



Kenya National School-Based Deworming Programme



A Report on Five Years of Implementation

Ministry of Education and Ministry of Health

Message from the Ministry of Education



Children's ability to learn depends on their health. Cognisant of this, the Ministry of Education supports programmes that promote health for children as well as systems that can provide them a quality education. Robust policies have been put in place to achieve these goals such as the National School Health Policy and Guidelines (2009; currently under review) in collaboration with the Ministry of Health.

The last fourteen years have seen a significant rise in school enrolment rates, following the Free Primary Education policy that was introduced in 2003. Primary school enrolment increased from 62% in 2002 to 86% by 2012, positioning schools as an efficient and effective platform to provide certain health programmes that target children. One such programme is National School-Based Deworming, which has consistently dewormed approximately 6 million children every year for the last five years (2012-2017). This represents 85% of all school-age children living in endemic areas.

We are proud to have been a part of this great success, and we will continue to assert our unequivocal commitment to school-based deworming through the next five-year phase (2017-2022). We stand ready to work alongside our partners to increase our role in programme coordination and management during this phase, working hand-in-hand with our colleagues in the Ministry of Health. We recognize the comparable dedication of the Ministry of Health and acknowledge their assurance of the same. The children cannot be treated at such an expansive scale without the support of county, sub county and ward/division level officers from the Ministry of Education. The commitment of teachers does not go unrecognized in tirelessly implementing at the last mile, as they administer tablets to children.

Our sincere gratitude goes to the donors; both for financial support and drug donations. Albendazole and praziquantel drugs are generously donated by GlaxoSmithKline and Merck respectively, then availed to the country through the coordination of the World Health Organization (WHO). Financial support from the END Fund and the Children's Investment Fund Foundation (CIFF) have been invaluable as well as Evidence Action's fiscal management and technical support. Thank you all, for the programme would not have been possible without you.

We look forward to continued commitment and partnership as we see this programme through the next five years, to a time when children no longer miss school due to preventable worm infections.

Kwa Afya na Elimu Bora, Tuangamize Minyoo!

**Dr. Belio Kipsang, CBS
Principal Secretary, Ministry of Education**

Message from the Ministry of Health



Neglected tropical diseases (NTDs) have been identified as a cause of morbidity and disability in many African countries. The June 2012 Accra Urgent Call to Action petitioned for accelerated efforts to eliminate targeted NTDs in the Africa Region. This is in line with the World Health Assembly's adoption of resolutions to scale up interventions against infections such as soil-transmitted helminthiasis (STH) and schistosomiasis. The Ministry of Health is fully committed to this, and toward this end, launched the 2nd Kenya National Strategic Plan for the Control of NTDs (2016-2020) as well as the National School Health Policy and Guidelines 2009 (under review) that codify and coordinate approaches to control these diseases.

The burden of STH and schistosomiasis is heaviest among pre-school and school-age children. The effects of worm infection can be chronic and may cause malnutrition, anemia and increased vulnerability to other illnesses. This is a public health problem that the Ministry is dedicated to managing, namely through a collaboration of the Neonatal Child and Adolescent Health and NTD Units.

The last five years (2012-2017) are a testament to this commitment, evidenced by our partnership with the Ministry of Education to treat at-risk children through the school system. Together, we have seen children across endemic counties treated once a year, every year under National School-Based Deworming. In 2017 alone, nearly 6 million children in 145 sub counties received treatment, surpassing the 75% coverage target set by the WHO.

We are truly proud to be a part of such an effective programme. Having now completed five years of consistent treatment coupled with rigorous monitoring, we look forward to the opportunity to evaluate the programme's impact to date. The Ministry looks forward to integrating improved environmental sanitation, use of safe water and hygiene with robust health education. We will use the evidence to further guide the programme's success toward the goal of ensuring that worms are no longer a public health problem for the children of Kenya. The accomplishments over the last five years cannot be overemphasised and we are confident that the hard work and dedication of officials from both ministries will be seen even more through the next phase.

Our gratitude extends to other key partners; GlaxoSmithKline, Merck, and WHO for providing drugs free of charge, and Evidence Action for providing technical, fiscal, and administrative support. We also appreciate funding partners without whom the programme could not be possible; the Children's Investment Fund Foundation and The END Fund for their financial commitments and partnership throughout the first five years.

It is through the hard work and dedication of ministry officers at all levels and the support of partners that this programme will continue to be impactful for the next five years and beyond.

Kwa Afya Na Elimu Bora, Tuangamize Minyoo!

Peter K. Tum, OGW
Principal Secretary, Ministry of Health

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Abbreviations

BIU	Blood in Urine
CHEW	Community Health Extension Worker
CHV	Community Health Volunteer
CIFF	Children Investment Fund Foundation
CSO	Curriculum Support Officer
ESACIPAC	Eastern and Southern Africa Centre of International Parasite Control
ECD	Early Childhood Development
EPG	Eggs per gram
DivPHO	Division-level Public Health Officer
GOK	Government of Kenya
KEMRI	Kenya Medical Research Institute
MDA	Mass Drug Administration
MOE	Ministry of Education
MOH	Ministry of Health
NCAHU	Neonatal Child and Adolescent Health Unit
NSBD	National School-Based Deworming
NTD	Neglected Tropical Diseases
SCDE	Sub county Director of Education
SCMOH	Sub county Medical Officer of Health
STH	Soil-Transmitted Helminths
WASH	Water Sanitation and Hygiene
WHO	World Health Organization

Kenya's National School-Based Deworming

An Overview

National School-Based Deworming (NSBD) is a government programme implemented by the Ministry of Education (MOE) and the Ministry of Health (MOH). The goal of the programme is to eliminate worms as a public health problem for children in Kenya. Since 2012, it has aimed to treat at least 5 million Kenyan children each year and targets all children aged 2-14 years in at-risk sub counties, regardless of their enrolment status.

In Kenya, more than 5 million school-age children are at risk of intestinal parasitic worms, including soil-transmitted helminths (STH) and schistosomes, which have a negative impact on their health and education. The Government of Kenya recognizes that the health and education of its children are key in building a bright future. As such, it has prioritized NSBD, embedding it in policies that guide its alignment with national strategies, and ultimately promoting sustainable impact. These include:

- *National School Health Policy and Guidelines* (2009) (currently under review), which prioritize deworming under the thematic area of disease prevention and control
- *The 2nd Kenya National Strategic Plan For Control of Neglected Tropical Diseases* (2016-2020), which identifies school-based deworming as one of the treatment strategies for the control of STH and schistosomiasis

Along with these policies, the programme is also an activity under the National School Health Programme at the Ministries of Health and Education, which promotes the health and educational development of pupils and the health of the community. This contribution to health is also emphasized as one of the Kenya Vision 2030 social pillars alongside education and training.

The deworming programme was piloted in 2009, when 3.6 million children were treated. Following the success of this first mass drug administration (MDA) round, it expanded to national scale and has since dewormed 5.9 million, 6.4 million, 6.2 million, 6.4 million and 5.9 million children in 2012-2013, 2013-2014, 2014-2015, 2015-2016 and 2016-2017 respectively. Treatment takes place in schools across areas endemic for parasitic worms, according to WHO treatment thresholds.

Regularly providing deworming tablets to children through schools is a proven, cost-effective and safe treatment strategy due to the readily available, extensive and sustained educational infrastructure. WHO has certified the safety of administration of deworming tablets by teachers with support from the local health system.

While initiated and managed at the national level, NSBD is implemented at the county level. Personnel from the two ministries play a joint leadership role in ensuring that the programme is implemented in every school within targeted areas.

The programme is implemented with technical, fiscal and administrative support from Evidence Action's Deworm the World Initiative, which provides technical assistance to governments to launch, strengthen and sustain mass school-based deworming programmes. Evidence Action works directly with governments to scale and support high-quality implementation of programmes targeting all at-risk school-age children. For more information about the Deworm the World Initiative, please visit www.evidenceaction.org/dewormtheworld.

Financial support for the programme's first five years was provided by The Children's Investment Fund Foundation (CIFF) and The END Fund. The deworming medicines are sourced through WHO's international medicine donation programme. These medicines (albendazole and praziquantel) are provided free of charge to the Ministry of Health by GlaxoSmithKline and Merck respectively.

The Case for School-Based Deworming

The evidence base

Globally, 1.5 billion people - nearly 1 in 4 of the world's population - are infected with STH. Further, approximately 200 million are infected with schistosomiasis. Worm transmission is perpetuated in areas with poor sanitation and hygiene. School-age children typically hold the highest burden and intensity of infections, and are particularly susceptible to developmental and behavioural deficits caused by worms. Worms interfere with nutrient uptake, leading to anaemia, malnourishment, impaired cognition and physical development, lower school attendance and performance, and reduced economic productivity in adulthood. By leveraging existing school infrastructure, school-based deworming programmes can capitalize on a captive audience and engage widely trusted people (teachers) to deliver medication, resulting in high take-up. School-based deworming can reach upwards of 80% of school-age children through national programmes implemented by Ministries of Health and Education.

The impact

Rigorous evidence shows that mass deworming is a cost-effective solution that transforms the lives of children over the short and long term. School-based mass deworming has reduced school absenteeism more cost-effectively than alternative ways of boosting attendance. In a quasi-experimental trial in Kenya, school-based mass deworming reduced absenteeism by 25%¹. Deworming may also have positive spillover effects: in Kenya, young siblings of those treated, as well as children who lived nearby treatment schools but were too young to be dewormed, showed gains in cognitive development equal to half a year of schooling when evaluated ten years later². Systematic reviews have also shown that deworming treatment leads to statistically significant weight gain in infected children³, which allows more of a child's energy to be focused on growth and development. In a randomized health intervention, Indian preschool children were given iron supplements, vitamin A and deworming treatment, with a positive gain in weight and school participation compared to provision of vitamin A alone⁴.

The benefits of school-based deworming extend beyond short-term health and educational impacts. Studies have shown long-run educational and labor market benefits as a result of investment in deworming. A follow-on study to the Kenya trial found men who were dewormed as children stayed enrolled in school for a longer time, worked more hours each week as adults, and were more likely to work in higher-wage manufacturing jobs⁵. Women who were treated as children were more likely to pass primary school exit exams and to have attended secondary school. In the long run, investing in school-based deworming may generate more government revenue than it costs; conservative estimates suggest an annual financial return of 32%⁴.



¹ Miguel, E. & Kremer, M. (2004). Worms: Identifying impacts on education and health in the presence of treatment externalities. *Econometrica*, 72:159-217.

² Ozier, O. (2016). Exploiting Externalities to Estimate the Long-Term Effects of Early Childhood Deworming. World Bank- Development Research Group.

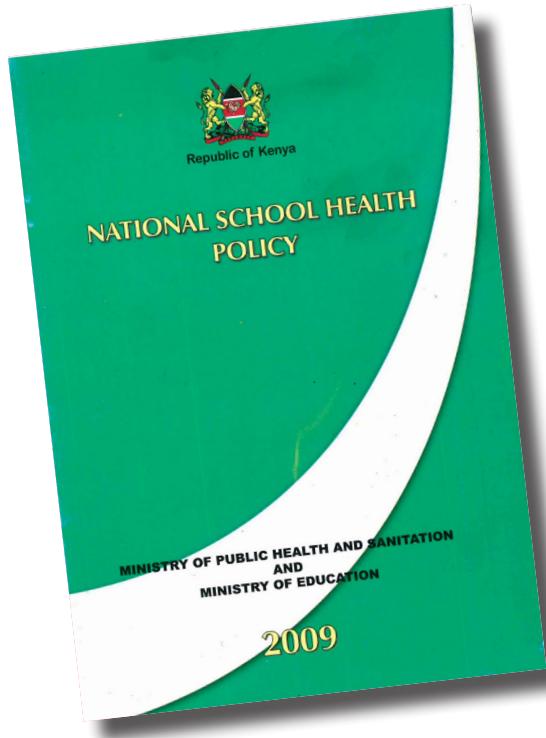
³ Croke, K., Hicks, J.H., Hsu, E., Kremer, M., & Miguel, E. (Working paper): Does mass deworming affect child nutrition? Meta-analysis, cost-effectiveness, and statistical power.

⁴ Bobonis, G.J., Miguel, E., & Puri-Sharma, C. (2006). Anemia and school participation. *The Journal of Human Resources*.

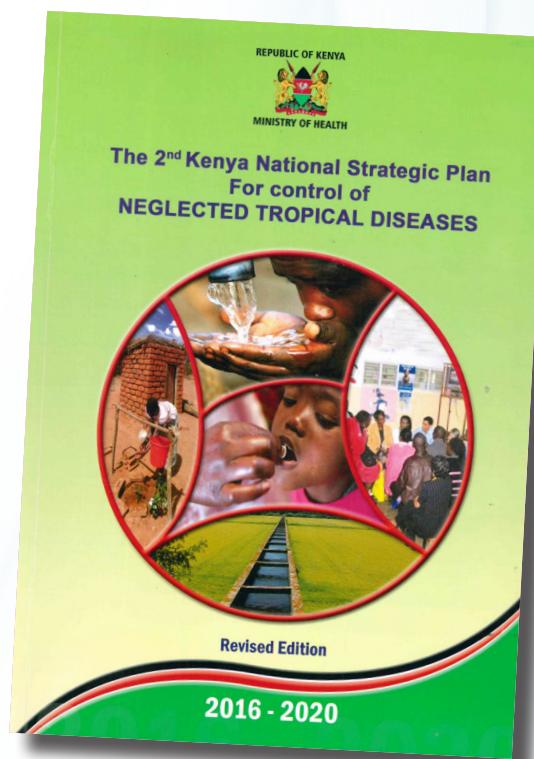
⁵ Baird, S., Hicks, J.H., Kremer, M., & Miguel, E. (Working Paper) Worms at Work: Long-run Impacts of Child Health Gains.

Government of Kenya policies

NSBD is guided by the National School Health Policy and Guidelines (2009; currently under review) and the 2nd Kenya National Strategic Plan for Control of Neglected Tropical Diseases (2016-2020). Deworming treatment data contributes to the Ministry of Health Cabinet Secretary's performance contracting indicators, signalling its importance within the sector.



The National School Health Policy and Guidelines adopt school-based mass deworming as an effective preventive and treatment strategy and state that "schools provide a good environment for control of neglected diseases (e.g. intestinal worms, schistosomiasis...)." It also states that "treatment shall be administered to all school-age children, including those out of school, based on the prevalence and intensity of worms and schistosomiasis in the area."



The 2nd Kenya National Strategic Plan for Control of Neglected Tropical Diseases also adopts school-based deworming as a treatment strategy for STH and schistosomiasis in school-age children. These policies help to govern the programme and ensure its alignment with Government of Kenya priorities and infrastructure.

In its first five years, the NSBD has been governed by a Steering Committee that is co-chaired by the Ministry of Health and Ministry of Education and meets quarterly to provide strategic oversight and decision-making authority. The committee convenes director-level personnel and technical experts to give high-level guidance for the programme. A Management Team convenes unit-level representatives from the Ministries of Health and Education, and representatives from the Kenya Medical Research Institute (KEMRI) and Evidence Action, to oversee day-to-day implementation and planning of programme logistics and operations. As the programme continues, partners will seek to maintain strong and collaborative governance structures that align and respond to Kenya's larger policy context.

Implementing Deworming: The Cascade

National School-Based Deworming uses a cascade implementation model that efficiently and cost-effectively delivers training, deworming tablets, monitoring forms, funds, and other programme materials and resources from the national level to schools. The cascade brings together personnel from the two ministries through collaborative leadership for the planning, implementation and monitoring of programme activities at all levels.

At the national level, the NSBD trains "Master Trainers" who are personnel from Ministries of Health and Education based in implementing counties. The programme also requisitions deworming tablets, develops implementation strategies, and produces training materials and monitoring tools. Thereafter, the cascade is initiated as below:

1

County Planning and Sensitisation Meeting

Before implementation, County Directors of Education and Health convene a meeting where county and sub county-level personnel are sensitised on the programme and their managerial roles. This is a critical meeting, as the programme gains buy-in and builds partnerships by engaging with county-level structures in Kenya.

Participants in this meeting include personnel that play leadership roles in implementing the programme, including County Health Records and Information Officers (CHROs), County Pharmacists, County Public Health Officers (CPHOs), County Quality Assurance & Standards Officers (CQASOs), County Directors of Teacher's Service Commission, Sub County Directors of Education (SCDEs) and Sub County Medical Officers of Health (SCMOHs).

County-level responsibilities include:

- **Financial management:** managing budgets for county-level activities
- **Programme management:** planning and reviewing cascade activities at the county level through the county school health coordinating sub committees, executing county-level community sensitisation and mobilization, providing supportive supervision and monitoring teacher trainings and deworming day
- **Management of deworming tablets:** receiving tablets from the national store and managing their distribution to the sub counties
- **Management of materials:** receiving training, community sensitisation, and monitoring materials from the national level and managing distribution to sub counties
- **Serving as programme representative:** serving as spokespersons by responding to questions regarding the programme from partners and the media

2

Sub county Training

County-based Master Trainers are deployed to train sub county and ward / division level personnel on managing and implementing the programme, including training teachers on how to implement a successful deworming day. During the training, SCMOHs and SCDEs work together to finalize the list of schools to be dewormed and update enrolment figures. Community Health Extension Workers (CHEWs), who also attend training at this level, support in community awareness and mobilization via Community Health Volunteers (CHVs) and assist to manage Severe Adverse Events (SAEs).

Personnel learn about their responsibilities for programme implementation, including:

- **Financial management:** managing budgets for sub county trainings, teacher trainings and deworming day
- **Management of deworming tablets:** receiving tablets from the county, managing their distribution to schools during teacher trainings and returning any remaining tablets through the reverse cascade
- **Management of materials:** receiving training and community sensitisation materials and monitoring tools from the county and managing their distribution to all sub county and teacher trainings and the return of the filled monitoring tools through the reverse cascade
- **Programme implementation:** coordinating teacher trainings, ensuring that all schools are adequately prepared for deworming day; overseeing community sensitisation and mobilization activities; managing any adverse events, monitoring teacher trainings and deworming day

3

Teacher Training

One head teacher and one health teacher per school are trained to sensitise children and the community, administer deworming tablets, fill monitoring forms during deworming day, and return forms and remaining tablets through the reverse cascade after deworming day. The teachers also sensitise other teachers within the school on how to carry out the exercise.

4

Community Sensitisation & Mobilization

Immediately after teacher trainings, the community sensitisation and mobilization timeframe officially begins. Health workers and teachers share key messages with children, parents, village elders, and community-based organisations prior to treatment. The aim is to encourage community members to bring their children for deworming, particularly non-enrolled children. Posters sharing messages on a) the importance of deworming, b) ways to prevent worm infections, and c) the date and location of deworming day are also posted in strategic places around the community by teachers and community health extension workers.

5

Deworming Day

On a designated county deworming day, teachers administer deworming tablets to children in schools within programme coverage areas. Deworming tablets are given to all children aged 2-14 years, including those enrolled in primary schools, in nearby Early Childhood Development (ECD) Centres, and those from the community who are not enrolled in school. Teachers fill in monitoring forms to record the number of children dewormed.

Ministry of Health personnel visit schools to monitor and ensure proper administration and manage any adverse events should they arise. Personnel from both ministries are available during deworming day to provide necessary support to teachers.

6

Reverse Cascade

After deworming day, schools send their filled monitoring forms to their ward / division-level Curriculum Support Officer (CSO), who compiles and sends the data to the SCDE for sub county-level summarization. The SCDE shares the data with the SCMOH and County personnel and returns the forms, along with financial accountability documentation, to the national level for data analysis and financial management.

Any remaining deworming tablets at the schools are collected by the CSOs and then given to the Division-level Public Health Officer (DivPHO) who fills a tracking form to show the number of unused tablets. The DivPHO submits extra, unopened tins and the summary form to the SCMOH for safe storage and use in the next round of deworming, provided expiry dates allow retaining the tablets. For opened tins, the SCMOH confirms and records the quantities, and redistributes the tablets to health facilities. The SCMOH then submits the record or "tablet form" to the NTD Unit indicating the numbers of unused tablets, their expiry dates, and where they have been redistributed.

Ultimately, the reverse cascade is critical for determining the number of children treated, the quantities of deworming tablets used and the overall success of the programme.

Impact, Successes and Lessons Learned

A 5 Year Success Story

Over the five years of NSBD, Kenya Medical Research Institute (KEMRI) has provided close monitoring and evaluation to establish the programme's impact on the prevalence and intensity of STH and schistosomiasis infections across treatment areas, and to assess programme effectiveness on an annual basis. According to KEMRI reports, NSBD has reduced the prevalence and intensity as well as reinfection of both STH and schistosomiasis among its target population over the last 5 years.

In Year 1, NSBD set an annual target of a 60% immediate reduction in post-treatment prevalence and intensity for both STH and schistosomiasis infections. The data indicate that this target for any STH infection has been met annually for years 1-5. There has also been a significant overall reduction (67%) in prevalence of any schistosome infection from years 1 to 5. Detailed results from KEMRI's parasitological monitoring are further described in the section titled "Programme monitoring and evaluation."

Drug management has evolved over the first five-year phase. Initially, any leftover drugs were redistributed to health facilities for routine use. However, this posed a challenge for clarifying inventory and procurement needs. As lead of the WHO drug requisition process and head of the programme's drugs technical working group, the NTD Unit revised the drugs protocol such that the SCMOH stores unopened tins with long expiry dates at the sub county stores for future deworming rounds, and redistributes only open tins to health facilities, keeping a clear record of each.

Engagement with master trainers also changed over the first five years. In years 1 and 2, the programme worked with national-level Master Trainers. Beginning in year 3, however, a cohort of county-based Master Trainers was established in response to devolution within the country. Engaging counties in this way increased their ownership, responsibility and accountability in the programme's execution.

At the start of the programme, deworming treatment was provided in 15 waves. This came with logistical challenges and high costs of distributing materials, carrying out trainings and monitoring activities. By the third year, the waves were reduced to two – a cost-effective approach that has allowed the programme to gain national-level attention by having most counties undertaking deworming on the same day.

While deworming has typically been implemented more widely in public schools, the programme has been able to significantly expand its engagement with private schools over the years. The number of private schools participating in NSBD has risen steadily from 4,853 in year 2 to 5,957 in year 5. Meanwhile, the number of non-enrolled children treated has decreased from 764,231 in year 1 to 379,029 in year 5, as an effect of Kenyan government policy, which increased enrolment rates through universal primary education. Even as enrolment increases, NSBD partners strive to extend much-needed treatment to hard-to-reach children. For instance, in year 5, programme partners tracked the migration patterns of mobile schools in nomadic pastoralist communities in Tana River county. Teachers at these schools migrate together with their communities and teach using supplies carried by camels provided by the Ministry of Education's National Council for Nomadic Education. Persistent follow-up with teachers as they prepared for deworming day ultimately ensured that treatment reached more vulnerable children.

Sensitising entire communities requires approaches that are both effective and cost conscious. Initially the programme relied on CHEWs and town announcers to give visibility to the programme at the community level. In the second year of the programme, some counties also engaged local radio stations to talk about the

programme. This proved useful in encouraging buy-in from the community, and was adopted more widely as a sensitisation method from year 3 onward to complement the community-wide influence that CHEWs achieve.

The programme was one of the first to respond to devolution in Kenya, as set forth by the 2010 constitution and effected in 2013. From 2013 onward, as the programme and the country's administrative structures became more stable, aspects of planning (such as quantification of materials) became more predictable and set the stage for the programme to achieve several cost efficiencies. Printing for a full year of activities was done in a single batch in Years 4 and 5 ultimately reducing printing costs by over 55%. County school health subcommittee meetings were also reduced from four to two annual meetings in year 4, leading to a 15% cost reduction in years 4 and 5. Budgets for county planning meetings, sub-county trainings, teacher trainings, and deworming day activities all decreased from year 3 to year 5.

What's next

Having celebrated five successful years of high-impact collaboration and life-enriching treatment for millions of children, programme partners maintain a strong commitment to a vision for a worm-free Kenya.

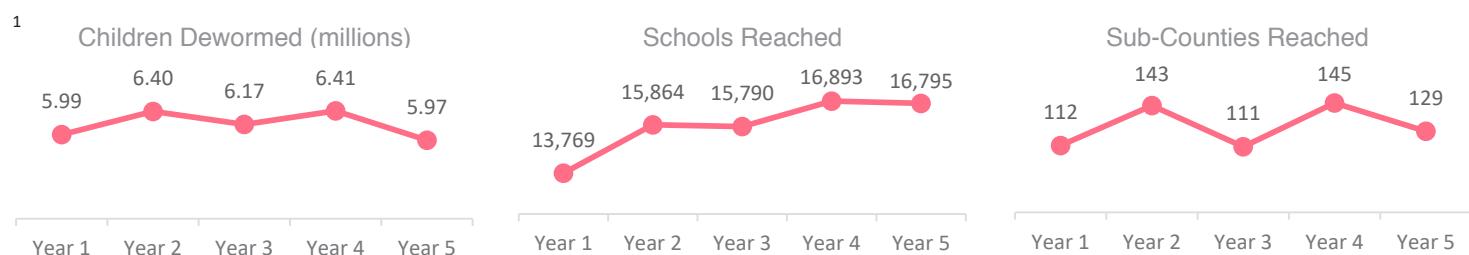
A second five-year phase of national deworming has already begun, codified by a partnership agreement between the Ministries of Health and Education and technical assistance partner Evidence Action, spanning 2017-2022. As noted in the agreement, all partners share a goal to build upon the government's ownership of the programme by transitioning tasks and responsibilities from Evidence Action to government implementers using a strategic, stepwise approach. Co-developed work plans and annual targets will provide a guiding framework to achieve this goal. As partnering ministries continue implementing NSBD, they also look to identify additional resources that can complement existing contributions of personnel time and in-kind resources that have been the programme's foundation to date.

Kenya's NSBD has become a global model for cross-sectoral collaboration and evidence-based programme implementation at scale. To maintain this reputation, NSBD must remain aligned to relevant national policies and strategies, WHO and global guidelines and best practices, and the best available scientific evidence. This will include alignment to the reviewed School Health Policy forthcoming from the Ministry of Health. Leaders from the Ministries of Health and Education now have a concrete and immediate opportunity to review and use the wealth of context-specific evidence in Kenya, including parasitological mapping, treatment and impact monitoring data, to ensure that the programme makes any adjustments necessary to continue a comprehensive and appropriate treatment targeting strategy in its second phase.

Finally, the Ministries can continue and extend the NSBD's spirit of cross-sectoral collaboration by identifying points of synergy with stakeholders pursuing complementary goals in areas such as improved water, sanitation, and hygiene in schools or communities, or robust health education and promotion. By further leveraging partnerships and domestic resources, the Government of Kenya can maximize the likelihood of eliminating worms as a public health problem.

Y1-5 NSBD Results: County breakdown

Soil-Transmitted Helminths (STH)



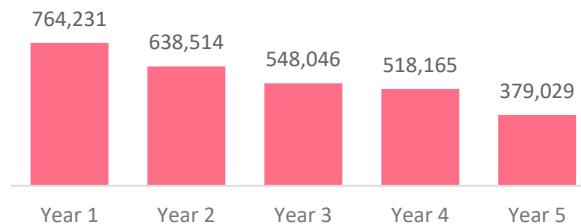
Schistosomiasis (SCH)



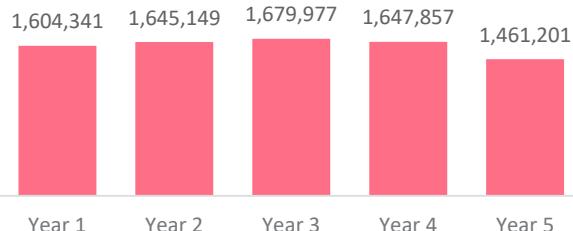
Treatment analysis

Soil-Transmitted Helminths

Number of non-enrolled children treated*

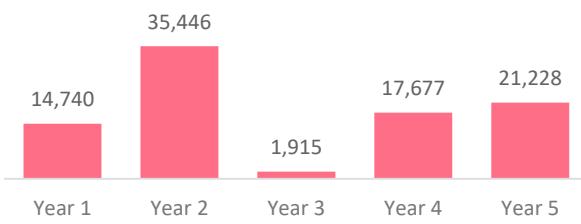


Number of children under 5 treated (ECD)



Schistosomiasis*

Number of non-enrolled children treated



*The decreasing non-enrolled children treated over the years corresponds with simultaneously increasing enrolment due to expanded free primary education.

*Schistosomiasis treatment is only for children over 5 years old so does not target ECD children

¹ In May 2017, Kwale County distributed albendazole through the Lymphatic Filariasis (LF) programme. The NSBDP did not treat with albendazole in that county to avoid double treatment. This accounts for the overall lower treatment figures for STH in year 5. The number of school-age children treated under the LF programme was 194,204.

² In year 3, praziquantel tablets were unavailable in the country hence significantly low treatment figures for schistosomiasis. Targets for schistosomiasis also vary year on year in accordance with WHO guidelines.

NSBD Results: Comparison across the 5 years

County	STH and SCH county results					Sub county	STH sub county results					SCH sub county results				
	Y1	Y2	Y3	Y4	Y5		Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5
Bomet	295,806	292,936	304,609	300,454	288,149	Bomet Central	100,832	93,848	93,300	86,673	51,437					
						Bomet East					24,539					
						Chepalungu	61,997	69,901	74,197	76,374	74,921					
						Konoin	53,585	52,462	54,842	54,046	55,278					
						Sotik	79,392	76,725	82,270	83,361	81,974					
Bungoma	574,830	592,771	639,544	678,926	610,156	Bumula	76,934	74,395	79,222	86,261	82,286					
						Bungoma Central	61,320	58,568	68,020	75,847	65,993					
						Bungoma East	91,986	108,411	106,490	119,261	47,911					
						Webuye West					51,839					
						Bungoma North	88,314	85,618	89,278	96,958	90,868					
						Bungoma South	80,727	87,931	99,098	91,919	67,732					
						Bungoma West	40,034	48,083	51,978	52,745	52,797					
						Cheptais	47,391	49,891	56,306	55,734	57,411					
						Kimili Bungoma	53,593	44,937	52,194	63,052	57,619					
						Mt Elgon	34,531	34,937	36,958	37,149	35,700					
Busia	304,959	317,705	328,738	331,658	329,959	Bunyala	24,643	27,429	27,420	27,308	26,934					
						Busia	49,634	48,058	49,175	48,776	48,016					
						Butula	50,951	55,710	62,267	57,708	54,244					
						Nambale	38,354	41,098	38,647	42,479	40,647					
						Samia	37,014	40,081	37,612	40,305	40,255					
						Teso North	45,804	49,799	52,482	53,132	50,365					
						Teso South	58,559	55,530	61,135	61,950	69,498					
						Lagdera					322					
Garissa	0	19,103	0	12,421	869	Balambala	2,584			2,102	439					
						Dadaab	2,344			962						
						Fafi	2,603			3,051						
						Garissa	4,111			3,815						
						Hulugho	722			390						
						Ijara	5,868			1,779	430					
						Lagdera	871			322						
										98						
Homa bay	390,599	393,454	402,400	408,226	412,220	Homa Bay	87,895	86,915	85,286	84,371	84,998					
						Mbita	40,186	36,385	46,029	45,842	47,138					
						Ndhiwa	78,741	73,780	77,817	79,390	81,262					
						Rachuonyo East	81,984	90,902	88,208	94,223	41,844					
						Rachuonyo South					48,685					
						Rachuonyo North	55,900	62,024	61,346	60,135	62,125					
						Suba	45,893	43,448	43,714	44,265	46,168					
Kakamega	655,996	662,831	684,524	688,322	679,122	Butere	53,887	55,343	60,706	59,640	57,225					
						Kakamega Central (Lurambi)	101,889	51,119	54,864	54,683	57,596					
						Navakholo	58,524	58,104	58,034	57,982						
						Kakamega East (Shinyalu)	60,183	63,350	64,753	64,864	62,572					
						Kakamega North (Malava)	87,110	88,064	90,731	88,187	90,228					
						Kakamega South (Ikolomani)	41,600	40,123	41,751	40,637	42,288					
						Khwisero	38,553	38,643	39,826	40,784	39,753					
						Likuyani	51,086	51,530	57,000	60,017	56,691					
						Lugari	46,025	44,539	41,716	42,957	43,803					
						Matete	32,353	27,328	28,044	29,458	29,012					
						Matungu	59,715	59,488	60,022	61,581	56,056					
						Mumias East	83,595	84,780	87,007	87,480	42,256					
						Mumias West					43,660					
Kericho	285,463	270,531	292,384	296,361	297,105	Belgut	79,201	74,583	77,170	79,377	47,979					
						Buret	66,029	60,819	63,770	66,507	63,192					
						Kericho	60,099	56,735	64,536	64,040	52,036					
						Kipkelion East	55,001	50,897	41,105	40,051	49,127					
						Kipkelion West					41,312					
Kilifi	386,498	387,276	388,605	395,238	348,150	Ganze	59,652	58,764	55,844	59,779	50,373					
						Kaloleni	59,401	60,268	59,533	61,816	53,587					
						Kilifi North	105,513	103,079	102,900	102,768	34,989					
						Kilifi South</td										

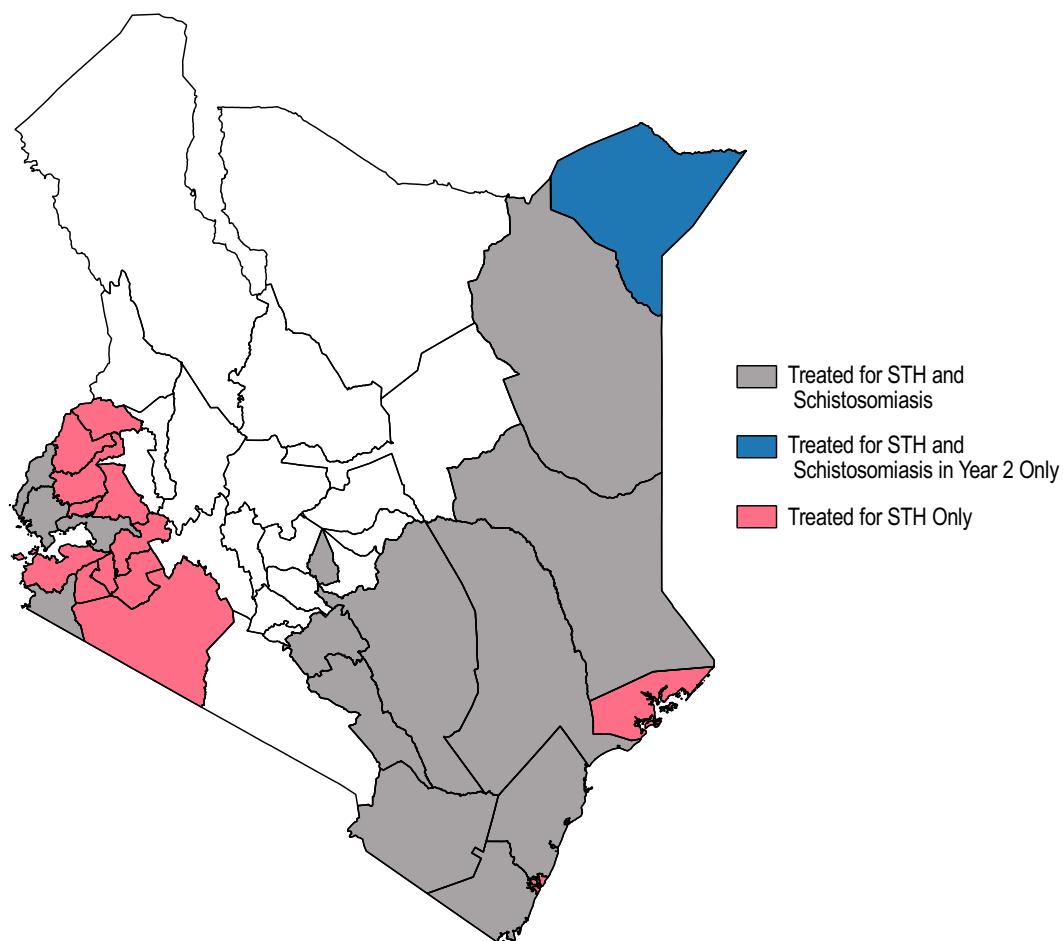
NSBD Results: Comparison across the 5 years

County	STH and SCH county results					Sub county	STH sub county results					SCH sub county results				
	Y1	Y2	Y3	Y4	Y5		Y1	Y2	Y3	Y4	Y5	Y1	Y2	Y3	Y4	Y5
Lamu	34,904	36,467	34,832	32,615	32,796	Lamu East	6,196	5,957	6,207	5,453	5,863					
						Lamu West	28,708	30,510	28,625	27,162	26,933					
Machakos	0	176,059	0	5,230	203	Kangundo	30,238		1,786			23,399		1,169		
						Kathiani	36,293		208			28,854		176		
						Machakos	33,694		419			27,049		106		
						Matungulu	26,317		1,655			22,943		1,613		
						Mwala	31,398		338			25,596		285		
						Yatta	18,119		824	203		14,684		660	176	
Makueni	0	82,612	0	55,832	343	Kibwezi	39,036		2,193			32,848		1,774		
						Kilungu			8,098					7,033		
						Makindu			9,986					7,709		
						Makueni	28,827		424			22,075		320		
						Mbooni East		11,615	343					9,607	343	
						Mbooni West			13,723					11,621		
Mandera	0	33,918	0	0	0	Mukaa		381						323		
						Nzau		9,412						7,264		
						Banisa	3,408							2,398		
						Mandera Central	4,104							3,204		
						Mandera East	14,442							3,523		
Migori	387,226	374,144	387,415	401,460	422,242	Mandera North	4,400							6,160		
						Mandera West	7,564							10,527		
						Awendo	39,495	46,092	43,762	42,343	48,683					
						Kuria East	35,685	34,049	35,236	37,754	36,393					
						Kuria West	66,453	68,959	69,158	71,697	78,901					
						Migori	94,869	81,932	88,014	98,811	106,331					
Mombasa	171,418	189,225	192,264	226,744	221,725	Nyatiike	61,872	55,578	61,500	61,608	57,864					
						Rongo	40,361	41,958	44,938	42,893	48,064					
						Uriri	48,491	45,576	44,807	46,354	46,006					
						Changamwe	40,055	52,708	54,633	58,547	26,938					
						Jomvu					31,825					
						Kisauini	66,237	71,147	66,126	91,070	45,581					
Nandi	145,264	140,861	150,163	147,756	147,025	Nyali					40,319					
						Likoni	33,981	35,792	42,759	47,447	47,877					
						Mvita	31,145	29,578	28,746	29,680	29,185					
Narok	118,162	106,365	114,564	119,332	122,676	Nandi East	46,427	46,138	47,391	47,423	45,986					
						Nandi South	62,390	58,055	64,046	63,097	58,771					
						Tinderet	36,447	36,668	38,726	37,236	42,268					
Nyamira	204,176	209,462	216,079	219,063	209,144	Trans Mara East	47,861	43,222	44,984	49,045	49,863					
						Trans Mara West	70,301	63,143	69,580	70,287	72,813					
						Borabu	28,563	27,347	27,859	26,042	25,604					
						Manga	32,541	31,287	33,380	31,560	33,458					
						Masaba North	39,772	36,670	39,760	39,301	34,527					
						Nyamira North	54,233	60,032	60,458	66,140	60,684					
Siaya	377,439	303,513	315,570	309,818	304,476	Nyamira South	49,067	54,126	54,622	56,020	54,871					
						Bondo	70,170	55,067	58,966	50,913	52,761					
						Gem	70,928	54,071	57,681	58,160	58,957					
						Rarieda	63,744	48,241	50,450	49,690	46,564					
						Siaya	82,230	68,195	67,489	69,685	61,834					
						Ugenya	51,509	45,475	48,740	46,199	46,951					
Taita Taveta	98,049	84,470	89,060	91,374	88,555	Ugunja	38,858	32,464	32,244	35,171	37,409					
						Mwatate	24,307	19,776	22,073	22,564	21,280					
						Taita	17,652	14,932	14,704	15,491	14,374					
						Taveta	25,164	23,671	24,145	25,142	23,886	10,491	9,366			
Tana River	63,527	66,894	68,688	64,895	66,740	Voi	30,926	26,091	28,138	28,177	29,015					
						Tana Delta	15,434	27,161	28,273	26,839	26,201					
						Tana North / Bura	21,578	19,355	19,675	18,385	19,938	7,528	6,425			
Trans Nzoia	388,970	306,788	327,678	328,615	331,653	Tana River / Galole	26,515	20,378	20,740	19,671	20,601	6,554	4,237			
						Endebess	114,894	89,130	107,040	103,214	37,411					
						Kwanza					68,854					
						Kiminini	178,843	142,741	141,986	144,751	75,484					
						Trans Nzoia West / Saboti					68,010					
						Trans Nzoia East / Cherengany	95,233	74,917	78,652	80,650	81,894					
Vihiga	255,208	211,009	211,636	205,924	209,150	Emuhaya	81,416	63,342	64,530	65,480	32,010					
						Luanda					33,593					
						Hamisi	72,136	58,845	62,278	61,646	61,272					
						Sabatia	60,825	56,516	50,492	47,831	48,048					
						Vihiga	40,831	32,306	34,336	30,967	34,227					
Wajir	0	11,086	0	9,704	388	Buna	775		703	228		507		512	183	
						Eldas	2,149		614	160		1,624				

The NSBD has employed different treatment strategies in different parts of the country, according to the prevalence of STH and schistosomiasis. The former Western, Nyanza, Coastal regions, and parts of Rift Valley were targeted for widespread annual STH treatment, with all except Western requiring some schistosomiasis treatment as well. Additional schistosomiasis treatment was needed in areas of Eastern, Central, and North Eastern regions where this disease was endemic. Unlike STH, schistosomiasis is focally distributed, requiring more specific targeting; this is done by determining the prevalence, as assessed by surveys of stool or urine samples in school-age children according to WHO guidelines. In the case of NSBD, it was determined that areas endemic for schistosomiasis alone should also receive complementary STH treatment, given the operational and cost efficiencies of bundling the treatments. However, there have been some fluctuations in numbers of sub counties receiving schistosomiasis treatment. Because of lower prevalence levels, some areas only required the treatment on alternating years, but there were some unplanned fluctuations in the treatment areas as well. For instance, in Year 3, most sub counties missed treatment due to a drug stock-out. The number of sub-counties receiving schistosomiasis treatment each year are shown below.

	Number of sub-counties treating for schistosomiasis
(note: in Years 1 and 2 these were classified as districts rather than sub-counties)	
Year 1	14
Year 2	63
Year 3	6 (note: in Year 3, drug stock-outs prevented most treatment from taking place)
Year 4	68
Year 5	44

Counties Covered by the Programme



Monitoring and evaluation

KEMRI is the national body responsible for carrying out health research in Kenya and a key partner in NSBD. Through its renowned international experts in STH and schistosomiasis, KEMRI provides technical support in mapping, parasitology, monitoring, and impact evaluation. Results from this work guide fundamental decisions on treatment targeting, helping NSBD maintain its evidence-based approach as described in detail below.

Programme Targeting

Scientists from KEMRI help define the programme's targeted geographies. For instance, in 2009, they provided data showing that the prevalence and intensity of STH infection in sub counties in Western, Nyanza, Coast and parts of Rift Valley regions justified treating every child in identified areas through MDA. Each year, parasitological analyses have informed decisions on programme scope, including:

- In year 2, the programme added high-risk schistosomiasis areas in Eastern, Central and North Eastern regions for treatment due to results from parasitology surveys and school-based questionnaires assessing whether children had blood in urine (BIU)
- In year 3, KEMRI conducted schistosomiasis mapping in North Eastern region to reconfirm BIU findings, ultimately reducing the number of targeted counties and schools to maintain an evidence-based treatment strategy.

Impact Monitoring Strategy

Each year since January 2012, KEMRI's Eastern and Southern Africa Centre of International Parasite Control (ESACIPAC) conducts a series of repeat cross-sectional school-level surveys capturing worm prevalence and intensity for three types of STH (hookworm, whipworm—specifically *Trichuris trichiura*, and roundworm—specifically *Ascaris lumbricoides*) and schistosome infections (*Schistosoma mansoni* and *S. haematobium*) in school-age children.

These surveys assess the impact of deworming over time and include 200 schools drawn from 20 sub counties across 16 counties in Western, Nyanza, Rift Valley and Coast regions. The strategic distribution of sampling sites allows the surveys to establish an accurate measurement of infection at the national level. The schools were surveyed at baseline (year 1), with follow-up in year 3 and again in year 5. In a subset of 60 of these schools, surveys were conducted pre- and post-treatment each year to evaluate immediate reductions in infections, which can be directly linked to programme implementation.

Programme monitoring and impact report

During the fifth year of NSBD implementation, KEMRI analyzed stool and urine samples of 21,045 children from 199 schools before deworming and 6,280 children from 60 schools after deworming to determine prevalence and intensity of infection. Here, we summarize results of the 60 schools compared over the five years of implementation. The detailed report of KEMRI's monitoring will be publicly available through a published paper. Table 1 summarizes the overall prevalence and mean intensity of both STH and schistosomiasis from year 1 pre-MDA to year 5 post-MDA.

Table 1: Overall prevalence (%) and average intensity¹ of STH and schistosomiasis infection: Y1 baseline – Y5 post-MDA (based on 60 schools)

Infection	Y1 baseline	Y1 post- MDA	Y2 pre- MDA	Y2 post- MDA	Y3 pre- MDA	Y3 post- MDA	Y4 ² pre- MDA	Y4 ² post- MDA	Y5 pre- MDA	Y5 post- MDA
	epg	epg	epg	epg	epg	epg	epg	epg	epg	epg
STH combined	33.4%	8.7 %	19.0%	6.0%	16.2%	6.3%	15.9	5.8	13.9	3.0
Hookworm	16.9%	3.2%	4.5%	2.2%	2.4%	1.8%	2.5	1.0	1.7	0.6
<i>A. lumbricoides</i>	19.2%	2.3%	12.5%	1.9%	12.7%	2.8%	11.9	1.8	10.5	0.7
<i>T. trichiura</i>	5.4%	4.3%	5.1%	2.7%	3.0%	2.3%	3.8	3.7	3.5	2.0
<i>S. mansoni</i>	1.8%	2.4%	2.7%	0.6%	1.7%	0.8%	1.7	1.2	1.8	0.7
<i>S. haematobium</i>	18.0%	8.3%	10.5%	7.6%	15.0%	5.8%	3.0	5.3	4.1	2.1
STH combined	1730	127	1110	90	922	128	1188	128	963	86
Hookworm	65	7	18	4	6	6	33	2	7	3
<i>A. lumbricoides</i>	1656	108	1078	82	909	117	1135	114	945	78
<i>T. trichiura</i>	10	12	14	5	8	6	20	12	11	5
<i>S. mansoni</i>	6	27	15	2	8	1	6	4	4	2
<i>S. haematobium</i>	14	7	5	4	9	1	3	2	4	2

¹Intensity of infection measured as eggs per gram of faeces (epg) for STH and *Schistosoma mansoni*, and eggs per 10mL of urine for *Schistosoma haematobium*

²Year 4 post-MDA was based on 48 schools, 12 schools were not surveyed due to miscommunication in the treatment dates

Worm Burden Before and After Year 5 Treatment

Five years of treatment resulted in significant reductions in prevalence for all STH as depicted in Table 2. Immediate reductions in prevalence for *S. mansoni* and *S. haematobium* were not significant, possibly because treatment for these infections was not delivered in year 3, and was only delivered to parts of programme regions in year 1.

In addition to the longer-term trends, Table 2 also shows that during year 5 of programme implementation, prevalence of any STH had significantly reduced by 57.6% overall, and prevalence of *S. haematobium* by 77.1%. The results from pre- and post-MDA surveys shows relative reductions in infections immediately after the MDA delivery in the programme areas, however, these results are not sustained over time due to the rapid reinfection rates of these parasites.

Table 2: Relative reductions in prevalence (PR) and intensity of infection (IR)

Infections	Year 5 post-MDA compared to Year 5 pre-MDA (based on 60 schools)	Year 5 pre-MDA compared to Year 1 baseline (based on 60 schools)
STH combined:		
PR	78.4%	57.6%
IR	90.8%	45.3%
Hookworm:		
PR	65.0%	89.7%
IR	50.5%	88.8%
<i>A. lumbricoides</i>:		
PR	92.8%	45.9%
IR	91.6%	44.0%
<i>T. trichiura</i>:		
PR	43.8%	35.4%
IR	51.9%	Increase*
<i>S. mansoni</i>:		
PR	62.7%	0.1%
IR	52.2%	35.1%
<i>S. haematobium</i>:		
PR	47.9%	77.1%
IR	56.1%	73.5%

Trends in prevalence and moderate to heavy intensity infection for all STH and schistosome infections from years 1 to 5 are summarized in Fig 1 and 2.

Fig 1: Prevalence (%) of STH infections and moderate to heavy intensity infections from Year 1 baseline to Year 5 post-MDA based on 60 schools

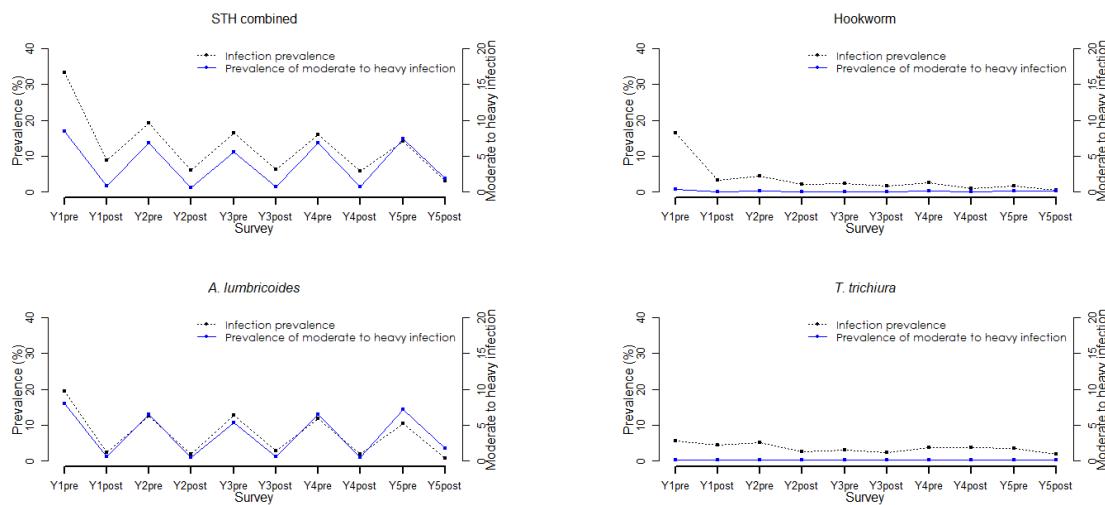
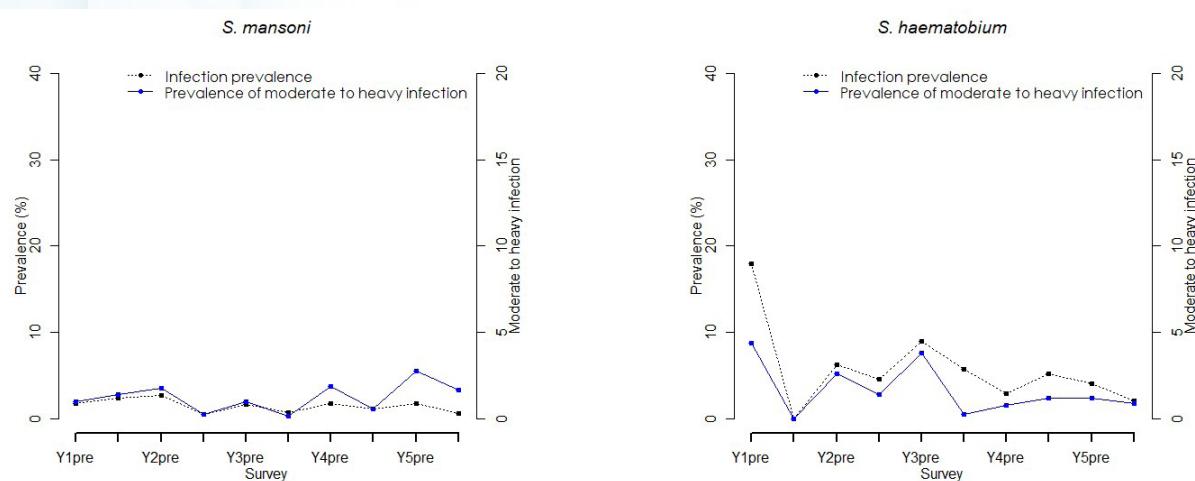


Fig 2: Prevalence (%) of schistosome infections and moderate to heavy intensity infections from Year 1 baseline to Year 5 post-MDA based on 60 schools



Monitoring findings after five rounds of MDA indicate that STH infections have continued to steadily decline from a baseline infection level of 33.4% to 3.0% at year 5 post-MDA with an overall significant relative reduction of 90.8% for any STH. Despite the staggered treatment for schistosome infections, there has been a non-significant decline in prevalence for *S. mansoni* infection from 1.8% in baseline to 0.7% in year 5 post-MDA, and a significant decline in prevalence for *S. haematobium* infection from 18.0% in baseline to 2.1% in year 5 post-MDA. The overall reduction in STH prevalence is a useful measure of programme impact and likely reflects high, and sustained, treatment coverage throughout this period; however, lack of treatment delivery for schistosomiasis in parts of some programme areas during years 1 and 3 may have affected reductions in prevalence for both schistosome species.

Using Programme Evidence to Inform Future Treatment Strategy

The prevalence and intensity of STH combined and species-specific infections decreased significantly after five rounds of MDA. There were also significant immediate reductions in STH prevalence and intensity seen in all five programme years. This is encouraging progress toward the NSBD's goal of eliminating worms as a public health problem for children in Kenya. However, worm prevalence and intensity remain at a level that warrants continued regular mass treatment for at-risk children, according to WHO guidelines. It is critical that the programme continues to treat in all at-risk areas to sustain the gains made to date. Moving into the next phase of the programme, there is a need for implementation and technical assistance partners to review and examine all relevant parasitological and mapping data to ensure that the programme continues to operate from a sound treatment strategy informed by the best available evidence. Only with a strategic and data-driven targeting approach can the programme continue its high impact and hallmark cost-effectiveness.

As much as mass drug administration can result in significant prevalence reductions, drug therapy alone is only a short-term measure of reducing worm infection and reinfection, and additional complementary interventions need to be considered as well.

Programme partners

Kenya's National School-Based Deworming is implemented with the support and technical assistance of several partner organizations.

Evidence Action scales proven development solutions to benefit hundreds of millions of people, seeking to approach the challenges of poverty on the same scale at which they exist across the globe. Our approach fills the gap between research on "what works" and implementing solutions for those in need. We implement cost-effective interventions whose efficacy is backed by substantial rigorous evidence; our current programs range from global health to safe water access to micro-financing. We voraciously self-evaluate, learn, and improve our models for scaling with a commitment to transparency on progress, impact, and value for money. Evidence Action's Deworm the World Initiative envisions a world where all at-risk children have improved health, increased access to education, and better livelihoods potential as a result of being free of intestinal worms. Evidence Action's Deworm the World Initiative currently supports governments in Kenya, India, Ethiopia, Nigeria, and Vietnam. Learn more about our work at www.evidenceaction.org.



The Children's Investment Fund Foundation (CIFF) is an independent philanthropic organisation headquartered in London with offices in Nairobi and New Delhi. We work with a range of partners to transform the lives of poor and vulnerable children and adolescents in developing countries. We support bold ideas to seemingly intractable challenges. We know that the returns on smart investments in areas such as children's early development and adolescent girls are especially high, so we strive to fill a catalytic role as a funder and influencer to deliver urgent and lasting change at scale. Our areas of work include maternal and child health, adolescent sexual health, nutrition, education and deworming, tackling child slavery and exploitation, and supporting smart ways to slow down and stop climate change. For more information, please visit www.CIFF.org and follow us on Twitter @CIFFchild.



The END Fund was founded with a clear mission to control and eliminate the most prevalent neglected tropical diseases (NTDs) among the world's poorest and most vulnerable people. END Fund does this by:

- 1) Mobilizing and directing resources to where they can have maximum impact,
- 2) Advocating for innovative, integrated, and cost-effective NTD programmes, and
- 3) Facilitating private sector engagement in the movement to address the devastating effects of NTDs.

In line with this strategy, one of the END Fund's core competencies and activities is the ongoing mapping and assessment of the NTD landscape of partners, projects, national plans, programme implementing organizations, and Ministry of Health capacity across disease-endemic countries. The END Fund proactively assesses where resource investment can most efficiently and effectively move forward the NTD control and elimination agenda. The END Fund then makes strategic investment recommendations to donors engaging in the cause. Where no existing qualified program implementing partner exists, the END Fund at times implements NTD programmes in partnership with Ministries of Health. For more information, visit www.end.org.





KENYA NATIONAL
SCHOOL-BASED
DEWORMING PROGRAMME