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A coordinated response to the needs of the learner: How deworming and school meals together will contribute to the global recovery from the COVID-19 pandemic

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Introduction

In the first few months of 2020, 1.5 billion children worldwide were excluded from schools by the COVID-19 pandemic. They lost out on education, some for as long as two years (and some permanently), and millions of the poorest children were also suddenly deprived of their one reliable meal a day and their access to school-based preventative treatment for intestinal worms and schistosomiasis. Today, more than 65 countries, with over 30 in Africa, are rolling out recovery programs that aim to rebuild education systems to provide learning while simultaneously restoring the health of the learner through various initiatives.

One such initiative is mass drug administration (MDA) of anthelmintics, which prior to the COVID-19 pandemic had been one of the public health success stories of our day (1). Real movement towards reducing the burden of human worm infections began in earnest in the past century when the ubiquity of chronic human infections was first understood to be a public health concern (2, 3). Responding to this challenge was made possible by several advances: the introduction of safer anthelmintics for use in humans in the 1970's; the recognition that treatment against several Neglected Tropical Diseases

(NTDs) could safely and affordably be delivered to populations without requiring individual diagnosis; the acceptance of both the education and health sectors to target soil-transmitted helminthiasis (STH) and schistosomiasis treatment campaigns to school-age children – the population with the largest reservoir of infection (4); and, more recently, commitments from pharmaceutical companies to donate the treatments in large quantities, thus enormously reducing the most significant cost barrier to large-scale delivery (5).

Good progress is being made to ensure that deworming programs are accessible for the target populations in endemic areas. In 2016, deworming programs reached one billion people, largely through school-based treatments, making school-based deworming one of the largest public health campaigns in the world (6). In 2006, Johnson & Johnson began donating mebendazole for treatment of STH in school-aged children, and in 2007, Merck KGaA, Darmstadt, Germany started to donate 20 million tablets per year of praziquantel for schistosomiasis control, which has been increased in 2012 to up to 250 million tablets per year. In 2010, Glaxo-Smith Kline expanded the donation of albendazole (7).

The education system, through schools, is an exceptional platform to deliver education on and interventions for many of the causes of morbidity that arise during the next 7,000 days of life (or up to age 21), including treatment, health education, and sanitation (8). Schools represent an exceptionally cost-effective and efficient platform through which to deliver an essential integrated package of health and nutrition services – such as deworming, school meals, WASH, among other interventions – to schoolchildren (9).

Intervening in the next 7,000 days

Investment and intervention in childhood has largely taken an age-siloed approach, with disproportionate action targeting the first 1,000 days of life, spanning conception to two years of age. Growing research calls for further investment during the next 7,000 days to sustain and build upon the gains achieved from earlier intervention and to respond to the developmental changes that occur as children and adolescents mature (10). It is during these formative years that children and adolescents undergo physical, emotional, and cognitive changes.

Healthy and well-nourished schoolchildren learn better; this is in turn associated with improved health literacy and health outcomes, and downstream outcomes such as life-time fertility preference and higher human capital formation (11–13). School deworming programs provide an immediate health benefit for the learners but also are a pathway to improve earning potential in adulthood. A study by the Nobel Prize winner, Michael Kremer, on alleviating poverty showed that children with access to deworming treatment earn 13% higher incomes, have 14% higher consumer spending, and significantly higher chances

of working in jobs that earn more wages and offer more growth opportunities (14).

The dynamic interaction between health and education is one of the driving forces for developing the human capital that drives shared prosperity. Aggregated at the national level, investments in human capital drive national economies, with over 70% of the wealth of high-income countries attributed to human capital compared to 40% in low-income countries (15).

Targeting service delivery through schools to reach children and adolescents

An essential tenet of the MDA approach for STH and schistosomiasis is that by using a periodically repeated approach, most attributable morbidity is reduced by treating the school-aged cohort (with preschoolers offered treatment). School-age children are the cohort with the highest infection burden for STH and schistosomiasis, and to mitigate the impact of these infections, the WHO set a global target of 75% treatment coverage of school-age children (WHO 2012).

MDA campaigns for soil-transmitted helminths and schistosomiasis are largely conducted through schools, reflecting the near universality of children enrolled in primary school as well as the feasibility and cost-effectiveness of using existing infrastructure to reach this cohort during some of their most vulnerable years. Among children with moderate- to heavy helminth infections, treatment with anthelmintics offers human capital benefits precisely at the time when children are physically and cognitively maturing, including increasing the percentage of girls who pass primary school exams and attend secondary school (16). This approach has worked extremely well, particularly over the past decade, for the establishment of deworming campaigns treating over 676 million school-age children in endemic areas in 2018, and reaching more than half (approximately 53%) of all children estimated to be at risk of infection (17).

An additional complementarity of the school-based MDA approach is its augmentation with other school-based health and hygiene infrastructure and education to reduce risk factors associated with schistosomiasis, STH, and trachoma. Major multilateral initiatives such as the World Food Programme's (WFP's) school feeding efforts (18), integrated child-beneficiary activities such as the Focusing Resources on Effective School Health (FRESH) in schools (19), and an array of localized microeconomic initiatives linked to school feeding and school hygiene programs mutually reinforce the health of children through integrated messages and activities including deworming. These interventions frequently provide health benefits that extend beyond the economic means of children's families. School-based initiatives are therefore a strong example of integrated interventions that benefit the child learner.

Despite the efficiency of school-based MDA, this approach does not adequately reach students who are absent when campaigns are scheduled, nor do they reach non-enrolled children, adolescents or adults such as women of reproductive age; all of whom are now recommended to receive treatments if in STH-endemic areas. Similarly, WHO now recommends community wide treatment with a single dose of praziquantel in all age groups from 2 years old in endemic communities with prevalence of 10% and above (20). A combination of community-wide MDA with school-based treatment campaigns can maximize coverage for children and adolescents who are in- or out-of-school (20, 21). Vocational programs that reach out-of-school adolescents may similarly serve as a delivery mechanism.

COVID-19 as a counterfactual for the efficiency of school-based service delivery

School closures in response to the COVID-19 pandemic highlighted the vital role schools play in protecting the health and well-being of learners, and serve as a counterfactual of what happens when school-based health service delivery – including deworming – is no longer provided. At the height of the pandemic, an estimated 370 million children worldwide lost access to their daily school meal (22). In parallel, an additional 100 million people were pushed below the \$1.90 poverty threshold in 2020, primarily concentrated in the Africa region (23). In terms of deworming programs, a WHO pulse survey conducted in the first quarter of 2021, identified that NTDs were the second most frequently affected service after mental health, with most predominant NTD disruptions being MDA campaigns (24).

These concurrent disruptions from the pandemic highlighted the need to build back education systems that can deliver health services to improve child wellbeing. In recognition of the need to build back better, over 65 countries have committed to the School Meals Coalition, established at the 2021 UN Food Systems Summit, with the specific goals of restoring national school meals and complementary school health programs to pre-pandemic coverage by 2023, and to develop new approaches to reach another 73 million of the most in-need children who had not previously been reached, by 2030 (25). To help countries make this happen, the Coalition has created a Research Consortium for School Health and Nutrition that seeks to provide independent evidence on good practice. An important example of good practice is providing complementary school-based health interventions alongside the school meals, and it is for this reason that the Research Consortium is working with the END Fund to help countries rebuild and expand their national deworming programs alongside their national school meals programs.

Since its inception, the END Fund has supported school-based deworming to reach children in challenging contexts. In

partnership with WFP, children in Afghanistan (ongoing), Chad, Côte d'Ivoire, Democratic Republic of Congo, South Sudan, Sudan and Zambia received school-based deworming in tandem with the school feeding program. The END Fund also is making a concerted effort to support education and behavior change within the school system for the purpose of effecting long-term, sustainable reductions in STH and trachoma. Particularly, in Angola, tippy taps and latrines were installed at schools within the deworming project. This was coupled with teacher education, which was cascaded to the school children, thereby providing the infrastructure and education to support lasting changes in water, sanitation, and hygiene behavior.

It is critical for public health actors to utilize schools to implement public health initiatives to reach large numbers of children and ensure these students can effectively participate in school as healthy learners. As such, school-based MDAs are an example of cross-sector collaboration that responds to the needs of the learner (21, 26). School-based deworming programs, when combined with activities to reinforce WASH infrastructure, health, and hygiene education (27–29), have the compound benefit of bridging gendered education disparities, particularly as girls reach the age of menstruation (30, 31).

Multisectoral collaborations as transformative actions

Despite the potential for catalytic impact when integrated, health and education programs are often spearheaded by different stakeholders and overseen by different government ministries in parallel. Evidence demonstrates that breaking down silos and integrating health programs into school settings can reap enormous benefits in both health and education outcomes for school-aged children (8, 32).

The WHO Road Map for NTDs 2021-2030 recommends multisectoral collaborations to achieve the ambitious NTD control and elimination targets within the stated timeframe (33). In the last decade, most NTD programs have been delivered in silos with an exception being the school deworming program. During this decade we must double down on this collaboration by strengthening the engagement of policy makers at the Ministries of Education and Health, better utilizing the teachers to deliver the deworming medicines, educate parents and in partnership with community health workers advocate for deworming in the communities, and “integrated MDA” for multiple NTDs simultaneously.

Global economic recessions and pandemics such as COVID-19 have led to increased donor fatigue and led to a call for greater focus and progressive thinking on national government ownership, integration across sectors and sustainability of health, education and poverty reduction initiatives. The School Meals Coalition approach may be one way to achieve this vision

with its emphasis on high-level government ownership and on providing health interventions through the school system, and thus extending programmatic action beyond the health sector.

The End Fund is one of the actors that are spearheading this movement, and we call on others to join. The END Fund seeks to raise new sources of philanthropic capital for the NTD community, clarify messaging around NTD treatment effects, and promotes donor coordination and seeks to support domestic ownership. With the ethos of “leaving no one behind”, the END Fund strengthens both school-based health interventions as well as community-directed interventions. Increasingly more partners also thinking beyond “business as usual” approaches to enable the sector to achieve 2030 aspirations. The Global Schistosomiasis Alliance, also heavily involved in school-based and community-based NTD control and elimination efforts, provided strong support for the linkage of health and education initiatives, with specific consideration of how best to support the School Meals Coalition and build upon the momentum with partnership approaches.

The COVID-19 pandemic showed us what the world is like without children attending schools. Sixty-seven countries are collaborating through the School Meals Coalition to link the restore the well-being of the learner. The END Fund is working with many of these same countries to support school-based deworming. Together, these actions support the learner and learning, and are central to the recovery of these nations from the COVID pandemic.

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CK and DB conceptualized the opinion article and all authors contributed to the writing of the manuscript. LS managed the writing team and prepared the manuscript for submission. All authors contributed to the article and approved the submitted version.

Conflict of interest

Author JW was employed by company Merck KGaA.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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