Supplementary information

The Model

The fundamental model used to describe the mean worm burden of individuals of a given age and the quantity of infectious eggs in the environment was developed from the founding work of Anderson and May [1]. The current version of the model is described in detail in [2-5]. The key parameters in Supporting Table 1 and Supporting Table 2.

The model was further adapted to allow for systematic non-compliance (individuals never taking treatment) [6, 7]. A more detailed description of the model is provided in Truscott *et al*. [8].

Supporting Table S1: Model parameters for *Schistosoma mansoni*

Parameter	Value	Source
Adult worm life expectancy	5.71 years	[9, 10]
Aggregation parameter, *k*	0.24	[11]
Density dependence fecundity, γ	0.0007/female worm	[3]
Drug efficacy (proportion of worms killed by praziquantel)	0.86	[12]
Egg output per female worm in absence of density dependence (in terms of faecal egg counts)	0.14	[13]
Human demography	Based on Uganda's demographical profile	[14, 15]
Life expectancy of the infected snails	4 weeks	[16]

Baseline scenarios

Based on the available data [3], we developed three age-intensity profiles representing a range of possible scenarios regarding the relative burden in adults.

When changing the assumed the life span of the adult worms, the age-specific parameters for the exposure and contribution to the infectious reservoir were refitted – so that the shape of the age profile does not change.

Supporting Table S2: Model for the three age-intensity profiles

Parameter	Setting 1: Low burden in adults	Setting 2: Medium burden in adults	Setting 3: High burden in adults
5.71 year average lifespan			
Basic Reproductive number (Lower setting)	1.30485	1.31547	1.30577
Basic Reproductive number (Higher setting)	1.6687	1.68	1.62886
Age specific degree of exposure and contribution to the infectious reservoir	0-5 year olds: 0.01 5-10 year olds: 1.2 10-16 year olds: 1 16+ year olds: 0.02	0-5 year olds: 0.032 5-10 year olds: 0.61 10-16 year olds: 1 16+ year olds: 0.06	0-5 year olds: 0.01 5-12 year olds: 0.61 12-20 year olds: 1 20+ year olds: 0.12
4 year average lifespan			
Basic Reproductive number (Lower setting)	1.33155	1.3638	1.325568
Basic Reproductive number (Higher setting)	1.7752	1.83495	1.6778
Age specific degree of exposure and contribution to the infectious reservoir	0-5 year olds: 0.32 5-10 year olds: 4.95 10-16 year olds:1 16+ year olds: 0.065	0-5 year olds: 0.032 5-10 year olds: 0.14 10-16 year olds: 1 16+ year olds: 0.09	0-5 year olds: 0.01 5-12 year olds: 0.5 12-20 year olds: 1 20+ year olds: 0.14

The model was used to simulate two transmission settings; a higher transmission setting with an age-weighted mean worm burden of 155, and a lower transmission setting with a mean worm burden of 60. The data used to define the three scenarios is presented in [3].

The model was used to simulate two transmission settings; a higher transmission setting with an age-weighted mean worm burden of 155 (based on model fits to the data [5]), and a lower transmission setting with a mean worm burden of 60. To ensure the results for the different scenarios are comparable, the R_0 was adjusted such that the different scenarios had the same pre-control mean worm burden (i.e. we ensured that we are not comparing the impact of both a different age-infection profile and a different pre-control burden when comparing the different scenarios).

Supporting Table S3: Sensitivity of the relative increase in effectiveness when using annual community-wide versus school-based treatment to the treatment coverage in adults (55% vs. 75%).

Metric	Relative pre-control worm burden in adults	Relative increase in effectiveness	
		Higher transmission setting	Lower transmission setting
Worm-years averted	Low	15-17%	13-15%
	Medium	27-30%	20-23%
	High	72-80%	55-59%
Prevalent case years averted	Low	68-83%	59-70%
	Medium	101-124%	83-99%
	High	228-303%	204-258%
Heavy case years averted	Low	21-23%	11-12%
	Medium	39-43%	16-18%
	High	107-118%	49-52%

The range in each cell shows the variation in the relative increase in effectiveness when using annual community-wide versus school-based treatment to the assumed level of treatment coverage in adults (55% vs. 75%). The scenarios for the relative pre-control burden in adults are shown in Figure 2 (note they have the same age-weighted overall mean worm burden). The results assume 5% systematic non-compliance and 75% treatment coverage of SAC. The analysis was conducted with a five-year implementation period and a 15-year time horizon (i.e. looking at the impact of five years of treatment over 15 years).

Supporting Table S4: Sensitivity of the relative increase in effectiveness when using annual community-wide versus school-based treatment to the assumed mean life expectancy of the adult worms (4 years vs. 5.71 years).

Metric	Relative pre-control worm burden in adults	Relative increase in effectiveness	
		Higher transmission setting	Lower transmission setting
Worm-years averted	Low	7-17%	5-15%
	Medium	30-55%	23-30%
	High	80-94%	59-61%
Prevalent case years averted	Low	70-83%	47-70%
	Medium	124-182%	99-149%
	High	303-359%	258-302%
Heavy case years averted	Low	10-23%	4-12%
	Medium	43-83%	18-26%
	High	118-139%	52-54%

The range in each cell shows the variation in the relative increase in effectiveness when using annual community-wide versus school-based treatment to the assumed mean life expectancy of the adult worms (4 years vs. 5.71 years). The scenarios for the relative pre-control burden in adults are shown in Figure 2 (note they have the same age-weighted overall mean worm burden). The results assume a treatment coverage of 75% and 5% systematic non-compliance. The analysis was conducted with a five-year implementation period and a 15-year time horizon (i.e. looking at the impact of five years of treatment over 15 years).

Supporting Table S5: Sensitivity of the relative increase in effectiveness when using annual community-wide versus school-based treatment to the assumed level of systematic non-compliance (0% vs 20%).

Metric	Relative pre-control worm burden in adults	Relative increase in effectiveness	
		Higher transmission setting	Lower transmission setting
Worm-years averted	Low	16-17%	14-15%
	Medium	28-30%	22-22%
	High	76-81%	59-60%
Prevalent case years averted	Low	58-124%	49-98%
	Medium	74-195%	60-252%
	High	178-491%	154-408%
Heavy case years averted	Low	21-25%	12-13%
	Medium	40-42%	17-21%
	High	111-114%	48-60%

The range in each cell shows the variation in the relative increase in effectiveness when using annual community-wide versus school-based treatment to the assumed level of systematic non-compliance (0% vs. 20%). The scenarios for the relative pre-control burden in adults are shown in Figure 2 (note they have the same age-weighted overall mean worm burden). The results assume a treatment coverage of 75%. The analysis was conducted with a five-year implementation period and a 15-year time horizon (i.e. looking at the impact of five years of treatment over 15 years).

Supporting Table S6: Relative increase in effectiveness when using annual community-wide versus school-based treatment when assuming poor school enrolment.

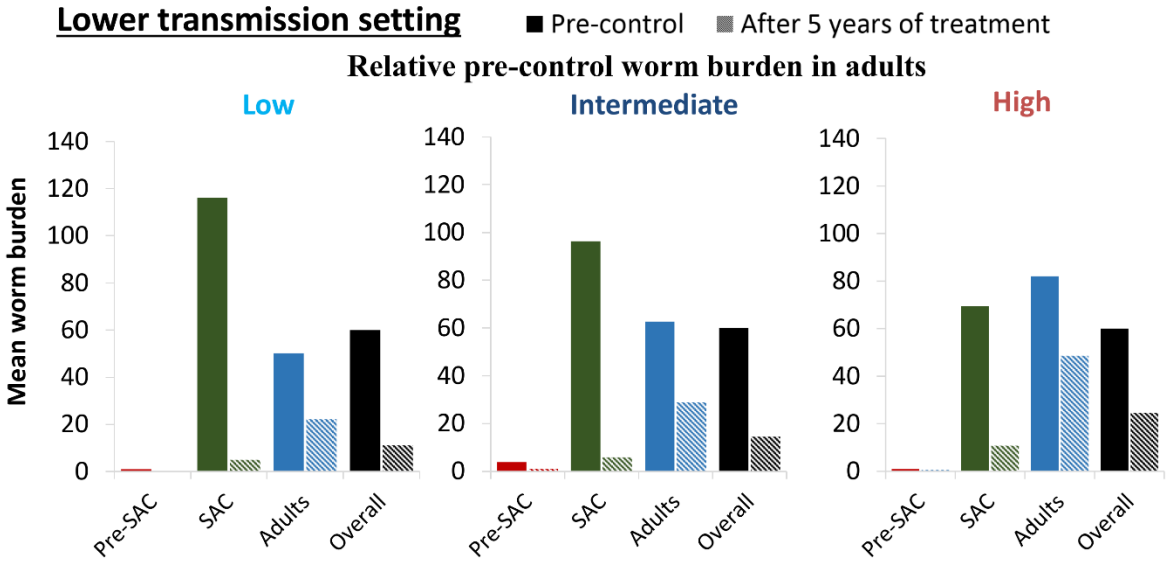
Metric	Relative pre-control worm burden in adults	Relative increase in effectiveness	
		Higher transmission setting	Lower transmission setting
Worm-years averted	Low	32%	23%
	Medium	45%	33%
	High	98%	74%
Prevalent case years averted	Low	169%	146%
	Medium	205%	168%
	High	381%	330%
Heavy case years averted	Low	51%	18%
	Medium	70%	26%
	High	149%	67%

The results assume the systematic non-compliance rate is 20% for the school-based programme, and 5% when using community-wide mass treatment (simulating a scenario where many of the non-enrolled SAC are only reached when using a community-based programme). The scenarios for the relative pre-control burden in adults are shown in Figure 2 (note they have the same age-weighted overall mean worm burden). The treatment coverage was assumed to be 75%. The analysis was conducted with a five-year implementation period and a 15-year time horizon (i.e. looking at the impact of five years of treatment over 15 years).

Supporting Table S7: The effect of using different fitting methods to account for the age-intensity profile on the projected incremental increase in effectiveness when using annual community-wide versus school-based treatment.

	When fitting to fully age structured data	**When only fitting to the mean burdens in children and adults**	**Percentage difference between the two fitting methods**
Average number of worm-years averted per person	645.38	830.58	29%
Prevalent case years averted (per 100 individuals)	308.39	439.36	42%
Heavy case years averted (per 100 individuals)	56.43	77.45	31%

In the first results column the model was fitted to fully age-structured data (and therefore accounts for the true shape of the age-intensity profile) *[5]. In the second results column, the model was only fitted to reproduce the estimated mean pre-control worm burdens in SAC and adults from the same dataset. The data used in this example is from the Iietune village (Kenya) [60]. The results assume a treatment coverage of 75% and no systematic non-compliance. The analysis was conducted with a five-year implementation period and a 15-year time horizon (i.e. looking at the effect of five years of treatment for 15 years).*



Supporting Figure S1: The impact of annual school-based treatment on the mean worm burden in different age groups in three settings with a different relative pre-control worm burden in adults. *The solid bars represent the pre-control burden and the hashed bars, the burden after 5 years of treatment. The scenarios for the relative pre-control burden in adults are shown in Figure 2 (note they have the same age-weighted overall mean worm burden). The results assume a treatment coverage of 75% and 5% systematic non-compliance. The results pertaining to the higher transmission setting are shown in Figure 4. Pre-SAC: 2-4 year-olds, SAC: 5-14 year-olds and adults: ≥15 year-olds.*

Relative pre-control worm burden in adults

Low

20% systematic non-compliance

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	-
20%	NA	NA	NA	NA	NA	-
40%	10	10	10	9	9	-
60%	7	7	7	7	7	-
80%	6	6	6	6	6	-
95%	-	-	-	-	-	-

0% systematic non-compliance

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	NA
20%	NA	NA	NA	15	15	15
40%	8	7	7	7	7	7
60%	5	5	4	4	4	4
80%	3	3	3	3	3	3
95%	3	2	2	2	2	2

Intermediate

20% systematic non-compliance

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	-
20%	NA	NA	NA	NA	NA	-
40%	12	10	10	10	9	-
60%	9	8	7	7	7	-
80%	8	7	6	6	6	-
95%	-	-	-	-	-	-

0% systematic non-compliance

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	NA
20%	NA	NA	15	14	14	13
40%	10	8	7	7	7	7
60%	6	5	5	4	4	4
80%	5	4	3	3	3	3
95%	4	3	3	2	2	2

High

20% systematic non-compliance

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	-
20%	NA	NA	13	11	10	-
40%	NA	11	9	8	7	-
60%	14	9	7	6	6	-
80%	12	8	6	6	5	-
95%	-	-	-	-	-	-

0% systematic non-compliance

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	15	14
20%	NA	14	10	8	7	7
40%	15	9	6	5	5	4
60%	11	6	5	4	3	3
80%	9	5	4	3	3	2
95%	8	5	3	3	2	2

Supporting Figure S2: Sensitivity of the number of years of annual treatment to achieve elimination of *Schistosoma mansoni* to the assumed level of systematic non-compliance. *The scenarios for the relative pre-control burden in adults are shown in Figure 2 (note they have the same age-weighted overall mean worm burden). The results use the parameters for the lower transmission setting. When assuming a systematic non-compliance rate of 20% it is not possible to get 95% coverage (indicated by a dash on the figure). NA; Not achievable within 15 years of annual treatment.*

Relative pre-control worm burden in adults

Low **Intermediate** **High**

Assuming a mean worm life expectancy of 4 years

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	NA
20%	NA	NA	NA	NA	NA	NA
40%	11	10	10	10	10	10
60%	7	7	6	6	6	6
80%	5	5	5	5	5	5
95%	4	4	4	4	4	4

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	NA
20%	NA	NA	NA	NA	NA	NA
40%	NA	12	10	9	9	8
60%	11	8	7	6	6	6
80%	9	6	5	5	4	4
95%	8	6	5	4	3	3

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	NA
20%	NA	NA	11	9	8	7
40%	NA	10	7	6	5	5
60%	13	8	6	5	4	4
80%	11	7	5	4	3	3
95%	10	6	4	3	3	2

Assuming a mean worm life expectancy of 5.71 years (baseline assumption)

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	NA
20%	NA	NA	NA	NA	15	15
40%	8	8	8	8	7	7
60%	5	5	5	5	5	5
80%	4	4	3	3	3	3
95%	3	3	3	3	2	2

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	NA
20%	NA	NA	NA	15	14	14
40%	10	9	8	7	7	7
60%	7	6	5	5	5	5
80%	5	4	4	3	3	3
95%	5	4	3	3	3	2

Coverage of SAC (%) \ Coverage of adults (%)	0%	20%	40%	60%	80%	95%
0%	NA	NA	NA	NA	NA	15
20%	NA	15	11	9	8	7
40%	NA	9	7	6	5	5
60%	12	7	5	4	4	3
80%	10	6	4	3	3	3
95%	9	5	4	3	2	2

Supporting Figure S3: Sensitivity of the number of years of annual treatment to achieve elimination of *Schistosoma mansoni* to the assumed mean life expectancy of the worms. *The scenarios for the relative pre-control burden in adults are shown in Figure 2 (note they have the same age-weighted overall mean worm burden). The results use the parameters for the lower transmission setting, and assume 5% systematic non-compliance. NA; Not achievable within 15 years of annual treatment.*

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