Improving learning outcomes through school-based health programs

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Around the world, learning levels remain low and therefore a priority area for improvement. A key barrier to participation and learning in school is student health, especially in low- and middle-income countries. However, due to a lack of coordination between health and education departments, the health of schoolchildren—and the impact of their health on their potential to learn—is sometimes overlooked. Child health programs can improve learning outcomes, and schools are an especially important, convenient, and cost-effective venue to deliver these interventions.

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Summary

Many children are struggling to master basic skills in reading and math despite a dramatic rise in school enrollment around the world. For instance, India's 2018 Annual Status of Education Report (ASER) found that only about half of all grade 5 students in rural India could read a grade 2 text [1], . Assessments showed similar results in other countries, from Malawi to Nicaragua to Zambia [13].

Especially in low- and middle-income countries, poor health is often a key barrier that students must overcome in order to be able to learn. The health of schoolchildren may fall through the cracks of government systems in which education departments focus on pedagogy and school infrastructure, while health departments focus on health workers and medical infrastructure. Improving the coordination between health and education systems could address this gap. School-based health interventions have been effective at increasing learning outcomes, and many can be delivered at a low cost, although the relative cost-effectiveness varies depending on the specific approach and context.

Results from eight randomized evaluations in Burkina Faso, China, Kenya, and the United States show that health interventions delivered at schools can improve student health and positively affect learning outcomes.

The programs included in this insight address a variety of health issues. A school-based deworming program increased learning outcomes by directly treating a contagious condition at school. Other programs increased learning outcomes by delivering iron supplements or eyeglasses, addressing non-contagious conditions that nonetheless inhibit the ability of children to learn. Finally, some programs increased learning outcomes through a broader health and anti-poverty approach of providing free meals at schools. Meanwhile, programs that aimed to improve health by providing only information typically did not improve health or learning outcomes unless accompanied by other complementary interventions.

In contexts where students experience poor health and learning levels are low, policymakers may want to consider school-based interventions that directly address child health. If interested in implementing health information campaigns, policymakers should also consider the extent to which parents will be able to understand and act on the information provided.

Finally, cost data is included in this insight when available. Of the studies that provided cost data, deworming had by far the lowest per-child costs. All included cost information is based on estimates from individual research teams and therefore may differ based on context and which factors researchers took into account. Additionally, while the potential cost of a program should be an input into a policymaker's decision-making process, both the relative cost-effectiveness of and need for a program relies not only on cost but also the extent of that health problem in the area. Policymakers must carefully consider the existence and prevalence of various health issues in their area and then incorporate cost as one input into plans for how to address these challenges.

Supporting evidence

In general, schools are a good venue to cost-effectively and conveniently deliver health services to more children. A number of factors make schools important sites for delivery of health interventions. First, schools are often crowded, public spaces where contagious conditions can easily spread. It is therefore especially important to ensure that schoolchildren are not spreading germs, intestinal worms, or other conditions. Second, treating some children in a school may positively affect other students who are not treated, in the case of conditions that are spread through close contact. Third, delivering a health program at school can solve the “last-mile problem” faced by many social programs: If children are already gathered at school, one can conveniently administer treatment to many people at once, rather than spending time and effort locating and reaching them individually. Using schools as the venue to roll out health programs also reduces actual costs: It is much less expensive to bring a few health workers to a school than to individually bring each student to a health center. Improving the predictability of health worker availability (for example, through well-publicized school health days) may also improve take-up of health programs, since high rates of health worker absenteeism and closure of facilities may reduce the extent to which parents use these services. For example, in Udaipur, India, researchers found that health centers were closed more than half of the time that they were scheduled to be open [3].

When determining implementation details for health programs aimed at school-aged children, policymakers should remember that schools may be an especially important, convenient, and cost-effective venue, and that there may be an added benefit of increasing not only health but also learning outcomes, as noted in this insight. However, it is important to keep in mind that this may not be the case in areas with low enrollment or attendance rates, and to consider alternative ways to reach children who do not attend school.

Treating contagious conditions such as intestinal worms can be an especially cost-effective intervention that may lead to longer-term increases in test scores and cognitive functioning. Schools may be a particularly important place to address this problem, as sick children can infect other children at school. Intestinal worms are transmitted through poor sanitation

practices and can cause diarrhea, abdominal pain, fatigue, and weakness, creating obstacles to focusing and performing well in school[1], . More than 880 million children worldwide are affected by intestinal worms[2], , including more than 9 million children in Kenya in 2017[3], . Deworming is often cited as very low cost, at between USD $0.49 and $0.59 per child per year [2], [8], . Given that even children who do not receive treatment benefit from a lower overall community wormload in areas with high initial rates of intestinal worms, school-based mass deworming is an extremely cost-effective that has been scaled up to reach hundreds of millions of children.

Although children in Kenya who received deworming medication when they were 9 to 16 years old did not see immediate gains in learning [2], [8], , girls performed better on the national secondary school entrance exam ten years later [2], . These girls were 9.6 percentage points more likely to pass the exam, compared to a 41 percent pass rate among girls who did not receive deworming medication, an increase that also roughly halved the existing gender gap in exam performance [2], . Test scores also increased for those not directly dewormed, likely because the overall wormload in the community fell as a result of the program [11], . Ten years later, children who were themselves too young to receive school-based deworming, but who lived in areas where deworming took place, performed almost 0.3 standard deviations higher on nonverbal reasoning tests than children who did not live in treated areas [11].

In communities with high wormloads, policymakers should consider not only the short-term health impacts of deworming programs but also the long-term educational impacts. However, the impact of any health program may vary based on the underlying prevalence of the issue it addresses: in this case, the severity of the location's wormload may affect the extent of a deworming program's effects on learning.

Non-contagious medical conditions may also present a barrier to learning. For example, directly treating micronutrient deficiencies such as anemia at school has been shown to increase learning outcomes. These programs may not be as low-cost as deworming but may still be a low-cost option in areas where anemia is a critical problem. Iron deficiency anemia is caused by a micronutrient-poor diet and can cause fatigue, weakness, and headaches that make it difficult for children to pay attention and learn in school[4], . Globally, anemia affects 598 million children under age 15[5], , and various estimates from 2010 to 2013 put the prevalence of anemia among school-children in rural China in a range from 22 to 42 percent[6], [7], . In China, three programs that aimed to reduce anemia by directly providing students with a source of iron all increased learning levels. Treating anemia through iron supplementation at school is relatively low cost: Researchers estimated that the per-child cost of providing students in China with iron supplements every day for a period of six months was between CN¥ 36 and 45 (or between USD $5.15 and $6.44) for pills and CN¥ 72 (USD $10.30) for chewable vitamins [6], [7], [12], .

An evaluation in Gansu, China found that giving fourth graders daily chewable vitamins with 5 mg of iron for six months increased their hemoglobin levels and improved their math scores by 0.12 standard deviations more than students who received no vitamins [6]. In two programs in Shaanxi Province in China, fourth graders who received daily 5 mg iron supplements for five to six months experienced increased hemoglobin levels and also performed 0.1 standard deviations better on math exams than comparison students [7], [12].

However, those designing programs to address anemia in schools should also consider the intensity and per-unit cost of the dose. A daily egg provided to students in Gansu, China had no effect on learning outcomes, likely because the egg did not raise children's hemoglobin levels [6], . Eggs contain much lower levels of iron than the vitamins tested in Gansu—less than 1 mg[8], compared to the 5 mg of iron in the vitamins [6]. Eggs are also much more expensive than supplements, in this case estimated by the researchers to cost about CN¥ 144 per child for six months, or USD $20.60, plus additional fuel and labor costs for cooking [6] .

Poor eyesight is another non-contagious medical condition that can make it difficult for children to learn at school. If students are physically unable to see well enough to read, providing them with eyeglasses may increase learning outcomes. This may be a higher-cost option than either deworming or anemia treatment in some contexts but addresses a very different type of health issue students may be facing. Vision problems affect 10 to 20 percent of school-aged children [10], [4], . If these issues go undiagnosed or uncorrected, students may struggle to see classroom materials and therefore to learn. A program that provided eyeglasses to junior high school students in poor and rural parts of Western China increased the usage of eyeglasses by 19 percentage points (from a base of 50 percent) and improved math exam scores by 0.14 standard deviations [10] , . This effect was largely driven by students who did not own glasses at the start of the program [10], . Because this program also decreased drop-out rates by 2 percentage points (from a base of about 5 percent), it is possible that these students performed better because of increased time in school [10], . When accounting for the wholesale cost of glasses, researchers estimate that the eyeglasses provision program would cost approximately USD $20 per student, including the costs of training and equipping local staff, screening students in schools, and making and delivering the glasses. Given that eye doctors recommend children change their prescriptions every two years, the cost would be approximately USD $10 per student per year. A similar program in the United States, which provided free vision tests and eyeglasses to children attending low-income elementary schools, increased the passing rate of the Florida Comprehensive Achievement Test by 2 percentage points among students who received eyeglasses [4], . These results faded by the second year (perhaps because students lost or broke their glasses), suggesting that free eyeglasses programs may not continue to be effective over time without repeated interventions [4].

School-based feeding programs address the general health status of students rather than one specific condition. These interventions may also increase learning. Their cost-effectiveness, however, will vary depending on the context. School feeding programs can reduce macronutrient and caloric deficiencies, which may be especially important in areas with widespread food insecurity. For example, in Burkina Faso, giving either free daily school meals to all children or free monthly take-home rations of flour to all girls with at least a 90 percent attendance rate increased school participation and student learning for both genders after a year [5], . The program also increased enrollment by 4 to 5 percentage points and led to an increase in correct answers on a math quiz compared to students who did not receive the food. This increase in test scores could be driven by improved health and cognition due to increased consumption of food [5], . In this case, school meals cost USD $41.46 per child per year, while take-home rations cost USD $51.37 per child per year [5]. Additional evidence from the global public health sector also supports the idea that school-based feeding programs may increase learning outcomes.

In contrast to direct treatment at school, indirectly addressing poor health by providing information has been less successful at affecting either health or learning outcomes. Five interventions that indirectly addressed students' health problems through information campaigns did not improve student health or educational outcomes, except in cases in which the information was accompanied by a complementary intervention [4], [7], [12], [9]. These information campaigns may not have worked because the importance of the information was not conveyed or because parents either did not understand or did not have the ability to act on it.

In the vision program from the United States, free vision screening alone had no effect on learning outcomes [4], . Student learning only increased when, in addition to providing students with information on their eyesight, glasses were provided to those who needed them [4].

In Shaanxi, China, providing parents with information about their child's anemia status or ways to prevent anemia had either a much smaller effect on health than supplements or no effect on health at all. Consequently, these information programs had no effects on learning outcomes [7], [12], . This may be because parents were not able to translate this knowledge into increased iron intake for their children due to lack of resources or because, in some cases, their children attended boarding schools and

therefore received most of their nutrition at school rather than home [7], . An information campaign focused on reducing anemia in Ningxia Autonomous Region, China, similarly found that the children of parents who received weekly texts about anemia prevention did not experience increased iron levels or perform better on math tests [9], . This may have been because the passive act of simply receiving information was not enough to encourage parents to pay attention to, or recognize the importance of, the information [9], . However, a more intensive version of this program did result in improved general health status, perhaps because parents could better recall the information or perceived it to be more important [9], . Children of parents that received both weekly texts and monthly quizzes performed 0.14 standard deviations better on math exams and concentrated more in class [9].

Before implementing a health information campaign through a school, policymakers may want to consider whether parents or students will understand the importance of the information or be able to act on it.

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