Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Sartorius B, Cano J, Simpson H, et al. Prevalence and intensity of soil-transmitted helminth infections of children in sub-Saharan Africa, 2000–18: a geospatial analysis. Lancet Glob Health 2021; 9: e52–60.
## Supplementary Material

### Section A: Country specific STH profiles

#### A1: Key STH indicators by country in 2018

| ISO 3 | Total number of IU's | National STH prevalence, 2018 | National moderate-to-heavy intensity STH prevalence, 2018 | Number of IU's with STH prevalence ≥ 20%, 2018 | Proportion of IU's with STH prevalence ≥ 20%, 2018 | Number of IU's above elimination target of 2% prevalence for moderate-to-heavy intensity, 2018 | Proportion of IU's above elimination target of 2% prevalence for moderate-to-heavy intensity, 2018 | Proportion of IU's in lowest 10 percentile i, for cumulative effective PC rounds, 2018 | Proportion of IU's in lowest 10 percentile i for improved sanitation, 2018 | Proportion of IU's in lowest 10 percentile i for slum-like living conditions, 2018 | Proportion of IU's in lowest 10 percentile i for GDP PPP, 2018 |
|-------|----------------------|-------------------------------|----------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| AGO   | 164                  | 20.4%                         | 2.2%                                                     | 88                                            | 53.7%                                         | 80                                            | 48.8%                                         | 62.8%                                         | 0.0%                                          | 51.2%                                         | 6.7%                                          |
| BDI   | 46                   | 15.8%                         | 1.5%                                                     | 15                                            | 32.6%                                         | 14                                            | 30.4%                                         | 0.0%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| BEN   | 77                   | 15.4%                         | 1.4%                                                     | 15                                            | 19.5%                                         | 14                                            | 18.2%                                         | 7.8%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| BFA   | 70                   | 1.4%                          | 0.0%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| BWA   | 24                   | 6.5%                          | 0.4%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 91.7%                                         | 0.0%                                          | 0.0%                                          | 8.3%                                          |
| CAF   | 17                   | 13.3%                         | 1.1%                                                     | 1                                             | 5.9%                                          | 1                                             | 5.9%                                          | 52.9%                                         | 0.0%                                          | 11.8%                                         | 94.1%                                         |
| CIV   | 83                   | 8.0%                          | 0.5%                                                     | 1                                             | 1.2%                                          | 0                                             | 0.0%                                          | 8.4%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| CMR   | 189                  | 20.6%                         | 2.8%                                                     | 112                                           | 59.3%                                         | 109                                           | 57.7%                                         | 0.5%                                          | 0.0%                                          | 0.0%                                          | 2.6%                                          |
| COD   | 516                  | 19.8%                         | 2.2%                                                     | 241                                           | 46.7%                                         | 234                                           | 45.3%                                         | 29.5%                                         | 0.0%                                          | 39.9%                                         | 36.4%                                         |
| COG   | 43                   | 29.4%                         | 3.9%                                                     | 31                                            | 72.1%                                         | 31                                            | 72.1%                                         | 4.7%                                          | 0.0%                                          | 0.0%                                          | 9.3%                                          |
| DJI   | 5                    | 3.2%                          | 0.1%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 100.0%                                        | 0.0%                                          | 20.0%                                         | 40.0%                                         |
| ERI   | 58                   | 0.3%                          | 0.0%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 79.3%                                         | 0.0%                                          | 0.0%                                          | 8.6%                                          |
| ETH   | 744                  | 14.9%                         | 1.4%                                                     | 132                                           | 17.7%                                         | 123                                           | 16.3%                                         | 26.5%                                         | 58.9%                                         | 14.8%                                         | 3.5%                                          |
| GAB   | 51                   | 43.0%                         | 7.0%                                                     | 51                                            | 100.0%                                        | 50                                            | 98.0%                                         | 90.2%                                         | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| GHA   | 216                  | 4.4%                          | 0.2%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 6.0%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| GIN   | 38                   | 11.0%                         | 0.9%                                                     | 4                                             | 10.5%                                         | 4                                             | 10.5%                                         | 28.9%                                         | 0.0%                                          | 0.0%                                          | 26.3%                                         |
| GMB   | 44                   | 7.9%                          | 0.6%                                                     | 2                                             | 4.5%                                          | 2                                             | 4.5%                                          | 100.0%                                        | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| GNB   | 118                  | 18.4%                         | 2.2%                                                     | 55                                            | 46.6%                                         | 55                                            | 46.6%                                         | 15.3%                                         | 0.0%                                          | 0.8%                                          | 0.0%                                          |
| GNQ   | 17                   | 72.9%                         | 26.9%                                                    | 17                                            | 100.0%                                        | 17                                            | 100.0%                                        | 100.0%                                        | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| KEN   | 290                  | 9.0%                          | 0.7%                                                     | 28                                            | 9.7%                                          | 23                                            | 7.9%                                          | 57.2%                                         | 0.3%                                          | 0.3%                                          | 5.2%                                          |
| LBR   | 15                   | 24.8%                         | 4.0%                                                     | 11                                            | 73.3%                                         | 10                                            | 66.7%                                         | 6.7%                                          | 0.0%                                          | 0.0%                                          | 53.3%                                         |
| LSO   | 10                   | 54.7%                         | 11.3%                                                    | 10                                            | 100.0%                                        | 10                                            | 100.0%                                        | 50.0%                                         | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| MDG   | 114                  | 30.9%                         | 5.3%                                                     | 68                                            | 59.6%                                         | 67                                            | 58.8%                                         | 19.3%                                         | 23.7%                                         | 36.0%                                         | 7.0%                                          |
| MLI   | 66                   | 1.6%                          | 0.0%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 1.5%                                          | 0.0%                                          | 1.5%                                          | 36.4%                                         |
| MOZ   | 159                  | 18.9%                         | 1.9%                                                     | 72                                            | 45.3%                                         | 70                                            | 44.0%                                         | 1.3%                                          | 0.6%                                          | 6.9%                                          | 39.6%                                         |
| MRT   | 42                   | 9.2%                          | 0.7%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 100.0%                                        | 0.0%                                          | 0.0%                                          | 4.8%                                          |
| MWI   | 29                   | 5.0%                          | 0.3%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| NAM   | 34                   | 7.1%                          | 0.5%                                                     | 4                                             | 11.8%                                         | 4                                             | 11.8%                                         | 100.0%                                        | 20.6%                                         | 0.0%                                          | 11.8%                                         |
| NER   | 39                   | 1.2%                          | 0.0%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 0.0%                                          | 0.0%                                          | 5.1%                                          | 41.0%                                         |
| NGA   | 774                  | 15.6%                         | 1.8%                                                     | 247                                           | 31.9%                                         | 238                                           | 30.7%                                         | 15.6%                                         | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| RWA   | 30                   | 21.0%                         | 2.8%                                                     | 13                                            | 43.3%                                         | 13                                            | 43.3%                                         | 0.0%                                          | 0.0%                                          | 0.0%                                          | 0.0%                                          |
| SDN   | 157                  | 1.2%                          | 0.0%                                                     | 0                                             | 0.0%                                          | 0                                             | 0.0%                                          | 100.0%                                        | 0.0%                                          | 0.0%                                          | 7.6%                                          |
| Country | Code | Prevalence | IU with 1 IU | IU with 2 IU | IU with 3 IU | IU with 4 IU | IU with 5 IU | IU with 6 IU | IU with 7 IU | IU with 8 IU | IU with 9 IU | IU with 10 IU | IU with 11 IU | IU with 12 IU | IU with 13 IU | IU with 14 IU | IU with 15 IU | IU with 16 IU | IU with 17 IU | IU with 18 IU | IU with 19 IU | IU with 20 IU | IU with 21 IU | IU with 22 IU | IU with 23 IU | IU with 24 IU | IU with 25 IU | IU with 26 IU | IU with 27 IU |
|---------|------|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| SEN     | 76   | 5.9%       | 1            | 1.3%         | 1            | 1.3%         | 1            | 1.3%         | 0.%          | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| SLE     | 14   | 13.6%      | 3            | 21.4%        | 3            | 21.4%        | 0.%          | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| SOM     | 18   | 8.8%       | 0            | 0.0%         | 0            | 0.0%         | 100.0%       | 0.0%         | 0.0%         | 0.0%         | 94.4%        | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| SSD     | 80   | 4.8%       | 2            | 2.5%         | 2            | 2.5%         | 91.3%        | 11.3%        | 0.0%         | 0.0%         | 2.5%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| SWZ     | 55   | 10.4%      | 4            | 7.3%         | 3            | 5.5%         | 52.7%        | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| TCD     | 91   | 3.7%       | 0            | 0.0%         | 0            | 0.0%         | 58.2%        | 30.8%        | 29.7%        | 19.8%        | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| TGO     | 40   | 16.6%      | 11           | 27.5%        | 11           | 27.5%        | 12.5%        | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| TZA     | 186  | 13.8%      | 36           | 19.4%        | 34           | 18.3%        | 0.5%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 19.9%        | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| TZZ     | 11   | 18.6%      | 5            | 45.5%        | 2            | 18.2%        | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 9.1%         | 9.1%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| UGA     | 116  | 13.0%      | 15           | 12.9%        | 14           | 12.1%        | 13.8%        | 5.2%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| ZAF     | 52   | 27.7%      | 31           | 59.6%        | 30           | 57.7%        | 28.8%        | 0.0%         | 0.0%         | 5.8%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| ZMB     | 103  | 14.7%      | 33           | 32.0%        | 32           | 31.1%        | 17.5%        | 0.0%         | 14.6%        | 8.7%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |
| ZWE     | 62   | 5.9%       | 0            | 0.0%         | 0            | 0.0%         | 58.1%        | 0.0%         | 0.0%         | 8.1%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         | 0.0%         |

i: based on centile values for SSA in 2018
ii: Only IU's with estimated baseline STH prevalence ≥20%
A2: High burden IU’s (estimated prevalence exceeding $\geq 10\%$) and in the lowest 10 percentile range for key intervention/development indicators (red) in 2018.

Lowest cumulative PC, 2018

Poor sanitation, 2018
A3. Moderate-to-heavy intensity infection by country and exceedance probability uncertainty associated with this threshold, 2018. Note: list of country names and ISO3 codes provided below the table.

| ISO3 | STH prevalence (any and moderate-to-heavy intensity) by year showing range across IU’s using a box plot. Key provided below to aid interpretation: |
|------|----------------------------------------------------------------------------------------------------------------------------------|
|      | Prevalence of moderate-to-heavy intensity infection in 2018 at IU level                                                                                                                   |
|      | Probability that a given IU is below the target 2% elimination threshold in 2018 (areas towards red spectrum significantly more likely to exceed the threshold and include solid black outline while those areas towards blue spectrum and in black outline were significantly less likely to exceed aforementioned threshold) |

| <2%   | 0.00 - 0.04                                                                                                         |
| 2-4.9%| 0.05 - 0.09                                                                                                         |
| 5-9.9%| 0.10 - 0.19                                                                                                         |
| 10-14.9%| 0.20 - 0.34                                                         |
| 15+%  | 0.35 - 0.49                                                                                                         |
|       | 0.50 - 0.64                                                                                                         |
|       | 0.65 - 0.79                                                                                                         |
|       | 0.80 - 0.89                                                                                                         |
|       | 0.90 - 0.94                                                                                                         |
|       | 0.95 - 1.00                                                                                                         |
The diagram shows the distribution of a particular indicator across various countries over several years. The countries mentioned in the document include Congo, DRC, Gabon, Cameroon, Angola, Central African Republic, Nigeria, Equatorial Guinea, South Sudan, and Sao Tome & Principe. The graph on the left appears to represent statistical data with bars indicating variations over time, while the map on the right illustrates spatial patterns with color coding.

The document seems to focus on data visualization, possibly related to a study or report on cross-border indicators in Central Africa.
NAM

South Africa
Namibia
Angola
Zambia
Botswana
Mozambique
Madagascar
Zimbabwe
Malawi
Lesotho
Congo, DRC
Swaziland
Tanzania (Mainland)
| ISO3 | Full Country Name       | ISO3 | Full Country Name       |
|------|-------------------------|------|-------------------------|
| AGO  | Angola                  | MLI  | Mali                    |
| BDI  | Burundi                 | MOZ  | Mozambique              |
| BEN  | Benin                   | MRT  | Mauritania              |
| BFA  | Burkina Faso            | MWI  | Malawi                  |
| BWA  | Botswana                | NAM  | Namibia                 |
| CAF  | Central African Republic| NER  | Niger                   |
| CIV  | Cote d'Ivoire           | NGA  | Nigeria                 |
| CMR  | Cameroon                | RWA  | Rwanda                  |
| COD  | Congo, DRC              | SDN  | Sudan                   |
| COG  | Congo                   | SEN  | Senegal                 |
| DJI  | Djibouti                | SLE  | Sierra Leone            |
| ERI  | Eritrea                 | SOM  | Somalia                 |
| ETH  | Ethiopia                | SSD  | South Sudan             |
| GAB  | Gabon                   | SWZ  | Swaziland               |
| GHA  | Ghana                   | TCD  | Chad                    |
| GIN  | Guinea                  | TGO  | Togo                    |
| GMB  | The Gambia              | TZA  | Tanzania (Mainland)     |
| GNBQ | Guinea-Bissau           | TZZ  | Tanzania (Zanzibar)     |
| GNQ  | Equatorial Guinea       | UGA  | Uganda                  |
| KEN  | Kenya                   | ZAF  | South Africa            |
| LBR  | Liberia                 | ZMB  | Zambia                  |
| LSO  | Lesotho                 | ZWE  | Zimbabwe                |
| MDG  | Madagascar              |      |                         |
### Section B: Additional data descriptions, methodological information and results

**B1.** Gather checklist of information that should be included in new reports of global health estimates

| Item # | Checklist item                                                                                                           | Reported on page # |
|--------|--------------------------------------------------------------------------------------------------------------------------|--------------------|
|        | **Objectives and funding**                                                                                            |                    |
| 1      | Define the indicator(s), populations (including age, sex, and geographic entities), and time period(s) for which estimates were made. | 6-7                |
| 2      | List the funding sources for the work.                                                                                  | 3                  |
|        | **Data Inputs**                                                                                                         |                    |
| 3      | For all data inputs from multiple sources that are synthesized as part of the study: Describe how the data were identified and how the data were accessed. | 6-7                |
| 4      | Specify the inclusion and exclusion criteria. Identify all ad-hoc exclusions.                                           | 6-8 Supplementary B2, B4 |
| 5      | Provide information on all included data sources and their main characteristics. For each data source used, report reference information or contact name/institution, population represented, data collection method, year(s) of data collection, sex and age range, diagnostic criteria or measurement method, and sample size, as relevant. | 6-7 Supplementary B2, B4 |
| 6      | Identify and describe any categories of input data that have potentially important biases (e.g., based on characteristics listed in item 5). | 8 Supplementary B6 |
|        | For data inputs that contribute to the analysis but were not synthesized as part of the study: Describe and give sources for any other data inputs. | 6-7 Supplementary B2, B4 |
| 7      | For all data inputs: Provide all data inputs in a file format from which data can be efficiently extracted (e.g., a spreadsheet rather than a PDF), including all relevant meta-data listed in item 5. For any data inputs that cannot be shared because of ethical or legal reasons, such as third-party ownership, provide a contact name or the name of the institution that retains the right to the data. | Supplementary B4 |
| 8      | Provide a conceptual overview of the data analysis method. A diagram may be helpful.                                   | 7-8 Supplementary B10 |
| 9      | Provide a detailed description of all steps of the analysis, including mathematical formulae. This description should cover, as relevant, data cleaning, data pre-processing, data adjustments and weighting of data sources, and mathematical or statistical model(s). | 7-9 Supplementary B10 |
| 10     | Describe how candidate models were evaluated and how the final model(s) were selected.                                 | 8-9 Supplementary B14 |
| 11     | Provide the results of an evaluation of model performance, if done, as well as the results of any relevant sensitivity analysis. | 9 Supplementary B14 |
| 12     | Describe methods for calculating uncertainty of the estimates. State which sources of uncertainty were, and were not, accounted for in the uncertainty analysis. | 8-9                |
|   |   |   |
|---|---|---|
| 14 | State how analytic or statistical source code used to generate estimates can be accessed. | Supplementary B11 |
| 15 | Provide published estimates in a file format from which data can be efficiently extracted. |   |
| 16 | Report a quantitative measure of the uncertainty of the estimates (e.g. uncertainty intervals). | 10-13 Figures 1,2,4 |
| 17 | Interpret results in light of existing evidence. If updating a previous set of estimates, describe the reasons for changes in estimates. | 12-14 |
| 18 | Discuss limitations of the estimates. Include a discussion of any modelling assumptions or data limitations that affect interpretation of the estimates. | 14-15 |
Distribution and quality of programmatic or survey data points, 1975-2019

- Initial input data points or surveys: 30,732
  - 2,236 surveys without year
  - 13,253 surveys prior to 2000
  - 867 surveys which could not be IU located

- Final input data points or surveys used in analyses: 26,304
| Georeliability                                                                 | No of data points | %     |
|--------------------------------------------------------------------------------|-------------------|-------|
| Reliable: Exact location identified on Google Maps                               | 8,121             | 30.9% |
| Reliable: Approx. location identified on Google Maps                            | 237               | 0.9%  |
| Reliable: Coordinates located within the correct ADM1 boundary                  | 15,814            | 60.1% |
| Unreliable: Coordinates not within the correct ADM1 boundary/Not found          | 2,132             | 8.1%  |
| Overall                                                                        | 26,304            | 100.0%|

| Grading quality by site from 1998 to 2018                                       | No of data points | %     |
|--------------------------------------------------------------------------------|-------------------|-------|
| 1. Good Quality: Survey conducted since 2005, reporting prevalence of all three species using Kato Katz) | 24,496            | 93.1% |
| 2. Middle Quality: Insufficient information on prevalence, numbers tested or non-standard diagnostic, since 2000; | 1,762             | 6.7%  |
| 3. Poor quality: Old data (pre-2000), or insufficient information available on survey details | 46                | 0.2%  |
| Overall                                                                        | 26,304            | 100.0%|
### B3: Age profile of survey data points, 2000 to 2018

| Age_start | Freq. | Percent | Cum.  |
|-----------|-------|---------|-------|
| 57        | 392   | 1.49    | 1.49  |
| 58        | 75    | 0.29    | 1.78  |
| 59        | 18    | 0.07    | 1.84  |
| 60        | 24    | 0.09    | 1.94  |
| 61        | 47    | 0.18    | 2.11  |
| 62        | 1,444 | 5.49    | 7.60  |
| 63        | 1,779 | 6.76    | 14.37 |
| 64        | 897   | 3.41    | 17.78 |
| 65        | 1,245 | 4.73    | 22.51 |
| 66        | 940   | 3.57    | 26.08 |
| 67        | 4,864 | 18.49   | 44.57 |
| 68        | 648   | 2.46    | 47.04 |
| 69        | 352   | 1.34    | 48.38 |
| 70        | 122   | 0.46    | 48.84 |
| 71        | 6     | 0.02    | 48.86 |
| 72        | 3     | 0.01    | 48.87 |
| 73        | 1     | 0.00    | 48.88 |
| 74        | 1     | 0.00    | 48.88 |
| 75        | 6     | 0.02    | 48.91 |
| 76        | 2     | 0.01    | 48.91 |
| 77        | 1     | 0.00    | 48.92 |
| 78        | 1     | 0.00    | 48.92 |
| 79        | 1     | 0.00    | 48.92 |
| 80        | 1     | 0.00    | 48.92 |
| 81        | 1     | 0.00    | 48.93 |
| 82        | 1     | 0.00    | 48.93 |
| 83        | 3     | 0.01    | 48.94 |
| 84        | 1     | 0.00    | 48.95 |
| 85        | 1     | 0.00    | 48.95 |
| 86        | 1     | 0.00    | 48.95 |
| 87        | 1     | 0.00    | 48.96 |
| 88        | 1     | 0.00    | 48.96 |
| 89        | 13,425| 51.04   | 100.00|
| Total     | 26,304| 100.00  |       |
| Year | 0   | 1   | Total |
|------|-----|-----|-------|
| 2000 | 18  | 28  | 46    |
| 2001 | 39  | 12  | 51    |
| 2002 | 86  | 45  | 131   |
| 2003 | 58  | 10  | 68    |
| 2004 | 131 | 590 | 721   |
| 2005 | 226 | 201 | 427   |
| 2006 | 79  | 160 | 239   |
| 2007 | 47  | 304 | 351   |
| 2008 | 358 | 503 | 861   |
| 2009 | 350 | 1,532 | 1,882 |
| 2010 | 81  | 956 | 1,037 |
| 2011 | 114 | 1,217 | 1,331 |
| 2012 | 1,308 | 1,909 | 3,217 |
| 2013 | 2,517 | 2,343 | 4,860 |
| 2014 | 2,943 | 1,337 | 4,280 |
| 2015 | 2,539 | 1,914 | 4,453 |
| 2016 | 138 | 103 | 241   |
| 2017 | 1,102 | 0 | 1,102 |
| 2018 | 745 | 261 | 1,006 |
| Total | 12,879 | 13,425 | 26,304 |

Total: 12,879 13,425 26,304
. xtmixed Cum_Prevalence missing_age || ISO3: || idlim2:, vce(robust)

Mixed-effects regression Number of obs = 26,304

| Group Variable | No. of Groups | Observations per Group |
|----------------|---------------|------------------------|
| ISO3 | 46 | Minimum: 1 Average: 571.6 Maximum: 3,045 |
| idlim2 | 3,594 | Minimum: 1 Average: 7.3 Maximum: 411 |

Wald chi2(1) = 1.01
Prob > chi2 = 0.3152

(Std. Err. adjusted for 46 clusters in ISO3)

| Cum_Prevalence | Coef. | Std. Err. | z | P>|z| | [95% Conf. Interval] |
|----------------|-------|-----------|---|-----|-------------------|
| missing_age | .0438275 | .0436352 | 1.00 | 0.315 | -0.0416959 .1293508 |
| _cons | .1840767 | .0344213 | 5.35 | 0.000 | .1166122 .2515413 |

| Random-effects Parameters | Estimate | Std. Err. | [95% Conf. Interval] |
|---------------------------|----------|-----------|---------------------|
| ISO3: Identity | sd(_cons) | .154399 | .0162615 | .1256016 .1897991 |
| idlim2: Identity | sd(_cons) | .144734 | .009942 | .1265029 .1655925 |
| sd(Residual) | .1577436 | .0105519 | .1383607 .1798419 |
. logit Cum_Prevalence missing_age, cluster(idlim2)

Logistic regression
Number of obs = 26,304
Wald chi2(1) = 0.28
Prob > chi2 = 0.5994
Log pseudolikelihood = -14655.754
Pseudo R2 = 0.0001
(Std. Err. adjusted for 3,545 clusters in idlim2)

|               Robust          |
|-----------------|-----------------|-----------------|-----------------|
| Cum_Prevalence  | Coef. | Std. Err. | z    | P>|z| | [95% Conf. Interval] |
| missing_age     | -.0388108 | .0738784 | -.53 | 0.599 | -.1836099, .1059883 |
| _cons           | 1.142296   | .0712945  | 16.02| 0.000 | 1.002561, 1.28203   |

59
A detailed summary of the covariates, source as well as temporal and spatial resolution can be found in the table below.

Climatic data by year for 2000 to 2017 were derived using high-resolution satellite and meteorological data from the WorldClim database at 1 km spatial resolution (1). Aridity was calculated using mean annual precipitation divided by mean annual Potential Evapo-Transpiration (PET). Soil porosity, using sand fraction of the top-soil as a proxy, and top-soil pH data were extracted from SoilGrids system at a 250 m resolution available at https://soilgrids.org/ with a published description (2).

Data for living in a house that has dirt or earth floors and living in slum conditions were extracted from high-resolution, standardized estimates of housing conditions across SSA for 2000 to 2015 recently published (3) and available at https://map.ox.ac.uk/research-project/housing_in_africa/.

As a further marker for poverty, we utilised annual gridded dataset predictions for GDP at purchasing power parity (GDP PPP) at 5 arc-min resolution available for 1990 to 2015 (4).

Treatment data at the IU level were provided by national programmes to ESPEN as part of routine reporting. Only LF MDA rounds that exceeded 65% population coverage were included.

Environmental, climatic and socio-economic/development raster data were imported into ArcGIS 10.5 (ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute) and linked by geographical location (IU) and year (if TV) to the parasitological survey data.

For IUs without parasitological data points we took the median value of a given covariate (and by year if TV) as the value for inclusion in the model. For IUs with parasitological cluster data (with latitude/longitude) the value of the covariate at the location (or closest to it) was utilised.

**Table B4:** Summary of explanatory covariates tested and/or utilised in the model:
| Grouping                          | Variable                                           | Source                                      | Temporal resolution          | Spatial resolution |
|----------------------------------|----------------------------------------------------|---------------------------------------------|------------------------------|--------------------|
| Climatic/terrain                 | Max temperature                                    | WorldClim (1, 5)                            | Monthly, 2000 to 2016        | 1km                |
|                                  | Aridity index (ratio of the annual precipitation and potential evapotranspiration (PET) totals) | WorldClim (1)                              | Period, 1970-2000            | ~1km               |
|                                  | Soil type (texture fraction)                       | SoilGrids250m (2)                          | Updated 2016, static         | 250m               |
|                                  | Soil pH                                            | SoilGrids250m (2)                          | Updated 2016, static         | 250m               |
| Socio-economic/living conditions | Lack of access to safe drinking water              | Local Burden of Disease (LBD) project (The Lancet Global Health, In press) | Annual, 1990-2017            | 5km                |
|                                  | Lack of access to sanitation facilities            | Local Burden of Disease (LBD) project (The Lancet Global Health, In press) | Annual, 1990-2017            | 5km                |
|                                  | Night lights                                       | Earth observatory (NASA)                    | Annual, 2012, 2016           | 3km                |
|                                  | GDP at purchasing power parity (GDP PPP)           | Gridded global datasets for Gross Domestic Product and Human Development Index (4) | Annual, 1990-2015            | 5arc-minutes or ~10 km at |
| Population count (overall and school aged between 5 to 14 years) | Gridded Population of the World (GPW), version 4, SEDAC [https://sedac.ciesin.columbia.edu/data/collection/gpw-v4](https://sedac.ciesin.columbia.edu/data/collection/gpw-v4) | Annual 2000-2017 | 1km |
|---|---|---|---|
| Slum to non-slum living conditions | Mapping changes in housing in sub-Saharan Africa from 2000 to 2015 (3) | Annual, 2000-2015 | 5x5km |
| Programmatic Cumulative number of effective mass drug administrations for LF (>75% coverage) and school based deworming for STH | ESPEN [http://espen.afro.who.int/](http://espen.afro.who.int/) | Annual, 1990-2018 | IU level |
B5.1 Fitted relationship between prevalence of infection for a given STH subtype (red= *Ascaris lumbricoides*, blue=hookworm, grey= *Trichuris trichiura*) and intensity of infection (moderate to heavy) prior to mass drug administration.

Note: dashed lines provide uncertainty intervals for these estimates.
B5.2 Validation of fitted relationship between intensity and prevalence compared to independent data from the Tumikia cluster randomised trial in Kenya, both at baseline (circles) and post (squares) PC treatment. Note relationship for *Ascaris lumbricoides* not displayed due to small sample size of moderate-to-heavy intensity infections in trial setting.

Hookworm

*Trichuris trichiura*

1. Brooker SJ, Mwandawiro CS, Halliday KE, Njenga SM, McHaro C, Gichuki PM, et al. Interrupting transmission of soil-transmitted helminths: a study protocol for cluster randomised trials evaluating alternative treatment strategies and delivery systems in Kenya. BMJ open. 2015;5(10):e008950. pmid:26482774
2. Halliday KE, Oswald WE, Mcharo C, Beaumont E, Gichuki PM, Kepha S, et al. (2019) Community-level epidemiology of soil-transmitted helminths in the context of school-based deworming: Baseline results of a cluster randomised trial on the coast of Kenya. PLoS Negl Trop Dis 13(8): e0007427. https://doi.org/10.1371/journal.pntd.0007427
B6: Relationships between STH prevalence and selected covariates plus outlier identification (in red)
B7. a) Summary of data points by country for the period 2000-2018 and b) comparison to resultant Bayesian credibility interval uncertainty

| Country                     | Data points (2000-2018) | Total cumulative sample size (2000-2018) |
|-----------------------------|-------------------------|----------------------------------------|
| Central African Republic    | 0                       | 0                                     |
| Congo                       | 0                       | 0                                     |
| Djibouti                    | 0                       | 0                                     |
| Equatorial Guinea           | 0                       | 0                                     |
| Somalia                     | 0                       | 0                                     |
| Sudan                       | 1                       | 0                                     |
| Seychelles                  | 6                       | 201                                   |
| Cape Verde                  | 16                      | 1661                                  |
| Guinea-Bissau               | 36                      | 1279                                  |
| Mauritius                   | 49                      | 1495                                  |
| Lesotho                     | 50                      | 2517                                  |
| Sao Tome & Principe         | 75                      | 2551                                  |
| Namibia                     | 80                      | 4833                                  |
| Guinea                      | 85                      | 4249                                  |
| Ghana                       | 90                      | 743                                   |
| Burkina Faso                | 113                     | 8666                                  |
| Sierra Leone                | 114                     | 6730                                  |
| Senegal                     | 135                     | 1356                                  |
| Mauritania                  | 140                     | 12791                                 |
| Angola                      | 160                     | 3585                                  |
| Botswana                    | 161                     | 7302                                  |
| Mozambique                  | 162                     | 7900                                  |
| South Africa                | 211                     | 8494                                  |
| Mali                        | 221                     | 17480                                 |
| Swaziland                   | 276                     | 13834                                 |
| Gabon                       | 280                     | 13513                                 |
| Zimbabwe                    | 283                     | 12368                                 |
| Cameroon                    | 298                     | 13192                                 |
| Madagascar                  | 353                     | 18385                                 |
| Eritrea                     | 368                     | 17462                                 |
| Chad                        | 409                     | 20469                                 |
| The Gambia                  | 431                     | 21194                                 |
| South Sudan                 | 434                     | 18810                                 |
| Rwanda                      | 445                     | 16778                                 |
| Benin                       | 448                     | 22797                                 |
| Burundi                     | 529                     | 62365                                 |
| Country        | Mean uncertainty interval width (2018) |
|---------------|--------------------------------------|
| Equatorial Guinea | 0.870                               |
| Lesotho       | 0.856                                |
| Gabon         | 0.853                                |
| Congo         | 0.818                                |
| Madagascar    | 0.756                                |
| Cameroon      | 0.749                                |
| Angola        | 0.719                                |
| South Africa  | 0.694                                |
| Tanzania (Zanzibar) | 0.685    |
| Congo, DRC    | 0.681                                |
| Liberia       | 0.676                                |
| Mozambique    | 0.666                                |
| Togo          | 0.620                                |
| Rwanda        | 0.616                                |
| Benin         | 0.594                                |
| Burundi       | 0.590                                |
| Zambia        | 0.587                                |
| Guinea-Bissau | 0.573                                |
| Tanzania (Mainland) | 0.561    |
| Nigeria       | 0.552                                |
| Ethiopia      | 0.532                                |
| Uganda        | 0.515                                |
| Sierra Leone  | 0.507                                |
| Country          | Value |
|-----------------|-------|
| Central African | 0.475 |
| Guinea          | 0.463 |
| Somalia         | 0.463 |
| Swaziland       | 0.392 |
| Cote d'Ivoire   | 0.362 |
| Mauritania      | 0.337 |
| Kenya           | 0.336 |
| Botswana        | 0.309 |
| Zimbabwe        | 0.274 |
| Ghana           | 0.229 |
| Chad            | 0.187 |
| Djibouti        | 0.186 |
| Namibia         | 0.177 |
| Senegal         | 0.176 |
| The Gambia      | 0.149 |
| Malawi          | 0.139 |
| South Sudan     | 0.128 |
| Sudan           | 0.076 |
| Mali            | 0.068 |
| Burkina Faso    | 0.060 |
| Niger           | 0.029 |
| Eritrea         | 0.013 |
B8. Classification of implementation units (n=5183) within STH spatial limits (6) according to any STH infection prevalence thresholds (7) by year (a), by country in 2018 (b), exceeding 20% in 2018 and without reported preventative chemotherapy rounds (c), estimated number of children aged 5 to 14 by prevalence category in 2018 (d), and number of IU’s above/below the target 10% prevalence threshold after implementation of ≥5 years of preventive chemotherapy (e).

### a)

| Year | StH prevalence category |
|------|-------------------------|
|      | <2% | 2-19.9% | 20-49.9% | ≥50% |
| 2000 | 30 (1%) | 883 (17%) | 2022 (39%) | 2248 (43%) |
| 2001 | 47 (1%) | 1142 (22%) | 2299 (44%) | 1695 (33%) |
| 2002 | 111 (2%) | 1707 (33%) | 2516 (49%) | 849 (16%) |
| 2003 | 64 (1%) | 1374 (27%) | 2479 (48%) | 1266 (24%) |
| 2004 | 177 (3%) | 1676 (32%) | 2526 (49%) | 804 (16%) |
| 2005 | 116 (2%) | 1561 (30%) | 2516 (49%) | 990 (19%) |
| 2006 | 130 (3%) | 1784 (34%) | 2500 (48%) | 769 (15%) |
| 2007 | 103 (2%) | 1658 (32%) | 2496 (48%) | 926 (18%) |
| 2008 | 146 (3%) | 1720 (33%) | 2464 (48%) | 853 (16%) |
| 2009 | 204 (4%) | 2030 (39%) | 2348 (45%) | 601 (12%) |
| 2010 | 354 (7%) | 2471 (48%) | 2042 (39%) | 316 (6%) |
| 2011 | 414 (8%) | 2686 (52%) | 1853 (36%) | 230 (4%) |
| 2012 | 347 (7%) | 2400 (46%) | 2066 (40%) | 370 (7%) |
| 2013 | 391 (8%) | 2259 (44%) | 2115 (41%) | 418 (8%) |
| 2014 | 243 (5%) | 2217 (43%) | 2203 (43%) | 520 (10%) |
| 2015 | 592 (11%) | 2790 (54%) | 1623 (31%) | 178 (3%) |
| 2016 | 733 (14%) | 3257 (63%) | 1103 (21%) | 90 (2%) |
| 2017 | 779 (15%) | 3301 (64%) | 1017 (20%) | 86 (2%) |
| 2018 | 602 (12%) | 3222 (62%) | 1233 (24%) | 126 (2%) |

### b)

| Country | StH prevalence category | Total IU's |
|---------|-------------------------|------------|
|         | <2% | 2-19.9% | 20-49.9% | ≥50% | |
| AGO     | 0 (0%) | 76 (46%) | 85 (52%) | 3 (2%) | 164 |
| BDI     | 0 (0%) | 31 (67%) | 15 (33%) | 0 (0%) | 46 |
| BEN     | 1 (1%) | 61 (79%) | 15 (19%) | 0 (0%) | 77 |
| BFA     | 52 (74%) | 18 (26%) | 0 (0%) | 0 (0%) | 70 |
| BWA     | 0 (0%) | 24 (100%) | 0 (0%) | 0 (0%) | 24 |
| Country | 0 (0%) | 16 (94%) | 1 (6%) | 0 (0%) | 17 |
|---------|--------|----------|--------|--------|----|
| CAF     | 0 (0%) | 82 (99%) | 1 (1%) | 0 (0%) | 83 |
| CIV     | 33 (17%) | 102 (54%) | 10 (5%) | 189 |
| CMR     | 12 (2%) | 263 (51%) | 13 (3%) | 516 |
| COD     | 0 (0%) | 12 (28%) | 1 (2%) | 43 |
| COG     | 2 (40%) | 3 (60%) | 0 (0%) | 5 |
| ERI     | 58 (100%) | 0 (0%) | 0 (0%) | 58 |
| ETH     | 20 (3%) | 121 (16%) | 11 (1%) | 744 |
| GAB     | 0 (0%) | 33 (65%) | 18 (35%) | 51 |
| GHA     | 35 (16%) | 0 (0%) | 0 (0%) | 216 |
| GIN     | 0 (0%) | 34 (89%) | 4 (11%) | 38 |
| GMG     | 18 (41%) | 24 (55%) | 0 (0%) | 44 |
| GNB     | 3 (3%) | 60 (51%) | 49 (42%) | 118 |
| GNQ     | 0 (0%) | 1 (6%) | 16 (94%) | 17 |
| KEN     | 34 (12%) | 228 (79%) | 0 (0%) | 290 |
| LBR     | 1 (7%) | 7 (47%) | 4 (27%) | 15 |
| LSO     | 0 (0%) | 4 (40%) | 6 (60%) | 10 |
| MDG     | 0 (0%) | 46 (40%) | 17 (15%) | 114 |
| MLI     | 50 (76%) | 16 (24%) | 0 (0%) | 66 |
| MOZ     | 0 (0%) | 87 (55%) | 72 (45%) | 159 |
| MRT     | 1 (2%) | 41 (98%) | 0 (0%) | 42 |
| MWI     | 2 (7%) | 27 (93%) | 0 (0%) | 29 |
| NAM     | 13 (38%) | 17 (50%) | 4 (12%) | 34 |
| NER     | 32 (82%) | 7 (18%) | 0 (0%) | 39 |
| NGA     | 26 (3%) | 501 (65%) | 13 (2%) | 774 |
| RWA     | 0 (0%) | 17 (57%) | 3 (10%) | 30 |
| SDN     | 123 (78%) | 34 (22%) | 0 (0%) | 157 |
| SEN     | 23 (30%) | 52 (68%) | 1 (1%) | 76 |
| SLE     | 0 (0%) | 11 (79%) | 3 (21%) | 14 |
| SOM     | 1 (6%) | 17 (94%) | 0 (0%) | 18 |
| SSD     | 33 (41%) | 45 (56%) | 5 (7%) | 80 |
| SWZ     | 0 (0%) | 51 (93%) | 0 (0%) | 55 |
| TCD     | 17 (19%) | 74 (81%) | 0 (0%) | 91 |
| TGO     | 0 (0%) | 29 (73%) | 11 (28%) | 40 |
| TZA     | 7 (4%) | 143 (77%) | 2 (1%) | 186 |
| TZZ     | 0 (0%) | 6 (55%) | 5 (45%) | 11 |
| UGA     | 4 (3%) | 97 (84%) | 15 (13%) | 116 |
| ZAF     | 0 (0%) | 21 (40%) | 3 (6%) | 52 |
| ZMB     | 0 (0%) | 70 (68%) | 0 (0%) | 103 |
| ZWE     | 1 (2%) | 61 (98%) | 0 (0%) | 62 |
| Total   | 602 (12%) | 3222 (62%) | 1233 (24%) | 5183 |
c) IU’s by country in 2018 with estimated STH prevalence exceeding 20% and with no reported preventative chemotherapy rounds

| Country | Freq. | Percent |
|---------|-------|---------|
| AGO     | 55    | 17.8    |
| BEN     | 1     | 0.32    |
| CMR     | 1     | 0.32    |
| COD     | 60    | 19.42   |
| COG     | 2     | 0.65    |
| ETH     | 7     | 2.27    |
| GAB     | 46    | 14.89   |
| GIN     | 4     | 1.29    |
| GMB     | 2     | 0.65    |
| GNB     | 10    | 3.24    |
| GNQ     | 17    | 5.5     |
| KEN     | 5     | 1.62    |
| LBR     | 1     | 0.32    |
| LSO     | 5     | 1.62    |
| MDG     | 17    | 5.5     |
| MOZ     | 1     | 0.32    |
| NAM     | 4     | 1.29    |
| NGA     | 52    | 16.83   |
| SSD     | 2     | 0.65    |
| TZA     | 1     | 0.32    |
| UGA     | 2     | 0.65    |
| ZAF     | 8     | 2.59    |
| ZMB     | 6     | 1.94    |
| **Total** | 309 | 100     |

d)

| Year | STH prevalence | Estimated population of children 5to14 in 2018 residing in category |
|------|----------------|---------------------------------------------------------------------|
| 2018 | <2%            | 33,716,500                                                          |
| 2018 | >2-19.9%       | 169,720,524                                                         |
| 2018 | >20-49.9%      | 60,554,912                                                          |
| 2018 | ≥50%           | 4,923,187                                                           |
Number of IU’s by country having implemented ≥5 years of preventive chemotherapy and attained a STH prevalence under 10% (N=331):

| ADMINISO3 | Freq. | Percent | Cum. |
|-----------|-------|---------|------|
| BDI       | 13    | 3.93    | 3.93 |
| BEN       | 7     | 2.11    | 6.04 |
| BFA       | 126   | 38.07   | 44.11|
| CMR       | 6     | 1.81    | 45.92|
| ETH       | 12    | 3.63    | 49.55|
| GHA       | 94    | 28.40   | 77.95|
| MLI       | 28    | 8.46    | 86.40|
| MWI       | 6     | 1.81    | 88.22|
| NER       | 6     | 1.81    | 90.03|
Number of IU’s by country having implemented ≥5 years of preventive chemotherapy and NOT attained a STH prevalence under 10% (N=399):

| ADMINISO3 | Freq. | Percent | Cum. |
|-----------|-------|---------|------|
| BDI       | 31    | 7.77    | 7.77 |
| BEN       | 55    | 13.78   | 21.55|
| BFA       | 14    | 3.51    | 25.06|
| CMR       | 25    | 6.27    | 31.33|
| ETH       | 50    | 12.53   | 43.86|
| GHA       | 25    | 6.27    | 50.13|
| MDG       | 15    | 3.76    | 53.88|
| MWI       | 2     | 0.50    | 54.39|
| NGA       | 86    | 21.55   | 75.94|
| RWA       | 21    | 5.26    | 81.20|
| SLE       | 12    | 3.01    | 84.21|
| TGO       | 31    | 7.77    | 91.98|
| TZA       | 14    | 3.51    | 95.49|
| TZZ       | 18    | 4.51    | 100.00|
| **Total** | 399   | 100.00  |      |
B9. Classification of implementation units (n=5183) within STH spatial limits (6) according to moderate-to-heavy intensity STH infection prevalence thresholds (7) by year (a) by country in 2018 (b) and change in estimated number of school aged children by STH moderate-to-heavy intensity STH infection prevalence thresholds from 2000 to 2018

| Year | STH moderate-to-heavy intensity prevalence category |
|------|---------------------------------------------------|
|      | <2% | 2-4.9% | 5-9.9% | 10-14.9% | ≥15% |
| 2000 | 946 (18%) | 1048 (20%) | 1196 (23%) | 841 (16%) | 1152 (22%) |
| 2001 | 1218 (23%) | 1171 (23%) | 1348 (26%) | 671 (13%) | 775 (15%) |
| 2002 | 1873 (36%) | 1424 (27%) | 1183 (23%) | 378 (7%) | 325 (6%) |
| 2003 | 1485 (29%) | 1260 (24%) | 1371 (26%) | 538 (10%) | 529 (10%) |
| 2004 | 1898 (37%) | 1478 (29%) | 1147 (22%) | 360 (7%) | 300 (6%) |
| 2005 | 1730 (33%) | 1339 (26%) | 1283 (25%) | 429 (8%) | 402 (8%) |
| 2006 | 1972 (38%) | 1451 (28%) | 1133 (22%) | 334 (6%) | 293 (6%) |
| 2007 | 1814 (35%) | 1401 (27%) | 1199 (23%) | 394 (8%) | 375 (7%) |
| 2008 | 1485 (29%) | 1260 (24%) | 1147 (22%) | 360 (7%) | 300 (6%) |
| 2009 | 1972 (38%) | 1451 (28%) | 1133 (22%) | 334 (6%) | 293 (6%) |
| 2010 | 1814 (35%) | 1401 (27%) | 1199 (23%) | 394 (8%) | 375 (7%) |
| 2011 | 1485 (29%) | 1260 (24%) | 1147 (22%) | 360 (7%) | 300 (6%) |
| 2012 | 1972 (38%) | 1451 (28%) | 1133 (22%) | 334 (6%) | 293 (6%) |
| 2013 | 1814 (35%) | 1401 (27%) | 1199 (23%) | 394 (8%) | 375 (7%) |
| 2014 | 1485 (29%) | 1260 (24%) | 1147 (22%) | 360 (7%) | 300 (6%) |
| 2015 | 1972 (38%) | 1451 (28%) | 1133 (22%) | 334 (6%) | 293 (6%) |
| 2016 | 1814 (35%) | 1401 (27%) | 1199 (23%) | 394 (8%) | 375 (7%) |
| 2017 | 1485 (29%) | 1260 (24%) | 1147 (22%) | 360 (7%) | 300 (6%) |
| 2018 | 1972 (38%) | 1451 (28%) | 1133 (22%) | 334 (6%) | 293 (6%) |

| Country | STH moderate-to-heavy intensity prevalence category |
|---------|---------------------------------------------------|
|         | <2% | 2-4.9% | 5-9.9% | 10-14.9% | ≥15% |
| AGO     | 84 (51), (2) | 68 (41), (7) | 9 (5), (4) | 1 (1), (2) | 2 (1), (6) |
| BDI     | 32 (70), (1) | 14 (30), (1) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) |
| BEN     | 63 (82), (2) | 14 (18), (1) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) |
| BFA     | 70 (100), (2) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) |
| BWA     | 24 (100), (1) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) |
| CAF     | 16 (94), (0) | 1 (6), (0) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) |
| CIV     | 83 (100), (2) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) | 0 (0), (0) |
| CMR     | 80 (42), (2) | 79 (42), (8) | 22 (12), (9) | 7 (4), (12) | 1 (1), (3) |

Total | 164 (100), (3) | 46 (100), (1) | 77 (100), (1) | 70 (100), (1) | 24 (100), (0) | 17 (100), (0) | 83 (100), (2) | 189 (100), (4)
| Country | 2000 (55), (7) | 2005 (36), (19) | 2010 (8), (17) | 2015 (1), (12) | 2020 (0), (0) | 2025 (100), (10) |
|---------|----------------|-----------------|----------------|----------------|----------------|------------------|
| COG     | 12 (28), (0)   | 17 (40), (2)    | 14 (33), (6)   | 0 (0), (0)     | 0 (0), (0)     | 43 (100), (1)    |
| DJI     | 5 (100), (0)   | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 5 (100), (0)     |
| ERI     | 58 (100), (1)  | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 58 (100), (1)    |
| ETH     | 621 (83), (16) | 97 (13), (10)   | 18 (2), (7)    | 8 (1), (13)    | 0 (0), (0)     | 744 (100), (14)  |
| GAB     | 1 (2), (0)     | 7 (14), (1)     | 32 (63), (13)  | 8 (16), (13)   | 3 (6), (9)     | 51 (100), (1)    |
| GHA     | 216 (100), (6) | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 216 (100), (4)   |
| GIN     | 34 (89), (1)   | 4 (11), (0)     | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 38 (100), (1)    |
| GMB     | 42 (95), (1)   | 2 (5), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 44 (100), (1)    |
| GNB     | 63 (53), (2)   | 36 (31), (4)    | 16 (14), (6)   | 1 (1), (2)     | 2 (2), (6)     | 118 (100), (2)   |
| GNQ     | 0 (0), (0)     | 0 (0), (0)      | 1 (6), (0)     | 7 (41), (12)   | 9 (53), (26)   | 17 (100), (0)    |
| KEN     | 267 (92), (7)  | 23 (8), (2)     | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 290 (100), (6)   |
| LBR     | 5 (33), (0)    | 4 (27), (0)     | 3 (20), (1)    | 0 (0), (0)     | 3 (20), (9)    | 15 (100), (0)    |
| LSO     | 0 (0), (0)     | 0 (0), (0)      | 4 (40), (2)    | 5 (50), (8)    | 1 (10), (3)    | 10 (100), (0)    |
| MDG     | 47 (41), (1)   | 34 (30), (4)    | 18 (16), (7)   | 7 (6), (12)    | 8 (7), (24)    | 114 (100), (2)   |
| MLI     | 66 (100), (2)  | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 66 (100), (1)    |
| MOZ     | 89 (56), (2)   | 70 (44), (7)    | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 159 (100), (3)   |
| MRT     | 42 (100), (1)  | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 42 (100), (1)    |
| MWI     | 29 (100), (1)  | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 29 (100), (1)    |
| NAM     | 30 (88), (1)   | 4 (12), (0)     | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 34 (100), (1)    |
| NER     | 39 (100), (1)  | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 39 (100), (1)    |
| NGA     | 536 (69), (14) | 176 (23), (18)  | 52 (7), (21)   | 6 (1), (10)    | 4 (1), (12)    | 774 (100), (15)  |
| RWA     | 17 (57), (0)   | 10 (33), (1)    | 0 (0), (0)     | 2 (7), (3)     | 1 (3), (3)     | 30 (100), (1)    |
| SDN     | 157 (100), (4) | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 157 (100), (3)   |
| SEN     | 75 (99), (2)   | 1 (1), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 76 (100), (1)    |
| SLE     | 11 (79), (0)   | 3 (21), (0)     | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 14 (100), (0)    |
| SOM     | 18 (100), (0)  | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 18 (100), (0)    |
| SSD     | 78 (98), (2)   | 2 (3), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 80 (100), (2)    |
| SWZ     | 52 (95), (1)   | 3 (5), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 55 (100), (1)    |
| TCD     | 91 (100), (2)  | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 91 (100), (2)    |
| TGO     | 29 (73), (1)   | 11 (28), (1)    | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 40 (100), (1)    |
| TZA     | 152 (82), (4)  | 27 (15), (3)    | 7 (4), (3)     | 0 (0), (0)     | 0 (0), (0)     | 186 (100), (4)   |
| TZZ     | 9 (82), (0)    | 1 (9), (0)      | 1 (9), (0)     | 0 (0), (0)     | 0 (0), (0)     | 11 (100), (0)    |
| UGA     | 102 (88), (3)  | 13 (11), (1)    | 1 (1), (0)     | 0 (0), (0)     | 0 (0), (0)     | 116 (100), (2)   |
| ZAF     | 22 (42), (1)   | 19 (37), (2)    | 10 (19), (4)   | 1 (2), (2)     | 0 (0), (0)     | 52 (100), (1)    |
| ZMB     | 71 (69), (2)   | 32 (31), (3)    | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 103 (100), (2)   |
| ZWE     | 62 (100), (2)  | 0 (0), (0)      | 0 (0), (0)     | 0 (0), (0)     | 0 (0), (0)     | 62 (100), (1)    |

Total population of children 5-14 years by change in intensity infection category from 2000 to 2018:

| STH cat | Total population | Total population | Sum, 2018 | Proportion, 2018 |
|---------|------------------|------------------|-----------|-----------------|
| 2000:2018 |                  |                  |           |                 |
| 3882 (75), (100) | 956 (18), (100) | 251 (5), (100) | 60 (1), (100) | 34 (1), (100) | 5183 (100), (100) |

332

c) Estimated child population counts (5-14 years) by change in intensity infection category from 2000 to 2018

75
| Time   | (5 to 14), 2000 | (5 to 14), 2018 | Total 206,204,822 | % 76.7% |
|--------|-----------------|-----------------|--------------------|---------|
| 01:01  | 32,849,816      | 50,816,069      |                    |         |
| 02:01  | 35,181,375      | 54,414,795      |                    |         |
| 03:01  | 42,574,678      | 65,862,106      |                    |         |
| 04:01  | 18,846,441      | 29,154,094      |                    |         |
| 05:01  | 3,851,143       | 5,957,758       |                    |         |
| 02:02  | 27              | 42              | 62,710,301         | 23.3%   |
| 03:02  | 1,118,003       | 1,729,219       |                    |         |
| 04:02  | 8,786,572       | 13,591,188      |                    |         |
| 05:02  | 20,578,010      | 31,830,726      |                    |         |
| 04:03  | 13,330          | 20,621          |                    |         |
| 05:03  | 7,662,719       | 11,854,222      |                    |         |
| 05:04  | 1,529,323       | 2,366,044       |                    |         |
| 05:05  | 851,367         | 1,318,239       |                    |         |
| Total  | 173,842,804     | 268,915,123     |                    |         |

i STH cat: 1: <2% moderate-to-heavy intensity; 2: 2-4.9%; 3: 5-9.9%; 4: 10-14.9%; 5: 15+%
The input data were as follows: \( O_{1ij}, O_{2ij} \) and \( n_{1ij}, n_{2ij} \) and \( n_{3ij} \) represent the observed number of cases of and number tested for HK, ASC and TT respectively, for implementation unit (IU) \( i = 1, ..., 5183 \) and year \( j = 2000, ..., 2018 \). Specifically, the observed numbers of positives (\( O_1 = \text{HK}, O_2 = \text{ASC}, O_3 = \text{TT} \)) scaled by the total number tested (\( n_1, n_2, n_3 \)) in each unit \( i \) in year \( j \) is assumed to follow a binomial distribution with prevalence proportions \( \rho_{1ij}, \rho_{2ij}, \rho_{3ij} \).

\[
\begin{align*}
O_{1ij} &\sim \text{Binomial} (\rho_{1ij}, n_{1ij}) \\
O_{2ij} &\sim \text{Binomial} (\rho_{2ij}, n_{2ij}) \\
O_{3ij} &\sim \text{Binomial} (\rho_{3ij}, n_{3ij})
\end{align*}
\]

where \( \rho_{1-3ij} \) corresponds to the prevalence rate for a given STH and \( n_{1-3ij} \) is the total number of tested individuals in area \( i \) in year \( j \), \( \alpha \)'s are the disease-specific intercepts, \( X_i \) and \( X_t \) are the time in varying and time varying covariates respectively and \( \beta_{1-3} \) are the vector of regression coefficients for each STH species. The space–time structure is introduced on the logit scale through the terms:

\[
\begin{align*}
\mu_{1ij} &= \lambda_{1i} \delta_1 + \lambda_{2i} \gamma_k + \xi_{1j} \kappa_1 + \xi_{2j} \kappa_2 + v_{ij} \\
\mu_{2ij} &= \lambda_{1i} \delta_2 + \lambda_{3i} \gamma_k + \xi_{1j} \kappa_1 + \xi_{3j} \kappa_3 + v_{ij} \\
\mu_{3ij} &= \lambda_{1i} \delta_3 + \lambda_{4i} \gamma_k + \xi_{1j} \kappa_1 + \xi_{4j} \kappa_4 + v_{ij}
\end{align*}
\]

where \( \lambda_{1-4i} \) and \( \xi_{1j} \) represent the shared spatial and temporal patterns respectively; \( \lambda_{2-3i}, \lambda_{4i} \) represent the differential spatial pattern from the shared spatial pattern for each STH respectively;

\( \xi_{2j}, \xi_{3j}, \xi_{4j} \) represent the differential temporal pattern from the shared temporal pattern for each STH respectively and \( v_{ij} \) is the space–time order 2 interaction term. The spatial structure (\( \lambda \)) was modelled using a conditional autoregressive Gaussian distribution (CAR) i.e. the conditional.
distribution of each $\lambda_i$ given all $\lambda$’s is a normal distribution with mean equal to the average of the $\lambda$’s of its neighbouring polygons, and precision proportional to the number of ‘neighbours’. A first order queen contingency (i.e. all surrounding IU’s which share or touch the boundary of a given IU) neighbourhood structure was utilised and utilised in the CAR via matrix $W$. We assumed a first order random walk for the temporal effects ($\xi$) or one dimensional versions of the CAR spatial priors, with weight matrices $Q$ that define the temporal neighbours of year $j$ as years $j - 1$ and $j + 1$ (with a single neighbour in the first and last year in the series namely years $j = 2000$ and $j = 2018$).

The scaling parameters ($\delta$ and $\kappa$) represent the relative contribution of the shared terms to the risk of given STH species to the overall STH spatial and temporal effects respectively. We implemented a sum to zero constraint for $\delta_{1:3}$ and $\kappa_{1:3}$ to ensure model identifiability (10).

Lastly, we assumed an exchangeable (unstructured) hierarchical structure for the shared interaction terms $\nu_{ij}$.

For the regression coefficients ($\beta$), we choose non-informative normal prior distributions. We followed previous recommendations for the precision parameters of the spatial and temporal CAR priors (11) namely:

\[
\alpha's \propto 1 \text{ (for identifiability)}
\]

\[
\lambda's \sim \text{CARNormal}(W, \tau\lambda)
\]

\[
\xi's \sim \text{CARNormal}(Q, \tau\xi)
\]

\[
\nu_{ij} \sim \text{Normal}(0, \tau\nu)
\]

\[
\tau s \sim \text{Gamma}(0.5, 0.0005)
\]

\[
\log \delta, \log \kappa \sim \text{Normal}(0, 5.9)
\]
WinBUGS code for model implementation

```winbugs
model
{
    for (i in 1:N) {
        for (j in 1:T) {
            #Binomial likelihood
            Y1b[i,j]~dbin(p1[i,j],Y1m_tot[i,j])
            Y2b[i,j]~dbin(p2[i,j],Y2m_tot[i,j])
            Y3b[i,j]~dbin(p3[i,j],Y3m_tot[i,j])
            Y4b[i,j]~dbin(p4[i,j],Y4m_tot[i,j])

            #Risk factor model
            logit(p1[i,j])<-
                b1[1]*x1s[i]+b2[1]*x2s[i]+b3[1]*x3s[i,j]+b4[1]*x4s[i,j]+b5[1]*x5s[i,j]+mu[i,j,1]
            logit(p2[i,j])<-
                b1[2]*x1s[i]+b2[2]*x2s[i]+b3[2]*x3s[i,j]+b4[2]*x4s[i,j]+b5[2]*x5s[i,j]+mu[i,j,2]
            logit(p3[i,j])<-
                b1[3]*x1s[i]+b2[3]*x2s[i]+b3[3]*x3s[i,j]+b4[3]*x4s[i,j]+b5[3]*x5s[i,j]+mu[i,j,3]
            logit(p4[i,j])<-
                b1.4*x1s[i]+b2.4*x2s[i]+b3.4*x3s[i,j]+b4.4*x4s[i,j]+b5.4*x5s[i,j]+mu[i,j,4]

            mu[i,j,1:4]~dmnorm(eta[i,j,],Sigma.inv[,])

            #Joint modelling
            eta[i,j,1]<-phi1[i]*delta[1]+gamma1[j]*kappa[1]+nu1[i,j]
            eta[i,j,2]<-phi2[i]*delta[2]+gamma2[j]*kappa[2]+nu2[i,j]
            eta[i,j,3]<-phi3[i]*delta[3]+gamma3[j]*kappa[3]+nu3[i,j]
            eta[i,j,4]<-phi1[i]/delta[1]+ phi2[i]/delta[2]+ phi3[i]/delta[3] +gamma1[j]/kappa[1] +gamma2[j]/kappa[2] +gamma3[j]/kappa[3]+nu4[i,j]

            #Baseline and endline prevalence and exceedance probability posteriors
            sth2000[i]<p4[i,1]
            sth2018[i]<p4[i,19]
            hk2000[i]<p1[i,1]
            hk2018[i]<p1[i,19]
            asc2000[i]<p2[i,1]
            asc2018[i]<p2[i,19]
            tt2000[i]<p3[i,1]
            tt2018[i]<p3[i,19]
            exc_p_low_2000[i]<-step(0.1-p4[i,1])
            exc_p_low_2018[i]<-step(0.1-p4[i,19])
            exc_p_high_2000[i]<-step(0.2-p4[i,1])
            exc_p_high_2018[i]<-step(0.2-p4[i,19])

            #Spatial Modelling (priors)
            phi1[1:N]~car.normal(adj[],weights[],num[],tau.phi[1])
            phi2[1:N]~car.normal(adj[],weights[],num[],tau.phi[2])
            phi3[1:N]~car.normal(adj[],weights[],num[],tau.phi[3])

            #Weights for adjacency matrices in space
            for(k in 1:sumNumNeigh) {
                weights[k]<-1
            }
        }
    }
}
```
Temporal Modelling (priors)

\[
\begin{align*}
\gamma_1[1:T] & \sim \text{car.normal(adj.t[, weights.t[, num.t[, tau.gamma[1]]])} \\
\gamma_2[1:T] & \sim \text{car.normal(adj.t[, weights.t[, num.t[, tau.gamma[2]]])} \\
\gamma_3[1:T] & \sim \text{car.normal(adj.t[, weights.t[, num.t[, tau.gamma[3]]])}
\end{align*}
\]

\[
\text{for}(t \in 1:1) \{
\begin{align*}
\text{weights.t}[t] & \gets 1; \\
\text{adj.t}[t] & \gets t+1; \\
\text{num.t}[t] & \gets 1
\end{align*}
\}
\]

\[
\text{for}(t \in 2:(T-1)) \{
\begin{align*}
\text{weights.t}[2+(t-2)*2] & \gets 1; \\
\text{adj.t}[2+(t-2)*2] & \gets t+1 \\
\text{weights.t}[3+(t-2)*2] & \gets 1; \\
\text{adj.t}[3+(t-2)*2] & \gets t+1; \\
\text{num.t}[t] & \gets 2
\end{align*}
\}
\]

\[
\text{for}(t \in T:T) \{
\begin{align*}
\text{weights.t}[(T-2)*2 + 2] & \gets 1; \\
\text{adj.t}[(T-2)*2 + 2] & \gets t+1; \\
\text{num.t}[t] & \gets 1
\end{align*}
\}
\]

Spatial-time Interaction Modelling (priors)

\[
\begin{align*}
\nu_1[i,j] & \sim \text{dnorm(alpha1, tau.nu[1])} \\
\nu_2[i,j] & \sim \text{dnorm(alpha2, tau.nu[2])} \\
\nu_3[i,j] & \sim \text{dnorm(alpha3, tau.nu[3])} \\
\nu_4[i,j] & \sim \text{dnorm(alpha4, tau.nu[4])}
\end{align*}
\]

Hyperprior specification

\[
\begin{align*}
\tau_{\phi[1]} & \sim \text{dgamma(0.5, 0.005)} \\
\tau_{\phi[2]} & \sim \text{dgamma(0.5, 0.005)} \\
\tau_{\phi[3]} & \sim \text{dgamma(0.5, 0.005)} \\
\tau_{\gamma[1]} & \sim \text{dgamma(0.5, 0.005)} \\
\tau_{\gamma[2]} & \sim \text{dgamma(0.5, 0.005)} \\
\tau_{\gamma[3]} & \sim \text{dgamma(0.5, 0.005)} \\
\delta[1] & \sim \text{dunif(0.575, 1.675)} \\
\kappa[1] & \sim \text{dunif(0.575, 1.675)} \\
\kappa[2] & \sim \text{dunif(0.575, 1.675)} \\
\kappa[3] & \sim \text{dunif(0.575, 1.675)} \\
\alpha_1 & \sim \text{dflat()} \\
\alpha_2 & \sim \text{dflat()} \\
\alpha_3 & \sim \text{dflat()} \\
\alpha_4 & \sim \text{dflat()}
\end{align*}
\]
Sigma.inv[1:4, 1:4] ~ dwish(\(B\), 4)

503

504 \(B[1, 1] < -0.01\)

505 \(B[2, 2] < -0.01\)

506 \(B[3, 3] < -0.01\)

507 \(B[4, 4] < -0.01\)

508 \(B[1, 2] < 0\)

509 \(B[1, 3] < 0\)

510 \(B[1, 4] < 0\)

511 \(B[2, 1] < 0\)

512 \(B[2, 3] < 0\)

513 \(B[2, 4] < 0\)

514 \(B[3, 1] < 0\)

515 \(B[3, 2] < 0\)

516 \(B[3, 4] < 0\)

517 \(B[4, 1] < 0\)

518 \(B[4, 2] < 0\)

519 \(B[4, 3] < 0\)

520

521 # Coefficient for covariates

522

523 for (k in 1:3) {

524    b1[k] ~ dnorm(0, 0.01)

525    b2[k] ~ dnorm(0, 0.01)

526    b3[k] ~ dnorm(0, 0.01)

527    b4[k] ~ dnorm(0, 0.01)

528    b5[k] ~ dnorm(0, 0.01)

529 }

530

531 b1.4 <- (b1[1] + b1[2] + b1[3])/3

532 b2.4 <- (b2[1] + b2[2] + b2[3])/3

533 b3.4 <- (b3[1] + b3[2] + b3[3])/3

534 b4.4 <- (b4[1] + b4[2] + b4[3])/3

535 b5.4 <- (b5[1] + b5[2] + b5[3])/3

536

537 for (i in 1:N) {

538    for (j in 1:T) {

539        HKtot[i, j] <- p1[i, j] * pop[i, j]

540        ASCtot[i, j] <- p2[i, j] * pop[i, j]

541        TTtot[i, j] <- p3[i, j] * pop[i, j]

542        STHtot[i, j] <- p4[i, j] * pop[i, j]

543    }

544 }

545

546 for (j in 1 : T) {

547    HKprev[j] <- sum(HKtot[, j])/sum(pop[, j])

548    ASCprev[j] <- sum(ASCtot[, j])/sum(pop[, j])

549    TTprev[j] <- sum(TTtot[, j])/sum(pop[, j])

550    STHprev[j] <- sum(STHtot[, j])/sum(pop[, j])

551 }

552

553

554
B12. Gelman-Rubin convergence plots for key model parameters

Model convergence was assessed by visual inspection of the series plot of each parameter, and using Gelman-Rubin statistics (12). Furthermore, the final posterior samples were also assessed to check if the Monte Carlo error for each parameter was less than 5% of the sample standard deviation. An assessment of model convergence using Gelman-Rubin statistics/plots (Figure B12) are presented below. An inspection of these plots suggested convergence/stabilisation of the full multivariable space-time model after approximately 25,000 iterations.

Figure B12: Gelman-Rubin statistics plots for key model parameters as confirmation of convergence
A comparison of observed versus fitted STH prevalence overall and by sub-species (see scatter plots below, Figure B13) from the full model suggested a very high degree of correlation (STH: spearman rho=0.995, P<0.001; hookworm: spearman rho=0.967, P<0.001; Ascaris: spearman rho=0.951, P<0.001; Trichuris: spearman rho=0.995, P<0.001) with a few notable differences e.g. many data points with observed prevalence of zero were corrected upwards by the model and/or smoothed towards local areal mean based on contiguity matrix in space and time.

We also compared agreement between the observed and model fitted prevalence using the Bland-Altman method (Figure B13.2). This method suggests a high concordance (Lin’s Concordance Correlation coeff. of Absolute Agreement = 0.9979) with only 5.5% of observations outside the limits of agreement. This agreement was similar for the predictions for the individual species (please see below).
Figure B13.2: Bland-Altman plots for observed versus model fitted prevalence by species with limits of agreement (LoA).

STH

Bland-Altman: Absolute values of Bias & Limits of Agreement (LoA)

| Parameter | Estimate | Std. Dev. | Std. Err. | [95% Conf. Interval] |
|-----------|----------|-----------|-----------|----------------------|
| Diff. (Y-X): Bias | -.0003533 | .0139362 | .0002165 | -.0007778 - .0000711 |
| Lower LoA | .027678 | .000375 | .000375 | -.0276678 - .0276963 |
| Upper LoA | .0269611 | .000375 | .000375 | -.0269327 - .0269611 |

Cases over limit = 138 (3.33%)
Cases under limit = 92 (2.22%)
Spearman correlation between (Y-X) and (X+Y)/2: r = 0.1949 (p = 0.0000)
Lin's Concordance Correlation coeff. of Absolute Agreement = 0.9979

HK

Bland-Altman: Absolute values of Bias & Limits of Agreement (LoA)

| Parameter | Estimate | Std. Dev. | Std. Err. | [95% Conf. Interval] |
|-----------|----------|-----------|-----------|----------------------|
| Diff. (Y-X): Bias | -.0000311 | .0116327 | .000186 | -.0003958 - .0000336 |
| Lower LoA | .0228308 | .0003222 | .0003222 | -.0221369 - .0221369 |
| Upper LoA | .0227686 | .0003222 | .0003222 | -.0221369 - .0221369 |

Cases over limit = 116 (2.97%)
Cases under limit = 80 (2.05%)
Spearman correlation between (Y-X) and (X+Y)/2: r = 0.3465 (p = 0.0000)
Lin's Concordance Correlation coeff. of Absolute Agreement = 0.9966

ASC

Bland-Altman: Absolute values of Bias & Limits of Agreement (LoA)
Parameter Estimate Std. Dev. Std. Err. [95% Conf. Interval]

Diff. (Y-X): Bias .0002786 .0115271 .0001841 -.0000824 -.0006396
Lower LoA -.022314 .0003189 -.0229393 -.0216888
Upper LoA .0228713 .0003189 .022246 .0234966

Cases over limit = 74 (1.89%)
Cases under limit = 37 (0.94%)
Spearman correlation between (Y-X) and (X+Y)/2: r = 0.4013 (p = 0.0000)
Lin's Concordance Correlation coeff. of Absolute Agreement = 0.9970

Bland-Altman: Absolute values of Bias & Limits of Agreement (LoA)

Parameter Estimate Std. Dev. Std. Err. [95% Conf. Interval]

Diff. (Y-X): Bias .000109 .0063809 .0001033 -.0000935 -.0003114
Lower LoA -.0123974 .0001788 -.0127481 -.0120468
Upper LoA .0126153 .0001788 .0122647 .012966

Cases over limit = 77 (2.02%)
Cases under limit = 42 (1.10%)
Spearman correlation between (Y-X) and (X+Y)/2: r = 0.4308 (p = 0.0000)
Lin's Concordance Correlation coeff. of Absolute Agreement = 0.9979
Out of sample validation

A random 20% of observed data points were drawn for STH overall and for each sub-species separately from the space-time cube. The data with these points removed were then re-inputted into WinBUGS. The posterior distributions for the predicted prevalence for these 20% of removed data points were then compared against the observed values to ascertain the predictive power of the model (i.e. out of sample validation). The percentage of observed prevalence values that were contained within the credibility interval of the posterior distribution for the predicted prevalence were calculated. Of note is that 742/752 (or 99%) of the observed prevalence values were contained in the 95% credible interval (CI) for its posterior distribution while 507/752 or 67% were contained within the 50% credible interval (i.e. 25% to 75% centile). The scatter plot comparing observed versus model fitted prevalence for validation sample suggests highly significant moderate strength correlation (Spearman rank correlation coefficient +0.67, p-value <0.001) (please see Figure B14 below).

Figure B14: Scatter plot comparing observed versus model predicted for the out of sample validation
B15. World Health Organization preventive chemotherapy guidelines to control soil-transmitted helminth infections (reduce worm burden and thus morbidity) in at-risk population groups (13)

Preventive chemotherapy (or deworming), using annual or biannual (biannual administration recommended where the baseline prevalence is over 50%) single-dose albendazole (400 mg) or mebendazole (500 mg) (half-dose of albendazole (i.e. 200 mg) is recommended for children under 2 years of age) is recommended as a public health intervention for all young children (12-23 months of age), preschool (24-59 months of age) and school-age children (5 and 12 years of age) living in areas where the baseline prevalence of any soil-transmitted infection is 20% or higher among children (strong recommendation, low-quality evidence).

Preventive chemotherapy using annual or biannual (biannual administration recommended where the baseline prevalence is over 50%) single-dose albendazole (400 mg) or mebendazole (500 mg), is recommended for all non-pregnant adolescent girls (10–19 years of age) and non-pregnant women of reproductive age (15–49 years of age) residing in areas where the baseline prevalence of any soil-transmitted helminth infection is 20% or higher among non-pregnant adolescent girls and/or non-pregnant women of reproductive age (strong recommendation, moderate-quality evidence).

Preventive chemotherapy (deworming), using single-dose albendazole (400 mg) or mebendazole (500 mg), is recommended for pregnant women, after the first trimester, living in areas where the baseline prevalence of hookworm and/or T. trichiura infection is 20% or higher among pregnant women, AND where anaemia is a severe public health problem, with a prevalence of 40% or higher among pregnant women (conditional recommendation, moderate-quality evidence).
1. Hijmans RJ, Cameron SE, Parra JL, Jones PG, Jarvis A. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology: A Journal of the Royal Meteorological Society. 2005;25(15):1965-78.

2. Hengl T, de Jesus JM, Heuvelink GB, Gonzalez MR, Kilibarda M, Blagotić A, et al. SoilGrids250m: Global gridded soil information based on machine learning. PLoS one. 2017;12(2):e0169748.

3. Tusting LS, Bisanzio D, Alabaster G, Cameron E, Cibulskis R, Davies M, et al. Mapping changes in housing in sub-Saharan Africa from 2000 to 2015. Nature. 2019:1.

4. Kummu M, Taka M, Guillaume JH. Gridded global datasets for gross domestic product and Human Development Index over 1990–2015. Scientific data. 2018;5:180004.

5. Fick SE, Hijmans RJ. WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. International journal of climatology. 2017;37(12):4302-15.

6. Pullan RL, Brooker SJ. The global limits and population at risk of soil-transmitted helminth infections in 2010. Parasites & vectors. 2012;5(1):81.

7. Organization WH. Soil-transmitted helminthiases: eliminating as public health problem soil-transmitted helminthiases in children: progress report 2001-2010 and strategic plan 2011-2020. 2012.

8. Knorr-Held L, Best NG. A shared component model for detecting joint and selective clustering of two diseases. Journal of the Royal Statistical Society: Series A (Statistics in Society). 2001;164(1):73-85.

9. Richardson S, Abellan JJ, Best N. Bayesian spatio-temporal analysis of joint patterns of male and female lung cancer risks in Yorkshire (UK). Statistical methods in medical research. 2006;15(4):385-407.

10. MacNab YC. On Bayesian shared component disease mapping and ecological regression with errors in covariates. Statistics in medicine. 2010;29(11):1239-49.

11. Elliott P, Wakefield JC, Best NG, Briggs DJ. Spatial epidemiology: methods and applications: Oxford University Press Oxford; 2000.

12. Gelman A, Rubin DB. Inference from iterative simulation using multiple sequences. Statistical science. 1992;7(4):457-72.

13. World Health Organization. Guideline: preventive chemotherapy to control soil-transmitted helminth infections in at-risk population groups: World Health Organization; 2017.