAMS

- Several impact evaluations suggest that the benefits from school eye health programs can be large. Simply screening children for visual impairment and providing pairs of eyeglasses to the children who need them can make major differences, including for learning.

- A survey of some of the largest non-governmental organizations implementing school eye health programs (with several organizations implementing programs serving more than one million children) suggests that school eye health programs are relatively cheap to administer.

- Discounting outliers, just under six percent of children screened require eye glasses across programs, but with differences between programs. Among these children, discounting for outliers, about nine in ten children who need eyeglasses receive them. This suggests that the programs are effective at providing glasses to those who need them. Among children who need to be referred for more advanced care, about half of the children receive such care.

- Screening in school is typically done by teachers, nurses, or both, but in some cases screening is performed by other individuals (typically eye care professionals). Training length for teachers or nurses to be able to screen students in school typically takes a few hours, but there are large variations between programs. Training costs typically range from US$20 to US$100 per teacher or nurse trained, again with differences due in part to differences in training scope and length.

- In schools, screening children takes on average just under two hours per batch of 50 children –or less than 2.5 minutes per child. In most cases, screenings take place during classes, although in some cases they take place before school or during breaks. Most programs do not provide monetary incentives for teachers or nurses to conduct the screenings. The cost of screening materials are typically at US$10-US$20. Costs at the school level are difficult to assess, but typically range from US$60 to US$300 according to survey responses from NGOs.

- Most follow up care is provided through visits of eye professionals to schools, but reliance on the private sector or health facilities is also observed. The cost per child of follow-up care is in most cases low as well. Most children who need glasses get customized glasses at a cost per pair ranging from US$4.5 to US$ 20.5. Many NGOs again pay for this cost, but in some cases parents or the government contribute. The costs of providing drops for children who need them are also low, but the cost of other treatments are higher, often above $100.

- Overall, these results suggest that the cost of school eye health programs are relatively low and should be affordable for many governments. Implementing school eye health programs at scale should be a priority for ensuring that education systems are inclusive.

- As an example, building on initial donor support, the Liberian Ministry of Education has committed to incorporating school eye health in their next national education sector plan launching in 2021. An initial step was taken in 2018 when the Ministry of Education validated its first school health policy, which includes eye health. Beginning in 2021, the Ministry of Education will be allocating a line item in their budget for the ongoing operational expenses associated with school eye health –as a Global Partnership for Education country this presents an opportunity for development partners to support this component of the government's school health agenda.

IMPROVING DATA AVAILABILITY

- The note makes use of multiple data sources, including census, household survey, and student assessment data, as well as programmatic data from organizations implementing school eye health programs. Yet strong data limitations persist in many counties. Even if the number of countries using Washington Group questions in household surveys and censuses is increasing, this is still not the case in many countries. Student assessment data may include proxies for disabilities, but they rarely specifically ask about disabilities in developing counties. Information on disabilities from Education Management Information Systems (EMIS) are also often lacking, as are detailed data on the cost and returns to interventions. To better serve children with visual impairment and other children with disabilities, efforts need to be undertaken towards stronger data collection.

INTRODUCTION

Estimates suggest that globally, 2.2 billion people of all ages may have vision impairment. Most cases of vision impairment (92 percent) are caused by uncorrected refractive error which can be easily corrected with a pair of eyeglasses (on common causes of visual impairment, see Box 1). Among those, at least one billion people suffer from moderate or severe distance vision impairment or blindness that could have been prevented or has yet to be addressed (WHO, 2019). In all regions in the world, myopia is the most common type of refractive error in children. Estimates suggest that 312 million children suffer from myopia (Rudnicka et al. 2016).

Myopia can affect children as young as six years of age, but is commonly diagnosed between eight and twelve years of age and may worsen during teenage years. With this condition, children see nearby objects clearly, but objects farther way, such as a classroom blackboard, are blurry. The prevalence of myopia is rapidly increasing, due in part to close work such as reading and a decrease in children's exposure to bright light (Dolgin, 2015).

Over the last 40 years, many East Asian countries have seen myopia rates double and even triple (Morgan et al., 2012). In East and West Africa, where access to high quality eye care is limited, myopia prevalence could increase sevenfold and fivefold, respectively, from 2000 to 2050. If current trends continue, about half of the world's population, or 4.8 billion people, could have myopia by 2050 (Holden et al., 2016).

BOX 1: TYPES AND CAUSES OF VISUAL IMPAIRMENT

The World Report on Vision (WHO, 2019) identifies seven common eye conditions that can cause vision impairment including blindness. For children, refractive errors and especially myopia, are common.

1. **Age-related macular degeneration:** Damage to the central part of the retina responsible for detailed vision leads to dark patches, shadows or distortion of the central vision. The risk of developing macular degeneration increases with age.

2. **Cataract:** Cloudiness in the lens of the eye, leading to increasingly blurred vision. The risk of developing cataract increases with age.

3. **Corneal opacity:** A group of conditions causing the cornea to become scarred or cloudy. Opacity is most commonly caused by injury, infection or vitamin A deficiency in children.

4. **Diabetic retinopathy:** Damage to blood vessels in the retina which become leaky or blocked. Vision loss most commonly occurs due to swelling in the central part of the retina which can lead to vision impairment. Abnormal blood vessels can also grow from the retina, which can bleed or cause scarring of the retina and blindness.

5. **Glaucoma:** Progressive damage to the optic nerve. Initially, loss of vision occurs in the periphery and can progress to severe vision impairment (known as open angle glaucoma, the most common type).

6. **Refractive error:** Due to an abnormal shape or length of the eye ball; light does not focus on the retina resulting in blurred vision. There are several types of refractive error; those most commonly referred to are: (1) Myopia – difficulty seeing distant objects (near-sightedness); and (2) Presbyopia – difficulty seeing objects at near distance with increasing age (i.e. after 40 years of age).

7. **Trachoma:** Caused by a bacterial infection. After many years of repeated infections, the eyelashes can turn inwards (trichiasis), which can lead to corneal scarring and, in some cases, blindness.

Source: WHO (2019).

Among children, visual impairment is one of the most common forms of disability. According to the American Optometric Association, during the formative first 12 years of a child's life, an estimated 80 percent of all learning occurs through vision, in activities such as looking at blackboards, reading books and viewing other educational materials. Children with visual impairment who lack access to vision correction are often at a disadvantage in terms of school enrollment, educational attainment, and learning. When visual impairment is severe, children without access to correction may never enroll in school or might drop out. But even when children remain in school, visual impairment may contribute to lack of learning. Vision impairment limits children's ability and their motivation to learn, and as a result, their academic performance often suffers (Zaba, 2011). In the United States, a large share of children aged 8-18 who are academically and behaviorally at risk have been found to have either undetected or untreated vision problems (Johnson and Zaba, 1995). Children with vision impairment not only underperform in school, but they may also be falsely identified as having a learning disability and be placed in specialized classes. In China, the Smart Focus Program found that students with vision impairment were frequently diverted in Grade 7 into an alternative education track providing less academically challenging vocational training. While these outcomes are not uncommon for children with vision impairment in countries that offer such alternative tracks at the secondary level, in countries without alternative education tracks, children may simply drop out.

One of the most straightforward interventions to tackle visual impairment is for teachers to be trained to conduct vision screenings and comprehensive eye examinations and eyeglasses provided on-site in schools to the children who need them. While this does not solve all the issues (some forms of visual impairment are too severe to be remedied through eyeglasses), the majority of vision impairment in children can be easily corrected with a pair of glasses and school eye health programs can go a long way in ensuring that children with visual impairment have the same educational opportunities as other children. There is strong evidence linking the adoption of corrective measures for vision impairment with a positive impact on academic achievement (Kovarski et al. 2015). A cluster randomized controlled trial conducted in China suggested that providing glasses to primary school students who needed them resulted in an increase in math test scores by 0.11 standard deviation (Ma et al., 2014). This impact increased when teachers used the blackboard more in the classroom. Similarly, analysis looking at the effect of providing free vision exams and glasses to primary school children in the United States found improvements in math and reading skills in Grade 5, although some effects faded over time (Glewwe et al., 2018).

Evidence also suggests potential positive spillover effects for children in the same classroom apart from those who have had their vision corrected. Various factors could explain this effect: the class may be benefiting from joint attention and joint referencing; a teacher may be devoting less time to assisting children with poor vision; and children with corrected vision may be less reliant on their peers for help, thus allowing all children to focus on their assignments (Glewwe et al., 2018). School-based interventions have also been proven to be cost-effective for identifying children with vision problems (Frick et al., 2009). Appropriately trained teachers can safely and accurately identify children with vision problems.

As part of a broader work program at the World Bank making the case for investments towards inclusive education (see Box 2 and Annex 1), this note looks at the potential impact of exclusion related to visual impairment on educational outcomes for children, the types of school eye health programs that can be implemented, the benefits of such programs, and their cost. The note is structured as follows. The first few sections document statistical gaps in educational attainment and literacy between children without any disability and children with visual impairment. Since school eye health programs are typically implemented at the primary level, the focus is on three indicators: primary education completion, the likelihood of ever enrolling in school, and (subjectively declared) literacy. In each case, the analysis relies on census data (see Annex 2 on the advantages and limits of various data sources). While census data often underestimate the extent of disabilities and may thereby capture for the most part severe disabilities, they are still useful given their large size, including to look at trends over time in educational outcomes for children with and without visual impairment.

Because of an emphasis on sub-Saharan Africa in the work program for which this note was prepared, a special focus is placed on countries from that region. The sample of countries for sub-Saharan Africa included in the analysis consists of 13 countries: Benin, Burkina Faso, Ethiopia, Ghana, Kenya, Liberia, Mali, Malawi, Mozambique, Senegal,

BOX 2: INCLUSIVE EDUCATION AND THE WORLD BANK

Inclusive education refers to a process of strengthening the capacity of education systems to reach out to all learners, including learners with disabilities (UNESCO, 2017). Increasing access and ensuring learning and achievement for all children is critical for human capital and economic growth. While the need for education systems to be inclusive has long been recognized, 258 million children today, including many children with disabilities, remain out of school (UNICEF, 2019). In addition, many children from disadvantaged groups do not learn enough while in school (World Bank, 2018, 2019).

At the World Bank, inclusion is a central feature of analytical and operational work in support of developing countries' education systems. In 2018 at the Global Disability Summit, the World Bank announced a set of ten commitments to accelerate global action for disability-inclusive development in key areas such as education, digital development, data collection, gender, post-disaster reconstruction, transport, private sector investments, and social protection. In 2019, the World Bank launched an Inclusive Education Initiative is to accelerate action by countries and support their efforts in making education more inclusive. The initiative will work at both the global and country levels to help stakeholders and governments mobilize financing and develop programs that ensure inclusive education.

South Africa, South Sudan, and Zambia. In addition, analysis is carried for another set of eight countries: Bangladesh, Cambodia, Costa Rica, Dominican Republic, Indonesia, Mexico, Peru, and Vietnam. The choice of those countries is driven by data availability issues. Most of the countries have made samples of their censuses available through IPUMS (Integrated Public Use Microdata Series), and for some other countries, data were available through dialogue between the World Bank and National Statistical Offices. On purpose, the sample consists only of developing countries, with both low-income and middle-income countries included in the analysis.

It should be noted that the analysis may not fully reflect today's conditions, since on average the censuses used are about 10 years old. Unfortunately, because censuses tend to be implemented only every 10 years, with a few more years required before census samples are made available publicly, these are the most recent data sources that can be used for that part of the analysis. Still, it likely that conditions in many of these countries have not changed dramatically for children with visual impairment more recently.

Apart from documenting statistical gaps in educational attainment and literacy between children without any disability and children with visual impairment, census data are also used to measure through regression analysis the potential impact at the margin of exclusion related to visual impairment on education outcomes for children, something that is again more difficult to do with household and other surveys given limited sample sizes (too few observations for children with visual impairment).

Next, the focus shifts to gaps in learning between students with visual impairment and children without disabilities based on student assessment data. The analysis relies on data from PASEC (*Programme d'analyse des systèmes éducatifs de la Confemen*) for ten Francophone countries: Benin, Burkina Faso, Burundi, Cameroun, Congo (Republic of), Cote d'Ivoire, Niger, Senegal, Chad, and finally Togo. The data are from 2014 (data from the 2019 round of PASEC are not yet available). The analysis suggests that visual impairment, when not corrected, contributes to lower performance in school. It also suggests that screening for visual impairment in schools is very rare, and even when it happens, it does not necessarily increase in a statistically significant way the likelihood that students will have eyeglasses.

The last part of the note shows how school eye health programs and especially the provision of eyeglasses can make a difference, and how such programs can be implemented. The costs of implementing school eye health programs are estimated based on data collected through some of the main non-governmental organizations implementing such programs in sub-Saharan Africa and elsewhere. The analysis suggests that these costs should be affordable for education systems. Simply stated, school eye health programs should be a priority for achieving inclusive education.

PRIMARY EDUCATION COMPLETION

How large are gaps in educational outcomes between children with visual impairment and children without any disability? To answer this question, the first part of this note is based on census data which have the advantage of having large sample sizes. The analysis uses the same format as in Male and Wodon (2017) and Wodon et al. (2018), but the difference is that instead of comparing all children with a disability to children without a disability, the focus is on a comparison between children with visual impairment and children without any disability. In addition, the analysis is done separately for countries in sub-Saharan Africa (13 countries) and in other countries (eight countries).

Figure 1 provides primary completion rates for individuals aged 16 to 35. This age bracket is used to show trends in completion rates over time, considering not only children in school today, but also adults who went through the education system over the last two decades or so. Completion rates for children aged 12-15 are not shown because they tend to be too low versus expected lifetime completion rates. This is because some children enter primary school late or repeat grades, which leads them to complete primary school well beyond the normal completion age. Note that data from censuses are less recent than data from household surveys or education management information systems, hence changes that may have taken place in recent years are not accounted for. Yet it is unlikely under current circumstances that such changes would reverse the long-term trends observed in the census data.

Four groups are considered: boys with no disability, girls with no disability, boys with visual impairment, and girls with visual impairment. The statistics in Figure 1 are average completion rates across countries for individuals of the corresponding age bracket at the time of the census (three-year moving averages are used to better capture underlying trends and avoid jumps in the data when too few observations are available for individuals with disability). As expected, given efforts over the last two decades to enable girls to catch up with boys in terms of educational attainment, the gap between boys and girls has been dramatically reduced over time (this is less the case at the secondary level where girls still lag behind boys in many sub-Saharan African countries due in part to high prevalence of child marriage and early childbearing; see Wodon, Montenegro et al., 2018).

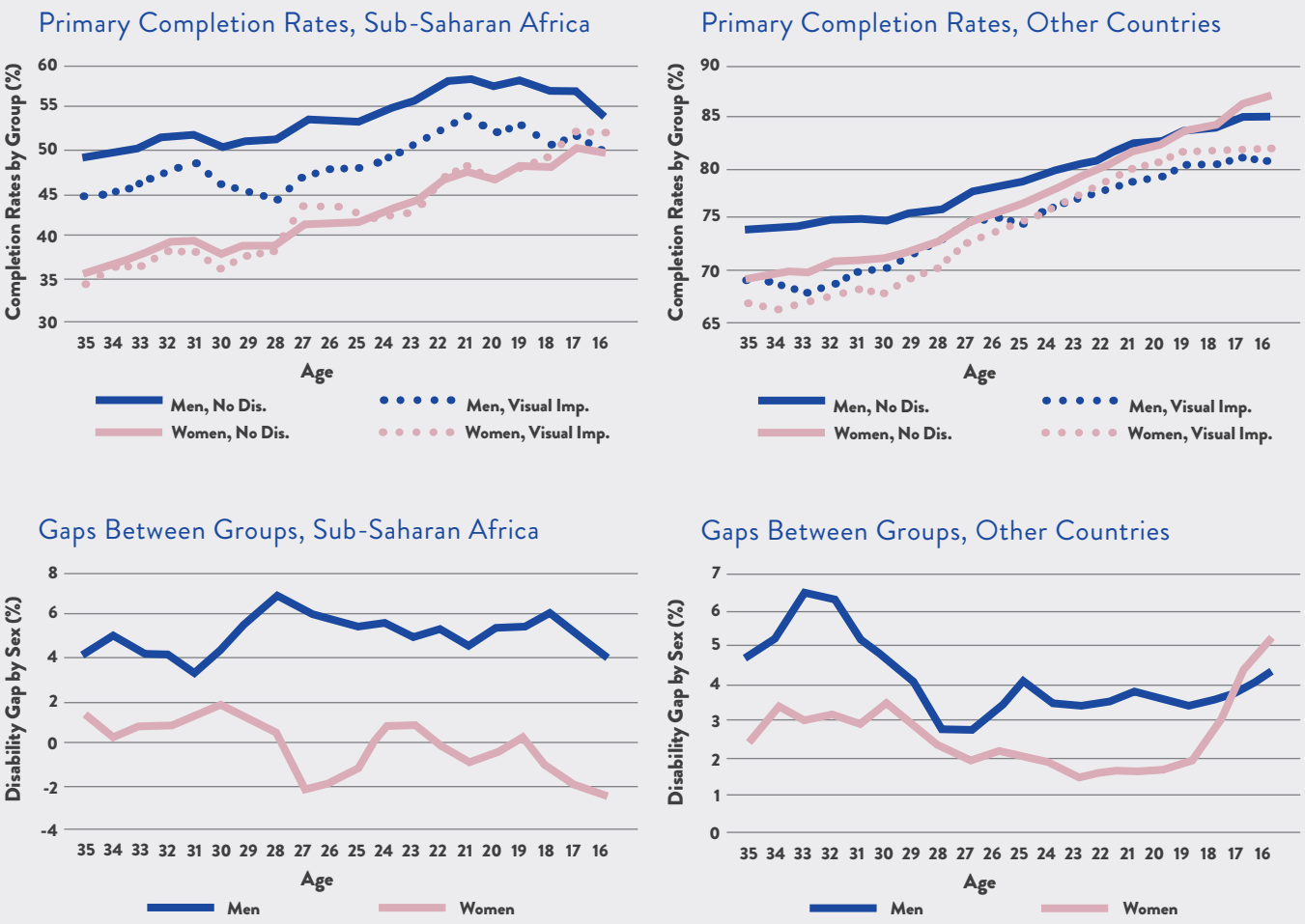
Disability gaps in educational attainment for older individuals could be underestimated. This is because older individuals may have suffered from a disability after leaving school. This would tend to reduce the measures of disability gaps observed for older individuals. To reduce the risk of bias, comparisons are made until age 35 because until that age, disability rates tend not to increase as much as they do at a later age.

In Male and Wodon (2017) and Wodon et al. (2018), when considering all types of disabilities together, the gaps in primary completion rates tended to increase over time versus children without disabilities, meaning that the gaps were larger for younger age groups. The diagnostic here is a bit different in terms of trends over time in gaps associated with visual impairment, perhaps because visual impairment tends to have smaller negative effects on educational outcomes than more severe types of disabilities (this is suggested below when looking at the marginal impacts of various types of disabilities). For both children without disabilities and children with visual impairment, completion rates at the primary level increased substantially. For children without disabilities, the gain is at 5.1 percentage points for boys and 14.1 points for girls over the time span separating the youngest and oldest groups in sub-Saharan countries. In the other countries, the gains are at 11.1 points and 18.0 points respectively for the same groups. Girls have essentially caught up with boys in terms of primary completion.

Similar gains are observed for children with visual impairment, at 5.2 percentage points for boys and 17.9 points for girls in sub-Saharan African countries, and at respectively 11.6 and 15.2 points in the other countries. Note again that the larger gains for girls are observed for both children with and without disabilities, as girls often caught up with boys in terms of primary completion rates. As a result of these trends, the absolute gap in primary completion rates between children with visual impairment and children without disabilities has remained of a similar order of magnitude over time. This is also visualized in Figure 1. While there are ups and downs in the gaps, there is no definitive trend. In one case (girls in sub-Saharan African countries) the gap has the unexpected sign in recent years. Overall though, it seems fair to conclude that gaps in primary completion rates remain between the two groups of children and are of the order of up to four percentage points in the most recent years.

Although there are differences between countries and by gender, overall gaps in primary completion rates between children with visual impairment and children without disabilities have remained persistent, and are of the order of up to four percentage points.

Figure 1: Primary Completion Rates by Age and Group and Gap Between Groups (%)



Source: Authors.

EVER ENROLLING IN SCHOOL

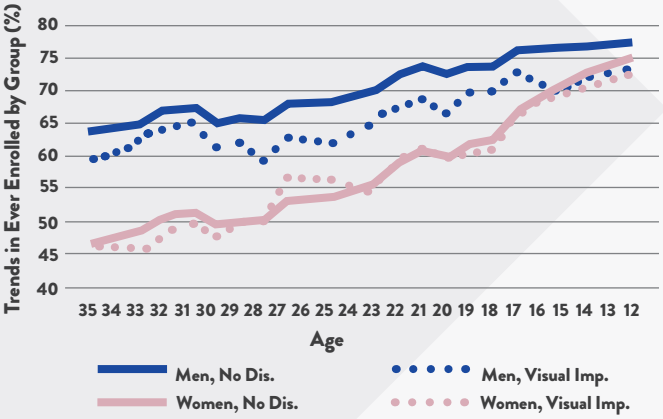
The gaps in primary school completion between children with visual impairment and children without disabilities may be due in part to the fact that children with visual impairment are at a higher risk of dropping out before completing the cycle than children without disabilities. However, some children with visual impairment may never even get to enroll in school. Indeed, the disadvantages faced by these children may start in early childhood. Figure 2 provides data on the share of children who ever enrolled in school. Statistics are computed for individuals aged 12 to 35. Statistics for individuals who are younger but in age of primary school are not shown because some of them could still enroll at a later age. This is less likely for children aged 12 and over if they have not yet enrolled by then.

Patterns observed in Figure 2 for ever enrolling in school are similar to those observed in Figure 1 for primary completion. In sub-Saharan Africa for example, for children without disabilities, the likelihood to ever enroll in school increased by 13.6 points for boys and 28.5 points for girls over the time separating the youngest and oldest age groups. Girls caught up with boys, as is the case for primary completion. Similar gains are observed over the period for children with visual impairment, at 14.0 points for boys and 26.3 points for girls. The story is similar for other countries, although with smaller shares of children never enrolling. Absolute gaps in the likelihood of ever enrolling in school between children with visual impairment and those without disabilities have broadly remained stable over time, as shown in Figure 2. At the time of the census, the absolute gaps associated with visual impairment were again at about four percentage points across regions and gender.

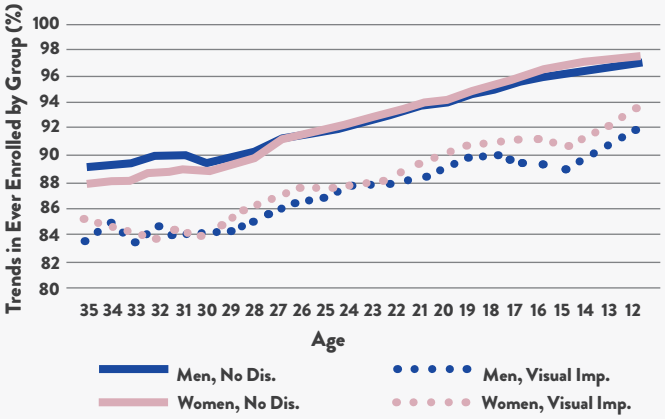
Some children with visual impairment are never enrolled in school. At the time of the latest census data, among children aged 12, the likelihood of having ever enrolled in school was about four percentage points lower for children with visual impairment versus children without disabilities. The disability gap has remained fairly stable over time.

Figure 2: Share of Children Ever Enrolling by Age and Group and Gap Between Groups (%)

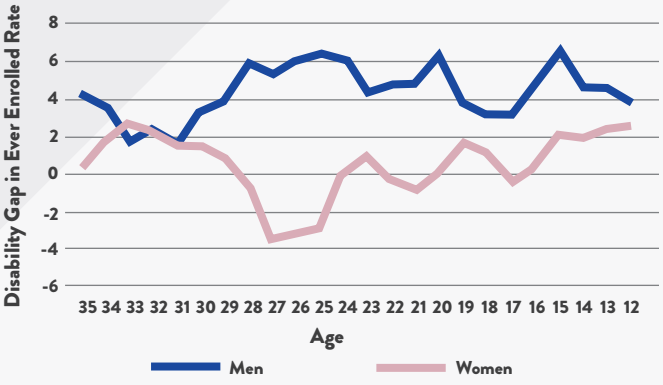
Share Ever Enrolling, Sub-Saharan Africa



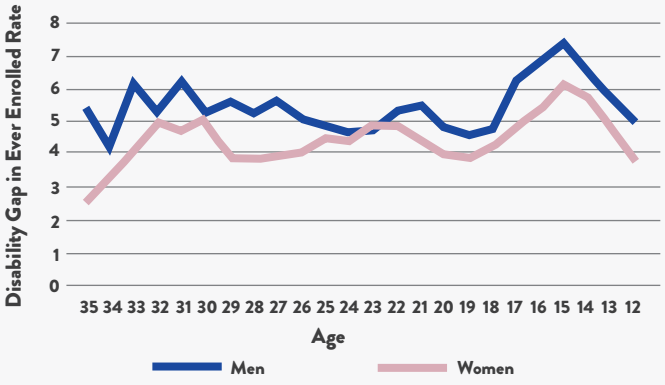
Share Ever Enrolling, Other Countries



Gaps Between Groups, Sub-Saharan Africa



Gaps Between Groups, Other Countries



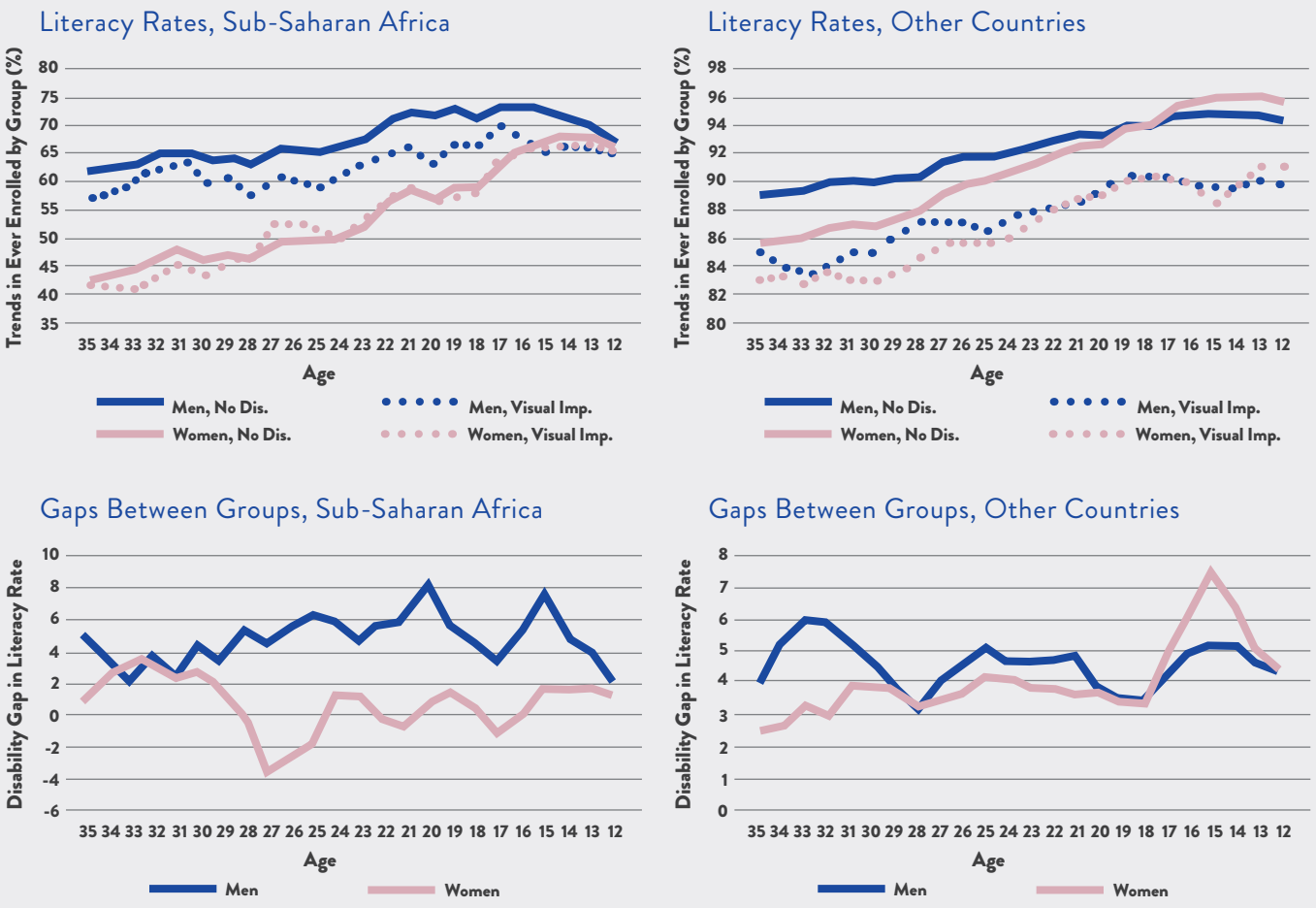
Source: Authors.

LITERACY

The last indicator considered for the analysis of trends over time is literacy, as declared subjectively by census respondents for their household members. While subjective perceptions of literacy may not necessarily indicate than an individual is indeed literate as a reading and comprehension test would, the data are still useful to conduct a tentative assessment of differences in literacy rates between individuals with and without disabilities. Figure 3 provides the trends in literacy over time by age groups, considering individuals from 12 to 35 years of age. In sub-Saharan African countries, for children without disabilities, the likelihood of literacy increased by 5.9 points for boys and 23.7 points for girls over the period separating the youngest and oldest age groups. As expected, girls caught up with boys. The gains for children with visual impairment are once again similar at 8.7 points for boys and 23.4 points for girls. Although levels are different in other countries, the broad trends in terms of gains are again similar for both groups of children. As shown in Figure 3, this again implies that broadly speaking, the disability gaps have persisted, with one more time an order of magnitude of four percentage points, although this differs depending on the regions and gender being considered.

The last indicator considered for the analysis of trends over time is literacy. As for the likelihood of ever enrolling in school and primary school completion, disability gaps for literacy have persisted over time, with again an order of magnitude of about four percentage points.

Figure 3: Literacy Rates by Age and Group and Gap Between Groups (%)



Source: Authors.

MARGINAL IMPACTS FOR ENROLLMENT, ATTAINMENT, AND LITERACY

The data presented in the previous sections suggest persistent gaps in educational attainment and literacy between children with visual impairment and without disabilities over time. Table 1 summarizes the key estimates for the youngest appropriate age cohorts for each of the three indicators. The last row in each of the two parts of the Table displays the disability gaps for the indicators for both boys and girls, depending on the set of countries considered. These are the average values of the disability gaps observed across the two sets of countries for which estimations are carried using census data. For example, on average across the four samples (boys and girls in the two sets of countries), the likelihood of literacy is almost five percentage points lower for children with visual impairment versus children with no disabilities. Similar gaps are observed for the likelihood of ever enrolling in school and primary school completion, although for that last indicator there is no gap for girls in sub-Saharan countries.

Are these gaps the result of exclusion associated with visual impairment, or do they result from other characteristics of children that could be correlated with disabilities? To assess the likely impact of exclusion related to visual impairment on educational attainment and literacy after controlling for other factors that may affect education outcomes, regression analysis is needed. The term "impact" is used for simplicity (see Box 3 on what is meant by "impact"). The regression analysis for the marginal impacts of exclusion related to visual impairment considers the same three education outcomes, but with slightly different age groups mostly for sample size reasons: (1) whether a child ever enrolled in school (the sample for the regression analysis consists of children ages 6 to 11 to account for conditions at the time of the implementation of the census); (2) whether a child completes primary education (sample of children 15 to 18 years old); and (3) whether a child is considered by parents as literate (sample of children ages 15-18). To account for children who may start school late or repeat grades, for each regression the sample of children is a bit older than the expected age to complete a level of schooling or be literate.

While census data have limits in terms of the variables that can be used as controls, a number of important variables known to affect educational outcomes are available in the data. As in Male and Wodon (2017) and Wodon et al. (2018), the regression analysis includes the following variables as controls (with minor variations between countries): the sex of the child; whether the child has a birth certificate; whether the child has a disability and the type of disability observed (in addition, an interaction effect is included to assess if a disability has a differential impact for boys or girls); whether the child is an orphan on the side of the mother, the father, or both; whether the child resides in an urban or rural area; the geographic area in which the child resides (these areas clearly differ between countries); the mother tongue of the child; the quintile of wealth of the households to which the child belongs; the religion of the child; the size of the household in which the child resides; the sex of the household head; a number of characteristics for the household head (age according to 10 years intervals, education level, and type of work); the same characteristics for the spouse of the household head; and the leave-out-mean of the dependent variable. This leave-out-mean variable is computed among all other children in the area where a child lives and is meant to capture local conditions that affect education outcomes for children in disaggregated areas where children live.

Table 1: Disability Gaps for the Most Recent Appropriate Age Cohorts (%)

Sample: 13 sub-Saharan African Countries and 8 other countries.

	Ever Enrolled (12 years old)		Primary Completed (16 years old)		Literacy (12 years old)	
	Boys	Girls	Boys	Girls	Boys	Girls
	Sub-Saharan African countries					
No disability	76.0	74.4	50.3	48.8	62.2	62.1
Visual impairment	70.6	69.8	46.2	49.3	56.8	60.1
Gap	5.4	4.6	4.1	-0.5	5.4	2.1
	Other countries					
No disability	97.0	97.6	85.2	87.9	93.0	94.4
Visual impairment	91.2	92.9	79.8	81.9	88.3	88.3
Gap	5.8	4.7	5.3	6.0	4.7	6.1

Source: Authors' estimations.

BOX 3: WHAT DO WE MEAN BY "IMPACTS" OF EXCLUSION RELATED TO DISABILITIES?

This note provides estimates of the impact of exclusion associated with a disability on education outcomes for children with visual impairment in comparison to children without a disability but with otherwise similar characteristics. The term "impact" is used for simplicity, but one must be careful about not necessarily inferring causality. Estimates of impacts are obtained through regression analysis to control for other variables that may affect education outcomes. What is measured are statistical associations, and not necessarily impacts as could be observed for example with randomized control trials. Since a disability cannot be randomized, we must rely on regression analysis to estimate likely impacts, but there is always a risk of bias in the measures of the impacts on outcomes of exclusion associated with a disability. At the same time, the fact that we observe strong effects that are robust to various specifications does suggest, as expected, that exclusion related to disability is often strong.

Table 2 provides a summary of the results for the impacts associated with exclusion related to visual impairment as well as other types of disabilities. The interpretation of the marginal impacts is in percentage points. For sub-Saharan African countries, after controlling for other factors that may affect outcomes, the reductions at the margin for children with visual impairment in the probabilities of ever enrolling in school, completing primary school, and being literate are estimated at 5.0, 5.0, and 6.1 percentage points respectively (this is the interpretation of the values of 0.050, 0.050, and 0.061 in Table 2) in comparison to children with no disability. These estimates are of a similar order of magnitude to the statistical measures mentioned in the previous section for those educational outcomes, suggesting that most of the differences between children with visual impairment and children without disabilities are indeed associated with the disability status of the children as opposed to other variables that could be correlated with that status. For other countries, the effects are of a similar order of magnitude.

As mentioned earlier, there are differences in the impacts associated with different types of disabilities. For example, children with cognitive, psychosocial or multiple disabilities often fare worse than children with physical disabilities or children with visual impairment, but all children with disabilities tend to fare less well than children without disabilities. This is also shown in Table 2 which provides the marginal impacts in the regression analyses for different types of disabilities.

The reductions at the margin for children with visual impairment in the probabilities of ever enrolling in school, completing primary school, and being literate are estimated at 5.0 to 7.3 percentage points depending on the indicator and sample of countries.

Table 2: Marginal Impacts of Exclusion by Type of Disability on Educational Attainment and Literacy

Sample: : Average effects for 13 sub-Saharan African Countries and 8 other countries.

	Sub-Saharan African countries			Other countries		
	Ever Enrolled (6-11 years)	Primary Completed (15-18 years)	Literacy (15-18 years)	Ever Enrolled (6-11 years)	Primary Completed (15-18 years)	Literacy (15-18 years)
Visual impairment	-0.050	-0.050	-0.061	-0.055	-0.062	-0.073
Other disabilities						
Hearing	-0.069	-0.069	-0.109	-0.069	-0.202	-0.200
Speech	-0.184	-0.184	-0.211	-0.276	-0.147	-0.153
Mental	-0.197	-0.197	-0.330	-0.250	-0.293	-0.308
Physical	-0.089	-0.089	-0.060	-0.124	-0.111	-0.111
Multiple	-0.272	-0.272	-0.279	-0.254	-0.254	-0.254
Other	-0.097	-0.097	-0.106	-0.173	-0.068	-0.078

Source: Author's estimations.
Note: Average marginal effects (dF/dX) across countries – for virtually all countries, the marginal effects are statistically significant at the ten percent level.

To provide perspective, it is useful to compare the marginal impacts on education outcomes of exclusion related to visual impairment when those effects are statistically significant with the impact of other factors affecting those outcomes (this is not shown in Table 2 but based on the full regression results available from the authors). For example, in many sub-Saharan African countries, girls continue to have lower educational outcomes than boys, and the magnitude of the gender gaps is similar to that of the disability gaps. Being an orphan is also associated with a lower likelihood of completing various levels of schooling as well as being literate, with similar effects than exclusion related to visual impairment. There are also wealth effects at work, with children from better off households more likely to do well. When comparing children from the lowest quintile of wealth to those from the top quintile of wealth, marginal effects can be large, but again, socio-economic differences tend to have similar effects at the margin that exclusion related to visual impairment. Finally, there are also marginal effects on education outcomes associated with the education level of the household head and the location of the household, and these impacts are again similar to those associated with visual impairment even if differences between urban and rural areas can be substantial.

The marginal effects on education outcomes of exclusion related to visual impairment are of a similar order of magnitude to the effect of other child or household characteristics. For example, when statistically significant, the marginal effect of visual impairment is similar to that of the quintile of wealth of the households in which a child resides.

LEVELS OF VISUAL IMPAIRMENT

The analysis provided above shows that having a disability is associated with lower levels of enrollment in school, primary school completion, and literacy, but it does not provide information on the magnitude of the potential impacts for various levels of disability. For census datasets publicly available for developing countries (these were often implemented up to a decade ago on average), while many censuses only ask questions as to whether individuals have a disability or not, some ask questions about how severe the disability may be. In most cases, when information on severity is available, the questions ask only whether a disability is mild or severe. This is progressively changing as more countries adopt the Washington Group questions, but in the data used here, only in a few cases do questionnaires follow the Washington Group's recommendations. As noted in Annex 2, the Washington Group on Disability Statistics recommends to measure disabilities in censuses through six questions related to the following core functional domains: seeing, hearing, learning, walking, cognition (remembering or concentrating), self-care (washing all over or dressing), and communicating. For each question, individuals must report whether they have difficulties performing tasks. Four responses are suggested – the individual has no difficulty, some difficulty, a lot of difficulty, or no ability at all to perform the task. These questions help measure functionality at various levels, and may thereby detect disabilities that may be less severe or apparent.

Among the censuses used in this note, Senegal and Vietnam have adopted the Washington Group's questions, while several other countries have adopted questions that include levels of severity for disabilities, but not in the format recommended by the Washington Group. In Senegal, the questions are asked for difficulties seeing (even if wearing glasses), hearing (even when having an auditory devise), walking or climbing stairs, and remembering or concentrating, taking care of oneself/washing oneself, and communicating or being understood by others. In Vietnam, the questions are asked for difficulties seeing (even if wearing glasses), hearing, walking, and remembering or paying attention.

When levels of severity are available, it is feasible to compute prevalence statistics by level of severity. In the Senegal census for example, 0.50 percent of boys (0.50 percent for girls) of children of primary school age have some visual impairment according to parental responses (not including those with multiple disabilities). This is after accounting for the fact that some children may have glasses. That is, if the

glasses solve the difficulty, the children are not counted as having a disability. Of those, 0.27 percent of boys (0.26 percent of girls) have some difficulty, 0.12 percent of boys (0.12 percent of girls) have a lot of difficulty, and 0.10 percent of boys (0.12 percent of girls) are unable to perform the task. For children of secondary school age, the proportions are a bit higher, at 0.70 percent of boys having difficulties (0.43 percent with some difficulties, 0.16 percent with a lot of difficulties, and 0.11 percent unable to perform the task), with again similar values for girls (0.51 percent with some difficulties, 0.13 percent with a lot of difficulties, and 0.12 percent unable to perform the task, for a total of 0.76 percent). These proportions may be on the low side, but again they account for the fact that some children may have glasses, and in any case they give an indication of the prevalence of difficulties to see by level. The availability of these questions in the census also helps in assessing the potential impact of visual impairment or other disabilities on educational outcomes by level of severity.

When considering the potential impact of the level of difficulties on educational outcomes, clear differences emerge by level of difficulty, as shown in Table 3. In the Table, D1, D2, and D3 correspond to the three levels of difficulty in the Washington Group's questions (some levels of difficulty, a lot of difficulty, or unable to perform the task). In general (but not always), the marginal effects are larger when the level of difficulty is higher as expected. This is the case not only for visual impairment, but also for other types of disabilities. Note that in some cases, a statistically not significant effect may be observed simply because even when using a census sample, the number of observations with severe difficulties in any functional area may be small. More than any single estimate, it is best to consider potential impacts through the overall pattern that emerges from the various estimates by severity and type of disability.

Table 3: Marginal Impacts of Exclusion by Level of Disability on Educational Attainment and Literacy

		Senegal 2010			Vietnam 2009		
		Ever Enrolled (6-11 years)	Primary Completed (15-18 years)	Literacy (15-18 years)	Ever Enrolled (6-11 years)	Primary Completed (15-18 years)	Literacy (15-18 years)
Visual impairment	D1	NS	0.113	0.126	-0.006	NS	-0.009
	D2	-0.073	NS	NS	-0.086	-0.138	-0.071
	D3	-0.061	NS	NS	-0.513	-0.467	-0.459
Other disabilities							
Hearing	D1	NS	-0.08	NS	-0.028	-0.079	-0.035
	D2	-0.162	NS	-0.211	-0.141	-0.332	-0.19
	D3	-0.383	NS	-0.446	-0.541	-0.806	-0.577
Mental	D1	-0.052	-0.12	NS	-0.098	-0.425	-0.266
	D2	NS	NS	NS	-0.498	-0.811	-0.686
	D3	NS	-0.426	-0.526	-0.827	-0.93	-0.926
Physical	D1	-0.062	NS	NS	-0.033	-0.052	-0.025
	D2	-0.198	-0.139	NS	-0.162	-0.147	-0.073
	D3	-0.107	NS	NS	-0.62	-0.672	-0.494
Speech	D1	-0.049	-0.13	-0.136	NA	NA	NA
	D2	-0.16	-0.256	-0.287	NA	NA	NA
	D3	-0.35	-0.381	-0.418	NA	NA	NA
Multiple	D1	-0.149	-0.173	-0.143	-0.252	-0.454	-0.341
	D2	-0.335	-0.345	-0.359	-0.627	-0.819	-0.732
	D3	-0.351	-0.326	-0.398	-0.927	-0.94	-0.942

Source: Author's estimations.
Note: Average marginal effects (dF/dX) across countries – for virtually all countries, the marginal effects are statistically significant at the ten percent level.

STUDENT PERFORMANCE IN SCHOOL

Apart from being less likely to ever go to school, complete their primary education, and being literate, children with visual impairment who lack access to correction tend to perform less well on standardized student assessments when they are in school. In this section, the focus is on analysis of PASEC data in which questions about children's difficulties seeing in the classroom can be used as a proxy for visual impairment (see Box 4 on PASEC data). The analysis is reproduced and extended from Wodon et al. (2018). Specifically, students in grade 6 of primary school in the ten participating countries are asked whether they have difficulties seeing while in the classroom. A similar question is asked about hearing difficulties. These are imperfect proxies for disability because in large classrooms other factors apart from disabilities (for example being far away from the teacher at the back of a large classroom) may lead to difficulties seeing or hearing. The share of students who declare they have difficulty seeing clearly or hearing is too large to represent only children with disabilities, and other types ofdisabilities are not represented by these two simple questions. Still, there is a clear link with disabilities since all children with eyeglasses declare having difficulty seeing clearly.

Table 4 provides estimates of the average scores of students with and without difficulty seeing on PASEC for both mathematics and French. Note that what is measured is the mastery of core literacy and numeracy skills, not the mastery of specific aspects of the curriculum in each country. A score of 500 indicates that a student is performing at the average level in the sample for the 10 countries. The estimates suggest that there are systematic differences in test scores for both mathematics and reading/language between children with visual impairment and other children. The average differences tend to be systematic. Chad is the only exception among the ten countries with a surprising reverse effect, although for Togo the expected sign is also not observed for the mathematics test.

Table 4: Average Student Performance on PASEC in Grade 6 by Visual Impairment (Mean Score at 500)

	Reading Test			Mathematics Test		
	No Seeing Difficulties	Seeing Difficulties	Difference	No Seeing Difficulties	Seeing Difficulties	Difference
Average student score						
Benin	531.8	493.5	38.3	503.5	473.2	30.3
Burkina Faso	535.4	520.8	14.6	541.2	535.5	5.7
Burundi	530.0	517.8	12.2	598.8	584.0	14.8
Cameroun	523.0	501.1	21.9	495.3	468.6	26.7
Congo (Republic)	507.6	495.3	12.3	485.0	474.7	10.3
Cote d'Ivoire	525.8	493.4	32.4	483.0	455.2	27.8
Niger	406.8	401.8	5.0	409.1	403.4	5.7
Senegal	563.0	506.4	56.6	560.3	507.8	52.5
Chad	429.6	452.1	-22.5	448.0	472.1	-24.1
Togo	495.8	506.1	-10.3	519.0	527.0	-8.0
Total	509.7	497.4	12.3	505.9	498.6	7.3
Proficiency level (%)						
Level 0	6.7	5.9	0.8	24.7	26.8	-2.1
Level 1	19.7	20.8	-1.1	32.2	32.5	-0.3
Level 2	26.5	33.1	-6.6	28.1	28.2	-0.1
Level 3	27.6	27.9	-0.3	15.0	12.5	2.5
Level 4	19.6	12.3	7.3	-	-	-
All	100.0	100.0	-	100.0	100.0	-

Source: Author's estimations.

BOX 4: INTERPRETING PASEC SCORES

The 2014 PASEC assessment was implemented in grades 2 and 6 in ten countries: Benin, Burkina Faso, Burundi, Cameroon, Chad, Cote d'Ivoire, Congo, Niger, Senegal, and Togo. the focus in this note is on student performance in grade 6, although data on whether students benefit from eye screening are provided for students in both grades. For grade 6, the test aims to evaluate student's ability to understand, learn and adapt their knowledge to situations encountered in daily life. The language test assesses pupils' comprehension of informative texts and documents, including the ability to extract information from literary texts. For mathematics, the test considers the ability of students to assimilate concepts and apply them in diverse situations.

Scores for both tests are scaled so that the international average is 500 points and the standard deviation is 100 points when weighting all countries equally. This implies that two in three pupils are in a range of 400 points to 600 points, and most students are in the 250 to 750 range. An average score of 500 does not mean however that a student is doing well as many students do not achieve language and mathematics competency.

To assess how well students are doing versus how they should be doing, students can be categorized by proficiency levels. Pupils below Level 1 are not able to correctly answer a majority of the most basic test questions; these pupils do not display the competencies measured by the test. Students are then categorized according to three other levels (levels 1 to 3 for mathematics, levels 1 to 4 in reading) with increasing degrees of mastery. A sufficient level of proficiency versus the test's standards is achieved by students performing at levels 3 and 4 for reading, and levels 2 and 3 for mathematics.

Source: CONFEMEN (2015).

Another way to look at the data is to group students by levels of proficiency. As noted in Box 4, students at level 0 do not display any of the competencies measured by the test, while students in levels 1 to 3 for mathematics, and 1 to 4 for reading display increasing levels of competencies. To achieve sufficient proficiency, a student must be at level 3 or 4 in reading, and level 2 or 3 in mathematics. As shown in Table 5, many students do not achieve sufficient levels of proficiency, and students with seeing difficulties tend to do more poorly in terms of the degree of competency that they display. On average across the 10 countries, a larger share of students with seeing difficulties tends to be clustered in low proficiency levels as compared to students without hearing or seeing difficulties.

As done for educational attainment and literacy, regression analysis can be used to test whether controlling for other factors, hearing and seeing difficulties lead to lower performance on PASEC. The analysis controls for a wide range of student, household, teacher and school characteristics that may affect test scores. The results are provided in Table 5. Hearing and seeing difficulties are associated with reductions in student performance after controlling for other factors. The language of "potential impacts" is used since causality cannot be inferred from these simple regressions. Potential impacts for the full sample are not necessarily a weighted combination of the impacts for girls and boys since the regressions are estimated separately. Recall that the average score for students is set at 500. Therefore, a reduction of, say, 15 points is equivalent a loss of about 3 percent versus the average score after controlling for other factors affecting student performance. The potential impacts are slightly larger for hearing than for seeing difficulties, and still larger when students have both difficulties as opposed to only one of them. Potential impacts tend to be similar in magnitude for boys and girls and for mathematics and reading.

To provide some perspective, potential impacts associated with selected other variables are also included in Table 5. When an independent variable does not have a statistically significant coefficient at least at the 10 percent level, this is denoted by NS in the Table. The impacts for visual and hearing impairment tend to be larger in magnitude than the benefits from going to a preschool or having textbooks at home. They are of a similar order of magnitude to the potential impacts observed for (among others) having homework to do and belonging to a higher socio-economic quintile of household well-being. Potential impacts from visual and hearing impairment tend to be smaller than those observed (again among others) from female teachers and an urban location for the school.

Table 5: Potential Impact of Exclusion from Seeing Difficulties on Student Performance, Grade 6

Sample: 10 PASEC countries.

	Mathematics			Reading		
	All	Boys	Girls	All	Boys	Girls
			Proxies for disabilities			
Seeing difficulties	-8.0	-5.3	-6.4	-10.2	-9.8	-9.7
Hearing difficulties	-13.8	-13.4	-12.8	-15.2	-17.5	-12.7
Both hearing and seeing difficulties	-19.7	-17.0	-21.3	-22.0	-19.4	-24.6
			Selected other variables			
Tired in class	-5.1	-4.0	-5.8	-3.8		-5.6
Hungry in class	NS	NS	NS	4.6	4.0	5.4
Schooling in home language	20.0	20.1	17.1	19.0	19.0	17.7
Student has been to preschool	NS	NS	NS	6.0	3.6	8.4
Student has homework	11.9	12.7	10.8	13.7	13.0	14.8
Student has French textbook at home	12.5	13.3	11.7	9.0	10.2	7.7
Student has math textbook at home	5.4	NS	9.8	6.1	NS	10.0
Quintile 2 (vs. first quintile)	NS	NS	NS	4.6	4.2	5.2
Quintile 3 (vs. first quintile)	NS	NS	NS	9.3	10.8	7.7
Quintile 4 (vs. first quintile)	NS	NS	NS	8.6	9.9	7.3
Quintile 5 (vs. first quintile)	4.1	5.7	NS	16.5	19.0	14.7
Female teacher	17.9	19.4	16.3	19.7	20.3	18.9
School located in rural area	-13.2	-12.0	-14.8	-24.8	-23.9	-26.1
Occasional teacher absenteeism	-3.8	-4.5	NS	-3.8	-5.6	NS
Frequent teacher absenteeism	-4.8	-6.8	NS	-4.9	-7.5	NS

Source: Authors' estimation. NS means not statistically significant at the 10 percent level.
Note: estimates differ from Wodon et al. (2018) because additional correlates were included in the regressions.

SCHOOL EYE HEALTH PROGRAMS

The analysis so far has focused on disability gaps in educational outcomes between children with visual impairment and children with no disabilities. As discussed in Wodon et al. (2018), large gaps in educational outcomes between children with and without disabilities in sub-Saharan Africa call for stronger policies and interventions to achieve the target of inclusive education adopted under the Sustainable Development Goals. Such interventions are likely to have high returns. Indeed, analysis of earnings data from household surveys suggests that the returns to education for individuals with disabilities are large and similar in magnitude to those observed for individuals without disabilities. Investing in the education of children with disabilities is therefore not only the right thing to do, it is also a smart investment with high returns (see Box 5).

In the case of children with visual impairment, school eye health programs are very promising. 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. In 2017 the London School of Hygiene and Tropical Medicine, Sightsavers International, and the Brien Holden Vision Institute came together to draft the Standard School Eye Health Guidelines for Low and Middle Income Countries (London School of Hygiene and Tropical Medicine et al., 2017). The guiding principles emphasize (1) engagement of school leadership and teachers, (2) close collaboration between ministries of health and education, (3) integration of inclusive education and school eye health into the Ministries, (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, 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.

- **Basic Vision Screening in Schools:** In most cases, two teachers per school can be trained to conduct basic vision screenings for the 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 for eye conditions, 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 a recognized cadre of eye health professionals within the local health system, either public or private, who have the necessary competencies to refract children. According to the Standard School Eye Health Guidelines for Low and Middle Income Countries, eye examinations can either be conducted on-site in schools, or at an eye care facility participating in the program. 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 refraction[1]. 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 (London School of Hygiene and Tropical Medicine et al., 2017).

- **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. Ready-made and ready-to-clip glasses can be procured at low cost and address vision problems where no astigmatism is present, but where 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.

[1] This 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).

BOX 5: INVESTING IN EDUCATION FOR CHILDREN WITH DISABILITIES HAS HIGH RETURNS

There is a large body of literature on the potential impact of educational attainment on earnings. The benefits are typically measured through regression analysis whereby the potential effect on earnings of educational attainment and experience is estimated. Estimates of the potential returns to education for four African countries (Burkina Faso, The Gambia, Rwanda and Senegal) are provided by Wodon et al. (2018) for workers with disabilities as well as for all workers with positive earnings. Having a disability is associated with lower earnings after controlling for education, experience, sex, and location. But for both the full sample of workers with earnings and for workers with disabilities, the marginal gains in earnings associated with higher educational attainment tend to be large. For example, in Burkina Faso, workers with primary education tend to make 50 percent more than those with no education at all, and the gain is similar when looking only at workers with a disability. The analysis suggests that the economic benefits from investing in the education of children with disabilities are likely to be large when they reach adulthood, as is the case for investments in the education of children without a disability.

It is widely accepted that teachers can safely and effectively prescreen children for vision problems on-site in schools (they should though be granted the time needed for training). There is robust evidence indicating that teachers are able to accurately measure and correctly identify children with vision impairment (Paudel et al. 2016; De Fendi et al. 2008; Khandekar et al. 2009; Ostadi Moghaddam et al. 2012; Sharma et al. 2008; Wedner et al. 2000). In Cambodia, a program trained school teachers to screen 13,000 children. Rescreening with eye doctors conducted six months later showed that the teachers' prescreening for vision problems was 100 percent accurate. In addition, teachers can play a key role in increasing usage of glasses in the classroom. One study found that by providing incentives to teachers to encourage children to wear their new glasses, usage in the classroom tripled over the course of a school year (Hongmei et al., 2015). Successful school eye health initiatives may also rely on eye health practitioners, who may not be eye doctors, to prescribe and dispense glasses in schools. (London School of Hygiene and Tropical Medicine et al., 2017)

Children sometimes refuse to wear glasses for a variety of reasons, including no perceived benefit (von-Bischhoffshausen et al., 2014), parental disapproval (Rustagi et al., 2012; Zeng et al. 2009), and fear of being teased (Wedner et al., 2008; Castanon Holguin et al., 2006; Ethan et al., 2010). Eye health education strategies targeting students, teachers, and parents about eye conditions, management and treatment options are key not only for providing glasses, but also to ensure their appropriate usage by children. Educating parents about the importance of proper eye care has been shown to benefit the entire family, as it increases the likelihood that other family members will access appropriate eye care as well. It is also critical for school eye health initiatives to establish referral networks to appropriate facilities for treatment of advanced eye disorders that might otherwise have gone undetected.

COVERAGE OF SCHOOL EYE HEALTH PROGRAMS IN AFRICA: THE CASE OF PASEC COUNTRIES

Programs towards inclusive education are the exception rather than the rule in sub-Saharan Africa. Using PASEC data, Wodon et al. (2018) note that among 11 different types of in-service training, training related to inclusive education is the least common, reaching less than one in ten teachers in grades 2 and 6. Are school eye health programs faring better in terms of coverage? Unfortunately not. A question is asked in PASEC to teachers as to whether students have benefitted from a medical check-up, a hearing test, and an eye test in the school. As noted in Wodon et al. (2018), only slightly more than a fourth of teachers mention medical check-ups in both grades. For hearing and eye tests, the proportions are much lower. Table 6 provides the estimates for eye screening tests, considering both the share of teachers stating that such screening has taken place, and the share of students benefitting from screening (accounting for class sizes). Only 4.8 percent of students in grade 2 have benefitted from the test, and the proportion is only slightly higher at 7.3 percent in grade 6. Without such diagnostics tests, it is often very difficult for teachers to be able to support the learning efforts of children who may have disabilities. The lack of such tests also does not enable the schools to use referral services for hearing aids or glasses.

It was mentioned earlier that the share of children mentioning difficulties in seeing in the classroom is too high for all these students to be affected by visual impairment. The shares are also provided in Table 6, together with the shares of students that have eyeglasses. What is clear is that the likelihood of having eyeglasses differs between countries and is also higher among students in the higher socio-economic quintiles. It is also higher in urban than in rural areas. This is not surprising, but given few differences in the shares of children declaring seeing difficulties between quintiles and between urban and rural areas, this suggests that the needs of children in poorer areas and from poorer households are not being met. Econometric analysis also suggests that in the sample, the likelihood of having eyeglasses is not positively affected when children have benefitted from an eye screening program in the school. This could suggest that in PASEC countries, screening programs may not have adequate systems in place to enable children to receive glasses, although more detailed data would be needed to confirm this hypothesis.

Table 6: Share of Teachers and Students Benefitting from Eye Screening Tests, Grades 2 and 6 (%)

Sample: 10 PASEC countries.

	Grade 2 Screening Test		Grade 6 Screening Test		Grade 6 Seeing Difficulties	
	Share of Teachers	Share of Students	Share of Teachers	Share of Students	Share with Difficulties	Share with Eyeglasses
All Countries	3.8	4.8	7.6	7.3	23.0	5.6
Benin	0.9	1.1	1.8	2.2	20.6	3.2
Burkina Faso	5.5	10.3	4.8	4.1	22.4	2.9
Burundi	2.7	7.1	4.8	5.0	35.1	13.2
Cameroon	6.7	6.7	4.8	5.2	26.3	7.1
Chad	8.9	5.1	4.8	2.8	15.5	4.8
Congo (Republic)	7.5	5.6	2.3	2.5	16.2	6.6
Cote d'Ivoire	1.8	2.5	17.7	19.3	25.2	4.5
Niger	4.0	4.0	2.6	5.0	15.3	6.6
Senegal	2.1	3.0	11.1	9.6	24.3	7.1
Togo	3.8	3.2	2.7	2.9	17.5	2.2
Location						
Urban	5.0	6.9	12.7	10.2	21.4	4.7
Rural	3.2	3.4	5.4	5.2	24.1	6.2
Quintiles						
Q1	NA	NA	5.0	4.8	20.4	3.8
Q2	NA	NA	5.1	4.6	22.5	5.1
Q3	NA	NA	7.7	7.1	23.1	5.1
Q4	NA	NA	10.0	8.8	24.4	6.5
Q5	NA	NA	14.0	12.3	25.2	7.7

Source: Authors' estimation.

IMPLEMENTING NATIONAL PROGRAMS IN AFRICA: THE CASES OF LIBERIA AND BOTSWANA

The low coverage of school eye health programs in PASEC countries is symptomatic of a broader lack of such programs in much of sub-Saharan Africa. But experiences are available to suggest that countries at various income levels can implement national school eye health programs. This section provides two examples of engagement, one for a low income county (Liberia), and one for a middle income county (Botswana), to suggest how national school eye health programs can be implemented. The case study on Botswana was not included in the analysis of costs associated with school eye health due to the variance in cost structure, but it is mentioned here to demonstrate another approach to national program implementation led by government.

LIBERIA

In 2015, Ellen Johnson Sirleaf, President of Liberia 2006-2018, invited the L V Prasad Eye Institute to partner with JFK Medical Hospital to establish the country's first tertiary eye centre. Established in 1987 in India, the LV Prasad Eye Institute is one of the largest eye care systems in the world having provided care for over 28 million individuals. In 2017, EYElliance – an INGO that makes the case for global action and investment in addressing uncorrected refractive error promoted the potential to maximize the impact of the President's investment in the tertiary centre by expanding provision of eyeglasses to include schoolchildren and those living in remote communities. The President noted that she had

visited hundreds of schools during her tenure as President, but never seen a student with a pair of eyeglasses. At the request of the President, EYElliance convened a delegation of INGOs to advise the Ministries of Health and Education on a comprehensive eye health strategy that would include a national school eye health initiative. L V Prasad Eye Institute along with Sightsavers, a INGO that has been operating in Liberia since 2000 building the capacity of public eye care facilities, performing cataract surgeries, and conducting school eye health programs at the county level, joined the delegation. Also included in the delegation were: OneSight, Essilor's 2.5 New Vision Generation, and Our Children's Vision–all of which are organizations that have established best practices within their area of expertise. The outcome of the convening was a joint commitment to create a country-wide continuum of care with a national school eye health initiative and a referral network driven by the engagement of Liberia's 3,000 community health workers.

In the following months, a Memorandum of Understanding was signed between the two Ministries, the six organizations that were part of the delegation, and a Liberian NGO, New Sight Eye Centre. In September 2018, the new consortium launched the initial phase of the Liberia School Eye Health initiative – executing against a national operational plan to reach all public schoolchildren in primary and secondary schools in 12 out of 15 counties with school-based vision screening and free eyeglasses within four years.

The Ministries of Health and Education are actively collaborating to collate and share data. District and county-level staff from both ministries are compiling the number of students screened, the number of students who will require comprehensive eye exams, those whose vision problems can be corrected with a pair of eyeglasses, and those who will require more advanced care. Relevant data will be integrated into the Ministries' Health and Education Management Information Systems.

According to the Ministry of Health, in 2017 there were six practicing ophthalmologists and one optometrist in the entire country. The shortage of eye health professionals necessitates a model in which implementing partners support the training of appropriate cadres of eye health professionals. Both Sightsavers and the L V Prasad Eye Institute are supporting the Ministry of Health in building professional capacity. In addition, the L V Prasad Eye Institute is exploring the potential to establish a new training program in Liberia for physician assistants interested in receiving additional schooling and training that will enable them to perform eye examinations for children.

As the initiative scales, implementing partners are adopting an approach where children from multiple schools who have failed a vision screening will receive a comprehensive eye exam at one centrally located school to streamline the number of site visits required by eye health professionals. By the end of 2021, 480,000 children in 1,893 public schools will have received a vision screening, a pair of eyeglasses if needed, and treatment for more serious eye conditions or disorders for free at the tertiary eye centre in Monrovia. Access to advanced eye care is especially important as children who are Ebola survivors have a very high incidence of cataracts – a potentially blinding condition that is normally extremely rare in children.

Essilor's 2.5 New Vision Generation has made an in-kind contribution to supply all of the children's ready-to-clip frames and lenses needed for the national initiative free of charge. Limited availability of affordable, quality children's frames in Liberia has prompted OneSight to train a team in the tertiary eye centre to manage procurement of customized eyeglasses for the school eye health initiative, ensuring uniform quality for all children across the country.

In 2018 the Liberian Ministry of Education validated its first national school health policy –which includes eye health. Similarly, the Liberian Ministry of Health has prioritized school eye health in its policies, and hired the first ever national eye health program manager. The Ministry of Education has committed to including school eye health in their 2021 national education sector plan enabling the ministry to include the associated ongoing operational expenses into their next multi-year budget. As Liberia is a Global Partnership for Education (GPE) country, inclusion in the national education sector plan may also position school eye health for support from GPE or other development partners.

BOTSWANA

Botswana is another country that has made significant investments in eye care resources. The Government has developed a National Plan for Eye Health to reduce avoidable blindness by 30 percent and all visual impairment by 25 percent by 2020 –in line with commitments to the WHO Global Action Plan. In 2016 Peek Vision, a social venture that has developed technology-enabled tools and processes to improve eye health services, began conducting a donor supported school eye health pilot in Botswana at the district level. Initial results from the pilot prompted interest from the Government of Botswana.

The model that the Government of Botswana is planning involves the use of Peek's evidence-based design process to optimize health service delivery including use of a smartphone app to deliver vision screenings. The clinically-validated app enables non specialists or teachers to screen students using graphics displayed on the phone and it streamlines and automates the data collection process, sends personalized text messages and notifications to service providers and real-time health system level analytics. The technology-enabled tools facilitate data collection for stakeholders including both ministries and health service providers to manage their inputs while accessing results across the spectrum of intervention, from 1) cadres conducting vision screenings; 2) outcomes of comprehensive eye exams; 3) uptake of referrals for more advanced care and critically; 4) visibility of who is not being reached through screening; and 5) who is not adhering to referral.

In comparison to Liberia and many other sub-Saharan African countries, Botswana is fortunate to have a relatively high number of eye health professionals. Comprehensive eye exams conducted at schools can be performed by a combination of private optometrists and public eye health professionals employed by the Ministry of Health and Wellness. The Ministry issues tenders to private sector optometrists that outline the scope of the engagement. In three years 500,000 children are expected to receive vision screening, a pair of eyeglasses if needed, and a referral for appropriate treatment if non-refractive eye conditions or disorder is found.

All school children will be receiving their first pair of glasses free or subsidized as part of the Government's commitment, with fulfilment managed either by a local public health facility or an optometrist's business. All school children who are identified with non-refractive eye disorders are to be referred to specialist eye health facilities with treatment outcomes monitored to ensure maximum impact. Costs associated with the national school eye health initiative in Botswana will be assumed by the Ministry of Health and Wellness and the Ministry of Basic Education. This approach to national, government-led school eye health that is being demonstrated in Botswana should be relevant for similar middle-income countries where ministries are adequately resourced and there is the requisite professional base either within the public or private sector.

SUSTAINABILITY OF SCHOOL EYE HEALTH PROGRAMS

How sustainable are school eye health programs, especially in low income countries? Two aspects of sustainability are worth considering. The first is related to implementation capacity and coordination across Ministries. Screening can be conducted by teachers, but they should be granted leave by the Minister of Education for training. Ministries of Health should approve the use of eye health practitioners to prescribe and dispense eyeglasses in schools. Active collaboration across both Ministries of Health and Education is fundamental to the success of school eye health programs and their sustainability. Data collection must also be coordinated across the two Ministries, with shared responsibility for monitoring. Joint planning is also required to ensure that there are adequate numbers of eye health professionals or practitioners to support a national school eye health initiative. Finally, in order to maximize the potential for long term viability, school eye health programs should be integrated into either the Ministries' inclusive education agenda or school health agenda.

Another aspect of sustainability refers to the fiscal costs of school eye health programs. While the next section provides estimates of selected unit costs per activity, it is also useful to assess the potential costs of scaling up. For Liberia, the EYElliance prepared estimates of the potential cost of scaling up the programs to cover four of the 15 counties of the country that account for 47 percent of the total population (the districts selected were Bomi, Grand Cape Mount, Margibi, and Montserrado). As shown in Table 7, the costs appear relatively limited, at approximately $302,000, although this does not include any overhead and only essential activities are included. While costs would be substantially higher in countries with larger populations, they do seem to be affordable within national education budgets.

COST OF SCHOOL EYE HEALTH PROGRAMS: A SURVEY OF PROVIDERS

School eye health programs are relatively cheap to administer, so that education systems should be able to implement them. In order to measure the cost of school eye health interventions, a survey was administered to some of the largest non-governmental organizations (NGOs) implementing school eye health programs globally. Participating NGOs included Aravind Eye Care System, Brien Holden Vision Institute, CBM, Crispvision Ventures, Essilor Vision Foundation, EYElliance, Light for the World, L. V. Prasad Eye Institute, Mission for Vision, OneSight, Orbis International, Seva Foundation, Sightsavers, The Fred Hollows Foundation and Pham Quoc Anh, Ver Bien Para Aprender Mejor, and Vision For a Nation Foundation. The

Table 7: Illustrative Cost of Scaling Up of School Eye Health Program in Four Counties, Liberia

Category of Cost	Cost Estimate
Stakeholder convening and training of Ministerial line staff	$8,570
Master Trainers Training Program	$12,115
Teachers Training Program	$181,932
Community Outreach	$1,040
Comprehensive eye examinations in schools	$8,490
Expenses associated with ensuring children access advanced care	$42,896
Cost of glasses, shipping, and inventory management	$46,817
Total Budget for four counties	$301,861

Source: Author's estimations.

survey asked a series of question pertaining to the largest programs operated by these organizations. The organizations provided information on their programs implemented in China, Ghana, India, Liberia, Madagascar, Mexico, Nepal, Nigeria, Pakistan, Rwanda, Tanzania, Uganda, the United States, and Vietnam. While some of these programs are small, others are large, with four programs serving more than one million children each (the largest program served 4.6 million children). Preliminary analysis of the survey suggests that the cost of school eye health programs are relatively low. Statistics are provided considering all programs equally (programs reaching more students are not weighted more than programs reaching fewer students).

On average across screening programs, slightly more than one in ten children required glasses. This does not mean however that this proportion would be encountered in the overall population, since some programs targeted groups at high risk. In addition, in some countries and regions, the share of children needing glasses is higher than in others. Discounting the three programs with the largest share of screened students requiring glasses, the proportion falls by about half, but is still substantial. Among the children who required glasses, on average across programs more than eight in ten children received the eyeglasses. Discounting the two lowest values, this share increases to more than nine in ten children, suggesting that the programs were fairly effective at providing glasses to the children who needed them. Among the children who needed to be referred for more advanced care, the data suggests that across programs about half the children who needed advanced care received it.

A question was asked in the survey on who does the screening in schools. The most likely screeners were teachers,

followed by nurses, or a combination of both. In a few cases screenings were done by other individuals – typically eye care professionals such as optometrists, although in one case screening was done by students. Training length for teachers or nurses to be able to screen students in school varies quite a bit between programs, although most programs mention a few hours of training. The cost for training also varies substantially, but most trainings have costs in the $20 to $100 range per teacher or nurse trained depending on the scope and length of the training (this includes travel, per diem, materials, and the cost of the trainers).

In schools, screening children takes on average just under two hours per batch of 50 children (including data entry in many cases), but estimates vary from 30 minutes to more than four hours. In most programs, screening is conducted by two individuals, although in some cases – possibly for larger schools, more individuals are involved. In most cases, screenings take place during classes, although in some cases they take place before school or during breaks, but for no programs do screenings take place after classes. Most programs do not provide monetary rewards or incentives for teachers or nurses to conduct the screenings. The cost of screening materials tend to be low, typically at US$10 to US$20, although one program mentions other costs that can be substantially higher, such as providing smartphones for field team members. Other costs at the school level are difficult to assess, but when such costs are mentioned, estimates in the range of US$60 to US$300 are provided, for example for consent forms, referral cards, and consumables for simple treatment options.

There are quite a few differences between programs in terms of how children who require glasses or advanced care are referred. The most likely scenario is that children who require follow up care will benefit from the visit of eye professionals at their particular school, or in some cases at a cluster of schools. But some programs also rely on private sector eyeglasses providers or health facilities to provide glasses. The costs of follow-up care for providing eyeglasses (not including the cost of the eyeglasses themselves) are relatively low. Many NGOs pay for these costs, but in some cases costs are paid, at least in part, by families or the government. The costs include honorariums or pay for eye professionals, travel costs, and other costs. Among children receiving glasses, most children who need glasses receive customized glasses, as opposed to ready-made and clip-on glasses. Differences in costs between the three types of eye glasses are not very large, but for the most common case – customized glasses, the cost per pair of eyeglasses ranges from US$4.5 to US$ 20.5. Many of the NGOs pay for this cost, but in some cases families or the government contribute as well or pay the full cost. The costs of providing drops for children who need them are also very low, but the cost of other treatments are higher, often above $100. Again many of the NGOs pay for these costs, but in some cases families or the government contribute as well or pay the full cost.

Most follow up care is provided through visits of eye professionals to schools, but reliance on the private sector or health facilities is also observed. The cost per child of follow-up care is in most cases low as well. Most children who need glasses get customized glasses at a cost per pair ranging from US$4.5 to US$ 20.5. Many NGOs again pay for this cost, but in some cases parents or the government contribute. The costs of providing drops for children who need them are also low, but the cost of other treatments are higher, often above $100.

CONCLUSION

In comparison to children without disabilities, because of the lack of school eye health programs, children with visual impairment have been shown to be at a disadvantage for the likelihood of ever enrolling in school, completing primary education, and being literate. In addition, due to the lack of vision correction, students with seeing difficulties in the classroom tend to perform less well in school in comparison to students without such difficulties. School eye health programs can be used to provide better educational opportunities for students with visual impairment. Impact evaluations suggest that benefits from the programs can be large. Yet in many counties, the programs have very low coverage.

A survey of some of the largest non-governmental organizations implementing school eye health programs suggests that the programs are relatively cheap to administer. Screening in school is typically done by teachers, nurses, or both. Training costs tend to be in the $20 to $100 range per teacher or nurse trained depending on the scope and length of the training. In schools, costs are low as well since most programs do not provide monetary incentives for teachers or nurses to conduct the screenings. Follow up care is typically provided through visits by eye professionals to schools, again at limited cost. Most children who need glasses get customized glasses at a cost of US$4.5 to US$ 20.5 depending on the program. These findings suggest that school eye health programs are affordable and should be a priority for ensuring that education systems are inclusive.

Finally, while this note made use of multiple data sources, including census, household survey, and student assessment data, as well as programmatic data from organizations implementing school eye health programs, it should be noted that strong data limitations persist in many counties. Even if the number of countries using Washington Group questions in household surveys and censuses is increasing, this is still not the case in many countries. Student assessment data may include proxies for disabilities, but they rarely specifically ask about disabilities in developing counties. Information on disabilities from Education Management Information Systems (EMIS) are also often lacking, as are detailed data on the cost and returns to interventions. To better serve children with visual impairment and other children with disabilities, additional efforts need to be undertaken towards stronger data collection and analysis.

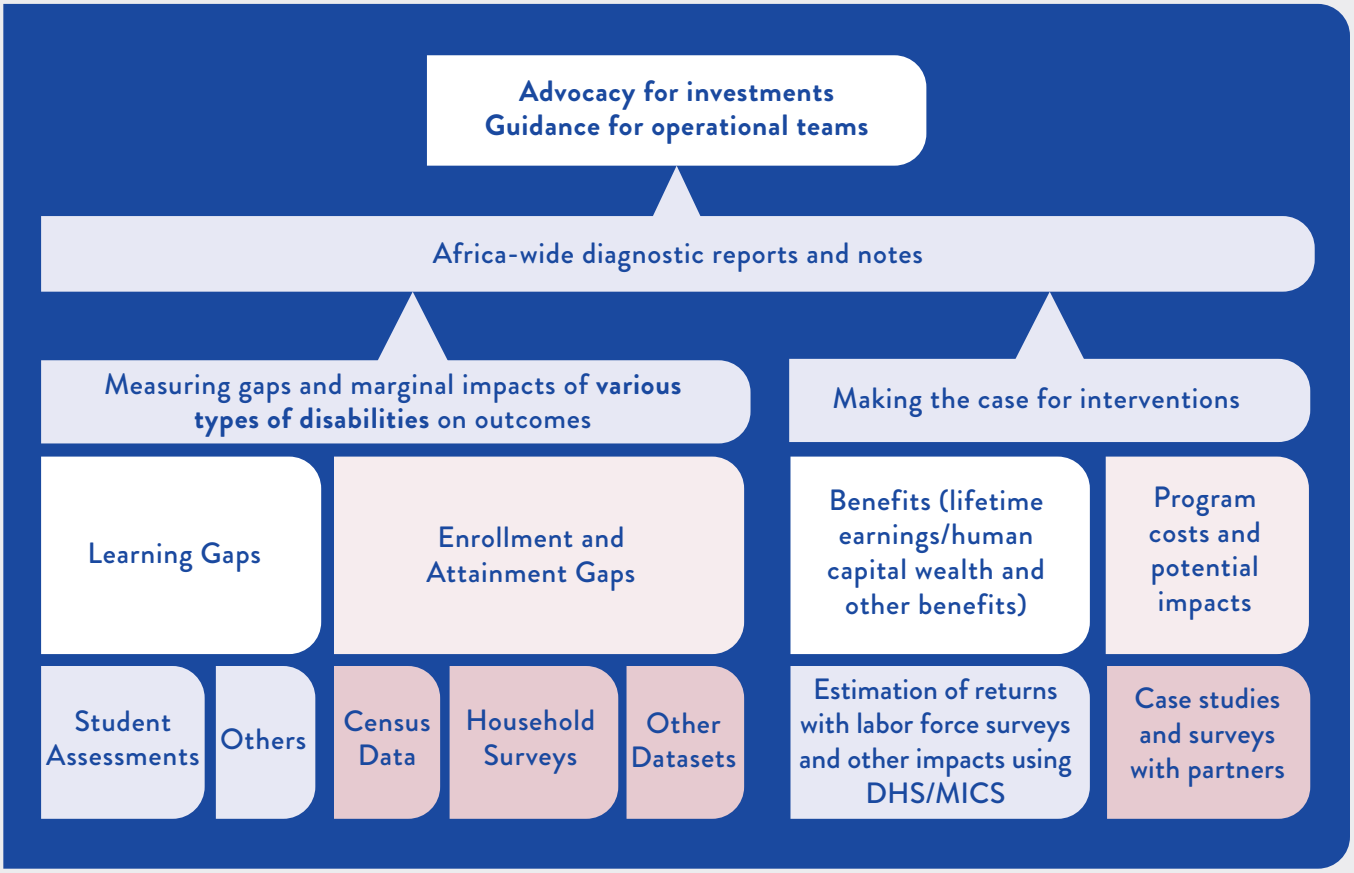
ANNEX 1: FRAMEWORK FOR THE NOTES SERIES

This note is part of a series making the case for investments in inclusive education. To make the case for such investments, a simple theory of change suggests that three components are needed: (1) showing that there is a need for interventions by documenting gaps in education outcomes between children with and without disabilities; (2) arguing that better educational outcomes for children with disabilities can make a major difference not only for them but also for society as a whole – including in economic term; and (3) demonstrating that successful interventions are feasible and affordable.

Building on Male and Wodon (2017), and Wodon et al. (2018), this note contributes to the first and third tasks. Its aim is simple: by showing how large disability gaps in education outcomes remain in sub-Saharan Africa, and by showing that investments in education for children with disabilities can have high returns, the note contributes to enabling Ministries of Education to prepare country diagnostics based on this theory of change (country profiles will be prepared separately apart from this note focusing on the region as a whole). The note also explains how school eye health programs can be implemented at low cost.

The broader analytical framework that informs this work and the series of notes more generally is provided in Figure A1. At the bottom are the data sources used for various components of the work. In the middle are the areas of focus of the work, with the aim of generating a series of reports and notes. The overall aim of the work is to advocate for investments in inclusive education and provide guidance to operational teams on how to implement appropriate programs and policies. This note is but a first attempt at measuring gaps and marginal impacts and illustrating some of the potential benefits from investments in school eye health programs.

Figure A1: Analytical Framework



Source: Authors.

ANNEX 2: ANALYZING DISABILITY AND EDUCATION OUTCOMES WITH VARIOUS DATA SOURCES

This note relies in part on census data. The use of censuses for work on disability and education has some advantages. The number of observations is large even when only a subsample is available for the analysis. This makes it feasible to measure trends over time in education outcomes and the impact at the margin (controlling for other factors) of exclusion related to disabilities. Marginal impacts can be estimated for all children with disabilities as well as by type of disability. By contrast, the sample size of household surveys is often insufficient to perform a similar analysis. But there are also limitations when using census data for such analysis. First, the data tend to underestimate the prevalence of disability. Second, despite efforts to improve questionnaire, the only information that is typically available relates to whether a child has a disability or not, and not whether the disability is severe or mild.

The Washington Group on Disability Statistics has developed ways to improve census data on disabilities through six questions related to core functional domains (these questions were not yet available in most of the census data used for this note). The functional domains are: seeing, hearing, learning, walking, cognition (remembering or concentrating), self-care (washing all over or dressing), and communicating. For each question, four responses are suggested – the individual has no difficulty, some difficulty, a lot of difficulty, or no ability at all to perform the task. These questions help measure functionality and thereby detect disabilities that may be less severe or apparent. By contrast, when a single question is asked, the result is typically a substantially lower rate of disability identifying only those with the most severe disabilities in the household as having a disability.

Because mot censuses have yet to include these questions, readers should be aware that only severe disabilities tend to appear in census datasets used here. In addition, in most countries censuses are implemented only once every ten years, so the data may not account for the latest developments in education systems. The timing of disabilities is also typically not observed (as is the case for most surveys). Especially for older individuals, the disability may have been observed after the individual has left school. Comparisons of educational attainment for individuals with and without disabilities may be less precise in identifying the role of disabilities in affecting educational attainment for older individuals. This is one of the reasons why the regression analysis in this note is performed on younger age groups than the statistical comparisons provided for broader age groups. Because censuses tend to identify severe disabilities that are often observed at or soon after birth, the risk of bias may however not be too large.

Despite these limitations, censuses remain a useful source of data for measuring the impact of exclusion related to disabilities on education outcomes by type of disability, especially over time. In addition, for a few countries, the analysis of educational attainment and (subjectively declared) literacy conducted with census data in this note is complemented by additional analysis using household surveys. The census years for which the data are available are as follows for sub-Saharan African countries: Benin 2013, Burkina Faso 2006, Ethiopia 2007, Ghana 2010, Kenya 2009, Liberia 2008, Mali 2009, Malawi 2008, Mozambique 2007, Senegal 2012, South Africa 2011, South Sudan 2008, and Zambia 2010. For other countries, the census years are as follows: Bangladesh 2011, Cambodia 2008, Costa Rica 2011, Dominican Republic 2010, Indonesia 2010, Mexico 2010, Peru 2007, and Vietnam 2009. In addition, the note references previous analysis based on household surveys to measure the returns to education for children with disabilities, and it relies also on student assessment data for assessing the performance of students with disabilities while in school. The student assessment data are from PASEC (2014) and they cover 10 Francophone countries.

Finally, it should be noted that efforts are underway to improve data on children with disabilities. One effort of note is being undertaken by UNICEF, especially for young children. For these children, the Washington Group questions may not be appropriate. A new module under the MICS (Multiple Indicators Cluster Surveys) is being implemented to better measure child functioning. This new module – the Child Functioning Module, covers children between 2 and 17 years of age and assesses functional difficulties in different domains. Unfortunately, for many countries the data from this module are not yet available.

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THE PRICE OF EXCLUSION: DISABILITY AND EDUCATION

THE CHALLENGE OF INCLUSIVE EDUCATION IN SUB-SAHARAN AFRICA

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