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## Impact of migration on the occurrence of new cases of Chagas disease in Buenos Aires city, Argentina

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### Background

Chagas disease, also known as American Trypanosomiasis, is endemic in the Americas, especially Central and South America. Chagas disease is a zoonotic disease caused by the parasite *Trypanosoma cruzi*. Most of the infections take place in children by vector or congenital transmission, with other modes of infection such as blood transfusion, organ transplants, and oral route being less frequent. In areas under vectorial control, congenital transmission is the most common way of accruing the disease [1].

The important population migratory movements of the last decades have significantly impacted public health. People migrate not just with their culture, beliefs and hopes, but also with their health problems. Many diseases, such as Chagas disease, can thus be transferred to new regions and progress silently due to lack of knowledge of the local health system, and eventually produce autochthonous cases.

Vector transmission of the disease takes place mostly in rural areas. In Argentina, this is limited to the north of the country, in the provinces of Santiago del Estero, Chaco, Formosa, Corrientes, Santa Fe, Tucumán, and Salta, with isolated cases also reported in the rural areas of Córdoba and Mendoza. In areas where vectors are better controlled, congenital infection has become the main route of transmission. The City of Buenos Aires is not currently an endemic area for the vector.

In 1991, the World Health Organization (WHO) promoted a plan to control the vector and to screen blood donors. This project, called the "South Cone

Initiative", led to a marked decrease in vector and blood-borne transmission.

The Pan-American Health Organization (PAHO) estimates that there are currently 1,600,000 infected people in Argentina, and approximately 1,000 new congenital infections every year [1]. Prevalence of Chagas disease in pregnant women in Latin America ranges from 5% to 40% depending on geographical area, and the rate of congenital transmission is estimated to be 4% to 10%. An infected mother can have several infected children, as vertical transmission of the infection can take place in either the acute or chronic stage.

Recently, migratory flows have changed the epidemiological landscape of Chagas disease from predominantly rural areas to a prevalent urban setting. It is estimated that most infected patients currently live in large cities. Also, migration has led to Chagas disease cases being described in non-endemic regions such as European countries (*e.g.*, Spain, France, Switzerland), United States of America, Australia and even Japan, among others [2]. As previously mentioned, an important consequence of these movements of infected people outside the geographic area of the vector is that, currently, most of the new cases are due to congenital infection [2,3].

According to the 2010 Argentine National Census, over 53% of the population of Argentina lives in urbanized areas of the Province of Buenos Aires and the City of Buenos Aires, a non-endemic region for the vector. The City of Buenos Aires in particular has received a large flow of migrants from the north of the

country and from neighboring countries with a high prevalence of infection such as Bolivia, Paraguay and Peru [2]. Argentina harbors 550,713 Paraguayan citizens, 345,272 Bolivians, and 157,514 Peruvians. From this migrant population, 85.9% of Paraguayans, 65% of Bolivians, and 82.4% of Peruvians live in urbanized areas of the Province of Buenos Aires and the City of Buenos Aires [5].

The relatively high birth rates of these populations may explain the increase in congenital cases observed in the last decade [2]. It has been estimated that approximately 1,000 to 1,300 infected children are born every year in Argentina [1,2]. According to the Argentine National Chagas Program, of the 22,798 births in 2010 reported in the City of Buenos Aires, 3.4% were from mothers infected with chronic Chagas disease. Forty-one percent of these mothers were originally from the north of Argentina (mostly from the endemic provinces of Santiago del Estero and Chaco), 29% from Bolivia, 18% from Paraguay, and 9% from Peru. However, the actual prevalence of Chagas disease in the City of Buenos Aires has not been thoroughly studied [2].

**The study**

Between 2005 and 2009 we performed a multicenter prevalence study of Chagas disease in primary care centers of the City of Buenos Aires.

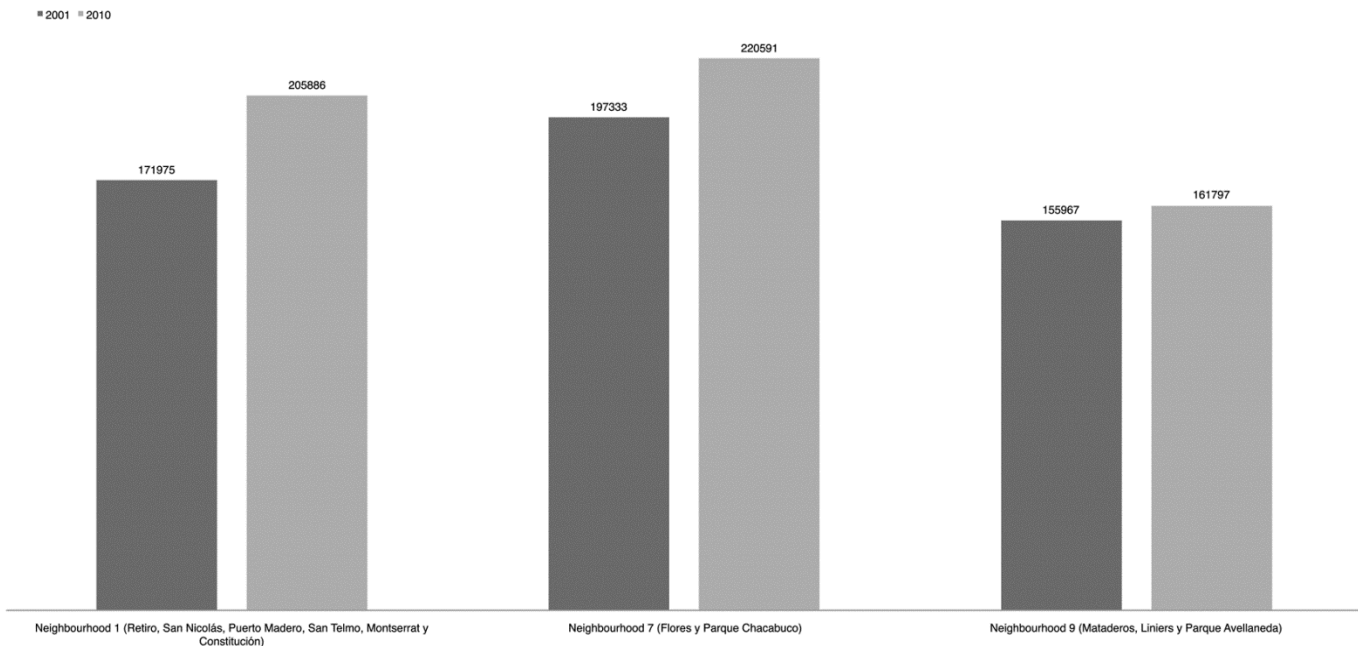
These centers (Neighborhoods 1, 7 and 9) are staffed by multidisciplinary health teams that cater to the health needs of low-income areas of the city where many newcomers live (Figure).

The target population of these centers in these neighborhoods includes over 200,000 people. A total of 1,786 subjects were included in the study. Demographic data including age, origin, place of birth, travel history and family structure were collected for all included patients. The study was approved by the Ethics and Research Review Boards, Buenos Aires Children’s Hospital “R Gutierrez”, Argentina. Written informed consent was obtained from the patients or the patients’ legal representatives, as appropriate.

**Results**

We observed a prevalence of 4.3% of Chagas disease infection in the population studied (n: 1786). Over half of the subjects in the study were female (68.6%); the median age was 19.2 years (range 8 months to 40 years), with 73% younger than 20 years old. Approximately 60% were Argentine, 17% Bolivian, 12% Peruvian, and 10% Paraguayan. The main risk factors for infection were the following: having a family member with Chagas disease, being familiar with the vector (*i.e.*, stating to know how to identify the vector), being born in Bolivia, and, in those from Argentina, being born in the province of

**Figure.** Migrant population growth in the areas examined in our study between 2001 and 2010



Santiago del Estero.

We also observed higher infection prevalence in school-age children than previously reported [6] in other areas of the city, likely due to the characteristics of the studied population, with a low percentage of immigrants from endemic areas.

Our study allowed for the identification and treatment of seven children with congenital infection. Treatment with benznidazole was well tolerated, and led to therapeutic response in all children.

The Parasitology and Chagas Service at “Ricardo Gutiérrez” Children’s Hospital in Buenos Aires, Argentina, is a referral center for Chagas disease with over 1,500 annual consultations, and approximately 650 children are currently being treated or under follow-up care for the disease. The mothers of these children were born in Argentina (57%), Bolivia (36.5%), and Brazil (6.5%). Approximately 50% of the mothers born in Argentina (194/370) came from endemic regions in the country. Sixteen percent of Argentine mothers were originally from the City of Buenos Aires and had never visited endemic areas nor received transfusions, making congenital transmission the most likely route of infection, and their infected children the second generation of congenital infection.

## Conclusion

The majority of new Chagas disease cases originate in the City of Buenos Aires by vertical transmission. Many infections are actually second-generation congenital cases, meaning that their mothers were themselves congenital cases. These findings highlight the fact that active screening for Chagas disease in urban settings should be considered an important component of childhood screening programs, particularly taking into account the high rate of pediatric response to treatment [2,3].

An undiagnosed individual with Chagas disease can eventually become a blood donor or, in the case of women, give birth to children with congenital infections, thus perpetuating the cycle of infection in non-endemic areas.

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