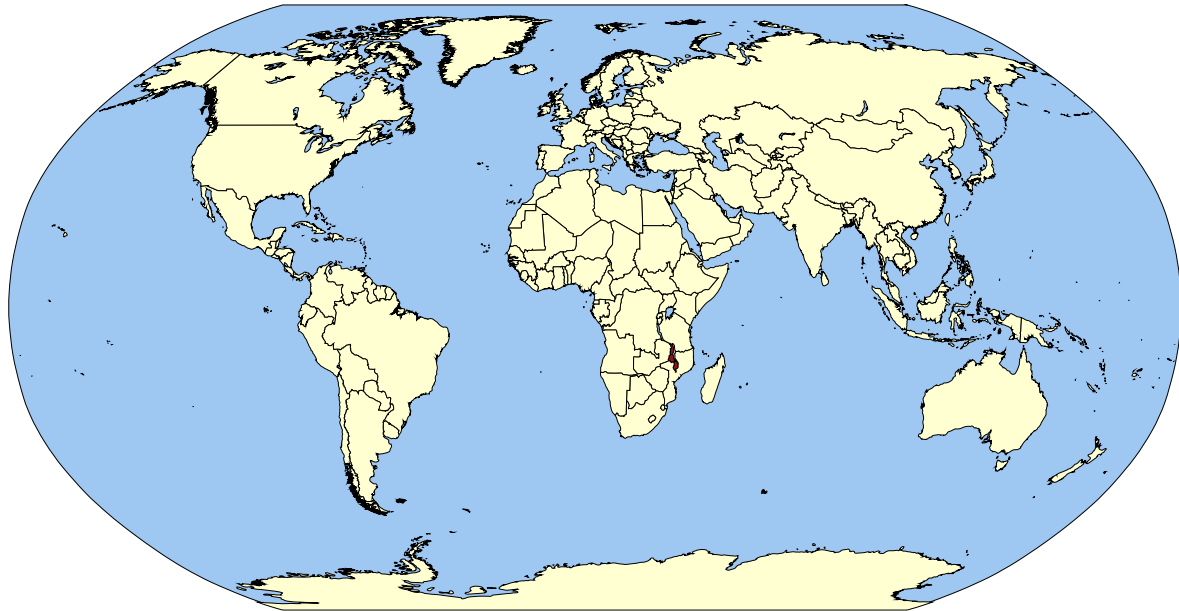


Malawi



Schistosomiasis in Context: Malawi

Malawi is a landlocked country with a population around of 14 million people [1]. Malawi's economy is largely agriculture-based, and it is one of the world's least developed countries [2]. The country faces many challenges, including high rates of HIV infection, a rapidly growing population, governmental corruption, an unsteady food supply, and threat of drought and other natural disasters [3]. In 2005, President Mutharika initiated programs to stimulate economic growth after decades of low development. Since his term and succession in 2012 by Vice President Joyce Banda, education standards and environmental conditions have gradually improved. In recent years, Malawi has steadily become less dependent on foreign aid.

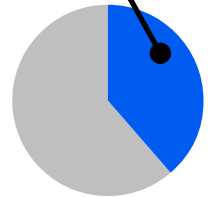
The population of Malawi has long been at risk to schistosomiasis. Over 6.7 million people were infected in 2010, with over 1.6 million people treated. Despite the millions treated, national treatment coverage reached only 13.4% [12].

Schistosomiasis in Malawi [17]

Nearly 7 million people require treatment

39% of the population requires preventative chemotherapy for schistosomiasis

Almost half of the infected population, or 3 million total individuals, are school-age children.

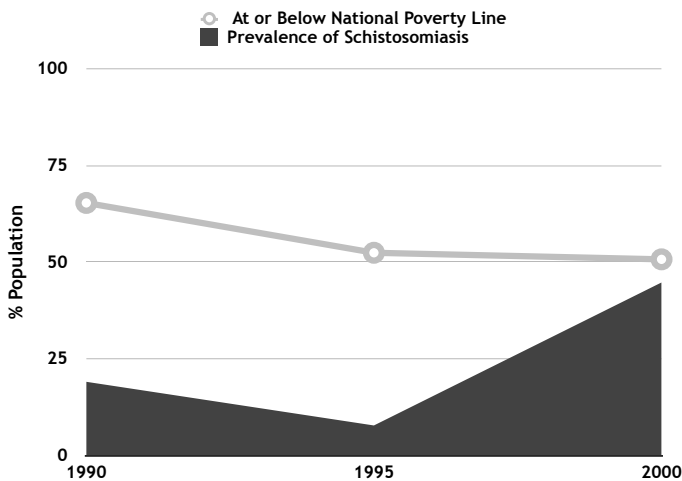


Overview of Malawi [2]

- » Population in 2015: 17,964,697
- » Official Language: English (although Chichewa is common)
- » Capital: Ulongwe
- » Multiparty Democracy
- » Percentage of Population with Access to Improved Drinking Water in 2015: 90.2%
- » Percentage of Population with Access to Improved Sanitation in 2015: 41%

Schistosomiasis Prevalence Over the Years

S. haematobium and *S. mansoni* were reported as highly endemic in 1977, but only a little over 3,100 patients were reported as hospitalized from the disease [9]. Based on 1989 infection estimates and 1995 population data, 1996 estimates indicated that 4.2 million people were infected and 9.9 million were at risk [10]. Another study conducted in 2002 randomly selected schools within six ecological zones and found prevalence rates of 6.9% and .4% for *S. haematobium* and *S. mansoni*, respectively [11]. It is not entirely clear why prevalence rates appear to have dropped so significantly in this particular study. In mid-2003 and 2010, the estimated prevalence of schistosomiasis was 7.7% and 44.7% respectively [12].



A Disease of Poverty

(Above) Schistosomiasis is a disease of poverty -- meaning those who contract the disease are often living at or below the poverty line. In Malawi, a country with 1 of 2 citizens living in poverty, schistosomiasis puts millions at risk.

Schistosomiasis Distribution and Prevalence

The wide distribution of schistosomiasis on the plains and plateaus of Malawi has been recognized for more than 70 years [5, 6]. During the rainy seasons, coastal lagoons and inland lakes flood and extend beyond the bordering marshlands across large areas. Snail infection rates are highest from July to the beginning of the rainy season when rivers are contracted [6]. The large amount of surface water provides suitable habitat for abundant intermediate snail host populations. Of 524 rivers surveyed in Mozambique and Malawi between 1952 and 1956, over half of them were found to contain schistosomiasis intermediate snail hosts [6]. *Bulinus globosus*, an intermediate host for *Schistosoma haematobium*, is located along shores of lakes and riverbanks throughout the country. *Bulinus nyassanus* transmits *S. haematobium* along the open shorelines of Lake Malawi [7]. *Biomphalaria pfeifferi*, an intermediate host for *Schistosoma mansoni*, also transmits disease, but only on the plains. *Biomphalaria pfeifferi* is somewhat of an anomaly in Malawi: unlike other East African countries, where *B. pfeifferi* is important snail host up to 1800-1900 meters above sea level, transmission in Malawi rarely occurs above 1200 meters.

Schistosomiasis infection along Lake Malawi has been well documented. As early as 1948, nearly all people living on the shores of the lake in the Nkhosakota district were infected. The prevalence rate of *S. haematobium* tends to increase from north to south, and correlates to population density. In 1970, the prevalence of *S. haematobium* in Malawi ranged between 32% and 94% in the southern and central regions [6]. The prevalence rate of *S. mansoni* is consistently lower than *S. haematobium*.

Malawi is a country faced with many problems, including rampant schistosomiasis, all of which compete for attention.

Water Development and Schistosomiasis

Irrigated agriculture creates large amount of the water surface area suitable for snail populations in Malawi. Its nine major dams with a height over 12 meters provide municipal water supplies, with the exception of two hydroelectric dams constructed in the 1950s. [4]. There are also between 700 and 750 small dams, most of which were erected during the colonial period, and currently exist in varying states of disrepair. As of 2006, the government began repair projects on some of these smaller dams as part of the national water conservation strategy. In the late 1940s, Malawi began irrigation projects, starting with the development of the Limphsa Irrigation Scheme in the Nkhata Bay District. Two more irrigation projects began in the 1950s - one on the Chilwa Phalombe Plain and another at a Makhanga research station. In 1965, the Sugar Corporation of Malawi started producing sugar cane with irrigation. Between 1968 and 1979 the government constructed an additional 16 schemes with a total area of 3600 hectares. However, over the last 15 years, irrigation has been given very low priority in the agricultural sector.

Schistosomiasis at Lake Malawi

Lake Malawi has served as a case study to examine the effects of snail-predators and schistosomiasis infection. Transmission of schistosomiasis has been historically recorded in the swampy and protected backwaters of the lake [7]. However, by the mid-1980s, *S. haematobium* was also found on the open shorelines of Lake Malawi. This increase in schistosomiasis transmission may be due to overfishing snail-eating fish [7]. Others point to increased infection rates in southern Malawi between 1978 and 1991 coinciding with the reduction of mollusk-eating fish [5]. Conversely, samples in 2003 demonstrate a decrease in schistosomiasis in school-aged children coinciding with an increase in the number of snail-eating fish [8]. All types of fishing are prohibited within a 100-meter zone along Lake Malawi National Park shores [7]. However, this rule is clearly not respected along southern part of the lake [7]. Beach seine-net fishing is the most damaging form of fishing because nets are often fine-meshed, and sometimes lined with mosquito nets. Fine-meshed nets hit fish the hardest, which tend to reproduce close to the shore. Thus, recruitment of fish populations is seriously impaired. Evidence from Lake Malawi suggests that schistosomiasis in humans is intimately related to a broader ecological system and maintaining and restoring snail predator populations may have some potential as a method for disease control.

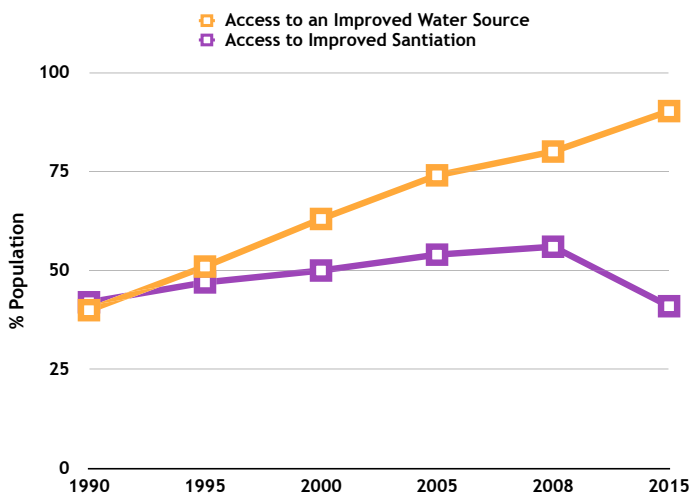
Schistosomiasis Control Efforts

According to reports in 1976, Malawi allocated 4% of the national budget to health [9]. Only .3% of the total health budget was allocated for schistosomiasis control, or about 27,000 USD. In 1976, Malawi reported to the WHO that ten square kilometers were covered by molluscicides. According to government reports, ten governmental staff members were employed in schistosomiasis control, although their qualification levels are unknown [13]. The German government has been a major funding partner through the German Agency for Technical Cooperation (GTZ), and has had projects in many countries including Malawi [10]. The Bilharzia Control Project, supported by GTZ and the Ministry of Health began in 1981, with two pilot projects in Nkoma and Pirititi [14].

More efforts to control schistosomiasis has been taken in recent years, including the formation of a National Strategy Plan to cover all neglected tropical diseases (NTDs) in 2011-2016, and the creation of a NTD secretariat committee [1]. There is also a national schistosomiasis and soil-transmitted helminthes control program based at the Ministry of Health. This program is integrated into the School Health and Nutrition Programme, an initiative led by the Ministry of Education and the Ministry of Health. In addition to including more school children, the program aimed to include children not enrolled in school in 2011, but there were insufficient amounts of praziquantel to carry out full treatment [1].

Looking Ahead to Control Schistosomiasis

The Schistosomiasis Control Initiative began working in Malawi in 2009, with limited support from World Vision, the WHO, and the Malawi government [1]. 5.6 million people were targeted for treatment by the program in May 2012. The Schistosomiasis Control Initiative's program in Malawi accounted for 14% of SCI's total program spending between 2010 and 2013 [15]. Although Malawi has a history of control efforts, the country is faced with many problems competing with schistosomiasis for funding and attention. Between 1990 and 2008, Malawi had the highest increase in access to improved water sources in Sub Saharan Africa, from 40% to 80%. Access to improved sanitation facilities also increased from 42% in 1990 to 56% in 2008 [16].



Water and Sanitation

(Above) Schistosomiasis is transmitted through defecation or urination into water sources, and then contracted during contact with contaminated water. In Malawi, increased access to clean water and improved sanitation gives hope to decreased schistosomiasis prevalence.

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