
Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities

Data User's Guide

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1. OVERVIEW

This document provides an overview of the data collected in an effort to monitor and evaluate the Primary School Deworming Project (PSDP), a primary school health intervention in rural Kenya. From 1998 until 2002, medical treatment for intestinal helminths (worms) was provided by a local non-governmental organization, Internationaal Christelijk Steunfonds Africa (ICS), to 75 rural Kenyan primary schools in the western district of Busia. Medical treatment was randomly “phased in” to the 75 schools between 1998 and 2001. Schools phased into the assistance project in earlier years served as “treatment schools”, and those phased in later as “comparison schools” in the evaluation.

The seventy-five schools participating in the program consisted of nearly all rural primary schools in the Budalangi and Funyula divisions of southern Busia district, and contained nearly 35,000 pupils at the start of the study. Baseline parasitological surveys conducted by the Kenyan Ministry of Health indicate that these two divisions had high rates of helminth infection, at over 90% (levels not atypical by sub-Saharan African standards, see Brooker *et al.* 2000). The data described here is employed in Miguel and Kremer (2004).

1.1 Intestinal Helminth (Worm) Infections

Hookworm, roundworm, whipworm, and schistosomiasis infect more than one in four people worldwide and are particularly prevalent among school-age children in developing countries. The former three worms are transmitted through ingestion of or contact with infected fecal matter, while schistosomiasis parasites are carried by snails in water where children swim or bathe. Because these worms do not reproduce in their human hosts, most infected individuals have minor cases with few if any symptoms. However, severe helminth infestations, resulting from repeated infection, can cause iron deficiency anemia, protein energy malnutrition, stunting, wasting, listlessness, and abdominal pain. In addition to the negative health and nutritional consequences, worm infections often result in impaired cognitive ability, poor academic performance, reduced school attendance, and high drop out rates.

Yet, helminths can be safely treated with drugs at pennies per dose through school-based mass deworming programs. Such programs were identified as among the most cost-effective health interventions in the 1993 *World Bank World Development Report*. Hookworm, roundworm, and whipworm—the geohelminths—can be effectively treated with the drug albendazole, and schistosomiasis can be successfully combated with praziquantel. Side effects are minor and seldom last more than one day, though the effects of praziquantel are generally more severe in individuals heavily infected with schistosomiasis. Both drugs need only be administered once, though they do not confer long-term immunity—children need to be re-treated every six months if they are exposed to continual re-infection.

The World Health Organization has endorsed mass school-based deworming programs in areas with high helminth infection rates, since this eliminates the need for costly individual parasitological screening (Warren *et al.* 1993, WHO 1987), bringing cost down to as little as US\$0.49 per person per year in Africa (PCD 1999), or even less in recent years. Known drug side effects are minor, and include stomach ache, diarrhea, dizziness, and vomiting in some cases

(WHO 1992). Medical treatment interferes with disease transmission, potentially creating positive externalities for other community members.

1.2 The School System in Kenya

Since primary schools were the principal channel through which deworming medicine was delivered, a brief description of the system will be instructive. The Kenyan system of education is divided into primary, secondary and post-secondary levels. The school year matches the calendar year. Term 1 runs from January through March. Term 2 runs from May to early August. Term 3 commences in early September and ends in late November. Primary schools in Kenya include standards (grades) 1 through 8, plus an Early Childhood Development (ECD) program for students too young for standard 1. The ECD program is analogous to a kindergarten or nursery school program.

Primary school pupils (excluding ECD pupils) typically range in age from six to seventeen years. There are two reasons for this wide age range. One is that some pupils start school late. A pupil typically begins standard 1 around age seven, but the age varies greatly from child to child. A second reason for the wide age range is the frequency with which pupils repeat standards. The Kenyan national curriculum is more or less standardized, and pupils who have trouble keeping up are held back. Rural pupils with poorer backgrounds and lower quality education often have difficulty grasping the curriculum, and so are held back more often. It is not uncommon for a pupil to repeat a standard two or more times.

After completing standard 8, pupils write a standardized exam, the Kenya Certificate of Primary Education (KCPE). Pupils who pass this examination (the grading scale has varied over time as changes have been made to the examination process) are eligible to go on to secondary school. The KCPE can be written multiple times, although before it can be rewritten the pupil must repeat standard 8. Pupils are selected into secondary schools based on their KCPE performance. National and provincial schools are the most prestigious, followed by District and Division secondary schools. Secondary school runs for four years, called Forms 1 through 4. Following secondary school, pupils write a formal exam that helps determine their eligibility for university education. Other post-secondary forms of education include trade schools, colleges (e.g., teachers college) and training centers.

During the study period, all schools levied fees on their pupils. In addition, pupils were required to provide their own school supplies and uniforms. In 2003, the Kenya National Rainbow Coalition (NARC) government instituted a policy of free primary education and school supplies (though pupils must still purchase uniforms), but this is after the period of study described in this document. See Glewwe *et al.* (2004) for more information on the school system.

1.3 Internationaal Christelijk Steunfonds Africa (ICS)

Internationaal Christelijk Steunfonds Africa (ICS) is an international non-governmental organization (NGO). (Note that the organization changed its name to “International Child Support” in 2005, keeping the same initials.) It is a field office of ICS Netherlands. During the study period, ICS Africa’s core areas of operation for development projects were Busia and Teso Districts, Kenya and Meatu District, Tanzania, though ICS also supported local NGOs in Uganda

and South Sudan. In Kenya, ICS ran assistance programs with primary schools, primary health centers, farmers, women's groups and others. In addition to the Primary School Deworming Project (PSDP), ICS has run several programs in Busia primary schools that overlap with PSDP schools. These overlapping programs are described in Kremer (2003), and include:

- *School Assistance Project (SAP)*—From 1996 to 2000 there were four SAP groups of 25 schools each, for a total of 100 schools. Group 1 received textbooks in 1996, Group 2 received grants in 1997, and Group 3 received grants in 1998. Group 4 schools received grants in 2000. Any school with an ICS school ID from 100-199 is an SAP school (where schools 100-124 are SAP Group 1, 125-149 are SAP Group 2, 150-174 are SAP Group 3, and 175-199 are SAP Group 4). Most important for this study, twenty-seven SAP schools are also in the PSDP sample.
- *Early Childhood Development (ECD) Program*—During 1998-99, half of the SAP schools received assistance (teacher training, classroom materials, teacher's manuals, and a salary bonus) for their ECD programs, also known as nursery school or pre-primary classes. The other half of the SAP schools served as the comparison group. The even numbered schools from the SAP program are treatment schools, while odd numbered schools are comparison schools.
- *Teacher Incentives (TI Program)*—During 1998-99, the SAP schools not in the ECD program were provided an assistance program that targeted older children. The Teacher Incentives program gave prizes to the upper primary (standards 3-8) teachers from the highest-scoring schools of these groups. Prizes were given in 1998 and 1999. Odd numbered schools from the SAP program are the treatment schools, while even numbered schools are comparison schools.

None of these programs involved health treatments for pupils, and given the cross-cutting design, are unlikely to complicate the identification of average treatment effects across PSDP program and comparison schools. Nonetheless, in many specifications Miguel and Kremer (2004) control for assignment to assistance through these other programs.

1.4 Primary School Deworming Project (PSDP)

In 1998, ICS Africa began an intestinal parasite eradication program in the primary schools of Busia, a poor and densely-populated farming district in western Kenya. Between 1998 and 2001, the Primary School Deworming Project (PSDP) was randomly phased into seventy-five primary schools in the two most heavily worm-afflicted divisions of Busia – Budalangi and Funyula. The seventy-five PSDP schools represent almost all of the rural primary schools located in these two divisions. Section 1.5 describes in further detail how these schools were selected and why a few local schools were excluded from the sample.

Before the program began, each of the seventy five schools was allocated to one of three treatment groups using a randomized evaluation methodology. Miguel and Kremer (2004) contains a partial description of the prospective experimental “list randomization” procedure, and we expand on it here. Schools were first stratified by geographical area (division, then zone), and the zones were listed alphabetically (within each division), and then within each zone the schools

were listed in increasing order of student enrolment. There are two divisions, Budalangi and Funyula, containing a total of eight zones (Agenga/Nanguba, Bunyala Central, Bunyala North, Bunyala South, Bwiri, Funyula, Namboboto, and Nambuku).

While the original plan had been to stratify by participation in other NGO programs, the actual randomization was not carried out this way. Schools participating in the intensive CSP/SHP program (described in more detail in section 1.5) were dropped from the sample, while 27 primary schools with less intensive SAP programs (described in section 1.3) were retained in the sample. These 27 schools were receiving assistance in the form of either free classroom textbooks, grants for school committees, or teacher training and bonuses. It is worth emphasizing that the randomized evaluations of these various interventions did not find statistically significant average project impacts on a wide range of educational outcomes (Glewwe, Kremer, and Moulin, 2009). The schools that benefited from these previous programs were found in all eight geographic zones; the distribution of the 27 schools across the eight zones is: Agenga/Nanguba (5 schools), Bunyala Central (1), Bunyala North (4), Bunyala South (2), Bwiri (4), Funyula (5), Namboboto (1), Nambuku (5).

The schools were “stacked” as follows. Schools were divided by geographic division, then zone (alphabetically), and then listed according to school enrolment (as of February 1997, for grades 3 through 8) in ascending order. If there were, say, four schools in a zone, they would be listed according to school enrolment in ascending order, then they would be assigned consecutively to Group 1; Group 2; Group 3; Group 1. Then moving onto the next zone, the first school in that stratum would be assigned to Group 2, the next school to Group 3, and so on. Thus the group assignment “starting value” within each stratum was largely arbitrary, except for the alphabetically first zone (in the alphabetically first division), which assigned the school with the smallest enrolment in the zone to Group 1. Finally, there were three primary schools excluded from the original stacking of 72 schools that were added back into the sample for the original randomization, to bring the sample up to 75. These schools were originally excluded for similar reasons as listed above – e.g., two are rather geographically isolated, and another is a relatively high quality school located near Funyula Town. However, in the interests of boosting sample size, these three schools were included in the list randomization alphabetically as the “bottom” three schools in the list.

Due to ICS’s administrative and financial constraints, the schools were phased into the deworming assistance program over the course of 1998-2001. Table 1.1 illustrates the basic design for 1998-2000 (all schools received treatment in 2001).

Table 1.1 Primary School Deworming Project (PSDP) Treatment Schedule, 1998-2000

Year	Group 1 (25 schools)	Group 2 (25 schools)	Group 3 (25 schools)
1998	Treatment	Comparison	Comparison
1999	Treatment	Treatment	Comparison
2000	Treatment	Treatment	Comparison

This phase-in is central to the empirical identification strategy in Miguel and Kremer (2004). Group 1 schools began receiving free deworming treatment in 1998, Group 2 schools in 1999, while Group 3 schools began receiving treatment in 2001. In 2001, a random subset of Group 1

and Group 2 schools participated in a cost-recovery program (refer to Kremer and Miguel (2004) for more details on that aspect of the program).

The PSDP intervention included both drug treatment and health education. Children who participated in the program received albendazole to treat the geohelminths and praziquantel to treat schistosomiasis. Women over thirteen years old were not treated because of concerns that albendazole might cause birth defects. However, the WHO recently called for a revision of this policy in light of a recent record of safe use of the drug by pregnant women (see, Savioli *et al.* 2003 for more information). The educational component of the intervention focused on teaching children about avoiding the disease. Health educators explained the transmission vectors for different types of helminths and also promoted hand-washing, wearing shoes, and avoiding contact with fresh water.

The Kenya Ministry of Health, Division of Vector Borne Diseases conducted parasitological exams of pupils in PSDP schools, and based on these results, deworming treatment was offered to pupils. Stool samples were first collected from Group 1 pupils in Term 1 of 1998. In all schools, geohelminth infections were found in over 50% of the pupils, so free albendazole was provided for all pupils in all 75 PSDP schools following standard treatment practice (once the school was phased in). Only in schools with schistosomiasis infections in over 30% of the pupils was mass-treatment with praziquantel provided for all pupils. If a school was found to have schistosomiasis prevalence less than 30%, only those infected pupils received praziquantel. The consent procedures are described in further detail in Miguel and Kremer (2004).

1.5 The Sample of Primary Schools

As of January 1998, there were a total of 92 primary schools in the Funyula and Budalangi divisions – 61 in Funyula division and 31 in Budalangi. Seventy-five of these 92 schools were selected to participate in PSDP—51 in Funyula and 24 in Budalangi. Thus only 17 schools were excluded. These include: town schools that were quite different from other local schools in terms of student socioeconomic background; single-sex schools; a few schools located on islands in Lake Victoria (posing severe transportation difficulties); and those few schools that had in the past already received deworming and other health treatments under an earlier small-scale ICS program. In all, the sample schools remain broadly representative of rural primary schools in the study area.

In particular, seven of the 92 schools—five in Funyula and two in Budalangi—were participants in ICS's Child Sponsorship Program/School Health Program (CSP/SHP). In 1998, it was felt that identification of treatment effects in these schools would be complicated by the past and ongoing ICS activities in those schools, activities that included health treatment, and hence they were excluded from the sample. CSP/SHP had been operating since 1995 in 16 schools across Busia and Teso districts. Eight of these schools were CSP schools, and received uniforms, textbooks, and new classrooms, as well as gifts directly from sponsors to sponsored children. SHP schools (the other eight schools) operated as a comparison group to the CSP schools, but still received monetary grants and health treatments, including deworming medicine for children who presented with severe worm infection symptoms.

Four primary schools in Funyula Town were excluded due to large perceived income differences between their student populations and those in other local schools. These schools charged schools fees well in excess of neighboring primary schools, and thus attracted the local “elite”.

Four other primary schools in Budalangi division were excluded from the sample due to geographic isolation, which introduced logistic difficulties and would have complicated deworming treatment, monitoring and evaluation. Three of these schools are located on islands in Lake Victoria, and the fourth is separated from the rest of Budalangi division by a marshy area. Fortunately the number of such schools excluded due to geographic isolation is fairly small (four of 92 schools in all).

Two additional schools were excluded for other reasons. One in Budalangi division served as the pilot school for the PSDP in 1997, receiving deworming treatment before other local schools, and thus was excluded from the evaluation. The final school was excluded since it was a newly opened school in 1998 with few pupils in the upper standards (grades), and thus not comparable to the other sample schools.

1.6 Monitoring and Evaluation

Funding for the PSDP program itself (i.e., treatment) was provided by ICS Africa.

Funding for various aspects of the monitoring and evaluating of the PSDP was provided by the World Bank Research Department, the Partnership for Child Development, the MacArthur Foundation, and the University of California, Berkeley.

The monitoring and evaluation plan was primarily designed and directed by Edward Miguel, Michael Kremer, Alfred Luoba (Kenyan Ministry of Health, Division of Vector Borne Diseases), James Nawiri (Kenyan Ministry of Health, Division of Vector Borne Diseases), Robert Namunyu (ICS Africa), Sylvie Moulin (World Bank), and Simon Brooker (Oxford University).

Project data was collected in 1998-1999 by nine enumerators: Laban Kilui Benaya (PSDP Project Coordinator), Polycarp Waswa (PSDP Project Assistant Coordinator), Moses Barasa, Salim Yusuf Hassan, Evelyn Khaemba, Sarah Luhunga Lugadiru, Helen Mukanda, Petronilah Okumu, and Godfrey Wasiche.

The data was primarily cleaned and formatted by Peter Wafula, Carol Nekesa, and Elizabeth Beasley in Kenya, and by Edward Miguel in the U.S. Tina R. Green, Ethan Yeh, and Joan Hamory, all Ph.D. students in the Economics Department at the University of California, Berkeley, did extensive work to format the data and facilitate creation of this data manual.

Table 1.2 Individuals Directly Involved in the PSDP, 1998-2004

NAME	AFFILIATION	ROLE
Edward Miguel	Associate Professor Economics Department University of California, Berkeley	Co-Principal Investigator
Michael Kremer	Gates Professor of Developing	Co-Principal Investigator

	Societies Economics Department Harvard University	
Alfred Luoba	Kenyan Ministry of Health, DVBD, Kisumu	Consultant
Simon Brooker	Partnership for Child Development	Consultant
Sylvie Moulin	World Bank	Evaluation Consultant
Elizabeth Beasley	ICS Africa	Evaluation Consultant
Robert Namunyu	ICS Africa	Project Manager
James Nawiri	Kenyan Ministry of Health, DVBD, Kisumu	Parasitologist
Laban Kilui Benaya	ICS Africa	Project Coordinator
Polycarp Waswa	ICS Africa	Assistant Project Coordinator
Moses Barasa	ICS Africa	Survey enumerator
Salim Yusuf Hassan	ICS Africa	Survey enumerator
Evelyn Khaemba	ICS Africa	Survey enumerator
Sarah Luhunga Lugadiru	ICS Africa	Survey enumerator
Helen Makunda	ICS Africa	Survey enumerator
Petronilah Okumo	ICS Africa	Survey enumerator
Godfrey Wasiche	ICS Africa	Survey enumerator
Carol Nekesa	ICS Africa	Data Coordinator
Peter Wafula	ICS Africa	Assistant Data Coordinator
Tina Green	Ph.D. Student Economics Department University of California, Berkeley	Research Assistant (cleaning and formatting data)
Ethan Yeh	Ph.D. Student Economics Department University of California, Berkeley	Research Assistant (cleaning and formatting data, data user's manual)
Joan Hamory	Ph.D. Student Economics Department University of California, Berkeley	Research Assistant (cleaning and formatting data, data user's manual)

2. PSDP DATA

2.1 Data Sets

Eight data sets are available. The contents of these data sets are described in Table 2.1 below.

Table 2.1 Available Data Sets

namelist.dta	Data on school participation (attendance) of pupils, as recorded during visits by PSDP survey enumerators. Observations in this data set are for each visit for each pupil.
namelist_old.dta	Data nearly identical to that available in “namelist.dta”. This data set was used for Table 8, Table 9, and Appendix Table 4 of Miguel and Kremer (2004), although it was later updated in the entry and cleaning process to produce the “final” data in namelist.dta. Use of this “intermediate” data set in future analysis is not recommended. For more information, see the “Guide to Replication of Miguel and Kremer (2004)”.
schoolvar.dta	School-level data on zonal worm infection levels, 1996 district mock exam scores, pupil population and other characteristics for all 75 schools involved in the PSDP.
wormed.dta	Data on helminth infections from 1998 and 1999 parasitological examinations, and hemoglobin concentrations in 1999.
test.dta	Data from academic examinations—ICS exams in 1998 and 1999, district mock exam in 1998, ICS drop out exam in 1998, and 1998 Kenya Certificate in Primary Education exam. For more information on these exams, see Miguel and Kremer (2004).
comply.dta	Data on pupils’ deworming treatment status.
comply_old.dta	Data nearly identical to that available in “comply.dta”. This data set was used for Table 7, Table 9, and the appendix tables of Miguel and Kremer (2004), although it was later updated in the entry and cleaning process to produce the “final” data available in comply.dta. Use of this “intermediate” data set in future analysis is not recommended. For more information, see the “Guide to Replication of Miguel and Kremer (2004)”.
pupq.dta	Data from 1998 and 1999 pupil questionnaires.

Throughout the data sets, pupils are identified by a seven digit identification number, called the “pupid”. Primary schools are similarly tagged with three digit school identification codes which take various names in the data sets, but generally with the prefix “sch” (e.g. “schid” or “schmk98”). The first three digits of the pupid correspond with the pupil’s school in Term 1 of 1998, and the fourth digit of the pupid corresponds with the pupil’s standard in Term 1 of 1998.

Observations in all data sets are at the pupil level, except for observations in the *schoolvar.dta* data set, which are at the school level.

2.2 Notes on the Data

A brief description of the data sets is presented below. The codebooks provided in a separate document contain more detailed information on the variables.

2.2.1 *namelist.dta*

Student participation was recorded during school visits by survey enumerators. Each school was visited at least four times during one year. The main activity during each school visit was to conduct an attendance / enrollment check, and compile a namelist for the school.

The namelist data is in “long” form, where each data point is a single namelist observation for a child. In the data, “visit” numbers range from 981 to 988 and 991 to 998. Each school was visited between 4 and 6 times per year in 1998 and 1999. The schedule of visits differed somewhat for two sets of schools—first, schools taking part in both the PSDP and the SAP, and second those schools only in PSDP. Some visits in the data were only carried out for one set of schools or the other, and this was the result of the fact that namelist visits were coordinated between the PSDP and SAP (since similar school participation data was used in the evaluation of the SAP). The schedule for visits by type of school is listed in Table 2.2.

In a few cases, a namelist visit was not conducted when it was scheduled, typically due to logistical constraints (e.g., flat tires, sick enumerators, flooded roads) or the school not being in session (e.g., most children in a school taking part in extra-curricular activities, or a large local funeral that day), but these missed visits were rare.

School participation measures were generated using the data compiled on pupils from each school visit. Participation figures for 1999 utilize information from all school visits, while figures for 1998 omit observations from the first visit (visit 981), which took place prior to the implementation of deworming treatments.

A set of time indicator variables was created for each semester (six month period) after the start of treatment in early 1998 to capture trends in school participation over time (these variables begin with “Isem” in the data set).

2.2.2 *namelist_old.dta*

This data set is nearly identical to *namelist.dta*, but is an “intermediate” version of the data. Some further data cleaning took place after its creation. This data set is being made public to allow data users to replicate the results in Miguel and Kremer (2004). However, it is not recommended that this data be used for future research: *namelist.dta* provides the most complete and final version of the data.

Table 2.2 Schedule for School Visits

Year	Term	Visit	PSDP and SAP schools	PSDP only schools
1998	1	981	X	
1998	2	982	X	
1998	2	983		X
1998	2	984	X	X
1998	2	985	X	X
1998	3	986	X	
1998	3	987		X
1998	3	988	X	
1999	1	991	X	X
1999	1	992	X	
1999	2	993	X	
1999	2	994	X	X
1999	2	995	X	X
1999	2	996		X
1999	3	997		X
1999	3	998	X	

2.2.3 *schoolvar.dta*

Data on school characteristics was collected in 1998 with the assistance of primary school headmasters. The *schoolvar.dta* data set contains statistics on school enrollment, infrastructure, average test scores, in addition to information on zonal infection status and local school and student population densities.

In this data set, “eligible” children refer to girls aged less than 13 years and all boys (i.e. the pupils “eligible” for deworming drugs) enrolled in the school based on school records. Eligibility does not have any relationship with PSDP treatment group: there are “eligible” children in all three program groups.

School enrollment figures are important in the estimation of cross-school externalities in Miguel and Kremer (2004). For each measure of the number of children or schools located within a certain distance (measures typically named “sch#_#km” or “pop#_#km” in the *schoolvar.dta* data set), there exist two variables. One variable has the suffix “_original” while the other variable has the suffix “_updated”. The variables denoted “_original” were those used in the analysis in Miguel and Kremer (2004), and were generated using a manual method of converting GPS coordinates into distances. During the process of preparing this documentation, two coding issues were discovered in the creation of these variables, related to a truncation of the number of schools counted in each geographic radius. Therefore, use of these variables in future analysis is not recommended. The variables denoted “_updated” eliminate this coding error, and also employ a Geographic Information System (GIS) computer package to convert the GPS information into more precise measures of distance. These updated variables now provide a more precise measure of local school and pupil population densities. For more information, see the “Guide to Replication of Miguel and Kremer (2004)”.

2.2.4 *wormed.dta*

This data set contains data on worm infections of pupils. Stool samples were collected by ICS survey enumerators, and parasitological exams were conducted on these samples by the Kenya Ministry of Health, Division of Vector Borne Diseases (DVBD) in January to March 1998 for Group 1 schools, and from January to March 1999 for Group 1 and Group 2 schools. A representative subset of the original Group 1 parasitological sample in 1998 was re-surveyed in 1999. Hemoglobin data were collected by Kenya Ministry of Health officials and ICS survey enumerators using the portable Hemocue machine.

The moderate-to-heavy infection thresholds used in Miguel and Kremer (2004) differ in some cases from the WHO thresholds, and were developed in personal communication with Dr. Simon Brooker and Dr. Donal Bundy, both global experts on intestinal worms, for the specific context of Busia District, Kenya during 1998 and 1999. The moderate-to-heavy infection thresholds for the various intestinal helminths are: 250 eggs per gram of stool (epg) for *S. mansoni*, and 5,000 epg for Roundworm, both the same as the WHO standard, and 750 epg for Hookworm and 400 epg for Whipworm, both somewhat lower than the WHO standard. Readers for the parasitological exams were from the Kenya Ministry of Health, DVBD, in Alupe and Kisumu. In the helminth egg counts, Reader A and Reader B each examined 50 mg of stool from a sampled child. The two separate egg counts were then added together for egg counts per 100 mg, which were then converted to eggs per gram (multiplying by ten).

A slight coding error was later discovered in the creation of the “indicator of any geohelminth moderate-heavy infection, 1999”. The original version of the variable is included in the data, named “any_geo99_original”, and the updated version of this variable is included as “any_geo99_updated”. It is not recommended that the variable “any_geo99_original” is used in future analysis. For more information, see the “Guide to Replication of Miguel and Kremer (2004)”.

2.2.5 *test.dta*

In 1998 and 1999, ICS administered English, Mathematics, and Science-Agriculture exams to pupils in grades 3 to 8. ICS exams were modeled on those given by the district office of the Ministry of Education, and prepared using the same procedure. The ICS tests for 1998 and 1999 were similar in content, but differed in two important respects. First, the 1998 exam featured multiple-choice questions while the 1999 test included short answers. Second, while each grade in 1998 was administered a different exam, in 1999 the same exam – including questions across a wider range of difficulty levels – was administered to all pupils in grades 3 to 8 to facilitate comparability across grades (especially important for comparing students who were left back a grade). Government district exams in English, Math, Science-Agriculture, Kiswahili, Geography-History, Home Science, and Arts-Crafts were also administered in both years. Both the 1998 and 1999 ICS exam scores are contained in the data set.

The average score across all subjects is employed as the principal test score outcome measure for each set of tests in Miguel and Kremer (2004). For both 1998 and 1999, test scores were normalized to mean zero and standard deviation one among comparison pupils initially enrolled in the same grade (standard) in early 1998.

The Kenya Certificate in Primary Education (KCPE) exam is taken at the end of primary school, in standard (grade) 8, and is the key exam for determining secondary school admission. Mock tests are administered to students in earlier standards in preparation for the KCPE. A drop-out exam, similar to the ICS exam was administered to a sample of students who had dropped out of school in 1998; these students were located at home and asked to come to school to take the exam. Further information on the test score data is presented in Miguel and Kremer (2004).

2.2.6 comply.dta

Pupils in program schools were treated with albendazole twice per year and with praziquantel once per year. Deworming treatment took place during two rounds. In Round 1, pupils were treated with albendazole and praziquantel, and in Round 2, pupils were treated only with albendazole. Round 1 lasted from the beginning of Term 1 to early in Term 2. Round 2 occurred during Term 3. The treatment rounds did not coincide with school visits. Treatments were administered by Kenyan nurses, and treatment dates were announced at the school in advance in an attempt to boost take-up.

In the data, children with missing drug treatment values (e.g., variables a981, a982, p98, etc.) are those children not eligible for treatment. In particular, even in treatment schools there are many missing values for praziquantel treatment (e.g., p98); these are children in schools that did not qualify for mass praziquantel treatment since schistosomiasis prevalence was relatively low there.

2.2.7 comply_old.dta

This data set is nearly identical to the comply.dta file. The comply_old.dta version is an “intermediate” version of the data. Some further data cleaning took place after its creation. This data set is being made public to allow data users to replicate the results in Miguel and Kremer (2004). However, it is not recommended that this data be used for future research: comply.dta provides the most complete and final version of the data.

2.2.8 pupq.dta

The 1998 pupil questionnaire (Appendix A) and 1999 pupil questionnaire (Appendix B) were administered to all students present in school at the pre-announced day of survey administration, among students in grades 3-8. Lower grade students were not surveyed since information obtained from very young children was not thought to be sufficiently reliable. The surveys contain a range of information about child and household characteristics.

2.3 Getting More Information About the Data Sets

Contact Joan Hamory Hicks (jrhamory@berkeley.edu) for further information.

3. CITATIONS

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4. APPENDICES: SURVEY INSTRUMENTS

Appendix A. 1998 Pupil Questionnaire

ICS Primary School Deworming Project Pupil Questionnaire (1998)

1. Today's Date: Day_____ Month_____ Year_____
2. School: _____ P.S.
3. Standard: _____ St. _____
4. Pupil Index # _____
5. Pupil's Surname: _____
Pupil's Name (Christian Name): _____
Any Other Name that the student uses at school? _____
6. Absent Days: In the Register, # of days marked absent during previous 4 weeks: _____ days

The following questionnaire will be used only by ICS staff to determine the sanitary conditions in your community. All answers will be kept confidential. We would appreciate your assistance in filling out the questionnaire, but participation is voluntary and there is no obligation to answer every question. If you wish to end the interview at any time, you may do so. If you have any questions, or if problems arise, please contact the ICS Office in Busia town. (Interviewer should sign below if the child understands this statement and agrees to participate in the interview.

Interviewer: _____ *Child:* _____
Date: _____

7. Name of Interviewer: _____
8. Beginning Time of Interview: _____

OBSERVATIONS BY INTERVIEWER

9. Pupil's Sex: _____ 1=Boy, 2=Girl _____
10. Pupil's Height: _____ cm
11. Pupil's Weight: _____ kg
12. Is the child wearing shoes or slippers? _____ 1=Shoes, 2=Slippers, 3=None _____
13. Does the child have a uniform? _____ 1=Full uniform, 2=Partial, 3=None _____
14. Condition of the clothing 1=No holes/tears, 2=A few holes/tears, 3=Many holes/tears _____
15. Cleanliness of face and hands _____ 1=Clean, 2=A bit dirty, 3=Very dirty _____

16. Does the child have long fingernails? 1=Yes, 2=No _____
17. Does the child have a swollen or distended belly? 1=Yes, 2=No _____

PUPIL INTERVIEW

Confirm age, date of birth, and position from school records, if available.

18. Pupil's Age _____ years
19. Date of Birth Day _____ Month _____ Year _____
20. What position were you in your class last term? Number _____ out of _____
21. How many textbooks do you own for your current standard? _____
22. Where you stay, what is the floor of your house made of? 1=Cement, 2=Mud _____
23. Which animals do you keep at home, where you stay? Cows 1=Yes, 2=No _____
24. Goats 1=Yes, 2=No _____
25. Sheep 1=Yes, 2=No _____
26. Pigs 1=Yes, 2=No _____
27. Chickens/turkeys/ducks 1=Yes, 2=No _____
28. At home, where do you get your water for drinking and cooking? _____
 1=Piped water, 2=Bore hole, 3=Protected well
 4=Stream, 5=Lake, 6=Pond, 7=Burrow pit
29. Do you boil your water for drinking? 1=Yes, 2=No _____
30. Do you ever go in a stream, river or lake? 1=Yes, 2=No _____
31. What do you do there? 1=Bathe, 2=Fish, 3=Play, 4=Fetch water, 5=Wash clothes _____
 (indicate all that you do)
32. How many days a week do you go there? (put 0 if No days) _____ days in a week
33. At home, do you have a pit latrine? 1=Yes, 2=No _____
34. Do you use the pit latrine? 1=Yes always, 2=Long call only, 3=Never _____
35. Do you have a baby or toddler that stays in your compound? How many? (put 0 if none) _____
36. When that child goes for long call in the compound, what is normally done with the stool? _____
 1=It is thrown in the latrine
 2=It is thrown in the shamba
 3=It is covered with soil
 4=It is just left there
37. Do you fall sick very often? 1=No hardly ever, 2=Sometimes, 3=Often _____

Have you had any of the following today or in the past week?

- | | | | |
|-----|---|-------------|-------|
| 38. | Diarrhea? | 1=Yes, 2=No | _____ |
| 39. | Constipation? | 1=Yes, 2=No | _____ |
| 40. | Abdominal pain? | 1=Yes, 2=No | _____ |
| 41. | Seen blood in your stool? | 1=Yes, 2=No | _____ |
| 42. | Itching of the anus, especially at night? | 1=Yes, 2=No | _____ |

End Time of Interview: _____

**ICS Primary School Deworming Project
Pupil Questionnaire (1998)
Additional Questions**

Add the following questions to the original questionnaire:

43. Pupil Index # _____
44. What is your mother tongue? _____
- | | |
|---------------------|----------------|
| 1=Kisamia (Luhya) | 5=Kiteso |
| 2=Kikhayo (Luhya) | 6=Kiluo |
| 3=Kimarachi (Luhya) | 7=Other: _____ |
| 4=Kinyala (Luhya) | |

Replace questions 38 - 42 (on other sheet) with:

Have you had any of the following today or in the past week?

- | | | | |
|-----|---|-------------|-------|
| 45. | Headache? | 1=Yes, 2=No | _____ |
| 46. | Cough? | 1=Yes, 2=No | _____ |
| 47. | Scabies? | 1=Yes, 2=No | _____ |
| 48. | Malaria? | 1=Yes, 2=No | _____ |
| 49. | Toothache? | 1=Yes, 2=No | _____ |
| 50. | Eye infection? | 1=Yes, 2=No | _____ |
| 51. | Ear ache? | 1=Yes, 2=No | _____ |
| 52. | Cut or wound? | 1=Yes, 2=No | _____ |
| 53. | Vomiting? | 1=Yes, 2=No | _____ |
| 54. | Jiggers? | 1=Yes, 2=No | _____ |
| 55. | Diarrhea? | 1=Yes, 2=No | _____ |
| 56. | Constipation? | 1=Yes, 2=No | _____ |
| 57. | Stomach ache? | 1=Yes, 2=No | _____ |
| 58. | Blood in your stool? | 1=Yes, 2=No | _____ |
| 59. | Itching of the anus, especially at night? | 1=Yes, 2=No | _____ |

MAHOJIANO YA MWANAFUNZI

18. Umri wa mwanafunzi Miaka: _____
19. Tarehe ya Kuzaliwa Siku ____ Mwezi ____ Mwaka _____
20. Ulikuwa nambari ngapi muhula uliopita? Nambari ____ Kwa watoto _____
21. Una vitabu vingapi vya kusoma ulivyonunuliwa vya darasa hili?
22. Sakafu ya nyumba yenu imeundwa kutumia nini? 1=Simiti, 2=Udongo
23. Ninyi hufuga wanyama gani, pale mnapoishi?
Ng'ombe 1=Ndio, 2=La
24. Mbuzi 1=Ndio, 2=La
25. Kondoo 1=Ndio, 2=La
26. Nguruwe 1=Ndio, 2=La
27. Kuku/Bata/"Kulukulu" 1=Ndio, 2=La
28. Huko nyumbani, mna teka wapi maji ya kunywa na kupika?
1=Fereji 2=Mlipuko 3=Chemchem
4=Mtoni 5=Ziwa 6=Ziwa ndogo 7=Mtaro
29. Je, ninyi huchemsha maji ya kunywa? 1=Ndio, 2=La
30. Je, wewe huenda kwa mtoni/ziwani? 1=Ndio, 2=La
31. Je, wewe hufanya nini huko?
1=Kuogelea, 2= Kuvua samaki, 3=Kucheza, 4=Kuteka maji, 5=Kuosha nguo
32. Ni mara ngapi kwa jumla/wiki wewe huenda mtoni kufanya hivyo? _____ siku kwa wiki
33. Mna choo nyumbani kwenu? 1=Ndio, 2=La
34. Mna tumia hiyo choo? 1=Ndio kila mara 2=Kwa haja kubwa pekee 3=Hatutumii kabisa.
35. Mna mtoto mdogo mnayeishi naye katika boma lenu? Wangapi?
36. Wakati huyo mtoto mdogo huenda haja kubwa katika boma, ni nini hufanyiwa choo yake?
1=Hutupwa chooni
2=Hutupwa shambani
3=Hufunikwa kwa mchanga
4=Huachwa tu pale
37. Je, wewe huwa mgonjwa mara kwa mara?
1=Siwi mgonjwa kwa urahisi 2=Si mara kwa mara 3=Mara kwa mara.
- Je, umewahi kushuhudia moja wapo ya ishara zifwatazo wakati huu au siku chache zilizopita?
38. Kuendesha/kuhara?
39. Kupata shida wakati unaenda haja kubwa?
40. Maumivu ya tumbo?

- 41. Kuona damu katika choo yako?
- 42. Kuwashwawashwa katika sehemu ya kupitia choo has wakati wa usiku?

**ICS Primary School Deworming Project
Pupil Questionnaire (1998)
Instructions for the Interviewer**

- Consent box: In order to save time, the Interviewer should sign if the child understands the statement and agrees to participate in the interview. Do not make the child sign.
- Qu. 6 should be: Ask the child the number of days he was absent during the previous 2 weeks (not 4). If today is Wednesday, take the two full weeks prior to this week. Example: if today is Wed Jan. 28, take the days absent during the week of Jan 19th and the week of Jan 12th.
- Qu. 13: The uniform can be a school uniform of any school. It doesn't have to be the one of this school.
- Qu. 14: Make sure you observe the clothing accurately. Ask the child to turn around completely so that you can see the front and the back. Sometimes the shirt looks good, but the short trouser has many tears.
- Qu. 15-16: Ask the child to show you his hands, top and bottom.
- There is no need to confirm the pupil's age and date of birth from the school records. This will take too long. We will be able to confirm the position in the school later, from the mark lists.
- Qu. 18 - 50: If the pupil doesn't know the answer to a question, put "99" for "don't know".
- Qu. 20: If the pupil doesn't know his position, ask him which school he was in and which standard last term. Then, put that information below the blank.
- Qu. 28: Add a choice "8 = Spring"
- Qu. 31: If they say that they do more than three things, add a line for each additional activity.
- Make sure you complete the new page of "Additional Questions". Questions 38-42 have been replaced with Qu. 45-59.
- If the child says there is no latrine on their compound, but they use a neighbor's or an uncle's, then you say "yes" they have a pit latrine.

Measuring Height and Weight:

- One person will measure the height and weight of all pupils. That person should get a blank Pupil Qu. form and fill in questions # 1-5 and 9-11.
- If the pupil is wearing shoes, ask him to take them off. If he is carrying anything, ask him to set it down. If he has anything in his pockets, ask him to set it down.
- First measure height, then weight.

Height:

- Make sure the pupil is standing on a flat, hard surface.
- Ask the pupil to stand up very straight, with arms down by his sides, and looking straight ahead. He should not look down or up.
- Put the measuring pole exactly behind the heels of the pupil, in the middle. Hold the pole very straight, against the back of the head of the pupil. Then hold a ruler flat against the top of the pupil's head, perpendicular to the measuring pole. Where the ruler hits the measuring pole, that is the height of the pupil.

Weight:

- Make sure the scale is on a flat, hard surface.
- Ask the pupil to stand up on the scale. He should be standing straight, not leaning forward.
- The feet should be completely on the scale. The toes or the heels should not be hanging off.
- Stand exactly behind the pupil and look between his legs at the number on the scale. Do not stand to the left or the right of the scale to see the weight, because this will give you a false reading.

- At the end of the weighing, ask the child to put back his shoes, if he had any.
- Then, the child should take his questionnaire and wait in line to be interviewed.

Appendix B. 1999 Pupil Questionnaire

ICS Primary School Deworming Project Pupil Questionnaire (1999)

1. Today's Date: Day____ Month____ Year____
2. School: _____ P.S.
3. Standard: _____ St. _____
4. Pupil Index # _____
5. Pupil's Surname: _____
Pupil's Name (Christian Name): _____
Any Other Name that the student uses at school? _____
6. Pupil's Height: _____ cm
7. Pupil's Weight: _____ kg

OBSERVATIONS *(The child should be standing in front of you)*

8. Name of Interviewer: _____
9. Beginning Time of Interview: _____

The following questionnaire will be used only by ICS staff to determine the sanitary conditions in your community. All answers will be kept confidential. We would appreciate your assistance in filling out the questionnaire, but participation is voluntary and there is no obligation to answer every question. If you wish to end the interview at any time, you may do so. If you have any questions, or if problems arise, please contact the ICS Office in Busia town. (Interviewer should sign below if the child understands this statement and agrees to participate in the interview.)

Interviewer: _____

10. Is the child wearing shoes or slippers? 1=Shoes, 2=Slippers, 3=None _____
11. Does the child have a uniform? 1=Full uniform, 2=Partial, 3=None _____
12. Condition of the clothing 1=No holes/tears, 2=A few holes/tears, 3=Many holes/tears _____
13. Cleanliness of face and hands 1=Clean, 2=A bit dirty, 3=Very dirty _____

- PUPIL INTERVIEW** (*The child can now sit down*)

- 25

37. At home, do you have a pit latrine? 1=Yes, 2=No _____
38. Do you use the pit latrine? 1=Yes, nearly always, 2=Long call only, 3=Never _____
39. Do you fall sick very often? 1=No hardly ever, 2=Sometimes, 3=Often _____
40. During the last week, were you sick at all? 1=Yes, 2=No _____

Have you had any of these problems today or IN THE PAST WEEK? (*Keep stressing IN THE PAST WEEK*)

1=Yes

2=No

3=Don't Know

	English	Kiswahili	Kisamia	
41.	Headache	Kuumwa kichwa	Omutue khukhomaka	
42.	Malaria	Malaria	Malaria	
43.	Fever / Cold / Flu	Homa	Ekhoma	
44.	Cough	Kukohoa	Ekhololo	
45.	Toothache	Kuumwa meno	Erino lichunanga	
46.	Eye infection	Shida ya macho	Emoni chichunanga	
47.	Ear ache	Shida ya masikio	Okhutwi khuchunanga	
48.	Cut or wound	Jeraha kwa mwili/kidonda	Ori nende ekonjo	
49.	Vomiting	Unatabika	Oosala	
50.	Diarrhea	Kuhara	Oonyalala	
51.	Constipation	Kufunga kwenda haja kubwa	Ofunga okhuchia muchoo	
52.	Stomach ache	Kuumwa tumbo	Enda okhuchuna	
53.	Did you see any BLOOD IN YOUR STOOL? If they say No, ask: Is this because you use a pit latrine and you can't see? If so, put 3=Don't Know	Kuona damu kwa choo	Amabanga mubunyaka/muma fwi	
54.	Have you seen any BLOOD IN YOUR URINE? If they say No, ask: Is this because you use a pit latrine and you can't see? If so, put 3=Don't Know	Kuona damu kwa mkojo	Amabanga mumanyi	
55.	Itching of the anus,	Unajikuna au kuashwa katika sehemu ya	Okhweyaka mubuniero esiro	

	especially at night	kupitia choo		
56.	Worms	Minyoo	Enjukha chomunda	
57.	Schistosomiasis	Kichocho	Enjukha khekheta	

58. Did you receive any treatment for WORMS during the past year? 1=Yes, 2=No _____
Either at school or from a doctor or a dispensary or health clinic.

(If No, skip to #67)

59. Was the treatment provided by ICS? 1=Yes, 2=No _____

Were there any side effects from the treatment?

- | | | | | | |
|-----|--------------|---------------|-------------------|-------------|-------|
| 60. | Stomach ache | Kuumwa tumbo | Enda okhuchuna | 1=Yes, 2=No | _____ |
| 61. | Headache | Kuumwa kichwa | Omudue khukhomaka | 1=Yes, 2=No | _____ |
| 62. | Vomiting | Unatabika | Osala | 1=Yes, 2=No | _____ |
| 63. | Nausea | Kuchafuka | Omonyo Okhusiukha | 1=Yes, 2=No | _____ |
| 64. | Other? | | | 1=Yes, 2=No | _____ |

If other, what? _____

65. Did you notice any improvement in your health after treatment? 1=Yes, 2=No _____

If yes, what improvement? _____

66. Did you notice any improvement in your classmates' health after treatment? 1=Yes, 2=No _____

If yes, what improvement? _____

67. End Time of Interview: _____

68. Second Height Measure: _____ cm

MAHOJIANO YA MWANAFUNZI

18. Umri wa mwanafunzi Miaka: _____
19. Tarehe ya Kuzaliwa Siku ____ Mwezi ____ Mwaka _____
20. Ulikuwa nambari ngapi muhula uliopita? Nambari ____ Kwa watoto _____
21. Una vitabu vingapi vya kusoma ulivyonunuliwa vya darasa hili?
22. Sakafu ya nyumba yenu imeundwa kutumia nini? 1=Simiti, 2=Udongo
23. Ninyi hufuga wanyama gani, pale mnapoishi?
24. Ng'ombe 1=Ndio, 2=La
25. Mbuzi 1=Ndio, 2=La
26. Kondoo 1=Ndio, 2=La
27. Nguruwe 1=Ndio, 2=La
27. Kuku/Bata/"Kulukulu" 1=Ndio, 2=La
28. Huko nyumbani, mna teka wapi maji ya kunywa na kupika?
1=Fereji 2=Mlipuko 3=Chemchem
4=Mtoni 5=Ziwa 6=Ziwa ndogo 7=Mtaru
29. Je, ninyi huchemsha maji ya kunywa? 1=Ndio, 2=La
30. Je, wewe huenda kwa mtoni/ziwani? 1=Ndio, 2=La
31. Je, wewe hufanya nini huko?
1=Kuogelea, 2= Kuvua samaki, 3=Kucheza, 4=Kuteka maji, 5=Kuosha nguo
32. Ni mara ngapi kwa jumla/wiki wewe huenda mtoni kufanya hivyo? _____ siku kwa wiki
33. Mna choo nyumbani kwenu? 1=Ndio, 2=La
34. Mna tumia hiyo choo?
1=Ndio kila mara 2=Kwa haja kubwa pekee 3=Hatutumii kabisa.
35. Mna mtoto mdogo mnayeishi naye katika boma lenu? Wangapi?
36. Wakati huyo mtoto mdogo huenda haja kubwa katika boma, ni nini hufanyiwa choo yake?
1=Hutupwa chooni
2=Hutupwa shambani
3=Hufunikwa kwa mchanga
4=Huachwa tu pale
37. Je, wewe huwa mgonjwa mara kwa mara?
1=Siwi mgonjwa kwa urahisi 2=Si mara kwa mara 3=Mara kwa mara.
- Je, umewahi kushuhudia moja wapo ya ishara zifwatazo wakati huu au siku chache zilizopita?
38. Kuendesha/kuhara?
39. Kupata shida wakati unaenda haja kubwa?

- 40. Maumivu ya tumbo?
- 41. Kuona damu katika choo yako?
- 42. Kuwashwawashwa katika sehemu ya kupitia choo has wakati wa usiku?

**ICS Primary School Deworming Project
Pupil Questionnaire (1999)
Instructions for the Field Officers**

Measuring Height and Weight:

- One person will measure the height and weight of all the pupils.
- One other person will write the measurements on a small sheet of paper, which he will then give to the child. The child must take this piece of paper to the interviewer, who will use it to fill in Questions 6-7.
- If the pupil is wearing SHOES, ask him to take them off. If he is carrying anything, ask him to set it down. If he has anything IN HIS POCKETS, ask him to set it down.
- First measure height, then weight.

Height:

- Put one of the wooden boards down on a FLAT, hard surface.
- Ask the pupil to stand up on the board, very straight, with arms down by his sides, and looking straight ahead. He should not look down or up or to the side.
- Put the measuring tape exactly behind the heels of the pupil, in the middle. Hold the pole very straight, against the back of the head of the pupil. The tape must be very vertical, not leaning at all. Then hold a ruler flat against the top of the pupil's head, perpendicular to the measuring tape. Where the ruler hits the measuring tape, that is the height of the pupil.

Weight:

- Put the other wooden board down on a flat, hard surface. Put the scale on top of the board.
- Ask the pupil to stand up on the scale. He should be standing straight, not leaning forward.
- The feet should be completely on the scale. The toes or the heels should not be hanging off.
- Crouch behind the pupil and look between his legs at the number on the scale. Make sure your position is exactly behind the pupils's legs. Do not stand to the left or the right, because this will give you a false reading.
- At the end of the weighing, ask the child to put back his shoes, if he had any.
- Give the child the small piece of paper with his measurements on it.
- The child should take his paper and wait in line to be interviewed.

Filling in the Pupil Questionnaire

- Qu. 11: The uniform can be a school uniform of any school. It doesn't have to be the one of this school.
- Qu. 12: Make sure you observe the clothings accurately. Ask the child to turn around completely so that you can see the front and the back. Sometimes the shirt looks good, but the short trouser has many tears.
- Qu. 13-14: Ask the child to show you his hands, top and bottom.
- Qu. 37: If the child says there is no latrine on their compound, but they use a neighbor's which is very nearby, then you can say "yes" they have a pit latrine.
- Give the Pupil his questionnaire, and send him back to the Height Station to get his second height measurement.

Second Height Measurement

- The pupil should wait in line to get measured again for height. This time, you can write the height directly on his questionnaire.