Country by country

Anna Petherick investigates the nature of Chagas disease and how its management varies across Latin America.

The available data that describe Chagas disease's spread and impact are poor: they conceal assumptions, extrapolations and, in a few cases, alleged manipulations by government officials eager to minimize the apparent scale of the problem, and thus avoid pressure to deal with it (in the case of Mexico) or to overstate their performance at tackling the disease (Bolivia). The multinational Southern Cone, Andean, Central American and Amazon initiatives generate only recommendations for the ~100 Latin American provincial governments and 14,000 municipalities. These operate largely under their own steam. So the numbers given here merely sketch out the situation and there is often great variation within national borders.

Venezuela — population 26.7 million

Venezuela is a story of exemplary, sustained achievement that has been let slide in recent years. In 1961, it was one of the first countries to draw up a national campaign against Chagas disease. Before this, prevalence rates were 5–40% in the low Andes and open grasslands of the Orinoco basin, where sylvatic (forest-dwelling) *Rhodnius prolixus* is endemic. Nationally, prevalence among children aged <10 years was cut from 20% in 1960 to 0.8% in the late 1990s, and the size of the endemic area in Venezuela shrank by almost one-half. Since then, seroprevalence appears to have increased and dense populations of house-dwelling *R. prolixus* have re-emerged[1,2].

R. prolixus often reinvades from nearby palm trees after a house is sprayed. The successful four-decade-long campaign involved not only insecticide spraying but also a rural housing improvement project to lower the chance of vectorial transmission indoors. Half a million homes were constructed or modified. For example, roofs thatched with palm leaves, where *R. prolixus* often lays eggs, were replaced. Screening for *Trypanosoma cruzi* at blood banks became law in Venezuela in 1988. However, many researchers say that better surveillance is needed in the Venezuelan Amazon, where endemic areas might lie undiscovered.

Brazil — population 186.4 million

Vectorial transmission by *Triatoma infestans* was officially eliminated from Brazil in 2006 — the result of a control programme that started in some areas in 1950 and became national in 1983. Other domestic vectors are rare but occur in patches. Overall, in 1970, there were 100,000 new cases transmitted by the insect vectors; in 2007, there were 10. However, the country still has 3 million infected individuals.

Demographic shift is partially responsible for the changes in vectorial transmission. Brazil has seen massive rural-to-urban migration over recent decades. At the same time, however, many have moved into the Brazilian Amazon. Consequentially, transmission by new, exotic vectors such as *Rhodnius pictipes*, *Rhodnius robustus*, *Panstrongylus geniculatus* and *Panstrongylus lignarius* has arisen. These sylvatic vectors often have high rates of *T. cruzi* infection and adults occasionally fly into houses near the forest.

Oral transmission in towns in and around the Amazon is an increasing concern. Between 2005 and 2007, 330 cases of orally acquired *T. cruzi* infection were recorded in the country, of which 272 came from the Amazon region. However, it was an outbreak in the rich, southern state of Santa Catarina in 2005 in which five people died that drew national attention to the issue. The problem seems to be getting worse: between 1968 and 2005, only ~440 cases of oral transmission were identified[3,4].

This rise is to some extent explained by improved screening. Researchers at the Instituto Evandro Chagas spearheaded the training of technicians to check routinely for *T. cruzi* infection with each blood smear test for malaria — so Chagas disease surveillance can piggyback off an existing federal screening programme.

Mexico — population 107 million

Mexico has been slow to get to grips with Chagas disease. Unlike most of the other countries in Latin America, it is not part of a transnational initiative, and has attended the meetings of the Central American Initiative only a few times.

There are several reasons for this. Prevalence is officially low (1.5%) in Mexico, but the government has ducked the issue. There is no federal financing of Chagas disease control or monitoring, which leaves its 31 states to search for cash from their own budgets — and requires individuals to take it upon themselves to address the issue. Thirteen states have started to look into the disease, according to Janine Ramsey, who until recently was director of the

Regional Centre of Public Health Research in Tapachula, Chiapas. Ramsey estimates that 69,000 people are infected with *T. cruzi* each year in Mexico, only ~30% of the national blood supply is properly screened and the true prevalence of infection is closer to 2%.

Another historical hurdle came from public-health officials incorrectly arguing that DDT could kill *T. cruzi* vectors — and so the country needed only those spraying programmes already in place to fight malaria. This allowed the Chagas disease vectors to flourish, unchecked. Under the terms of the North American Free Trade Agreement (NAFTA) that Mexico signed in 1994, DDT has been banned in the country since 2006. This has been beneficial for controlling Chagas disease vectors, having encouraged the use of pyrethroids as a replacement. However, vector distribution is poorly documented.

Bolivia — population 9.2 million

Bolivia is Chagas disease's frontline. It has the biggest threat to fight: the disease is endemic across 60% of the country; it is *T. infestans*'s ancestral home; and the country's Andean valleys harbour numerous sylvatic populations, from which re-infestation of homes can occur. In some parts of the country, every community member aged >50 years is infected. Bolivia is also one of the poorest countries in Latin America, with a large, rural population.

TOMAS BRAVO/REUTERS

A member of a medical brigade fumigates a house on the outskirts of Tegucigalpa, Honduras, in May 2005.

In the late 1990s, only a few blood banks in Bolivia screened for *T. cruzi*, and there were 180,000 new cases of Chagas disease annually among a population of <8 million. The Inter-American Development Bank lent Bolivia US$25 million for an ambitious control project that ran from 2000 to 2007. Over the 7 years, after spraying, the infestation rate of houses fell from 55.0% to 3.2% overall.

Since 2008, the Bolivian government has done its best to finance a new Chagas disease programme that is due to run until 2012. The emphasis is on treating people with Chagas disease, including adults. Infection rates have fallen significantly among children, according to the government. Although some experts are sceptical of the official figures, Joaquim Gascón of the International Health Research Centre at Barcelona's Clinical Hospital says that he has found the same trend among Bolivian immigrants to Spain in recent years. Future concerns include urban transmission, which has been found in the city of Cochabamba, widespread pyrethroid resistance and migration, driven by the decline of mining in the Andes, from endemic areas into the Bolivian Amazon.

Guatemala, Honduras and El Salvador — combined population 26.7 million

Since the launch of the Central American Initiative in 1997, Guatemala, Honduras and El Salvador have been the most active in fighting Chagas disease — largely because of the involvement of Japan's development agency (JICA).

Historically, two vectors have dominated in Central America: *Triatoma dimidiata*, which disperses seasonally from forest habitats and, for unknown reasons, tends to produce more acute cases of Chagas disease; and *R. prolixus*, which spread in the region after specimens from Venezuela were accidentally released in 1914 by researchers from the Pasteur Institute in Paris, France. Spraying campaigns have now reduced this vector's distribution to pockets, with only residual foci remaining.

T. dimidiata is better controlled with housing improvement projects, which are typically cheaper than two rounds of insecticide spraying but take a long time. Carlota Monroy of the University of San Carlos in Guatemala has led efforts to teach communities to cement floors, plaster walls and build wire animal pens. Her team has covered two of the country's 22 departments over a decade. Many houses in El Salvador were opportunistically modified to make them better proofed against Chagas disease vectors after two earthquakes hit the country in 2001.

Recently, JICA's efforts in Honduras have been derailed by political instability. The coup of 2009 that temporarily removed Manuel Zelaya from office resulted in the agency's planned Chagas disease meeting being cancelled. This year, the Honduran government's insecticide spraying programme has not received any of the funds officially allocated to it. Ken Hashimoto, who runs JICA's Honduran programme, wishes there was more interest in Chagas disease from Honduras's academic community — particularly because JICA plans to leave Central America in March 2011.

Peru, Ecuador and Colombia — combined population 86.8 million

The Andean Initiative has been relatively slow to get off the ground. Set up in 1997, its original goal was to interrupt transmission of *T. cruzi* by insect vectors and by blood transfusion in the Andean countries (including Venezuela) by 2010. Although some progress has been made, there are still large gaps in all of these countries.

For example, Colombia has no central government programme for Chagas disease. Indeed, there is no Ministry of Health, although there is a Ministry of Social Protection, which is also responsible for labour issues. Good information about the distribution of *T. cruzi* vectors is available. In practice, academics are responsible for driving what is done at a departmental or municipal scale.

Ecuador has greater political momentum behind fighting Chagas disease, helped by Marcelo Aguilar, who is a specialist in the field and has held several important positions in the Ministry of Public Health since 1998. There have been recent steps towards better cooperation with Peru to study the remote tropical forest around the border dividing the two countries. Although vectorial transmission is usually thought of as sporadic in the Amazon, studies from Ecuador indicate that it is actually endemic in some regions.

Peru has seen an increase in cases in its Amazonian region in recent years, and new reports of vectorial transmission in several departments in the northern departments of Pasco, Loreto and Huanuco. Insecticide spraying in Arequipa, where urban transmission occurs, has lowered the number of cases. In 2009, Tacna, on the frontier with Chile, was declared the first department of Peru officially to interrupt vectorial transmission. ■

Anna Petherick is a freelance writer based in Buenos Aires, Argentina.

1. Marcelo Aguilar, H. *et al. Mem. Inst. Oswaldo. Cruz.* **102**, 47–55 (2007).
2. Aché, A. *Rev. Inst. Med. Reop. S. Paulo* **43** (1), 37-43 (2001).
3. Alarcón de Noya, B. *et al. J. Infect. Dis.* **201**, 1308–1315 (2010).
4. Miles, M. A. *J. Infect. Dis.* **201**, 1282–1284 (2010).