PART II Chapter 5

EPIDEMIOLOGY OF SCHISTOSOMIASIS

5.1 Population structure and schistosomiasis infection in villages on the right bank of the Benue river.

The Benue valley was until recently a sparsely populated area with an autochthonous population of fishermen, farmers, and semi-nomadic pastoralists. At the start of the North-East Benue project for regional development, in 1973, the average population density in the area was 2 person per km2 (excluding the provincial capital of Garoua). The official policy to stimulate migration from the overpopulated Extreme Northern Province, and the construction of a dam in the Benue near Lagdo, was the onset of a dramatic change in the regions' demography. Large numbers of settlers from the North and Extreme Northern provinces were attracted by the labour opportunities created on the construction site of the dam. Simultaneously, the creation of a large water reservoir attracted fishermen, while the subsequent construction of an irrigation scheme near Gounougou created further opportunities for farmers. The improvement of the entire infrastructure in the larger area around Lagdo, e.g. schools, health centres, roads and community training services, largely contributed to the popularity of this area for settlers. In 1991, the average population density of the Northeast Benue region had already increased to 18 inhabitants per km^2. (Data retrieved from unpublished project documents from the library of the MEAVSB, B.P. 17, Garoua).

To be able to assess the actual health situation concerning schistosomiasis in the study area, it was considered necessary first to perform a census in the villages of the pilot area, followed by a schistosomiasis survey. Many villages around the Lagdo reservoir had already been surveyed by a team of Médecins Sans Frontières for vesical schistosomiasis (*Schistosoma haematobium*) as well as intestinal schistosomiasis (*S. mansoni*) (Robert, 1986; 1990), but no data were available on the villages of Gounougou and Riao, situated immediately downstream of the Lagdo dam on the right bank of the Benue. In Gounougou irrigation schemes are under construction since 1987 and it is feared that schistosomiasis transmission will be propagated by the introduction of irrigated agriculture. For Riao an irrigation scheme is scheduled but due to financing problems, construction of this scheme has not even started yet. Both villages are situated on an elevated embankment of the Benue and are characterized by a large inflow of immigrants from the extreme northern province in the last two decades. Since only Gounougou possesses an irrigation scheme, results of a schistosomiasis survey might give interesting differences.

Methods

An inventory of all households in Gounougou and Riao was made, and their location was marked on a map. Data on numbers of inhabitants, age, sex and tribal group were gathered. From the resulting list, households that would be visited for the schistosomiasis survey were randomly chosen. In Gounougou also a school survey was carried out for *S. haematobium* only. On a specific day, the date of which had been announced earlier, sample containers were distributed among the selected people. They were asked to return the containers to their school the next morning. Urine samples were analyzed immediately using Nytrell filters; Kato slides were made on the spot and analyzed the following days. The survey in Gounougou was carried out by Médecins Sans Frontières (MSF) with the assistance of our project students and only a summary of these data can be given in this paper; they will be extensively discussed by Robert (in prep.). In Riao the survey was performed by the project team with assistance of MSF.

Results

Gounougou

In december 1988, Gounougou consisted of 22 ethnic groups and counted 451 households with 2234 inhabitants. Figure 20 shows the division among ethnic groups and religion. It is illustrative for this region that the three largest groups, Guiziga, Moundang and Toupouri, all recently settled in the village. The autochthones are the islamic Dama, Bata and Foulbé, who still have many privileges concerning land tenure rights and customary functions. The settlement history of Gounougou is illustrated by figure 21, that shows the enormous influx of migrants over a 15 year period. In the

perception of the inhabitants the distinction between religion is more important than ethnic descent, which is reflected in the division between the two main quarters of Gounougou, i.e. Gounougou s.s. and Labéré.

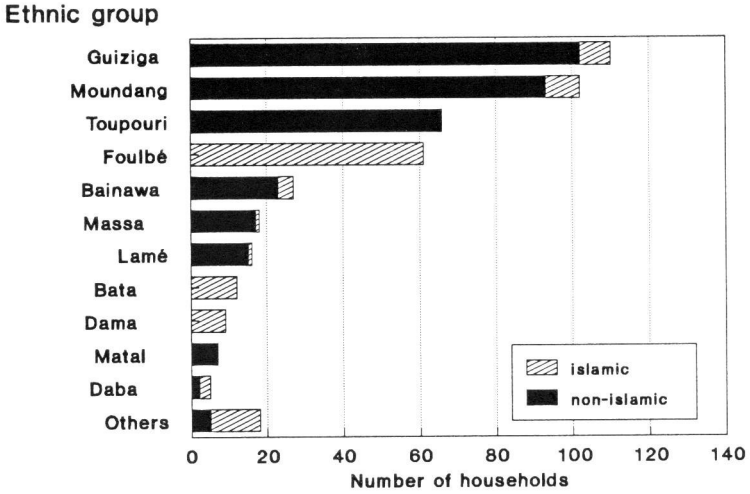

Fig. 20: Ethnic and religious composition of Gounougou

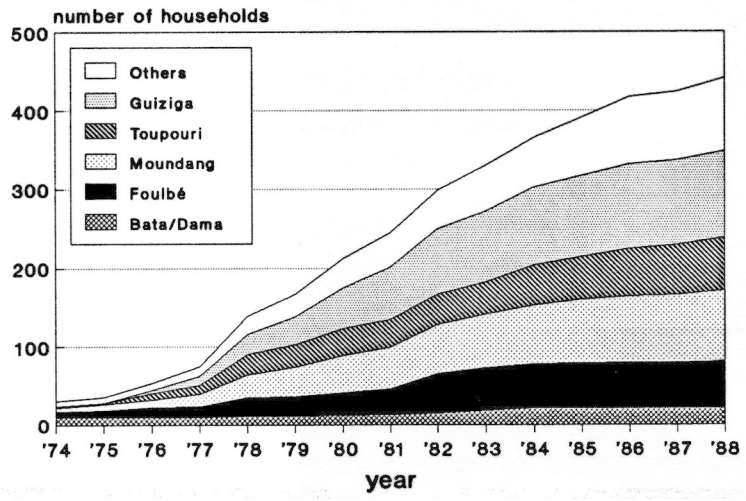

Fig. 21: Settlement history per ethnic group in Gounougou

Only three of the 126 islamic families live in Labaré (217 households); even more illustrative is that the Guiziga, the Moundang and the Bainawa that were "converted" to islam also moved to Gounougou s.s. The village is governed by the autochthonous village chief (djaoro) of Bata descent, assisted by 11 quarter chiefs reflecting more or less the division among ethnic groups. Conflicts are settled by the congregation of djaoros, and despite the diversity of inhabitants no open animosity or hostilities were observed that could not be settled.

The schistosomiasis survey in april 1989 revealed a prevalence of 28.7% for *S. haematobium* (N=87) and 12.2% for *S. mansoni* (N=81). The prevalence per age-class for *S. haematobium* (table 5) more or less shows the classical distribution with highest infections in the 10 to 20 years age-class. For *S. mansoni* the numbers of infected individuals are too low to discriminate between age-classes. A survey in the school of Gounougou on *S. haematobium* only, showed a remarkably high 65.6%

prevalence among pupils between 5 and 20 years of age (N=99). Since many pupils come from outside Gounougou we have tried to verify the residence of all pupils appearing on the 1989 survey list. In November 1991, it was possible to track 55 pupils living in Gounougou, Labaré (at 2 km north-east), Ouro Doukoudjé (at 4km north-east), and Lagdo (on the other side of the Benue at 7km). Table 6 shows that pupils from other villages are more often infected with *S. haematobium* and also have higher geometric mean egg-counts. The prevalence among the pupils living in Gounougou corresponds to the prevalence in this age group in the village survey. Severity of schistosomiasis in the other villages appears to be higher than in Gounougou itself. It must be noted that those villages have no relation at all with the Gounougou irrigation or drainage system.

Table 5: Prevalence rates of *Schistosoma haematobium* and *S. mansoni* in Gounougou in 1989.

	S. haematobium			*S. mansoni*		
age-class	N	infected	prevalence	N	infected	prevalence
0 - 9	40	10	25%	38	4	11%
10-19	20	9	45%	17	1	6%
20-29	12	3	24%	12	2	17%
30-39	7	1	14%	6	2	33%
40-49	5	1	20%	5	1	20%
50-59	1	0	0%	1	0	0%
>59	2	1	50%	2	0	0%
total	87	25	28.7%	81	10	12.3%

Riao

In August 1989, a total of 147 households with 867 individuals were counted in Riao, i.e. 5.9 persons per household. The village consists mainly of autochthonous islamic Foulbé (30 households; 4.1 persons per household) and immigrant christian Toupouri (107 households; 5.2 persons per household). The remaining 10 households from other tribal groups mostly are government appointed persons involved in teaching, community training, etc.). As figure 22 shows, the first wave of immigrants arrived in 1977 when the Northeast Benue project transported 57 families from Kar Hay to Riao. After 1977 the inflow of Toupouri continued, although at a less spectacular pace. The age-class distribution in figure 23 shows the dominance of Toupouri in 1989. Especially the small number of children and adolescents among Foulbé is in marked contrast with the Toupouri. The village chief is a Foulbé bearing the ardo title, one step higher than djaoro in the traditional hierarchy. He is assisted by three Toupouri quarter chiefs.

Table 6: Prevalence and intensity of infection of *S. haematobium* among pupils of Gounougou elementary school, divided according to village of residence. Asterisks (*) indicate if the difference between Gounougou and one of the other villages is significant; $p < 0.05$ (Chi^2 for prevalence rates; ANOVA for geometric mean egg-output).

Residence	Gounougou	Labaré	Ouro Doukoudjé	Lagdo
N survey	82	13	15	7
N infected	37	10	11	6
prevalence	45%	* 77%	* 73%	* 86%
egg-count (geom. mean)	11.8	* 64.7	31.0	19.1

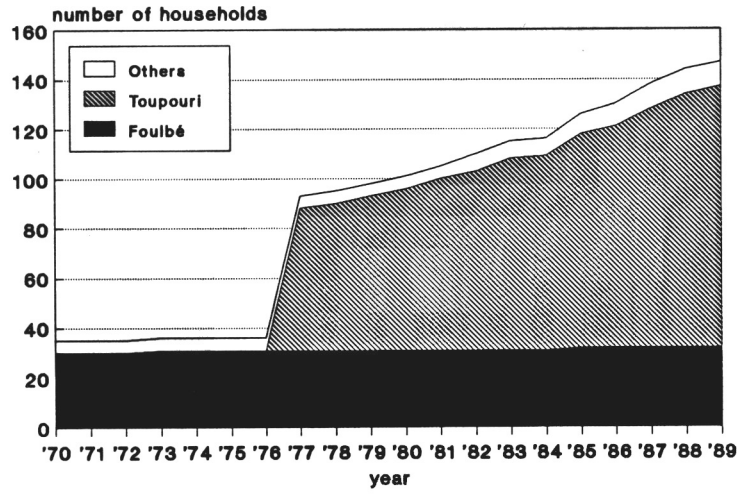

Fig. 22: Settlement history of Riao

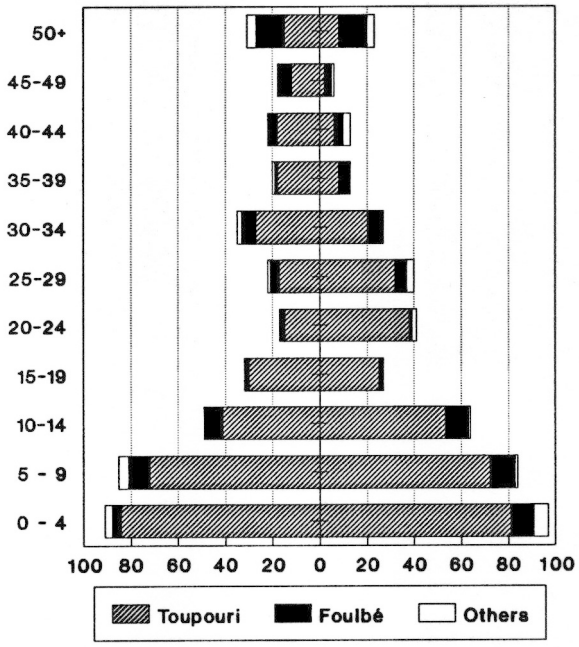

Fig. 23: Age-class distribution and ethnic groups in Riao.

The schistosomiasis survey was held in September 1989. Of 284 persons visited, 265 delivered their samples the next morning at the school building (93%). Only adult Foulbé males seemed somewhat reluctant to cooperate; 27% of them did not return their sample bottles. In 258 urine samples 28 persons (10.9%) were found infected with *S. haematobium* (16 males and 12 females). Fourteen of the infected individuals were born in Riao and could not have imported the disease from their region of origin. Geometric mean egg-output was low: 4.9 eggs/10 ml urine (males 6.0; females 3.8). In table 7 the results of census and survey are summarized. The overall prevalence is highest among persons between 10 and 25 years of age, although this rate can still be considered low. In 189 stools 7 cases of *S. mansoni* were found (3.7%), of which 4 are born in Riao.

Table 7: Census data and schistosomiasis survey in Riao, August 1989.

	Census		Survey		*S. haema tobium*		
age-class	males	females	males	females	males	females	total prevalence
0 - 4	91	97	22	26	1	3	8%
5 - 9	85	84	26	30	4	1	9%
10-14	49	64	21	17	5	2	18%
15-19	32	27	7	15	2	2	18%
20-24	17	41	6	10	2	2	25%
25-29	22	40	6	12	1		6%
30-34	45	27	9	8	1	1	12%
35-39	20	13	6	4		1	10%
40-44	22	13	6	3			0%
45-49	18	6	4	4			0%
50+	31	23	8	8			0%
Total	432	435	121	137	16 (13%)	12 (9%)	11%

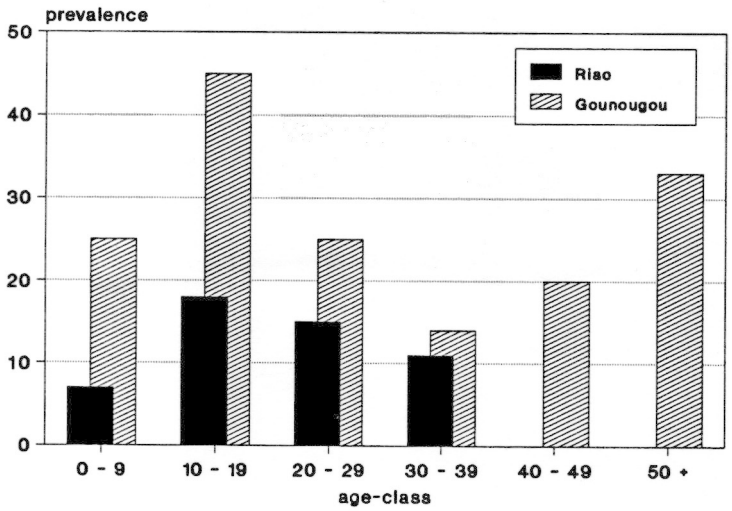

Fig. 24: Prevalence of vesical schistosomiasis per age-class in Gounougou and Riao.

Discussion and conclusion

Both Riao and Gounougou are dominated by recently settled immigrants, mainly coming from the southern part of the Diamaré plateau in the extreme northern province. Vesical and intestinal schistosomiasis are endemic in these regions of origin. Data on schistosomiasis prevalence in Riao and Gounougou must be considered with care, because they will be influenced by people carrying the parasite from elsewhere. Nevertheless, it is clear that transmission is occurring in the Benue valley because children who were born in Riao or Gounougou were found infected.

The prevalence rates for both *S. haematobium* and *S. mansoni* in Gounougou and Riao are moderate to low. The rates in Gounougou, however, are consistently higher than in Riao for all age-classes, as illustrated in figure 24. Although it is tempting to conclude that the influence of irrigation

development near Gounougou is responsible for these higher prevalences, the data from the school survey show that this conclusion is not justified. The villages with highest prevalence of *S. haematobium* among school children, Ouro Doukoudjé and Labaré, are situated at a 4km distance from the river and the irrigation scheme and do not possess any source of permanent open water. The occurrence of seasonal transmission in the rainy season, limited to only a few sites, might explain the relatively elevated prevalence of schistosomiasis in these villages. The seasonal rain-fed pools that can be found near O. Doukoudjé and Labaré harbour populations of *B. senegalensis*, an intermediate host of *S. haematobium* that is capable of surviving prolonged periods of desiccation (see chapter 3).

The only justified conclusion so far is that after two years of irrigation no dramatic outbreak of schistosomiasis can be recognized in Gounougou. However, the inflow of large numbers of immigrants that possibly carry parasites, the planned extension of the existing irrigation scheme, and the expected further colonization of these schemes by snail hosts, give reason for caution. According to recent information the prevalence of *S. haematobium* in Gounougou has indeed increased to 43% in January 1993 (Brussel & Contant, pers. com.).

Acknowledgements

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