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Edimar Alcides Bocchi, MD, PhD Alexandra Arias, MD Hugo Verdejo, MD Mirta Diez, MD Efraín Gómez, MD Pablo Castro, MD

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## The Reality of Heart Failure in Latin America

Brief title: HF in Latin America

Edimar Alcides Bocchi, MD, PhD;<sup>1</sup> Alexandra Arias, MD;<sup>2</sup> Hugo Verdejo, MD;<sup>3</sup> Mirta Diez, MD;<sup>4</sup> Efraín Gómez, MD;<sup>5</sup> Pablo Castro, MD;<sup>3</sup> for the Interamerican Society of Cardiology.

Heart Institute (InCor) of São Paulo University Medical School;<sup>1</sup> Instituto Nacional de Cardiología Ignacio Chavez –México;<sup>2</sup> Escuela de Medicina, Pontificia Universidad Católica de Chile;<sup>3</sup> Instituto Cardiovascular de Buenos Aires;<sup>4</sup> Cardiología Clínica, Fundación Clínica Shaio, Bogotá, Colombia.<sup>5</sup>

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**Address for Correspondence:**

Prof. Dr. Edimar Alcides Bocchi  
Rua Dr Melo Alves 690, apto 61  
São Paulo – Brazil – CEP 01417-010  
Phone 55 11 2661 5464  
e-mail :dcledimar@incor.usp.br

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### Structured Abstract

**Objectives:** Heart failure (HF) data in Latin America (LA) were reviewed to guide health service planning in the prevention and treatment of HF.

**Background:** The HF epidemiology and the adequacy of relevant health service provision related to HF in LA are not well delineated.

**Methods:** A systematic search of the electronic databases and WHO was undertaken for HF in LA.

**Results:** LA countries have reduced gross income, and lower total expenditure on health per capita. LA is a heterogeneous region with HF risk factors of developed and non-developed countries including lower raised blood glucose, obesity, tobacco, and ageing risk while systemic hypertension (SH), rheumatic fever, and Chagas' disease (C'D) are higher in LA. Main etiologies of HF in LA are idiopathic dilated cardiomyopathy (from 1.3 to 37%), C'D (from 1.3 to 21%), ischemic (from 68% to 17%), SH (from 14% to 76%), valvular (from 3% to 22%), and alcohol (from 1.1% to 8%). The prognosis of C'D HF is worse than other etiologies. Chronic HF is cause of death in 6.3% of cases. Decompensated HF is the main cause of cardiovascular hospitalization. The prevalence of systolic HF varies from 64% to 69%.

**Conclusion:** LA is under the awful paradox of the HF risk factors and HF epidemiology of developed countries with the added factors of SH, C'D and rheumatic fever. Overall in the scenario of lower total expenditure on health per capita and lower gross national income per capita. New strategies are essential for prevention and treatment of HF in LA.

**Key words:** heart failure, epidemiology, Latin America, cardiomyopathy, Chagas' heart disease, chagasic cardiomyopathy, Chagas' disease, prognosis, hospitalization, decompensated heart failure, rheumatic fever, etiologies, risk factors

### Abbreviations

HF = heart failure

HFPEF = HF with preserved left ventricular ejection fraction

LA = Latin America

CAD = Coronary artery disease

SH = Systemic arterial hypertension

C'D = Chagas' disease

WHO = World Health Organization

LV = Left ventricle

LVEF = Left ventricular Ejection fraction

DHF = Decompensated HF

The knowledge of risk factors of Heart Failure (HF) in Latin America (LA) is essential because apart from the prevalence of risk factors comparable to developed countries in certain areas, the epidemiology of HF could also be influenced by risk factors which are more frequent in LA. In fact, a review about HF in LA is of immediate interest. Also, the review of new LA HF data including HF risk factors obtained from World Health Organization (WHO), recent registry data from LA countries and Institutions, epidemiological studies, analysis of LA HF population selected for recent HF trials, LA expenditure in health and gross income, and new advances in the cumulated knowledge of neglected diseases in LA, could have strong impact in planning future health politics for HF in LA. Therefore, the objective of this review is to offer an HF LA update as a valuable resource for researchers, clinicians, healthcare policy makers, media professionals, and many others who seek the best available data on HF.

### **Systematic Review Methodology**

The online MEDLINE PubMed database (National Center for Biotechnology Information, US National Library of Medicine, Bethesda,MD) and other electronic bibliographic databases (eg, ClinicalTrials.gov, PubMed, Cochrane, Elsevier/ScienceDirect, SciELO, LILACS) were searched for data literature from LA in September-October 2012 . The search strategy used the MeSH terms “heart failure”, “chronic heart failure”, “decompensated heart failure”, “acute heart failure”, “Chagas ´ disease”, “chagasic heart failure”, “diastolic heart failure”, “systolic heart failure”. All titles and abstracts of the articles were evaluated. After exclusion based on the title and abstract, full articles were evaluated, and articles meeting the inclusion criteria were identified. Relevant articles with information about epidemiology were examined and thus reviewed. Also, data from WHO were obtained.

### **Risk Factors for HF in LA**

Socioeconomic deprivation is a powerful independent predictor of HF development and adverse outcomes.(1) The reduced gross income per capita of LA countries (US\$ 8,555) in comparison with Canada (US\$ 38370) and USA (US\$ 47310) is an evidence for lower economic status in LA and HF risk.(2) The lower total expenditure on health per capita, and lower total expenditure on health as % of gross national income per capita indicate limited access to primary or secondary care of diseases leading to HF, or therapies that have been shown to be effective in HF. In reference to access to health care, 2009 USA data from WHO shows expenditure percentage on health care of the gross domestic product and per capita expenditure 17,9% and US\$ 8,364 respectively, while in LA, Brazil, Argentina, Chile and Mexico the values were 7.2 and US\$ 632; 9% and \$ 943; 9.5% and \$1,387; 8.2% and \$ 1.172; 6.5% and \$ 846 respectively. (2)

Variability in high prevalence of HF risk factors can be observed among LA countries in WHO data (Figures 1, 2, 3, 4, 5). The WHO and CARMELA study data suggest that some countries in LA may have HF risk factors comparable to developed countries.(3) The CARMELA study the prevalence of systemic hypertension (SH) was 18% (9-29%), hypercholesterolemia 14% (6-20%), diabetes 7% (4-9%), metabolic syndrome 20% (14-27%), obesity 23% (18-27%), and smoking 30% (22-45%). Also, data showing that 40-49% of populations in some LA countries are Afro-Americans or mulatto is evidence for higher risk HF in LA. (4) An increment in the elderly population is expected in Brazil and LA in the next decades with implication for higher HF burden. (5) The influence of age and gender on HF differs among different countries (Table 1). In Argentina a review of five registries involving 2974 patients between 1992-2004 showed that mean age of HF subjects was 65-70 years old with 40% female, (6) although outpatients studies in Argentina showed a large male predominance (82-79%) (Table1). (7) In Brazil HF patients seem to be younger (53-73 years old) and at least one study showed female

predominance (58%). (8), (9) (10) In Chile, mean age in an in-hospital cohort was 69 years old, with a slight male predominance (59%). (11)

In summary: data from the WHO and the CARMELA study indicate that LA is currently experiencing a large-scale epidemic of HF risk factors.(12) This could be attributable to epidemiologic transition with changes in lifestyle, increased life-expectancy, urbanization, physical inactivity, and high caloric and high-fat diets. (13) An increment of HF risk factors in LA countries could cause deep concern. It might not be closely followed by more access to preventive and treatment strategy for HF based on LA limited expenditure on health. The threat to LA countries is the paradox of having HF risk factors similar to developed countries, but without the HF preventive and treatment policies of developed countries.

### **Decompensated HF**

In 2007 data from the Brazilian Ministry of Health showed that 39.4% of hospital admissions were related to decompensated HF (DHF). This proportion was 70% in the over-60-year age group. (14) DHF was the single most frequent cause of hospitalization in the elderly population in Brazil. (15) Hospital discharges with a final diagnosis of HF increased 164% from 1979 (total 377,000) to 2000 (999,000). The Table 1 and 2 show the etiology, age, type of HF (systolic or HFPEF), prognosis, and days of hospitalization in DHF in LA. (16), (17), (18), (19), (20), (21), (22), (23), (24)

In comparison with other countries in the ADHERE-I study LA countries had a longer average length of stay when compared with Asian-Pacific countries and USA 6.0 days (4.0, 10.0)] vs. 4.0 days (3.0 - 7.0).(25) However, in-hospital mortality rates (unadjusted) for patients hospitalized with HF and PEF showed wide variation by the country of enrollment. USA had the third-lowest observed inpatient mortality rate (2.7%); Brazil had the highest (8.5%), México had 2.9 % and

Hong Kong had the lowest (0.5%). Patients in the US cohort presented more comorbidities (like prior MI, renal insufficiency) and peripheral edema compared with patients outside USA. The I Latin America Guidelines for the Assessment and Management of Decompensated HF reported in Brazil a hospital stay of 5.8 days and in-hospital mortality of 6.58-6.95%.<sup>(15)</sup> Also, in a study from Brazil patients admitted in public hospitals were one decade younger in comparison with private hospitals. <sup>(26)</sup> In this study HF patients hospitalized in public hospitals presented higher percentage of afro-Brazilian race (65% versus 20% in private hospitals), illiterate individuals (56% versus 11% in private hospitals), and medication suspension before the hospital admission (51% versus 17% in private hospitals). The hospitalization length and the mortality rate adjusted for age were higher in patients in the public health system. These findings reinforce the concept of lack of access to preventive management of HF risk factors and treatment in socioeconomically deprived population.

In summary: DHF is an important cause of mortality and hospitalization in LA mainly in elderly population. Days of hospitalization seem to be higher in LA and the mortality is heterogeneous around the countries. Hospitalized patients in public hospitals may be younger and with less comorbidities.

### **Systolic HF in LA**

The table 2 shows the prevalence and prognosis of systolic HF in hospitalized DHF and out-patients. In the Chilean National Registry of Heart Failure patients with impaired systolic function were more often male (73.7 vs. 36.3%) and more commonly had a history of CAD (29.5 vs. 17.1%) in comparison with subjects with HFPEF.<sup>(27)</sup> In respect to HF in children, few publications have reported treatment effects in idiopathic dilated cardiomyopathy, but there are not epidemiological studies. <sup>(28)</sup>

HF due to long-standing SH was albeit rare in Brazil (7%),<sup>(8)</sup> which contrasted with the high prevalence of hypertensive HF reported in Antigua (41%) and Chile (35.2%) which showed a high prevalence of systolic HF. <sup>(11), (29)</sup> In the Chilean HF registry ICARO the etiology showed an interesting pattern associated to socioeconomic status. For subjects in the low-income tertile, SH etiology was predominant (58.2%); conversely, in the high-income tertile, ischemic etiology was far more common (34.5%).<sup>(30)</sup> In Argentina, ischemic etiology seems to be more common than SH etiology, ranging from 27.4% to 38.4% vs. 18.2-23.7% in HF patients with predominance of systolic HF. <sup>(31)</sup> This also seems to be the case in Mexico and Colombia (27.5%).<sup>(32),(33)</sup> Also, association of co-morbidities with HF has been reported in LA with relevant published data concerning diabetes mellitus, dyslipidemia, hypothyroidism, chronic obstructive pulmonary disease, renal dysfunction and anemia.<sup>(34), (35)</sup>

Despite the advances in HF treatment, compliance with international and national guidelines remains low in LA. <sup>(36)</sup> Otherwise, there is no substantial financial support for development of trials specific for LA population, as observed for the planned IRON-HF trial. <sup>(37)</sup> In the Chilean HF registry ICARO, beta-blocker use at admission was very low (15%) and did not improve substantially at discharge (21%). Conversely, ACEI/ARA use was acceptable both at admission (44.5%) and at discharge (67.9%), although below recommendations. <sup>(11)</sup> Medical treatment at the time of admission to the emergency room due to DHF showed a wide variation according to socioeconomic status. High-income subjects were more often adequately treated, and a 44% received a beta-blocker. In contrast, low-income subjects were usually undertreated and merely 23.6% received a beta-blocker in their prescription.<sup>(32)</sup> These results contrast with the high rates of compliance with the established guidelines seen in clinical trials from Argentina and Brazil. <sup>(4), (38),(39)</sup> Success of HF education programs, which is dependent upon the socioeconomic

status, was reported in randomized prospective trials in Brazil and Argentina. (40) The REMADHE Trial developed in Brazil was designed to include outpatients for a long-term follow-up with repetitive education at 6-month intervals. The intervention included the education of patients and caregivers; patients had their medical treatment optimized based on current guidelines, and received remote monitoring. The multidisciplinary team of care providers included nurses, cardiologists, pharmacists, social workers, dieticians, dentists, and psychologists. Communication with patients and caregivers was made during individual or group face-to-face interviews, as well as by telephone. The interval between interviews was reduced in the presence of any change in clinical status that required evaluation and/or treatment modifications. A daytime telephone number was provided to patients for emergencies or questions about HF management. (40)

For severely ill patients, heart transplantation availability differs widely among countries. Brazil has one of the largest transplantation programs in the world, second only to the USA. Patients submitted to heart transplantation in a Brazilian center were young (mean 36 years old), and a large proportion had dilated cardiomyopathy (53.4%). (41) In a tertiary center in Argentina, the mean age was 46 years old and the most common etiology for HF was ischemic (37%). (42) Those findings are closely similar to those published by a Chilean tertiary center, in which the mean age of the receptor was 43 years old and the main etiology for HF was ischemic (40%), closely followed by dilated cardiomyopathy (36%). Survival was 87.2% at 1 year and 74.7% at 7 years. (43),(44) Many surgical procedure have been tested in LA for systolic HF treatment, but neither of them are used in current clinical practice. (45),(46) Also, stem cell-based treatment was investigated in HF. (47)

In summary: systolic heart is a common syndrome in LA and the major etiology is heterogeneous according each country under influence of socioeconomic status. SH and CAD are the main etiologies. In general compliance with guidelines is low in clinical practice, except in some countries and selected centers. Heart transplantation is developed in select areas.

### **HF due to Neglected Diseases in LA**

Chagas' heart disease and rheumatic heart disease continue to be a burden in LA, affecting large sectors of the population (Table 1). Multiple factors explain the persistence of these neglected etiologies such as the lower total expenditure on health, the lower economic income of the population, and limited funding assigned to prevention and treatment of these neglected diseases in LA.

C<sub>1</sub>D was responsible for 7.8 % of HF deaths in a report from Brazil. (14) C<sub>1</sub>D etiology was reported in a range from 8.1% to 21% of HF out-patients, and in 0.6-21% of hospitalized patients with DHF (Table 1). It is estimated that 21,000 deaths related to C<sub>1</sub>D occur every year in the Southern cone in LA. (48) The patients with chagasic HF are younger in comparison with other etiologies. C<sub>1</sub>D is endemic in 21 countries in LA. In the early 1990s, an estimated 16 to 18 million individuals were reported infected; (49) although this figure has remarkably dropped to approximately 11 million, showing an important fall in prevalence. (50) *Trypanosoma cruzi*, the agent responsible for the infection is most frequently acquired through vectorial transmission from triatomine bugs; however, the *Trypanosoma cruzi* infection can also arise through blood transfusions, congenital infection, needle-stick injuries, oral transmission and organ transplantation. (51)

Longitudinal studies show that from 25% to 30% of infected individuals develop chronic C<sub>1</sub>D including symptoms related to heart damage. (52) Three phases are described in the course of the

disease. In the acute phase which lasts between 15 and 30 days, the feature can be intense parasitemia, which in turn triggers both B and T lymphocyte-mediated immune responses. In this phase the patient can manifested clinical status from asymptomatic to severe systemic infection with myocarditis. The subacute or indeterminate phase, lasting between 5 and 20 years, is characterized by low blood parasite concentrations; myocardial or nerve lesions generating minimum or no symptoms and can only be detected using ancillary diagnostic tests.(53) Seventy to 80% of positive serology patients remain in the indeterminate phase; the remaining 20–30% enters the chronic phase, exhibiting mainly cardiac involvement,(54) which may cause death due to ventricular arrhythmias, conduction disorders, embolic events and severe HF. The detection of *Trypanosoma cruzi* antigens in chronic chagasic cardiomyopathy and the reported reactivation of the *Trypanosoma cruzi* infection associated with myocarditis after heart transplantation suggest a direct effect of the agent apart from immunological mechanisms.(55) However, the value of specific treatment for *Trypanosoma cruzi* infection in chronic chagasic cardiomyopathy needs to be proven in randomized prospective trials in LA, taking into consideration the ineffective preventive treatment of *Trypanosoma cruzi* infection reactivation in heart transplantation.(56) Furthermore, co-infection with mycoplasma, chlamydia, virus, and archaeal organisms has been reported emphasizing the complexity of chagasic cardiomyopathy.(57),(58) Chagasic HF is associated with systemic inflammatory and neurohormonal activation. (59) However, a recent LA Guidelines proposed a new classification of the chronic C'D in four stages (A, B1/B2, C, and D) such as in HF according to the cardiac damage with the objective for better management of epidemiological, prevention, and treatment of C'D. (60)

Despite the worse outcome of patients with C'D in comparison with other etiologies having been firstly published in 1994,(61) there are not established specific trials for pharmacological

chagasic HF treatment. When only patients under  $\beta$ -blockers were considered, the survival of patients with C'D was similar to that of other etiologies suggesting that  $\beta$ -blockers may have a beneficial effect on survival in patients with HF and Chagas heart disease.(62) Consequently, research on surgical procedures and stem cell treatment has been promoted for chagasic HF in LA. (63), (64) However, sudden death, persistent myocarditis, right ventricular dysfunction and myocardial fibrosis are justifications for the lack of successful surgical procedures for chagasic HF with the exception of heart transplantation.(65),(66),(67) The common right ventricular dysfunction observed in C'D could be a limitation for left ventricular assist device. But, on other hand C'D HF may have low pulmonary hypertension. (68) Successful ventricular assist device procedure as a bridge for heart transplantation was reported. (69) Heart transplantation is now accepted as the surgical treatment of choice for chagasic refractory HF despite the risk of *Trypanosoma cruzi* infection reactivation. (62),(70) Successful long-term survival after heart transplantation for Chagas' heart disease was reported.(71), (72) *Trypanosoma cruzi* infection has been reported to occur in 26.5% to 42.9% of cases.(73),(74) A multivariate analysis showed rejection episodes, neoplasms, and mycophenolate mofetil as independent determinants for reactivation.(75),(76),(77) Prophylactic treatment early after transplantation was of no benefit in a small cohort of patients. (78)

Rheumatic cardiopathy is still a significant cause of morbimortality in LA, (Table 1). Rheumatic valvulopathy is an important cause of cardiac surgery both in children and adults in LA. (79) Reports from the Ministry of Health in Brazil show that in this country about 22.000 patients develop rheumatic cardiopathy every year, and that the prevalence of rheumatic fever is 3-5% in children and adolescents.(80) Also, rheumatic fever prevalence ranging from 7.9/1000 inhabitants was reported in La Paz (Bolivia) to 2.9/1000 inhabitants in Cuba.(81) In 2003,

101,822 cases of rheumatic fever were reported in children in LA. These data show that rheumatic fever and its associated complications characterized by valve disease and HF still pose a challenge to public health in LA.

In summary: C'D and rheumatic cardiopathy are important neglected causes of HF in LA. There are not specific trials for treatment of C'D and it is treated similarly to other etiologies despite of different physiopathology.

### **HF with Preserved Ejection Fraction**

In reports from LA the prevalence of HFPEF was from 0-37% in HF outpatients whereas in hospitalized patients it was from 20% to 45.7% (Table 2). SH prevalence observed in LA subjects in the I-PREFER study was greater than that observed in patients with HFPEF in developed countries. Also, the blood pressure control in patients with SH and HFPEF differed according the region. The blood pressure was controlled in only 39% of patients in LA. The high rate of SH, together with inadequate blood pressure control in LA patients could be one factor leading to HFPEF in LA. The Figure 6 shows medical treatment of HFPEF in LA.

In summary: HFPEF is common in LA, however, the prevalence may be lower in comparison with systolic HF. The younger age observed in HF trials in LA would be a factor influencing epidemiology of HFPEF in LA.

### **Limitations**

The most important limitation of this systematic review is that data in general were obtained from registries, government based database, selected populations or Institutions, and trials with inherent bias. However, the data were the best available and can be the basis for planning future well-design studies.

### **Clinical Implication and Conclusions**

Despite shortcomings of available published data, it is clear that there is an excess burden of systolic, HFPEF, and DHF HF in LA leading to high rates of hospitalization and high mortality. LA is under the awful paradox of HF risk factors and HF epidemiology of developed countries added by high SH prevalence, C'D and rheumatic fever together with lower total expenditure on health per capita. Lower total expenditure on health per capita in LA indicates limited access to primary or secondary care of diseases leading to HF. As a consequence of multiple factors in LA, the HF population seems to be younger than developed countries. New strategies for prevention and treatment of HF are essential in LA. Specific trials for LA populations are necessary. There is a need for large-scale epidemiological studies of the incidence, prevalence, determinants, and outcome of HF in LA to guide strategies for the treatment and prevention of HF on LA. Implementation of public policies proposed on 2012 jointly by the Brazilian Society of Cardiology, American Heart Association, European Society of Cardiology, World Heart Federation, and Interamerican Society of Cardiology (Letter of the Rio de Janeiro, III - Brazil Prevent & I Latin America Prevent, 2012) could reduce HF burden in Latin America.(82)

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## Figure Legend

**Figure 1. Raised Blood Glucose Prevalence in Aged >25 Years Population In Both Sexes.** Prevalence According to the World Health Organization Data (2008)

**Figure 2. Raised Systemic Blood Pressure Prevalence in Aged >25 Years Population In Both Sexes.** Prevalence According to the World Health Organization Data (2008)

**Figure 3. Obesity Prevalence in Aged >20 Years Population in Both Sexes.** Prevalence According to the World Health Organization Data (2008)

**Figure 4. Tobacco Use Prevalence in Aged >15 Years Population in Both Sexes.** Prevalence According to the World Health Organization Data (2009)

**Figure 5. Life Expectancy at Birth in Both Sexes.** Prevalence According to the World Health Organization Data

**Figure 6. Medication Use among Patients with HF with Preserved Left Ventricular Ejection Fraction in Certain Latin American Countries.** Modified Data from I PREFER Study.

Table1. Etiology of HF in Latin America According Studies in Selected Populations

Author	Country	Year	n	Mean Age	Etiology (in %)									
					IDC	C'D	Isch	SH	Valv	Alco	Perip	Myo	EMF	Toxi
Out-Pat														
Freitas <sup>16</sup>	Brazil	2005	1220	45	37	20	17	14	5	4	2	1	<1%	<1%
Bocchi <sup>4</sup>	Brazil	2008	350	50-52	10-17	21-16	22-28	22-18	3	8-4	NI	---	---	NI
Mendez <sup>32</sup>	Mexico	2007	72	61	44	---	47	---	---	---	---	---	---	---
Silva <sup>40</sup>	Brazil	2007	96	52	28.2	8.6	28.2	20.6	6.5	2.1	3.2	---	---	---
Gesica <sup>38</sup>	Argentina	2005	1518	65	NI	Ni	44.4	NI	---	NI	NI	---	---	---
Doval <sup>7</sup>	Argentine	1994	516	60-59	19.5-23	10.5-8.1	38.3-39.6	NI	---	NI	NI	---	---	---
DHF														
Mangini <sup>17</sup>	Brazil	2008	212	60	8	15	30	21	15	NI	NI	NI	NI	NI
Latado <sup>18</sup>	Brazil	2006	299	69	3	9.7	49.2	25.8	11.7	---	---	0.7	---	---
Tavares <sup>26</sup>	Brazil	2004	203	61-72	NI	NI	62-68	NI	NI	NI	NI	NI	NI	Ni
Fairman <sup>19</sup>	Argentina	2009	736	74	NI	4	21	76	20	NI	NI	NI	NI	NI
Perna <sup>6</sup>	Argentina	1992-2004	2974	65-70	1.3-13.8	1.3-8.4	27.-38	18.2-32.3	16-22	1-5.4	---	---	---	---
Castro <sup>11</sup>	Chile	2004	372	69	7.4	---	31.6	35	14.8	2.2	NI	NI	NI	NI
Bocchi <sup>20</sup>	Brazil	2008	182	55	NI	21	34	NI	NI	NI	NI	NI	NI	NI
Barretto <sup>21</sup>	Brazil	1998	903	53	25.8 <sup>d</sup>	6.2	32.6	7	22	NI	NI	NI	NI	NI
Rohde <sup>9</sup>	Brazil	2005	143	73	NI	0.6	39	25	10	NI	NI	NI	NI	NI
McSwain <sup>29</sup>	Antigua-Barbuda	1999	293	69	5	---	33	41	12	2	NI	NI	NI	NI
Thierer <sup>22</sup>	Argentine	2002	400	68	5	4.3	28	21.8	17	NI	NI	NI	NI	NI
Rizzo <sup>23</sup>	Argentine	2004	615	70	3.7	8.4	27.4	18.2	16.4	NI	NI	NI	NI	NI
Thierer <sup>24</sup>	Argentine	2006	2201	68	9.3	6	40.5	23.7	12	---	---	---	---	---

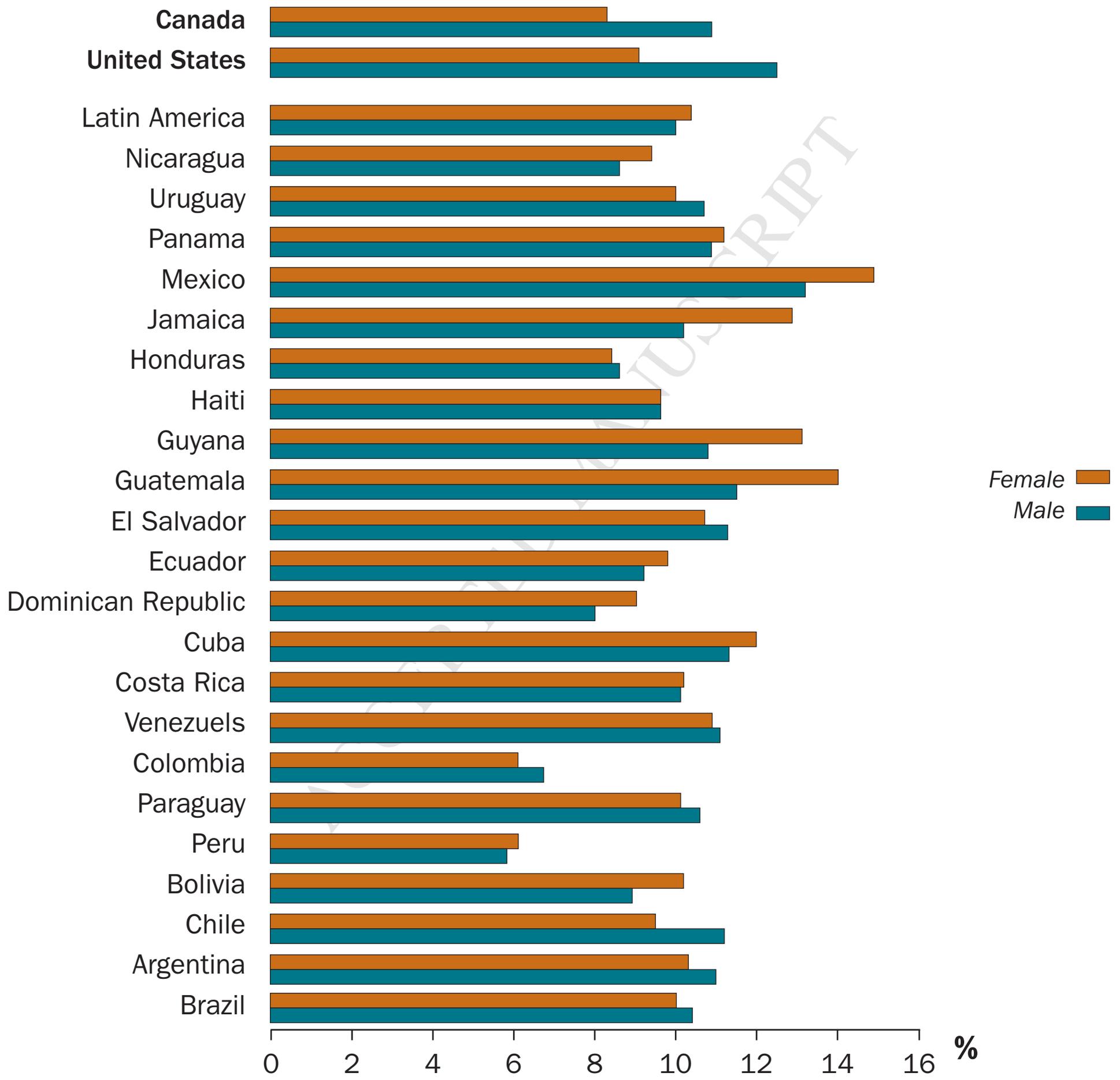
N means number of patients; out-pt, out-patient; Year, year of publication; IDC, idiopathic dilated cardiomyopathy; C'D, Chagas heart disease; SH, systemic arterial hypertension; valv, valvular etiology; alco, alcohol etiology; erip, peripartum cardiomyopathy; myo, myocarditis; EMF, endomyocardial fibrosis; Toxi, toxicity by drugs (example: quimiotherapy for cancer); age in years; DHF, decompensate HF in hospitalized patients; NI, not informed;

Table 2. Prevalence of Systolic Heart Failure and Heart Failure with Preserved Ejection Fraction and Mortality in Latin America

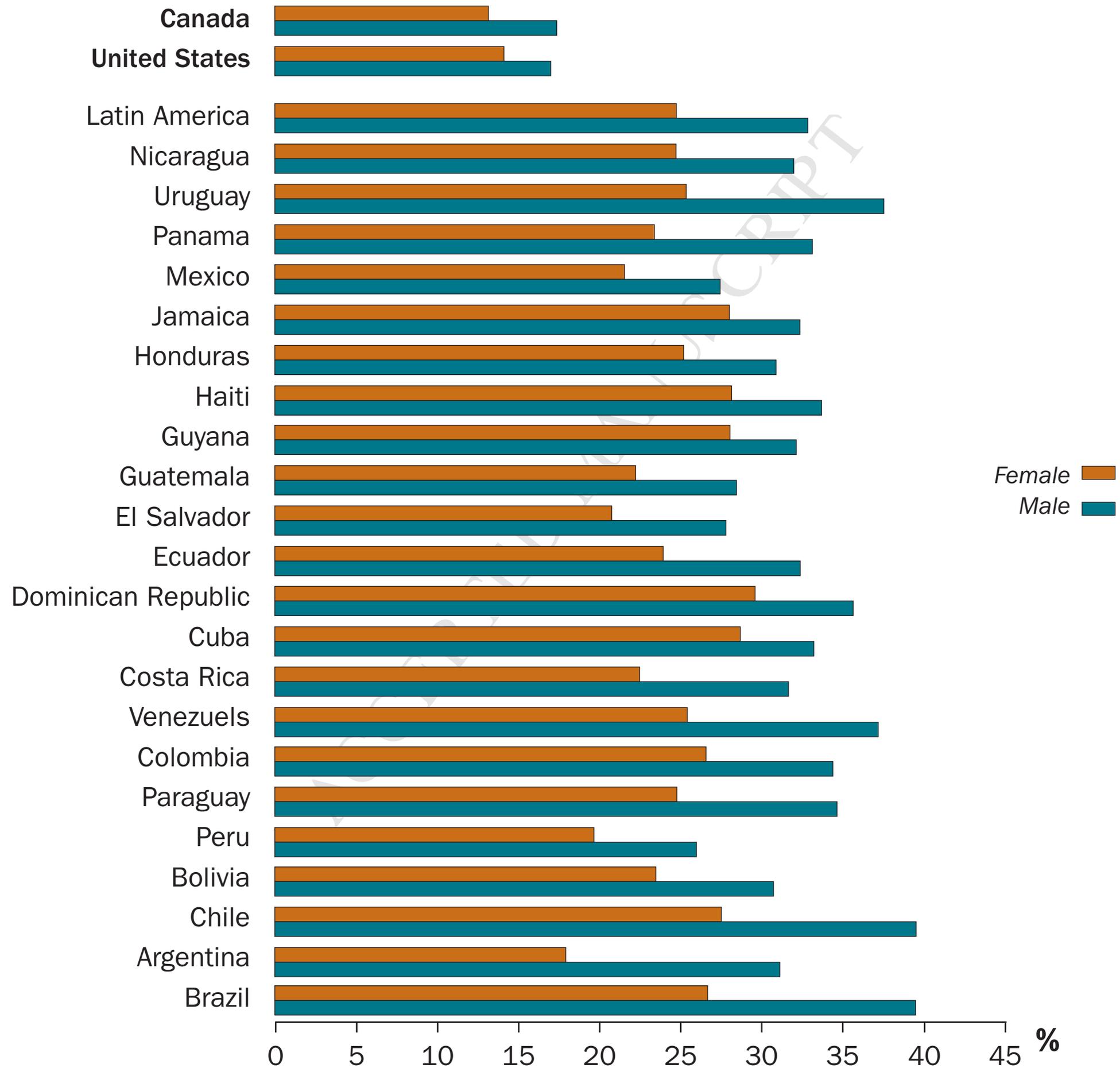
Author	Year	n	HF Type (in %)			Mortality (in %)		H. Days	Hospitalization (%)
			Systolic	HFPEF	In-Hospital	1 year	5 year		
Out-Pat									
Freitas <sup>16</sup>	2005	1220	100	-----			34(26m)		
Bocchi <sup>4</sup>	2008	350	80-81.6	20-19.4	-----		17.5	48-60	-----
Mendez <sup>32</sup>	2007	72	63	37	-----		12 for SHF (6m)	-----	-----
Silva <sup>40</sup>	2007	96	100	-----	-----		-----		
Gesica <sup>38</sup>	2005	1518	79.4	20.6	-----		15.3-16.1 (16m)	-----	34.3-39.1 (16m)
Doval <sup>7</sup>	1994	516	100	-----	-----		24.5-32.5	-----	-----
DHF									
ADHERE-I <sup>25</sup>	2011	151	-----	45.7#	8.5	-----	-----	10	
		33			2.9			7	
Bocchi <sup>26</sup>	2005	-----	-----	-----	6.58-6.95	-----	-----	5.8	
Mangini <sup>17</sup>	2008	212	55	45	10	-----	-----	8.5	
Latado <sup>18</sup>	2006	299	65.8	34.2	17.4	-----	-----	-----	
Tavares <sup>26</sup>	2004	203	NI	NI	9-13	-----	-----	12.6	
Fairman <sup>19</sup>	2009	736	60	40	8	-----	-----	7	24.5 (3m)
Perna <sup>6</sup>	ENUC-1993	521		31.8	36	12.1	4.6	-----	-----
	CONREC-1999	751		25.3	20	10.5	8.9		
	IC-SAC-2002	400		27		4.7		9.3	
	IC-SAC-2004	615						7	
	CONREC-2004	687							
Castro <sup>11</sup>	2004	372	69 (LVEF<40%)	NI	4.5	-----	-----	11	
Bocchi <sup>20</sup>	2008	182	100	-----	14.8	-----	-----	8	36(5m)
Barretto <sup>21</sup>	1998	903	≥ 58.5		15.7-14.6	-----	-----	-----	-----
Rohde <sup>9</sup>	2005	143	64	36	13	-----	-----	11	36(3m)
McSwain <sup>29</sup>	1999	293	NI	NI	17.4	-----	-----	NI	
Thiere <sup>22</sup>	2002	400	74	25	10.5	-----	-----	7	-----
Rizzo <sup>23</sup>	2004	615	71.7	28.3	8.94	-----	-----	7	-----
Thiere <sup>24</sup>	2006	2201	72.6	27.4	NI	-----	-----	NI	-----

# prevalence of HFPEF in the ADHERE-I; ≥, at least; m, months; out-pat, out-patients; n, number; HF, heart failure; H. days, days of hospitalization; HFPEF, Heart failure with preserved ejection fraction; NI, not informed.

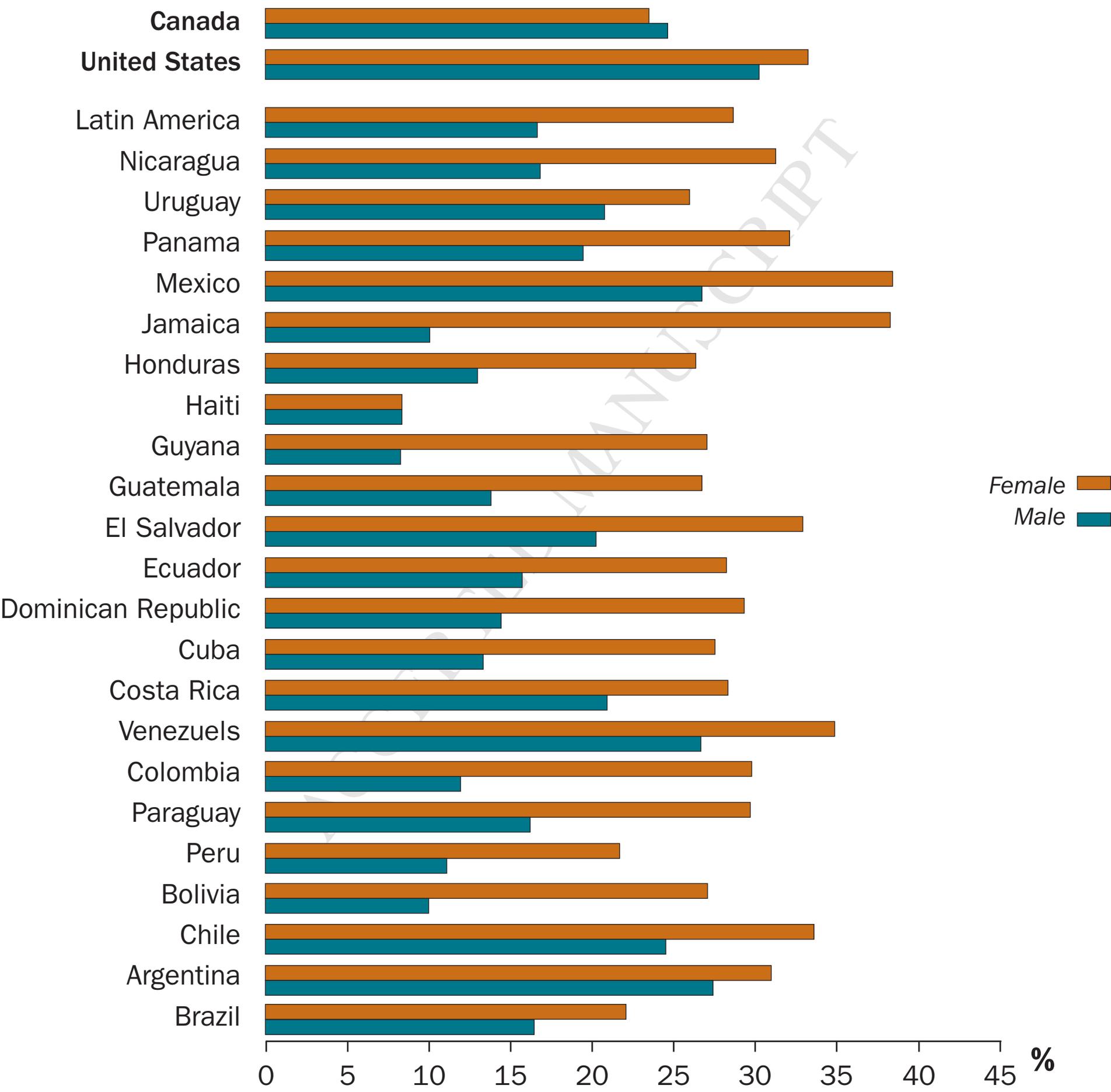
# Raised Blood Glucose Prevalence in >25 Year-Old Population in Both Sexes According to the World Health Organization Data (2008)



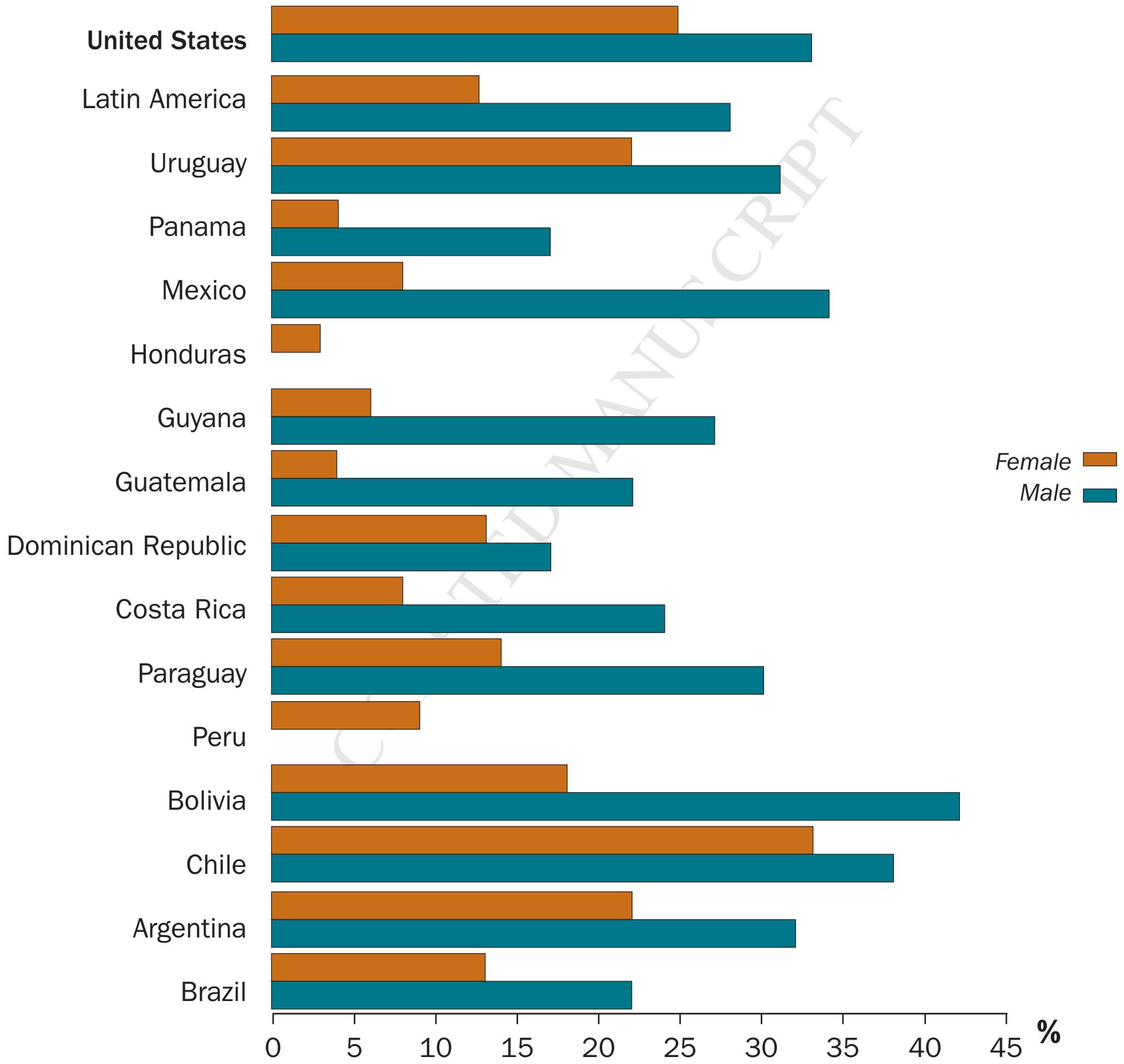
# Raised Systemic Blood Pressure Prevalence in >25 Year-Old Population in Both Sexes According to the World Health Organization Data (2008)



# Obesity Prevalence in >20 Year-Old Population in Both Sexes According to the World Health Organization Data (2008)

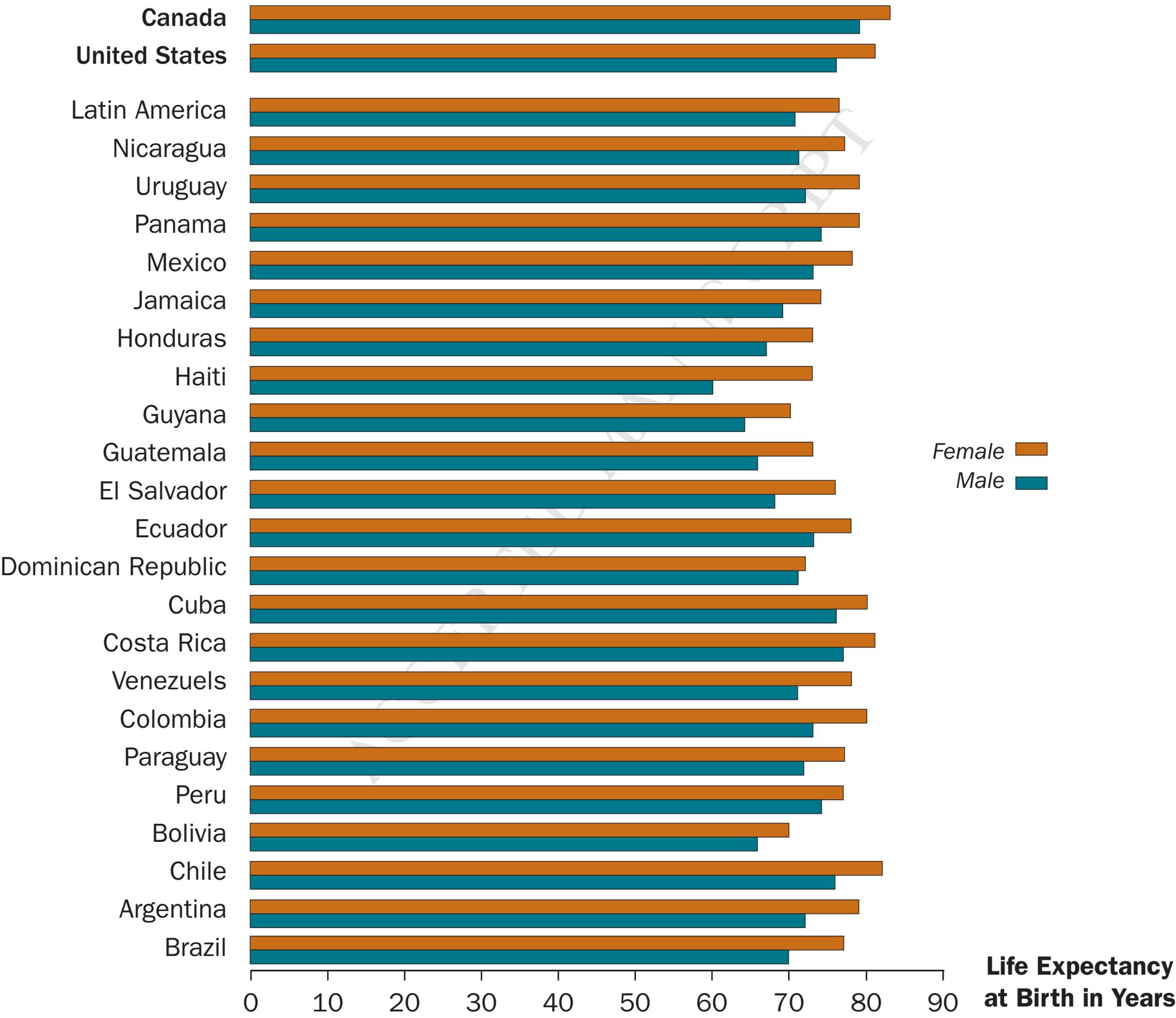


# Tobacco Use Prevalence in >15 Year-Old Population in Both Sexes According to the World Health Organization Data (2009)



# Life Expectancy at Birth in Both Sexes

## According to the World Health Organization Data



# Medication Use Among Patients with HF with Preserved Left Ventricular Ejection Fraction in Certain Latin American Countries

*Modified Data from I PREFER Study*

