Schistosomiasis in school-age children in Burkina Faso after a decade of preventive chemotherapy

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Objective To assess the impact of a decade of biennial mass administration of praziquantel on schistosomiasis in school-age children in Burkina Faso.

Methods In 2013, in a national assessment based on 22 sentinel sites, 3514 school children aged 7–11 years were checked for Schistosoma haematobium and Schistosoma mansoni infection by the examination of urine and stool samples, respectively. We analysed the observed prevalence and intensity of infections and compared these with the relevant results of earlier surveys in Burkina Faso.

Findings S. haematobium was detected in 287/3514 school children (adjusted prevalence: 8.76%, range across sentinel sites: 0.0–56.3%; median: 2.5%). The prevalence of S. haematobium infection was higher in the children from the Centre-Est, Est and Sahel regions than in those from Burkina Faso’s other eight regions with sentinel sites (P < 0.001). The adjusted arithmetic mean intensity of S. haematobium infection, among all children, was 6.0 eggs per 10 ml urine. Less than 1% of the children in six regions had heavy S. haematobium infections – i.e. at least 50 eggs per 10 ml urine – but such infections were detected in 8.75% (28/320) and 11.56% (37/320) of the children from the Centre-Est and Sahel regions, respectively. Schistosoma mansoni was only detected in two regions and 43 children – i.e. 1 (0.31%) of the 320 from Centre-Sud and 42 (8.75%) of the 480 from Hauts Bassins.

Conclusion By mass use of preventive chemotherapy, Burkina Faso may have eliminated schistosomiasis as a public health problem in eight regions and controlled schistosome-related morbidity in another three regions.

Introduction

Human schistosomiasis is endemic in 78 countries or territories. It has been estimated that, in 2013, there were nearly 261 million people – including about 240 million in Africa – who required preventive chemotherapy because they were at risk of schistosomiasis infection. Following the 2001 World Health Assembly resolution WHA54.19, several endemic countries in Africa launched national programmes for the control of schistosomiasis. These programmes are largely based on preventive chemotherapy with praziquantel and are targeted at school-age children and adults at risk. In resolution WHA65.21, the World Health Assembly called on all countries with endemic schistosomiasis to intensify their control programmes and, where appropriate, to initiate campaigns for the elimination of schistosomiasis.

The West African country of Burkina Faso is divided into 13 administrative regions (Fig. 1). Some form of human schistosomiasis is thought to be endemic in every one of the country’s 63 health districts. Although urogenital schistosomiasis – caused by Schistosoma haematobium – occurs throughout the country, intestinal schistosomiasis – caused by Schistosoma mansoni – is mainly confined to the southwest of the country.

Surveys conducted before the 1980s, showed that the prevalence of S. haematobium was very high, with focal prevalence up to 100% of people surveyed in the eastern part of the country. Over the same period, S. mansoni infection was found in up to 79% of people surveyed in the Hauts Bassins and Sud-Ouest regions.

Burkina Faso established a national programme for the control of schistosomiasis and soil-transmitted helminths in 2004, with funding from the Schistosomiasis Control Initiative. This programme’s main objective was to use mass administration of praziquantel to prevent human schistosomiasis. National mapping surveys led to the country being divided into a hyper-endemic zone – comprising the 19 health districts that make up the Boucle du Mouhoun, Nord, Sahel and Sud-Ouest regions – and a meso-endemic zone – comprising the country’s other 44 health districts. In 2004, baseline data were collected from children attending 16 randomly-selected primary schools in the four regions of the hyper-endemic zone. Depending on the study region, the observed prevalence of S. haematobium infection varied from 18.4% to 84.2% and the observed intensity of such infection – among all children investigated – varied from 39.4–126.9 eggs per 10 ml urine sample. Biennial mass administration of praziquantel to school-age children began in the hyper-endemic zone in 2004 and in the meso-endemic zone in 2005. Since 2006, adults who are considered to be at risk have also been targeted.

In 2007, Burkina Faso’s national programme for the control of schistosomiasis and soil-transmitted helminths became part of a national integrated programme against neglected tropical diseases. The integrated programme was initially supported by the Schistosomiasis Control Initiative and Réseau International Schistosomiases – Environnement Aménagements et Lutte, with funding from the United States Agency for International Development’s (USAID) Neglected Tropical Diseases Program.

Abstracts in العربية, کوردی, Français, Русский и Español at the end of each article.

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Fig. 1  Prevalence of *Schistosoma haematobium* infection among children aged 7–11 years in 22 sentinel sites, Burkina Faso, 2008 and 2013

Notes: Each map shows the country’s 13 regions subdivided into 63 health districts. Each coloured circle indicates the approximate location of a sentinel site and the prevalence of infection recorded at that site. The values shown for 2008 were previously published by the Ministry of Health.\(^\text{6}\) Source: Map drawn in ArcMap version 10 (ESRI, Redlands, USA).

Tropical Disease Control Programme, managed by RTI International.\(^\text{11}\) Since 2011, the programme has been supported by Helen Keller International, with funding from the USAID’s End Neglected Tropical Diseases in Africa Project, managed by Family Health International 360.

At the beginning of 2013, four and five rounds of mass praziquantel administration were done in the meso-endemic and hyper-endemic zones, respectively. To assess the impact of these rounds and plan for the next phase, primary-school children at 22 sentinel sites were tested for schistosomiasis in 2013. Here we present the results of the assessment and discuss possible future strategies for the elimination of all forms of schistosomiasis from Burkina Faso.

**Methods**

**Ethical considerations**

The assessment survey formed part of the monitoring and evaluation activities of the programme. It was conducted by the national monitoring and evaluation team and was authorized by the Ethics Committee of the Ministry of Health of Burkina Faso. Before the survey, written informed consent was obtained from the head teacher of each study school and verbal informed consent was obtained from a parent or guardian of each child. Each child was given a unique identification number so that data could be analysed anonymously.

**Mass drug administration**

Although the national strategy included biennial praziquantel rounds, the amalgamation of the national programme for schistosome control into the integrated programme for the control of neglected tropical diseases led to some scheduled administrations being missed (Table 1).

In each round of praziquantel administration, trained health workers treated children of school age either in schools or – for the children who were not attending any school – in communities.\(^\text{13}\) A dose pole was used to measure children’s height and determine the required dose.\(^\text{15}\)

**Baseline data**

For our analyses, we used baseline data that were collected for the national programme for schistosomiasis control. These data were collected from 16 randomly selected primary schools in the hyper-endemic zone, in 2004 – before the first mass administrations of praziquantel.\(^\text{15,17}\) Stool and urine samples were collected from about 100 randomly selected children aged 7–14 years – half of them girls – at each of the 16 schools and checked for the eggs of *S. mansoni* and *S. haematobium*, respectively.

**Impact surveys**

In 2008, the national Ministry of Health designated 22 sentinel sites for the monitoring and evaluation of the schistosomiasis programme in Burkina Faso: three in Hauts Bassins, two each in Boucle du Mouhoun, Centre Est, Centre-Nord, Centre-Ouest, Centre-Sud, Est, Nord, Sahel and Sud-Ouest and one in Cascades. These sites, all of which were schools, were purposefully selected across 11 of the country’s 13 health regions to give a fairly even geographical distribution across the country (Fig. 1). Cross-sectional surveys in each sentinel site were done in 2008 and 2013. In each of these surveys, stool and urine samples were collected and examined for schistosome
| Region          | District           | 2004  | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  | 2013  |
|-----------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Boucle du Mouhoun | Dedougou           | 79.92 | 92.00 | 83.45 | 91.00 | 97.69 |
|                 | Boromo             | 96.35 | 89.19 | 92.06 | 90.81 | 101.43 |
|                 | Nouna              | 104.34| 94.01 | 91.37 | 86.58 | 91.44 |
|                 | Solanzo            | 89.37 | 90.25 | 88.28 | 88.41 | 94.27 |
|                 | Tougan             | 97.74 | 94.08 | 89.91 | 89.35 | 98.06 |
|                 | Toma               | 97.37 | 96.35 | 94.58 | 93.09 | 94.25 |
| Cascades        | Banfora            | 108.24| 128.99| 104.31| 101.79|       |
|                 | Mangodara          | 108.24| 128.99| 104.70| 96.60 |       |
|                 | Sindou             | 110.87| 84.23 | 122.62| 105.03|       |
| Centre          | Baskuy             | 85.81 | 122.30| 106.78| 105.47|       |
|                 | Bogodogo           | 87.60 | 108.45| 91.47 | 91.75 |       |
|                 | Boumiougou         | 85.81 | 122.30| 107.47| 105.49|       |
|                 | Ninga-Masson       | 77.72 | 112.06| 96.52 | 108.16|       |
|                 | Siq-Nonghin        | 85.81 | 100.92| 109.01| 124.20|       |
| Centre-Est      | Bittou             | 82.26 | 85.49 | 114.57| 99.69 |       |
|                 | Garango            | 82.26 | 85.49 | 112.78| 103.22|       |
|                 | Koumbéla           | 83.42 | 78.64 | 122.91| 108.84|       |
|                 | Ouargaye           | 101.13| 120.32| 124.61| 105.62|       |
|                 | Pouyenga           | 83.42 | 78.64 | 110.25| 100.07|       |
|                 | Tenkodogo          | 82.26 | 85.49 | 120.69| 105.37|       |
|                 | Zabré              | 82.88 | 109.71| 138.99| 110.33|       |
| Centre-Nord     | Barsalogo          | 95.88 |       | 115.13| 101.57|       |
|                 | Boulsa             | 93.27 | 94.98 | 102.44| 103.53|       |
|                 | Kaya               | 87.11 | 98.89 | 103.07| 101.76|       |
|                 | Kouroungou         | 107.81|       | 110.58| 105.65|       |
| Centre-Ouest    | Koudougou          | 96.32 | 119.28| 90.07 | 97.41 |       |
|                 | Léo                | 90.06 | 111.11| 90.62 | 103.37|       |
|                 | Nanoro             | 94.77 | 134.96| 101.19| 103.07|       |
|                 | Réo                | 99.08 |       | 92.94 | 101.82|       |
| Centre-Sud      | Kombissiri         | 92.42 | 96.99 | 94.01 | 107.13|       |
|                 | Manga              | 91.58 | 80.10 | 82.61 | 100.19|       |
|                 | Pô                 | 93.95 | 96.69 | 97.41 | 102.99|       |
| Est             | Saponé             | 104.76| 111.16| 88.43 | 104.06|       |
|                 | Bogandé            | 81.17 | 91.35 | 88.92 | 104.03|       |
|                 | Diapaga            | 82.92 | 91.86 | 105.63| 98.55 |       |
|                 | Fada               | 81.17 | 99.72 | 106.98| 99.50 |       |
|                 | Gayeri             | 100.12| 93.78 | 101.50| 109.42|       |
|                 | Manni              | 81.17 | 91.35 | 105.32| 98.37 |       |
|                 | Pampa              | 94.04 | 89.09 | 105.64| 106.22|       |
| Hauts Bassins   | Dafra              | 86.14 | 109.64| 95.11 | 104.14|       |
|                 | Dandé              | 106.23| 108.26| 129.81| 97.39 |       |
|                 | Dô                 | 89.05 | 111.40| 109.45| 98.99 |       |
|                 | Houndé             | 93.45 | 128.60| 131.59| 99.39 |       |
|                 | Orodara            | 104.42| 112.03| 91.11 | 90.95 |       |
|                 | Lena               | 86.14 | 109.64| 103.17| 107.2 |       |
|                 | Karangasso Vigué    | 86.14 | 109.64| 92.04 | 95.08 |       |
| Nord            | Gourcy             | 101.96| 93.73 | 93.56 | 92.51 | 97.68 |
|                 | Ouahigouya         | 87.42 | 96.10 | 92.17 | 94.32 | 98.89 |
|                 | Seguenega          | 81.33 | 95.29 | 97.99 | 100.43| 97.99 |
|                 | Tita               | 99.27 | 100.66| 92.62 | 95.59 | 102.14|
|                 | Yako               | 99.27 | 91.53 | 106.26| 100.57| 99.85 |

(Continued . . .)
eggs. Each survey covered 160 school children aged 7–11 years – i.e. 16 boys and 16 girls from each of classes 1–5.

### Parasitological examination

One urine sample and one stool sample from each child were collected in separate containers with unique identification numbers, and sent to a laboratory for examination on the day of their collection. Urine samples were filtered through a nylon filter (pore size 12 μm; Merck Millpore, Billerica, United States of America) and the number of eggs counted under a microscope. For specimens of less than 10 ml, the volumes were measured before filtration and the number of eggs per 10 ml calculated. Intensity of *S. mansoni* infection was expressed as the number of eggs per 10 ml of urine examined.

The Kato–Katz method was used to check stool samples for *S. mansoni* eggs. On the day that the sample had been collected, duplicate slides were prepared from each sample and examined. Eggs were counted and intensity of infection was expressed as the number of eggs per gram of faeces.

### Data analysis

The data collected in 2013 were entered into spreadsheets and double checked by biomedical technicians. As we could not access the full data set from the 2008 assessment, we compared the data collected in 2013 with a descriptive summary of the data collected in 2008 and the data collected in the 2004 baseline survey. Prevalence and intensities of infection – and their corresponding 95% confidence intervals (CI) – were calculated using SPSS version 19 (IBM, Armonk, USA). When calculating the overall values for prevalence and intensity of infection across the 11 regions with sentinel sites, the samples were adjusted with weighting according to the proportion of the national population represented by each regional population in 2013 – as projected from the results of the 2006 census. The complex-samples module of the SPSS package was used – with regions as the strata and schools as clusters – to take account of the clustering of the investigated school children. In general, our comparisons of the intensity of infection were based on the arithmetic mean egg counts for all subjects. Children were considered to have heavy *S. haematobium* infections if they had at least 50 eggs per 10 ml of urine. Children with more than 399 eggs per gram of faeces were considered to have heavy *S. mansoni* infections. Prevalence and intensities were compared using $\chi^2$ and Kruskal–Wallis tests, respectively. The geographical coordinates of each sentinel site, as determined in Google Maps (Google, Mountain View, USA), were used to plot the site’s approximate position on national maps drawn in ArcMap version 10 (ESRI, Redlands, USA).

The adjusted arithmetic mean intensity of *S. haematobium* infection – among all children investigated – was 6.0 eggs per 10 ml urine. The mean egg counts for the children from Boucle du Mouhoun, Centre-Est and Sahel were significantly higher than those for the children from the other eight regions ($P < 0.001$). After adjustment for the sex distribution of the national population, the proportions of the boys (9.90%) and girls (7.65%) found infected with *S. haematobium* were similar ($P = 0.05$).

### Results

#### Situation in 2013

Fig. 1 and Table 2 summarize the prevalence of the *S. haematobium* and *S. mansoni* infections observed among the 3514 school children – 1748 boys and 1766 girls – aged 7–11 years who provided stool and urine samples at the 22 sentinel sites. Table 2 also summarizes the mean egg counts. Although the adjusted overall prevalence of *S. haematobium* infection was 8.76%, the prevalence of such infection ranged from 0.0% (0/160) to 56.3% (90/160) according to sentinel site (median: 2.5%). The children from Centre-Est, Est and Sahel had significantly higher prevalence of *S. haematobium* infection than the children from the other eight regions ($P = 0.001$). After adjustment for the sex distribution of the national population, the proportions of the boys (9.90%) and girls (7.65%) found infected with *S. haematobium* were similar ($P = 0.05$).

The adjusted arithmetic mean intensity of *S. haematobium* infection – among all children investigated – was 6.0 eggs per 10 ml urine. The mean egg counts for the children from Boucle du Mouhoun, Centre-Est and Sahel were significantly higher than those for the children from the other eight regions ($P < 0.001$). Boys were generally more heavily infected than girls ($P = 0.013$). The adjusted overall prevalence of heavy *S. haematobium* infection was 2.82%. The Centre-Est (8.75%; 28/320) and Sahel regions (11.56%; 37/320) had the highest percentages of children infected. In six of the regions included in the as-
assessment, less than 1% of the children investigated had *S. haematobium* infection. Overall, 3.83% of the boys investigated and 1.8% of the girls were found heavily infected with *S. haematobium* (*P* > 0.05).

*S. mansoni* was only detected in the Hauts Bassins region – with a prevalence of 8.75% (42/480) and an arithmetic mean egg count of 7.7 per gram of faeces – and the Centre-Sud region – with a prevalence of 0.31% (1/320) and an arithmetic mean egg count of 0.15 per gram of faeces.

**Data for 2004 and 2008**

The prevalence of *S. haematobium* recorded in the 22 sentinel sites during the national survey in 2008 was, in general, markedly higher than that recorded in 2013 (Fig. 1).

### Table 2. Prevalence and intensity of schistosome infection among children aged 7–11 years, Burkina Faso, 2013

| Schistosome, region | No. of children investigated | No. infected | Prevalence of infection, % (95% CI) | No. heavily infected | Prevalence of heavy infection, % (95% CI) | Mean egg count* (95% CI) |
|---------------------|------------------------------|--------------|------------------------------------|---------------------|------------------------------------------|--------------------------|
| *Schistosoma haematobium* | | | | | | |
| Boucle du Mouhoun | 320 | 20 | 6.25 (4.08–9.46) | 11 | 3.44 (1.93–6.05) | 9.86 (2.84–16.88) |
| Cascades | 160 | 0 | 0.00 (0.00–2.34) | 0 | 0.00 | 0.00 |
| Centre-Est | 320 | 110 | 34.38 (29.38–39.74) | 28 | 8.75 (6.12–12.36) | 20.08 (10.39–29.77) |
| Centre-Nord | 320 | 16 | 5.00 (3.10–7.97) | 3 | 0.94 (0.32–2.72) | 1.72 (0.62–2.83) |
| Centre-Ouest | 320 | 4 | 1.25 (0.49–3.17) | 1 | 0.31 (0.06–1.75) | 0.68 (0.00–1.84) |
| Centre-Sud | 320 | 7 | 2.19 (1.06–4.45) | 4 | 1.25 (0.49–3.17) | 1.37 (0.15–2.59) |
| Est | 314 | 57 | 18.15 (14.28–22.79) | 10 | 3.18 (1.74–5.76) | 6.60 (3.22–9.98) |
| Hauts Bassins | 480 | 0 | 0.00 (0.00–0.79) | 0 | 0.00 | 0.00 |
| Nord | 320 | 5 | 1.56 (0.67–3.60) | 1 | 0.31 (0.06–1.75) | 1.11 (0.00–3.08) |
| Sahel | 320 | 67 | 20.94 (16.84–25.73) | 37 | 11.56 (8.51–15.53) | 24.47 (14.33–34.60) |
| Sud-Ouest | 320 | 1 | 0.31 (0.06–1.75) | 0 | 0.00 | 0.10 (0.00–0.30) |
| *Schistosoma mansoni* | | | | | | |
| Boucle du Mouhoun | 320 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| Cascades | 160 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| Centre-Est | 320 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| Centre-Nord | 320 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| Centre-Ouest | 320 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| Centre-Sud | 320 | 1 | 0.31 (0.06–1.75) | 0 | 0.00 | 0.15 (0.00–0.45) |
| Est | 314 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| Hauts Bassins | 480 | 42 | 8.75 (6.54–11.62) | 1 | 0.21 (0.04–1.17) | 7.7 (4.18–11.22) |
| Nord | 320 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| Sahel | 320 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| Sud-Ouest | 320 | 0 | 0.00 | 0 | 0.00 | 0.00 |
| All investigated | 3514 | 43 | 1.15 (0.84–1.55) | 1 | 0.03 (0.01–0.16) | 1.00 (0.26–1.75) |

CI: confidence interval.

* Children were considered to have heavy *S. haematobium* infections if they had at least 50 eggs per 10 ml of urine and to have heavy *S. mansoni* infections if they had more than 399 eggs per gram of faeces.

* Calculated for all of the children investigated, irrespective of their infection status. Counts of *S. haematobium* and *S. mansoni* eggs were per 10 ml of urine and per gram of faeces, respectively.

* This value was weighted according to the proportion of the national population represented by each regional population in 2013 – as projected from the results of the 2006 census.

### Table 3 shows the baseline data collected in 2004 from the Boucle du Mouhoun, Nord, Sahel and Sud-Ouest and the corresponding data, from the same four regions, from the assessment in 2013. As these two sets of data were collected in different sites and different numbers of sites – and the exact locations of the sites surveyed in 2004 could not be determined – we made no direct statistical comparisons between the two data sets and could not produce a map of the baseline data to match our other figures. However, the data in Table 3 indicate that, between 2004 and 2013, there were large reductions in both the prevalence and intensity of *S. haematobium* infection in the Boucle du Mouhoun, Nord, Sahel and Sud-Ouest regions.

### Drug distribution costs

At the beginning of the national programme for schistosomiasis control, the cost of a round of mass treatment with praziquantel was estimated to be 0.32 United States dollars (US$) per child treated.1 Helen Keller International’s financial accounts indicated that the costs of schistosomiasis treatment – including the costs of drug transportation and distribution, supervision of the distribution, training of drug distributors and social mobilization within the integrated programme for the control of neglected tropical diseases – totalled US$ 209 761.71 in 2013 and US$ 422 404.49 in 2014. These costs, which reportedly covered the treatment of 8 243 795 people – i.e. 4 068 082 in 2013 and 4 175 713 in 2014.
Table 3. Changes in prevalence and intensity of *Schistosoma haematobium* infection among children aged 7–11 years from four regions, Burkina Faso, 2004 and 2013

| Variable          | No. of children investigated | Prevalence % (95% CI) | Reduction, % | Mean egg count Eggs/10 ml urine (95% CI)b | Reduction, % |
|-------------------|------------------------------|-----------------------|--------------|----------------------------------------|--------------|
|                   | 2004a                        | 2013                  | 2004b        | 2013                                   |              |
| Region             |                              |                       |              |                                        |              |
| Boucle du Mouhoun  | 413                          | 320                   | 58.6 (53.8–63.3) | 6.25 (4.08–9.46) | 89.3         | 106.7 (86.0–127.5) | 9.86 (0–22.95) | 90.8 |
| Nord               | 417                          | 320                   | 61.2 (56.5–65.8) | 1.56 (0.67–3.60) | 97.5         | 91.0 (67.3–114.6) | 1.11 (0–3.09) | 98.8 |
| Sahel              | 412                          | 320                   | 84.2 (80.7–87.7) | 20.94 (16.84–25.73) | 75.1         | 126.9 (99.3–154.4) | 24.47 (11.77–37.16) | 80.7 |
| Sud-Ouest          | 402                          | 320                   | 18.4 (14.6–22.2) | 0.31 (0.06–1.75) | 98.3         | 39.4 (22.8–56.1)  | 0.10 (0–0.30) | 99.7 |
| All four           | 1644                         | 1280                  | 55.8 (53.4–58.2) | 7.50 (6.18–9.08) | 86.6         | 91.3 (80.0–102.7) | 9.40 (4.03–14.76) | 89.7 |
| Sex                |                              |                       |              |                                        |              |
| Male               | 936                          | 637                   | 59.8 (56.7–63.0) | 8.50 (6.57–10.92) | 85.8         | 111.8 (95.6–128.1) | 5.13 (2.50–7.76) | 95.4 |
| Female             | 708                          | 643                   | 50.6 (46.9–54.2) | 6.53 (4.87–8.70) | 87.1         | 64.2 (49.1–79.3) | 13.74 (3.24–24.25) | 78.6 |

CI: confidence interval.

a Baseline data.15,17
b Calculated for all of the children investigated, irrespective of their infection status.
c This value was weighted according to the proportion of the total combined population of the four regions represented by each regional population in 2013 – as projected from the results of the 2006 census.

Discussion

After a decade of preventive chemotherapy, progress has been made in Burkina Faso in the control of schistosomiasis – at a modest cost. In the 2013 assessment, the prevalence of schistosome infection among school children was found to be below 5% in five of the 11 included regions – and below 10% in eight of the regions. In the two regions not included in the 2013 national assessment – i.e. Centre and Plateau Central – the Ministry of Health also found the prevalence of *S. haematobium* infection to be below 5% in 2013.19 In 2013, therefore, recorded prevalence of *S. haematobium* infection remained high – i.e. above 18% – in only three regions: Centre-Est, Est and Sahel. In addition, the heavy *S. haematobium* infections that are associated with most of the morbidity of urogenital schistosomiasis were only rarely detected – i.e. in less than 1% of the children checked in eight regions included in the 2013 national assessment or the smaller ministry of health study.19 According to the criteria of the World Health Organization (WHO),20 by 2013, these eight regions had eliminated urogenital schistosomiasis as a public health problem. By the same year, another three regions – i.e. those in which 1–5% of children surveyed were found to have heavy *S. haematobium* infections – had reached the target of controlling the morbidity caused by such schistosomiasis.20

Despite the generally encouraging trends revealed by our analyses, there were some causes for concern. For example, the Centre-Est and Sahel regions appeared to have failed to control urogenital schistosomiasis by 2013. At one Centre-Est sentinel site, the prevalence of *S. haematobium* infection was much higher in 2013 (56.3%) than in 2008 (14.4%). Similarly, in a Hauts Bassins sentinel site, the prevalence of *S. mansoni* infection recorded in 2013 (26.3%) was higher than that recorded in 2008 (17.9%). At several sites in the Centre-Est and Est regions, the prevalence of *S. haematobium* infection recorded in 2013 was similar to that recorded in 2008. There are at least three possible reasons for an increase or persistence in the prevalence of infection. First, the frequency of treatment may be inadequate, especially in areas with particularly high levels of infection and transmission. Second, even though the overall coverage of mass administration may appear adequate, focal treatment coverage may not be satisfactory. Third, there may be particular social or environmental factors that are supporting focal transmission despite the benefits of the preventive chemotherapy. The results of ongoing research in the Centre-Est region may help to explain the local persistence of schistosomiasis foci.

After studying the results of the 2013 assessment and the relevant WHO recommendations,20,21 the managers of the national programme against neglected tropical diseases have recently reviewed the progress achieved, set objectives for the next phase of the programme and increased treatment frequency in some areas. The objectives are now to use mass drug administrations: (i) biennially, to interrupt the transmission of *S. haematobium* and *S. mansoni* in the Cascades, Centre, Centre-Nord, Centre-Ouest, Centre-Sud, Nord, Plateau Central and Sud-Ouest regions; (ii) annually, to control schistosome-related morbidity or eliminate schistosomiasis as a public health problem in the Boucle du Mouhoun, Est, Hauts Bassins and Sahel regions; and (iii) biannually, to control schistosome-related morbidity or eliminate schistosomiasis as a public health problem in the Centre-Est region. At the same time, schistosomiasis surveys are to be extended to non-sentinel areas to check that the trends seen at the sentinel sites are nationally representative and identify any foci of transmission that have not been recognized previously.

Although it has long been known that regular treatment with praziquantel can prevent both the severe and milder morbidity associated with schistoso-
ملخص
نظرة إلى إداء البلهارسيا في البلدان العربية

الغرض: تقييم تأثير توزيع دواء "البرازيكوانتيل" على نطاق عمومي كل سنتين علىَ توزيع البلهارسيا الصمامي في البلاد العربية من عام 2013، من خلال تحديد معدل الإصابة بالأمراض المتصلة بعدوى البلهارسيا في ثلاثة مناطق.

الاستنتاج: تم اكتشاف عدوى البلهارسيا الدموية في بعض المناطق العربية، واستمرت هذه الحالة لفترة طويلة. تم تحديد معدل الإصابة بالأمراض المتصلة بعدوى البلهارسيا في ثلاث مناطق: البحرين وقطر والإمارات العربية المتحدة.

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ملاحظات
- تم استخدام مقياس "البرازيكوانتيل" في ثلاث مناطق عربية: البحرين وقطر والإمارات العربية المتحدة.
- تم تحديد معدل الإصابة بالأمراض المتصلة بعدوى البلهارسيا في ثلاث مناطق: البحرين وقطر والإمارات العربية المتحدة.
- تم تحديد معدل الإصابة بالأمراض المتصلة بعدوى البلهارسيا في ثلاث مناطق: البحرين وقطر والإمارات العربية المتحدة.

بكلمات رئيسية: البلهارسيا، إدادة، البلدان العربية.
Schistosomiasis in Burkina Faso

Hamado Ouedraogo et al.

Resumen
Una década de quimioterapia preventiva liée à la schistosomiase dans trois autres régions.

La schistosomiase chez les enfants d’âge scolaire au Burkina Faso après une décennie de chimiothérapie préventive

Objetivo Evaluar el impacto de una década de administración bienal de praziquantel en la schistosomiase en los niños de edad escolar en Burkina Faso.

Métodos En 2013, en el cadre d’une évaluation nationale basée sur 22 postes-sentinelles, un examen des urines et des échantillons des selles ont respectivement été utilisés pour déceler des infections à la Schistosoma haematobium et à la Schistosoma mansoni chez 3 514 écoliers âgés de 7 à 11 ans. Nous avons analysé la prévalence et l’intensité des infections, puis nous avons comparé les résultats pertinents de précédentes études réalisées au Burkina Faso.

Résultats La Schistosoma haematobium a été détectée chez 287 des 3 514 écoliers (prévalence ajustée: 8,76%; étendue entre les postes-sentinelles: 0,0–56,3%; moyenne: 2,5%). La prévalence de l’infection à la Schistosoma haematobium était plus élevée chez les enfants des régions Centre-Est et du Sahel que chez les enfants des huit autres régions du Burkina Faso comprenant des postes-sentinelles (P<0,001).

La moyenne arithmétique ajustée de l’intensité de l’infection à la Schistosoma haematobium était, chez tous les enfants, de 6,0 œufs pour 10 ml d’urine. Moins d’1% des enfants dans six régions souffraient d’infections graves à la Schistosoma haematobium – au moins 50 œufs pour 10 ml d’urine –, mais de telles infections ont été détectées chez respectivement 8,75% (28/320) et 11,56% (37/320) des enfants des régions Centre-Est et du Sahel. La Schistosoma mansoni a seulement été détectée dans deux régions et chez 43 enfants – à savoir 1 (0,31%) des 320 enfants de la région Centre-Sud et 42 (8,75%) des 480 enfants de la région des Hauts Bassins.

Conclusion Grâce à un recours massif à la chimiothérapie préventive, le Burkina Faso a peut-être éradiqué la schistosomiase en tant que problème de santé publique dans huit régions et endigué la morbidité liée à la schistosomiase dans trois autres régions.
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