Deworming

Improving Health and Increasing Attendance

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Intestinal worms are extremely prevalent in India, causing malnutrition, anemia, and stunted growth, and contributing to student absenteeism. Numerous treatments for worms are available, and schools are an efficient means to deliver these medications. Children treated with in-school deworming programs are observed to gain weight and attend school more frequently.

Researchers: Edward Miguel (UCB), Michael Kremer (Harvard)
Field Partners: International Christelijk Steunfonds Africa (ICS) in Kenya; Government of Andhra Pradesh for scale-up discussed below.

Policy Issue

Intestinal helminths—including hookworm, roundworm, schistosomiasis and whipworm—infect more than one in four people worldwide and are particularly prevalent among school-aged children in developing countries. Children infected with intestinal worms suffer from malnourishment, loss of appetite, iron deficiency anemia (IDA), Vitamin A deficiency, stunted physical growth and reduced ability to learn. As a result, worms are believed to have a negative impact on education, hindering child development as well as school attendance. The losses in schooling which result from these health problems are evident later in life: non-randomized studies have shown that children chronically infected with worms are 13% less likely to be literate and earn 43% less as adults.

Context

Worms are widespread in India, with infection rates ranging from 5% in some states to as high as 90% in regions of other states depending on regional ecology. It is estimated that only 7-10% of infected school children are currently treated with deworming medicines. Worms require vitamin A to survive, and can rob their hosts of this essential nutrient. According to a World Bank report, 57% of preschool children in India have Vitamin A deficiency, which can cause eye damage and a higher risk of dying from measles or malaria. Worms also cause chronic intestinal blood loss that can result in iron deficiency anemia and cause weakness, stunted physical growth and a compromised immune system. In India, more than 70% of children under 5-years old suffer from iron deficiency anemia. Intestinal worms also cause persistent diarrhea, leading to dehydration, malnutrition and weight loss. Micronutrient deficiencies are believed to cost India US$2.5 billion annually, and child malnutrition is responsible for 22% of the country's burden of disease.

Evaluations and Evidence

The impacts of worms on health are well known. A randomized study in Lucknow in the 1990s found that more than a third of preschool children were infected with soil-transmitted helminths (STH). Children who were administered the deworming drug Albendazole biannually for 2 years exhibited a 35% greater weight gain, equivalent to an extra 1 kg on average, compared to untreated children in neighboring slums.

The impact of worms on school attendance was less well established before 2001, when Kremer and Miguel found health and attendance gains from deworming school-aged children in a randomized study in Kenya. Deworming increased school participation by at least 7 percentage points - equivalent to a 25% reduction in student absence rates. Moreover, the entire community and those living up to 6 km away from the treatment schools benefited from "spillovers" of the deworming treatment, as deworming reduces transmission of disease to untreated children.

In 2004, a randomized study in the slums of Delhi found that 69% of the children in the sample were

anemic and 30% suffered from intestinal worm infections. Preschool children provided with a package supplement consisting of iron, Vitamin A and deworming drugs gained roughly 0.5 kg more than comparison children. Further, average pre-school participation rates increased sharply by 5.8 percentage points among treated children, reducing preschool absence by roughly 6 percentage points (from a base absence rate of ~30%). Given the low cost of the intervention and the positive externalities, school-based deworming is a highly cost-effective way to improve school attendance, child weight and health.

Retrospective studies of the American South have shown that the long-run gains to deworming are also quite substantial. Bleakley (2007) uses long-run data from over a century ago and shows that hookworm eradication increased school attendance, literacy, and ultimately long-run labor market returns to schooling. Groups with higher initial levels of hookworm infection (who therefore benefited more from the eradication efforts) went on to earn substantially higher incomes as adults.

The combination of rigorous evidence from randomized evaluations as well as historical evidence based on long-term data suggests that deworming may be able to improve child health and education outcomes in a highly cost-effective way.

Information campaign on school-based deworming in Andhra Pradesh.

Scale-Ups

Evidence from other contexts suggests that deworming could be a highly promising and cost-effective intervention, but some of these results are based on high baseline worm loads. Studies in India indicate prevalence rates ranging from 5% - 90%. At high prevalence rates, the benefits from deworming are very substantial, but even at low prevalence rates, the costs are low enough and administration simple enough to warrant a programmatic approach to deworming through schools. For instance, China has supported universal deworming even at infection rates of 5%.

The suggested policy action for India is therefore to conduct simple, regular surveys on worm load in school children and based on these measured worm loads, to conduct school-based deworming programs since deworming has been found to be most effective and efficient when administered through schools. School-age children typically have the heaviest intensity of worm infection, in part because transmission often happens when children are playing in soil or water contaminated with fecal matter. Schools offer a readily available, extensive, and sustained infrastructure with a skilled workforce that is already in close contact with the community. A school-based approach to deworming is feasible in India, considering 98% of children now have access to a primary school within 1 km of their home, and several school-based initiatives have already been undertaken across India.

There are a number of drug manufacturers in India that locally produce deworming drugs including Mebendazole, Albendazole and Praziquantel. The cost of deworming using existing government infrastructure is less than 50 cents (approximately Rs. 23) a year, per child. The major component of this cost is the initial training of school staff in administering the deworming medicines and the production of educational materials. It is also important to ensure alignment with other programs such as the National Filaria Control Program, since these programs also treat children with similar medication.

In Andhra Pradesh, the state government in coordination with J-PAL's partner organization—Deworm the World (DtW)—has launched a school-based mass deworming program. The program will cover approximately one crore (10 million) school children aged 6-14 years, and is being initially implemented in 6 districts (Anantapur, Mahbubnagar, Nalgonda, Nellore, Prakasam and Vizianagaram), before being extended to other

parts of the state. The program is being run in collaboration between the Department of Health, Medical and Family Welfare (DoHFW), the Department of School Education (DoSE), and the Department of Sarva Shiksha Abhiyan (DoSSA). This partnership structure, in coordination with partners including DtW and the World Bank, has been critical in creating a solid foundation for the scale-up of a sustainable school health program to improve children's health and education.

School girls stand in line to take deworming medication in Nalgonda district, Andhra Pradesh.

Once this partnership was in place, DtW helped train medical laboratory technicians drawn from various districts through a one day training demonstration of how to process stool samples to create worm prevalence surveys. The treatment was administered by school teachers who were trained in advance, and local communities were properly sensitized. The treatment was simple and safe: a single dose of mebendazole administered once or twice a year, depending on prevalence estimates. The success of the first phase of the Andhra Pradesh School-Based Deworming Program can be seen by its coverage: 1,954,888 children enrolled in schools and a total of 2,060,016 school-age children were dewormed through the program. All six districts were reached through this program and a total of 21,697 schools were covered.

In addition to the programmatic roll out of deworming, the AP program has been accompanied by a rigorous randomized evaluation of the impact of school-based health programs comprising deworming, iron, and Vitamin A supplements. In partnership with the Azim Premji Foundation and the World Bank, the Government of Andhra Pradesh has entered into a Memorandum of Understanding (MoU) to conduct large-scale randomized evaluations of several educational programs. The evaluation of school-based health programs is being carried out under the auspices of this MoU. The programmatic roll out of deworming will be phased to cover 23 districts over the next three to four years depending on worm load prevalence, intensity and other factors, with the evaluation districts being covered in the last phase (since the evaluation districts have both treatment and comparison schools).

Thus, the AP deworming program represents a good case study of a marriage between programmatic roll out (in some districts) and rigorous randomized evaluations (in other districts) in an Indian context. Operational lessons with regard to scale-up can be learned from the program roll out, while the impact of the program can be measured through the randomized evaluation. A similar approach may also make sense for other programs in other contexts, since most new programs need to be phased in for administrative reasons.

Additional Readings:
(available at www.povertyactionlab.org)

Shally Awasthi, Richard Peto, Vinod Kumar Pande, and Robert H. Fletcher: "Effectiveness and cost-effectiveness of albendazole in improving nutritional status of pre-school children in urban slums." *Indian Pediatrics*, January 2000; 37:19-29

Hoyt Bleakley: "Disease and Development: Evidence from Hookworm Eradication in the American South." *The Quarterly Journal of Economics*, February 2007.

Gustavo J. Bobonis, Edward Miguel, Charu Puri Sharma: "Iron Deficiency Anemia and School Participation." *Journal of Human Resources*, 2006, 41(4), 692-721.

"Mass Deworming: A Best Buy for Education and Health." *J-PAL Policy Briefcase # 4.*

Michael Kremer, Edward Miguel: "Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities." *Econometrica*, Vol.72, No.1, 2004, 159-217.