

Brazil's neglected tropical diseases: an overview and a report card

Peter J. Hotez^{a,b,c,*}, Ricardo T. Fujiwara^{d,**}

^a Sabin Vaccine Institute and Texas Children's Hospital Center for Vaccine Development, Departments of Pediatrics and Molecular Virology and Microbiology, National School of Tropical Medicine, Baylor College of Medicine, Houston, TX, United States

^b Department of Biology, Baylor University, Waco, TX, United States

^c James A. Baker III Institute for Public Policy, Rice University, Houston, TX, United States

^d Department of Parasitology, Institute of Biological Sciences, Universidade Federal de Minas Gerais, Brazil

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Abstract

Today, the nation of Brazil leads the Western Hemisphere in terms of the number of its citizens living with neglected tropical diseases (NTDs). These diseases continue to trap Brazil's "bottom 20 million" in extreme poverty.

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1. Introduction

When it comes to extreme disparities between its wealthy and its poor, there is no other nation quite like Brazil. While the World Bank categorizes Brazil as an "upper middle income country" [1], the reality is that it is a nation of economic extremes (Fig. 1).

In 2013 Brazil's population surpassed 200 million people such that it now accounts for approximately 34% of the population of the Latin American and Caribbean (LAC) region and 20% of the roughly one billion people living in the Western Hemisphere (Box 1) [2–4]. Brazil also represents the largest economy in the LAC region with a gross domestic product that now exceeds \$2.5 trillion; it is also the second largest economy in the Western Hemisphere behind the United States, and the seventh largest globally [4,5]. Brazil is one of

the world's fastest growing economies in recent years, with its gross domestic product growing by 7.5 percent in 2010, down to 2.7 percent in 2011, and recovering to 2.3 percent growth in 2013 after just one percent growth in 2012 [5,6].

Unfortunately such explosive economic growth has left behind approximately 10 percent of Brazil's population that still lives on less than \$2 per day [7] – approximately 20 million people, which includes around 12 million people living below the World Bank poverty line of \$1.25 per day [8]. Thus Brazil comprises approximately 20% of the 100 million people who live in extreme poverty in the LAC region and the Western Hemisphere [9]. Such extremes reflect the finding that at 54.7 Brazil has one of the world's highest GINI indices – a measurement used by economists to assess disparities between wealthy and poor [10]. Brazil's GINI coefficient is exceeded only by the nations of Colombia, Honduras, South Africa and Zambia [10].

As shown in Fig. 1, poverty is not evenly distributed in Brazil, but instead it is concentrated in the northeastern part of the country, including the states of Alagoas, Bahia, Ceara, Maranhao, Paraiba, Pernambuco, Piaui, Rio Grande do Norte, Sergipe, and the northern area of Minas Gerais state, and in northwest in Amazonas state [11].

* Corresponding author. National School of Tropical Medicine, 1 Baylor Plaza, Houston, TX 77030, USA. Tel.: +1 713 798 1199.

** Corresponding author. Department of Parasitology, Federal University of Minas Gerais, Belo Horizonte, Minas Gerais, Brazil. Tel.: +55 (31) 3409 2827.

E-mail addresses: hotez@bcm.edu (P.J. Hotez), fujwara@icb.ufmg.br (R.T. Fujiwara).

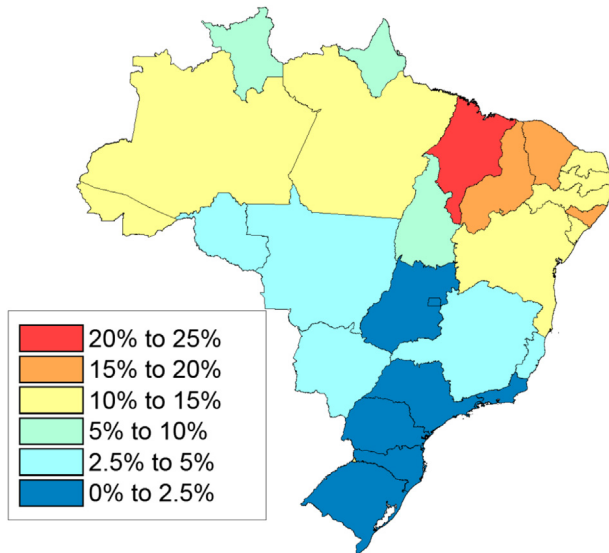


Fig. 1. Percentage of population living in extreme poverty, less than US\$70 per month. Original figure produced from data in Municipal social indicators: analysis from the Demographic Census of 2010 by the Brazilian Institute of Geography and Statistics, available here: http://www.ibge.gov.br/home/estatistica/populacao/censo2010/indicadores_sociais_municipais/tabelas_pdf/tab24.pdf.

Also concentrated in these impoverished areas where most of Brazil's affected people live on less than \$2 per day are high rates of neglected tropical diseases (NTDs). NTDs and poverty are closely linked in part because these chronic and debilitating parasitic and related infections can be demonstrated to cause poverty through their adverse impact on adult worker health and productivity and child growth and intellectual development [9]. NTDs also disproportionately affect girls and women [12], as well as indigenous populations [13]. In 2008, it was previously pointed out that NTDs disproportionately affect Brazil relative to other LAC nations and that these diseases represented one of the most potent forces that trap

Box. 1. Population and poverty of Brazil.

Brazil's Population (2013 estimate)	200.4 million people
Percentage of Latin American & Caribbean Population living in Brazil	34%
Percentage of Western Hemisphere Population living in Brazil	20%
Number of Brazilians living on less than \$1.25 per day (World Bank estimate in 2009)	12 million (6.1%)
Number of Brazilians living on less than \$2 per day (World Bank estimate in 2009)	22 million (10.8%)
Brazil's GINI index ^a	54.7

^a GINI index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. For more information, please see <http://data.worldbank.org/indicator/SI.POV.GINI>.

Brazilians in extreme poverty [14]. Here we update some of the latest information on Brazil's NTDs published since 2010 using World Health Organization (WHO, Preventive Chemotherapy and Transmission Control [PCT] http://www.who.int/neglected_diseases/preventive_chemotherapy/databank/en/) and Pan American Health Organization (PAHO) databases, as well as key published papers, including a 2009 review by Lindoso and Lindoso [15]. We find that with a few exceptions all of Brazil NTDs continue to remain widespread among the poor.

2. Neglected parasitic infections

Brazil's neglected parasitic infections include the major vector-borne protozoan and helminth infections, and the intestinal nematode infections and schistosomiasis.

2.1. Vector-borne protozoan infections

Brazil still leads the LAC region and Western Hemisphere in terms of the number of cases of Chagas disease, both cutaneous and visceral forms of leishmaniasis, and vivax malaria. Although many of the new cases of Chagas disease (American trypanosomiasis caused by *Trypanosoma cruzi*) resulting from *Triatoma infestans* vector-borne transmission have been eliminated in Brazil [15], there remain an estimated 1.9 million people living with the disease, accounting for approximately one-quarter of the world's cases [16]. However, an alternative estimate based on a systematic review indicates that as many as 4.6 million people may be infected with *T. cruzi*, with clear evidence of high prevalence in endemic areas, especially in urbanized regions and the elderly [17]. Outside of transmission from *T. infestans* there are concerns for continued emergence of this infection in Brazil through either sylvatic or oral transmission, especially in Amazonas where large numbers of impoverished Brazilians live [15,17]. More than 90% of the LAC region's several thousand cases of visceral leishmaniasis (*Leishmania chagasi* infection) occur in Brazil [18], with the highest concentration in the impoverished northeastern region [15]. Almost 40% of the LAC's region's cutaneous and mucocutaneous leishmaniasis is also found in Brazil equivalent to approximately 100,000 new cases annually [18]. Urbanization and deforestation are key social determinants that contribute to new cases [15]. According to PAHO, Brazil has the highest number of malaria cases in the LAC region, with approximately 87% caused by *Plasmodium vivax* [19,20]. More than one-third of the entire LAC region's 100 million people at risk for malaria are found in Brazil – mostly in the Amazon region [15] – despite important reductions of this disease in collaboration with WHO's Roll Back Malaria program and the Global Fund to Fight AIDS, Tuberculosis, and Malaria [19,20].

2.2. Vector-borne helminth infections

Both lymphatic filariasis (LF, caused by *Wuchereria bancrofti*) and onchocerciasis (*Onchocerca volvulus*) represent

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