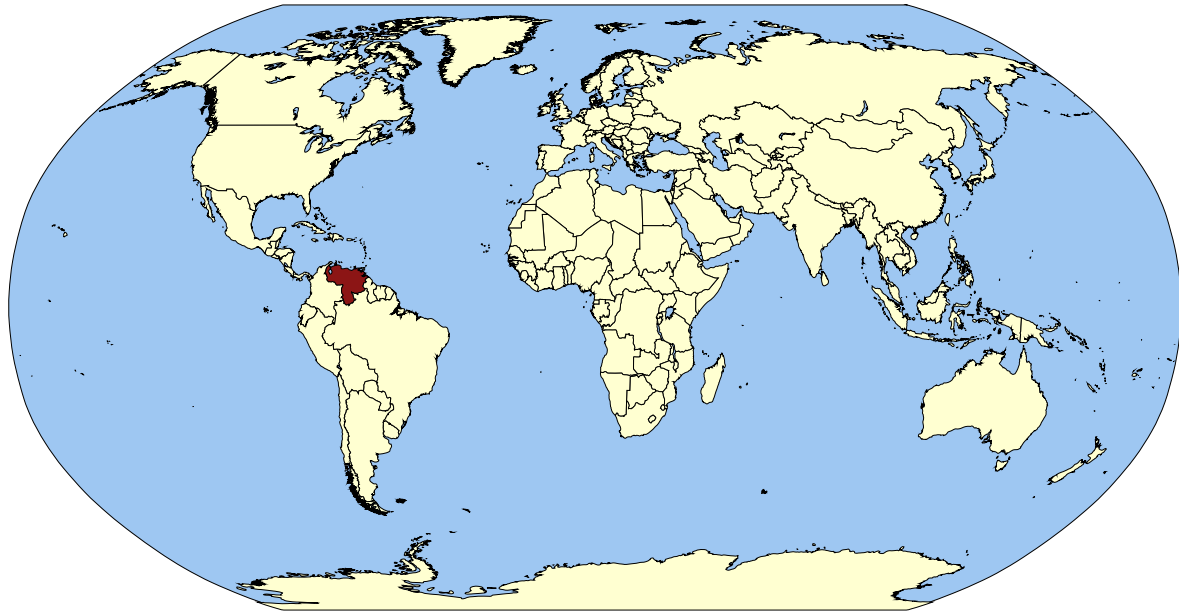


Venezuela



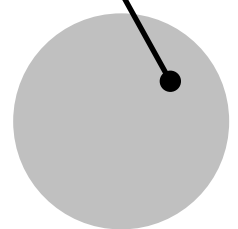
Overview of Schistosomiasis in Venezuela

Schistosoma mansoni infections in Venezuela manifest as a mild disease with a low parasite burden, making estimations of true disease burden amongst populations in endemic regions difficult [1]. The first case of schistosomiasis in Venezuela was reported in 1905, and regional snail control efforts were underway by 1922. When a national schistosomiasis control program was initiated in 1943, prevalence was estimated at 15% [2]. Control efforts, administered through the Ministry of Health, have mostly focused on snail population control and elimination. Following decades of snail population monitoring and control efforts, prevalence was estimated as low as 0.9% in 1986 and 0.2% in 2010, demonstrating sustained success of the Schistosomiasis Control Program [2,4]. The main schistosomiasis transmission sites include rivers, lakes, streams, ponds and dams [3].

Schistosomiasis in Venezuela [7]

67,020 school-age children require treatment for schistosomiasis each year. Few adults require treatment.

>1% of the population requires preventative chemotherapy for schistosomiasis



Overview of Venezuela [8]

- » Population in 2015: 29,275,460
- » Official Language: Spanish
- » Capital: Caracas
- » Federal Republic
- » Percentage of Population with Access to Improved Drinking Water in 2015: 93.1%
- » Percentage of Population with Access to Improved Sanitation in 2015: 94.4%

Treatment Procedures

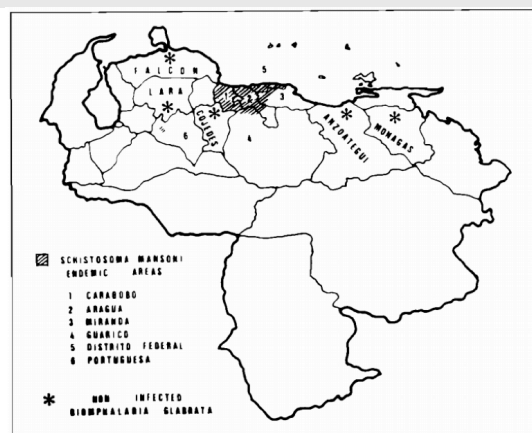
In 1992, an administrative decentralization process began granting each state autonomy in health policies and surveillance of endemic diseases. The process established the role of rural clinics and hospitals in the control of endemic disease including schistosomiasis. However, due to low intensity of infection and low morbidity, patients with schistosomiasis were rarely reported. Drugs are administered to infected patients based on individual diagnosis and need rather than treating large populations of at-risk individuals in endemic areas through mass drug administration programs [3].

Historical Distribution

Despite widespread and sustained success of snail elimination programs, transmission is still active in certain localities within the endemic area, which has remained largely unchanged geographically [3]. In 1946, the endemic area was estimated at 15,000 km², representing 40% of Venezuelan population with high focal transmission in the northern central region [3]. Stagnant water with high levels of pollution are conducive to *Biomphalaria glabrata* populations, and as suburban development grew in the 20th century, the snail's range extended beyond initially described endemic areas [3,4]. Repeated molluscicide treatment in many rivers in the endemic area successfully reduced the *B. glabrata* populations - targeted regions cite a 60-73% reduction [5]. Biological control through the introduction of competitor snail populations was also employed as a method for population control, and was found to successfully reduce or even eliminate vector species in some areas [4]. After 1975, the thiarid snails *Thiara granifera* and *Melanooides tuberculata* were observed to have invaded littoral in the north central seashore, displacing *B. glabrata*. *Biolimpharia* species were eliminated in ponds in the Valencia lake region following thiarid invasion, but still persist in rivers and streams [3]. In some areas where snail elimination was achieved, reappearance of *B. glabrata* populations has been observed in some parts of rivers where continued control had been abandoned, notably the San Julian River, where it was responsible for the reappearance of transmission foci [5].

Results of Control

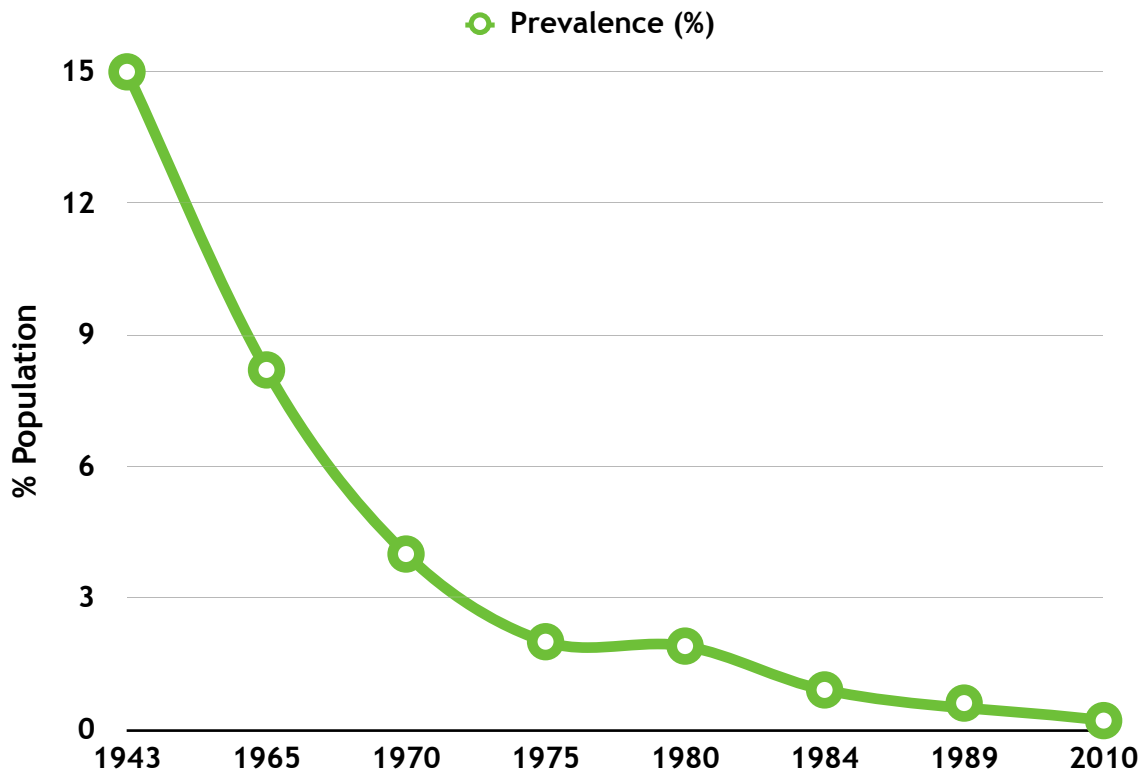
In this particular case of snail population resurgence in the San Julian River, colonies were successfully destroyed after continued molluscicide treatment. Most interestingly, the thiarid snail *T. granifera* was seen in the river, and over many years established dense, stable populations, while *B. glabrata* has not reappeared as of 2000. All of the rivers in central Venezuela are presently invaded by *T. granifera* and another snail species, *M. tuberculata*. The fact that these populations seem to provide a barrier against the re-establishment of *B. glabrata* and subsequent transmission risk represents a scenario wherein biological invasion of non-host competitive snail populations in littoral regions directly contributes to effective control in low-transmission areas [5]. As of 2012, IAMAT reports "The risk of infection is limited to the highly populated agricultural areas surrounding Lake Valencia (in the states of Carabobo and Aragua), extending from Valencia in the west to La Victoria in the east, and southwards to Manuare, Belen, and San Juan de los Morros (Guarico state). Localized infections are present in the following areas: Federal District in Caraballeda and Rosalia; State of Miranda in Cua on Rio Tuy and Guatire on Rio Caucagua; and in the centre of the state of Aragua in Boca del Negro" [6]. Schistosomiasis continues to persist in focal areas in the endemic region through low-level transmission, likely amongst young individuals in which the disease is undetectable [3].



Geographical distribution of *Schistosoma mansoni* and non-infected *Biomphalaria glabrata* in Venezuela. Source: Ministerio de Sanidad y Asistencia Social, Departamento de Parasitosis Intestinales y Esquistosomiasis, Maracay, Venezuela.

The Range of Schistosomiasis

The distribution of *Schistosoma mansoni* is shown in the northern shaded regions above -- the asterisks indicate the range of *S. mansoni*'s intermediate host, *Biomphalaria glabrata*.



Schistosomiasis Prevalence in Venezuela Over the Decades

Schistosomiasis infection rates started relatively small in 1943 at 15%, and the rates have experienced a mostly steady decline in years since. Now, schistosomiasis still exists, but only in small pockets around infected waters.

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