Incidence and prevalence of diabetes mellitus in the Americas

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ABSTRACT

Objective. *To present the incidence and prevalence of diabetes mellitus in the Americas as found through a thorough review of published information on the subject.*

Methods. *Data were obtained through a comprehensive review using the MEDLINE and BIREME bibliographical databases. In addition, government publications, conference reports, and meeting documents were identified by contacting government and nongovernmental organizations and other institutions. Incidence and prevalence rates were adjusted by age and sex, when possible, by the direct method using the world Segi population as the standard. The 95% confidence intervals were calculated using the Poisson distribution or the normal distribution.*

Results. *Diabetes mellitus represents a major public health problem in the Americas, and there is evidence that its prevalence is increasing in some countries.*

Conclusions. *Given that most Latin American and Caribbean nations are experiencing a demographic transition, it is expected that the prevalence of diabetes will continue to increase rapidly in the near future. Despite the economic constraints faced by the countries of the Americas, there is a clear need for more efforts in the area of diabetes prevention and control.*

Key words Diabetes, prevalence, Region of the Americas.

Diabetes mellitus is a chronic metabolic disease characterized by hyperglycemia and by disturbances of carbohydrate, fat, and protein metabolism. It is associated with an absolute or relative deficiency in the secretion and/or action of the hormone insulin. In the Americas, the number of people with diabetes mellitus was estimated at 35 million in 2000 and is expected to increase to 64 million by 2025. Whereas currently 52% of these people from the Americas live in Latin America and the Caribbean, by 2025 the percentage will have reached 62%, representing 40 million persons (1). This increase results from multiple factors involved in lifestyle changes related to modern life such as the decrease in physical activities and the predominance of hypercaloric diets and the resulting obesity. Also playing a major part is the aging process of the population in developing countries. Given these various factors, an increase in diabetes mellitus caseload will be more evident in developing countries.

Diabetes increases the risk of premature death mainly due to an increased risk of cardiovascular events. In addition, people suffering from diabetes have a greater risk of developing visual problems and renal disease as well as undergoing lower-extremity amputations.

Diagnostic criteria and classification

In 1985 the World Health Organization (WHO) published updated criteria for the diagnosis of diabetes mellitus (2). More recently, in 1997, the American Diabetes Association (ADA) published new diagnostic criteria lowering the fasting plasma glucose concentration for the diagnosis of the disease from ≥ 140 mg/dL to ≥ 126 mg/dL. WHO published similar criteria for the diagnosis of diabetes in 1999 after a WHO expert committee reviewed the issue and reached the same conclusions as the ADA (3, 4). A new cutoff point for plasma glucose concentration 2 hours after an oral dose of 75 mg of glucose was established because of the proven increase in the prevalence of diabetes-related microvascular com-

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plications (e.g., retinopathy and nephropathy) among people with values of ≥ 200 mg/dL. The previous fasting glucose cutoff point of 140 mg/dL identified subjects with more severe hyperglycemia than the present 2-hour cutoff point of 200 mg/dL. Thus, by lowering the fasting cutoff point to 126 mg/dL, it becomes possible to identify subjects whose hyperglycemia is roughly equivalent to that of subjects who test positive on the 2-hour glucose tolerance test.

In addition, in 2000 the ADA recommended using a fasting plasma glucose of ≥ 126 mg/dL as the sole criterion for diagnosing diabetes in epidemiologic studies (5). However, WHO still recommends the 2-hour oral glucose tolerance test (OGTT) as the single best diagnostic criterion for such studies, but if this test cannot be performed because of logistic or economic reasons, the fasting plasma glucose alone, as established by the ADA, may be used instead as the basis for the diagnosis (4). According to the updated WHO classification of diabetes, there are two major forms of the disease: type 1 and type 2 (formerly, respectively, insulin-dependent diabetes mellitus (IDDM) and non-insulin dependent diabetes mellitus (NIDDM)). Type 1 diabetes appears mainly in children and young adults, is characterized by an acute onset, and requires insulin treatment. Type 2 diabetes appears insidiously, mainly in adults, and can be treated in a variety of ways, including with a dietary regimen, oral hypoglycemic agents, insulin, or a combination of these. Type 2 diabetes is the most common form of the disease, accounting for about 85% to 90% of all cases. It has been linked to potentially modifiable risk factors such as obesity, lack of exercise, and a hypercaloric diet. As many studies have demonstrated, in most populations there are many people with undiagnosed type 2 diabetes (6–8). Another important subcategory under type 2 of the disease is gestational diabetes, which is defined as glucose intolerance (of any degree) diagnosed for the first time during pregnancy (9). It is estimated that about 4% of pregnant women develop this form of diabetes.

The objective of this paper is to present the incidence and prevalence of diabetes mellitus in the Americas as found through a comprehensive review of published information on the subject.

MATERIALS AND METHODS

We conducted a comprehensive literature search to identify results from apparently unbiased population-based diabetes surveys and registries. The search was conducted using the MEDLINE and BIREME bibliographic databases. The terms used in the search were "diabetes incidence," "diabetes prevalence," "diabetes survey," and "diabetes registry." Literature that was not indexed, such as gray papers, government publications, and conference proceedings, was obtained by contacting government offices, nongovernmental organizations, scientific and diabetes associations, and the country offices of the Pan American Health Organization (PAHO). Incidence and prevalence rates were adjusted by age and sex, when possible, by the direct method, using the world Segi population as the standard (10). The 95% confidence intervals (95% CIs) were calculated using the Poisson distribution or the normal distribution, as described by King et al. (11). Published articles including diabetes estimates and projections were also reviewed.

RESULTS

Incidence and prevalence of childhood diabetes

The worldwide incidence of type 1 diabetes has been evaluated during the last 20 years through the DiaMond Project (12–14), which oversees the maintenance of registries of children with diabetes around the world. About 24 of these registries operate in the Region of the Americas. There have been other publications in the Region on the incidence of type 1 diabetes, mainly in children under 15 years of age. Since most registries rely on more than one source of information, we assessed their completeness. The subsections below summarize the data for the specific subregions and countries of the Americas, with Table 1 providing additional details.

North America. Amos et al. (15) estimated the prevalence of type 1 diabetes in North America in 1997 among children under 15 years of age at 53.4 per 10 000 population. For that year, prevalence rates ranged from 8.3 per 10 000 population in the United States to 0.3 per 10 000 in Mexico. Prince Edward Island, Canada, has reported the highest incidence of type 1 diabetes in children in the Americas (12, 13). The Montreal, Canada, registry reported an incidence rate of 10.1 per 100 000 for the period 1975–1981 (16). Three registries from the United States were included in the DiaMond report of 2000, all of them covering the period of 1990–1994: Allegheny County, Pennsylvania (incidence of 17.8 per 100 000 population); Jefferson, Alabama (incidence of 15.0 per 100 000), and Chicago, Illinois (incidence of 11.7 per 100 000 population). A registry in Rochester, Minnesota, reported a childhood incidence rate of 20.8 per 100 000 in 1980 (14).

Caribbean. In the Caribbean, the estimated prevalence rate of type 1 diabetes in children under 15 years of age ranged from 6.4 per 10 000 in Puerto Rico to 0.3 per 10 000 in Haiti in 1997 (Table 1). A high incidence rate has been consistently reported by Puerto Rico (19). The lowest childhood incidence in the Caribbean was reported for Barbados.

Antigua, Barbados, Dominica, Saint. Croix, Saint Thomas, and Tortola Island reported on the incidence of type 1 diabetes among those aged 0 to 19 years. The highest incidence rate was reported for Saint Croix, and the lowest was reported for Saint Kitts (20).

Central America. The estimated prevalence of type 1 diabetes among chil-

TABLE 1. Incidence and estimated prevalence of type 1 diabetes mellitus in children in Latin America and the Caribbean

Country	Study, year(s), reference	Age (years)	Adjusted incidence (per 100 000)[a]			Estimated prevalence (per 10 000)
			Gender			
			Male	Female	Both (95% CI)	
North America						
Canada	Montreal, 1971–83 (15)	≤ 14	9.0	9.1	9.0 (7.7–10.6)	6.4
	Prince Edw. Isl., 1990–93 (13)	≤ 14	28.0	20.8	24.5 (16.38–35.15)	
	Alberta, 1990–94 (13)	≤ 14	23.4	24.7	24.0 (20.6–27.8)	
	Manitoba, 1985–93 (17)	≤ 14			20.4 (16.2–24.5)[b]	
	Manitoba, 1991–93 (13)	≤ 14	21.4	20.7	21.1 (17.1–25.9)	
Mexico	Veracruz, 1990–93 (13)	≤ 14			1.5 (0.7–2.9)	0.3
United States	Allegheny, PA, 1990–94 (13)	≤ 14	19.1	16.4	17.8 (15.5–20.3)	8.3
	Jefferson, AL, 1990–94 (13)	≤ 14	14.6	15.4	15.0 (12.2–18.2)	
	Chicago, IL, 1990–94 (13)	≤ 14	10.2	13.3	11.7 (10.5–13.1)	
Caribbean						
Antigua	1989–93 (20)	≤ 19			3.5 (0.9–8.8)	
Barbados	1989–93 (20)	≤ 19			2.6 (1.3–4.6)	
	1990–93 (13)	≤ 14	2.4	1.6	2.0 (0.32–6.4)	
Cuba	1990–94 (13)	≤ 14	2.5	3.4	2.9 (2.6–3.2)	2.5
Dominican Rep.						2.5
Dominica	1989–93 (20)	≤ 19			5.1 (2.2–10.1)	
	1990–93 (13)	≤ 14	6.6	4.9	5.7 (1.5–14.7)	
Haiti		≤ 14				0.3
Jamaica		≤ 14				2.5
Puerto Rico	1985–94 (19)	≤ 14			18.0 (17.6–18.3)[b]	6.4
	1990–94 (13)	≤ 14	16.2	18.7	17.4 (16.3–18.6)	
St. Croix	1989–93 (20)	≤ 19			10.1 (4.4–19.9)	
St. Thomas	1989–93 (20)	≤ 19			6.3 (2.6–15.7)	
Tortola	1989–93 (20)	≤ 19			3.8 (0.1–21.1)	
Trinidad and Tobago		≤ 14				2.8
U.S. Virgin Isls.	1990–94 (13)	≤ 14	14.7	11.5	13.1 (7.6–21.0)	
Central America						
Costa Rica		≤ 14				0.8
El Salvador		≤ 14				0.5
Guatemala		≤ 14				0.4
Honduras		≤ 14				0.4
Nicaragua		≤ 14				0.5
Panama		≤ 14				1.1
South America						
Argentina	Avellaneda, 1990–94 (13)	≤ 14	5.6	7.5	6.5 (4.3–9.5)	4.3
	Córdoba, 1991–92 (13)	≤ 14	6.2	7.9	7.0 (5.2–9.3)	
	Corrientes, 1992–94 (13)	≤ 14	2.9	5.7	4.3 (2.2–7.5	
	Tierra del Fuego, 1993–94 (13)	≤ 14	20.2		8.0 (2.2–17.6)	
Bolivia		≤ 14				0.6
Brazil	Passo Fundo, 1996 (21)	≤ 14			12.0[b]	4.0
	São Paulo, 1990–92 (13)	≤ 14	6.9	9.1	8.0 (5.5–11.1)	
Chile	Santiago, 1990–92 (13)	≤ 14	1.7	1.5	1.6 (1.3–2.0)	1.4
	Santiago, 1990–93 (22)	≤ 14			2.4[b]	
Colombia	1990 (13)	≤ 14	4.7	2.9	3.8 (2.9–4.9)	1.8
Ecuador						1.9
Paraguay	1990–94 (13)	≤ 14	1.0	0.8	0.9 (0.7–1.1)	1.0
Peru	1990–91(13)	≤ 14	0.2	0.6	0.4 (0.2–0.6)	0.4
Uruguay	1992 (31)	≤ 14	8.3	8.3	8.3 (5.4–12.1)	4.9
Venezuela	1992 (13)	≤ 14	0.1	0.2	0.1 (0.09–0.18)	2.4

[a] Using the world population as the standard (10).
[b] Crude rates.

dren under the age of 15 years ranged from 1.1 per 10 000 population in Panama to 0.4 per 10 000 in Guatemala and Honduras in 1997 (Table 1).

South America. In South America in 1997, 31 000 children under 15 years of age were estimated to have type 1 diabetes (15). The greatest prevalence was estimated for Uruguay (4.9 per 10 000), while the lowest was estimated for Peru (0.4 per 10 000) (Table 1). The highest incidence of type 1

TABLE 2. Characteristics of diabetes surveys of adults conducted in the Americas

Country	Population, reference	Year	Sample size	Age (years)	Diagnostic test[a]	Glucose load (g)	Criteria
North America							
Canada	Native, River Desert (25)	1995	131	30–64	OGTT	75	WHO 1985
	Native, Lac Simon (25)	1995	168	30–64	OGTT	75	WHO 1985
Mexico	Mexico City (26)	1992	646	35–64	OGTT	75	WHO 1985
	Mexico City (27)	1994	805	20–90	FPG	—	140 mg/dL
United States	Three ethnic groups (28)	1988–94	2 844	40–74	OGTT	75	WHO 1985
	Pima Indians (30)	1982–90	3 733	25+	OGTT	75	WHO 1985
Caribbean							
Barbados	Bridgetown (31)	1993	464	40–79	FPG	—	140 mg/dL
Cuba	Santiago C (32)	1987	500	15+	OGTT	75	WHO 1985
	Havana (33)	1998	250	25+	OGTT	75	WHO 1985
Guadeloupe	Guadeloupe (34)	1989	1 049	18+	OGTT	75	WHO 1985
Jamaica	Jamaica (6)	1995	2 109	15+	OGTT	75	WHO 1985
	Spanish Town (35)	1999	1 303	25+	OGTT	75	WHO 1985
Trinidad & Tobago	St. James (36)	1985	2 516	35–69	OGTT	75	WHO 1985
South America							
Argentina	La Plata (38)	1987	809	20–74	OGTT	50	WHO 1985
	Avellaneda (39)	1979	596	20–69	OGTT	50	150 mg/dL
Bolivia	Four cities (8)	1998	2 500	25+	OGTT	75	WHO 1985
Brazil	Nine cities (40)	1986–88	21 847	30–69	OGTT	75	WHO 1985
	Rio de Janeiro (41)	1986–88	2 051	30–69	OGTT	75	WHO 1985
	São Paulo, Issei (42)	1996	238	40–79	OGTT	75	WHO 1985
	São Paulo, Nisei (42)	1996	292	40–79	OGTT	75	WHO 1985
Chile	Santiago (45)	1979	1 110	20+	OGTT	50	150 mg/dL
	Valparaíso (44)	1997	3 120	25–64	OGTT	75	WHO 1985
	Mapuche (45)	1983	510	20+	OGTT	75	WHO 1985
	Mapuche (46)	1998	319	20+	OGTT	75	WHO 1985
	Aymara (47)	1998	196	20+	OGTT	75	WHO 1985
Colombia	Urban (7)	1993	670	30+	OGTT	75	WHO 1985
Paraguay	Urban (48)	1992	1 094	20–74	OGTT	75	WHO 1985
Peru	Three zones (49)	1997	302	30+	OGTT	75	WHO 1985
Suriname	Main ethnic groups (50)	1985	1 218	30+	OGTT	50	180 mg/dL
Uruguay	Urban-rural (51)	1966	484	30+	OGTT	[b]	150 mg/dL
Venezuela	Urban (51)	1966	480	30+	OGTT	[b]	150 mg dL
	Urban (52)	1997	669	30+	OGTT	75	135 mg/dL[c]
	Mérida (53)	1980	398	30–69	FPG	—	140 mg/dL

[a] Diagnostic tests: OGTT = oral glucose tolerance test; FPG = fasting plasma glucose.
[b] Glucose load: 1 g/kg of body weight.
[c] Diagnostic criteria: 1 h after glucose load, blood glucose of 180 mg/dL; 1.5 h after glucose load, blood glucose of 160 mg/dL, and 2 h after glucose load, blood glucose of 135 mg/dL.

diabetes among children was also reported in Uruguay (8.3 per 100 000), while the lowest was reported in Venezuela (0.1 per 100 000). Tierra del Fuego, Argentina, reported an incidence rate of 20.2 per 100 000 among boys, but this rate was based on only 4 cases, and no case was reported among girls, for a total incidence of 8.0 per 100 000 for both sexes. In the Americas, only the Colombian registry reported statistically significant differences between boys and girls (4.7 vs. 2.9 per 100 000, respectively).

Diabetes in adult populations

Most countries in Latin America and the Caribbean do not carry out epidemiological surveillance for diabetes in adults. Therefore, information on the prevalence of this type of diabetes in those nations is limited. Some surveys have been conducted but not usually as part of national or regional policies for diabetes surveillance. Accordingly, surveys of diabetes carried out in Latin America and the Caribbean have been sporadic, and they differ in important methodological features such as selection of the study population, age, sampling method, and diagnostic criteria. For this reason, comparison between studies is often problematic. Nevertheless, diabetes surveys provide the only data available on the epidemiology of this disease. The characteristics of the diabetes surveys conducted in the Americas are shown in Table 2. Most of the selected studies used the oral glucose tolerance test (OGTT) as a diagnostic test along with the WHO 1985 diagnostic criteria (2). The largest survey conducted in the Americas, which in-

cluded 21 847 persons, was carried out in Brazil in 1986–1988.

North America. The most recent estimate of the prevalence of diagnosed diabetes among adults in Canada, as revealed by the 1996–1997 National Population Health Survey, was 3.2% (24). In the United States, the National Health and Nutrition Examination Survey (NHANES) periodically conducts a cross-sectional nationally representative survey among participants aged 20 years and over who complete a household interview. As part of this survey, a subsample of 2 844 subjects between the ages of 40 and 74 years underwent an OGTT between 1988 and 1994. Based on WHO diagnostic criteria, the prevalence rate of diabetes (previously and newly diagnosed) increased from 11.4% in 1976–1980 to 14.3% in 1988–1994 (28). Diabetes prevalence rates for Mexican-Americans were twice as high as for non-Hispanic whites. About 20% of non-Hispanic blacks in the United States were affected by diabetes; the prevalence rate in this group was the second highest after that of Mexican-Americans (Table 3). The Pima Indians from the state of Arizona have shown the highest prevalence of diabetes in the Americas and one of the highest in the world. The reported age- and sex-adjusted rate for this group was 21.1% in 1978 (29). After adjusting for age and sex with the world population as the standard, the prevalence of diabetes for Pima Indians 25 years of age or older in 1982–1990 was 51.4% overall for males and females (30).

Caribbean. We found no reports showing survey results for the Dominican Republic, Haiti, Martinique, the Netherlands Antilles, and Puerto Rico. Among the surveys found that used OGTT as the diagnostic test, the highest crude prevalence rate of diabetes was reported by Jamaica in 1995, 17.9%. The lowest crude rate (4.6%) was reported in Santiago, Cuba, but a higher prevalence was reported more recently in Havana (11.8%). All Caribbean countries with surveys found had age- and sex-adjusted prevalence rates for diabetes of over 10%.

In Barbados, a diabetes survey that employed a fasting plasma glucose of > 140 mg/dL as the diagnostic criterion found a crude prevalence rate of 17%; after age and sex adjustment, that rate dropped to 16.4%.

Central America. No publications showing the prevalence of diabetes in Central America and meeting our methodological requirements for inclusion could be found. The 1998 National Household Survey in Costa Rica reported a prevalence rate of diagnosed diabetes among adults of 2.8% in the general population and 9.4% among those aged 40 years or over (37).

South America. No published reports were found showing results of glucose tolerance tests in Ecuador and Guyana. Among the surveys using OGTT and the WHO diagnostic criteria, the highest crude prevalence rate of diabetes was reported among Japanese immigrants to Brazil (Issei (second generation), 16.2%; Nisei (first generation), 12.6%). The adjusted prevalence rate for East Indians in Suriname (12.7%) was the highest in South America, but this study used an oral glucose load of 50 g for the 2-hour test and a cutoff blood glucose value of 180 mg/dL. Most South American studies reported diabetes prevalence rates of between 6% and 9%. The lowest crude prevalence rate was reported for the Aymara Indians in Chile (1.5%). The Mapuche Indians from Chile showed a low prevalence rate (1.0%) in 1985, but a more recent survey reported a prevalence rate of 4.1% in this group. A study conducted in Uruguay and Venezuela in 1966, using an oral load of 1 g of glucose per kg of body weight and a cutoff point of 150 mg/dL, reported prevalence rates of 6.9% and 7.3% for these countries, respectively.

Adjusted prevalence rates among subjects aged 35 to 64 years

Among people 35 to 64 years old, in the countries for which data were available, the prevalence of diabetes was highest in Jamaica (15.6%) (Table 4). Mexico, Trinidad and Tobago, and Bolivia also presented prevalence rates over 10%. Moderate prevalence rates (3%–10%) were observed in the rest of the countries. The lowest prevalence rate was observed in La Plata, Argentina (3.0%). Jamaican, Mexican, and Chilean males had prevalence rates of over 10%. Moderate prevalence rates for diabetes were observed in males from the rest of the countries. Women were at higher risk in Jamaica, Mexico, Trinidad and Tobago, and Bolivia, while Brazilian, Colombian, Paraguayan, and Surinamese women had moderate prevalence rates (3%–9%). Argentine women presented the lowest prevalence rate (2.6%).

DISCUSSION

As evidenced by the data presented in this article, in some areas of the Americas there is a pronounced lack of information regarding diabetes. Nonetheless, it is obvious that diabetes represents a major public health problem for the Americas, and there is evidence that its prevalence is increasing (33, 46). Given that most Latin American and Caribbean countries are experiencing a demographic transition, the prevalence of diabetes is expected to increase rapidly in the near future.

We found great variability in the incidence of type 1 diabetes in the Americas, ranging from 24 per 100 000 in some areas of Canada in 1990–1993 to 0.2 per 100 000 in Venezuela in 1992. In 1997, the prevalence of type 1 diabetes among persons under 15 years of age in the Americas was estimated at 88 000. Of these children, 35 000 (40%) lived in Latin America and the Caribbean. Although type 1 diabetes appears to be uncommon in most Latin American and Caribbean (LAC) countries, the increased related mortality

TABLE 3. Survey results showing the prevalence (%) of diabetes mellitus among adult populations of the Americas

Country	Population, reference	Crude rates (95% CI)			Adjusted rates[a] (95% CI)[b]		
		Male	Female	Both	Male	Female	Both
North America							
Canada	Native, River Desert (25)	17.6	16.3	—	16.3 (7.9–24.7)	16.3 (9.0–23.6)	
	Native, Lac Simon (25)	22.2	44.3	—	23.9 (12.9–34.9)	48.6 (38.4–58.8)	
Mexico	Mexico City (26)	10.6	14.8	13.0	11.9 (8.0–17.2)	17.9 (13.5–23.5)	14.9 (11.9–18.6)
	Mexico City (27)	6.6	11.0	8.7	8.7 (5.7–12.8)	12.0 (8.6–16.4)	10.4 (8.1–13.3)
United States	General population (28)	14.8	13.8	14.3	14.7 (12.8–16.5)	13.1 (11.4–14.8)	13.9 (12.6–15.2)[c]
	Non-Hispanic Whites (28)	—	—	—	13.9 (11.3–16.5)	11.5 (9.1–13.9)	12.7 (11.0–14.5)[c]
	Non-Hispanic Blacks (28)	—	—	—	19.5 (15.3–23.7)	20.1 (15.9–24.4)	19.8 (16.8–22.8)[c]
	Mexican-Americans (28)	—	—	—	24.0 (19.4–28.6)	27.5 (22.6–32.3)	25.7 (22.4–29.1)[c]
	Pima Indians (30)	—	—	—	50.2 (47.8–52.7)	52.6 (50.3–54.9)	51.4 (49.7–53.1)[c]
Caribbean							
Barbados	Bridgetown (31)	15.0	18.0	17.0	15.9 (10.6–22.9)	16.9 (12.5–22.3)	16.4 (13.1–20.5)
Cuba	Santiago (32)	1.5	6.6	4.6 (1.2–8.0)		—	—
	Havana (33)	—	—	14.8	—	—	11.8 (8.3–16.3)
Guadeloupe	Guadeloupean (34)	—	—	5.8 (4.4–7.2)			
Jamaica	Jamaican (6)	—	—	17.9	—	—	11.1 (9.7–12.3)[d]
	Spanish Town (35)	9.8 (7.2–12.4)	15.7 (13.1–18.3)	13.4 (11.5–15.2)	9.5 (7.0–12.0)	15.7 (13.2–18.3)	12.6 (10.8–14.4)[c]
Trinidad & Tobago	St. James (36)	11.9	14.9	13.2	11.6 (9.8–13.3)	13.9 (11.8–16.1)	12.7 (11.4–14.1)[c]
South America							
Argentina	La Plata (38)			5.0	—	—	—
	Avellaneda (39)	10.1	7.4	8.1	—	—	7.6 (5.6–10.1)[d]
Bolivia	Four cities (8)	6.8 (6.2–8.3)	7.6 (6.3–8.9)	7.2 (6.2–8.3)	8.2 (6.5–9.9)	9.1 (7.6–10.5)	8.6 (7.5–9.7)[c]
Brazil	Nine cities (40)	7.5[e]	7.6[e]	7.6[e]	—	—	—
	Rio de Janeiro (41)	5.7	9.9	7.6	5.7 (4.2–7.3)	9.4 (7.8–11.1)	7.6 (6.4–8.7)[c]
	São Paulo, Issei (42)			12.8[e]	—	—	—
	São Paulo, Nisei (42)			16.2[e]			—
Chile	Santiago (45)	5.8	7.7	6.5	8.4 (5.6–12.1)	5.7 (4.0–7.7)	7.0 (5.5–8.9)
	Valparaíso (44)	4.0	3.8	3.9	—	—	—
	Mapuche (45)	0.4	1.4	1.0	—	—	—
	Mapuche (46)	3.2 (0.7–9.0)	4.5 (2.2–8.1)	4.1 (2.2–6.9)	—	—	—
	Aymara (47)			1.5 (0.3–4.5)	—	—	—
Colombia	Urban (7)	7.3	7.4	—	7.7 (4.2–13.0)	8.7 (4.8–14.6)	8.2 (5.4–12.0)
Paraguay	Urban (48)	5.5	6.5	6.5	7.2 (4.9–10.6)	7.1 (5.6–9.1)	7.2 (5.9–8.8)
Peru	Three zones (49)	—	—	4.8 (3.2–7.0)	—	–	
Suriname	Main ethnic groups (50)	—	—	—	7.5 (4.6–11.6)	9.9 (6.6–14.3)	8.7 (6.4–11.6)
	Creoles (50)	7.0	4.0	—	6.3 (3.1–11.3)	13.3 (9.1–19.6)	9.8 (7.0–13.3)
	East Indians (50)	11.0	11.0	—	12.1 (7.1–19.4)	13.3 (8.7–19.6)	12.7 (9.2–17.2)
	Indonesians (50)	2.0	3.0	—	4.2 (1.3–9.8)	3.0 (1.2–6.1)	3.6 (1.9–6.3)
Uruguay	Urban-rural (51)	6.8	6.9	6.9	—	—	—
Venezuela	Urban (51)	4.5	9.4	7.3			
	Urban (52)	—	—	4.4	—	—	—
	Mérida (53)	—	—	3.8	—	—	—

[a] Standardized using the world population (10).
[b] 95% confidence intervals based on the Poisson distribution.
[c] 95% confidence intervals based on a normal distribution.
[d] Standardized by age.
[e] Standardized by the authors.

TABLE 4. Adjusted diabetes prevalence rates[a] (%) among individuals 34–64 years of age in selected countries of Latin America and the Caribbean

Country	Population, reference	Adjusted rate (95% CI)[b]		
		Male	Female	Both
Mexico	Mexico City (27)	11.9 (8.0–17.2)	17.9 (13.5–23.5)	14.9 (11.9–18.6)
Jamaica	Spanish Town (35)	12.7 (9.1–17.4)	18.4 (14.9–22.8)	15.6 (13.1–18.6)
Trinidad and Tobago	St. James (36)	9.3 (7.7–10.9)	12.5 (10.4–14.5)	10.9 (9.6–12.1)[c]
Argentina	La Plata (37)	3.4 (1.5–6.7)	2.6 (1.0–5.7)	3.0 (1.6–5.1)
Bolivia	Four cities (9)	9.5 (7.2–11.8)	10.6 (8.6–12.7)	10.1 (8.5–11.6)[c]
Brazil	Rio de Janeiro (40)	6.0 (4.8–7.6)	9.7 (7.7–12.1)	7.9 (6.7–9.2)
Chile	Santiago (42)	10.1 (5.9–16.1)	6.7 (4.3–10.0)	8.4 (6.0–11.4)
Colombia	Urban (8)	7.6 (4.1–12.8)	8.6 (4.7–14.4)	8.1 (5.3–11.8)
Paraguay	Urban (46)	7.6 (4.9–11.3)	8.6 (6.2–10.9)	8.9 (6.3–10.0)
Suriname	All races (47)	7.3 (4.3–11.6)	8.7 (6.0–10.6)	8.0 (6.0–10.6)

[a] Truncated rate adjusted using the world population (10) by the direct method.
[b] 95% confidence intervals based on the Poisson distribution.
[c] 95% confidence intervals based on a normal distribution.

and disability among young adults make this disease a considerable burden to society (54–57). Public health actions to ensure access to quality care in this population are urgently needed.

Although type 2 diabetes appears with more frequency in people over 40 years of age, there are reports showing a growing prevalence of this clinical type among children in various segments of the United States population (58–61). It is not clear whether this phenomenon is already occurring in LAC, but it is anticipated that a similar trend will emerge unless prevention strategies are introduced in the LAC nations.

Of special note are the prevalence rates of diabetes mellitus observed among native American populations and other ethnic and minority groups in the various countries of the Americas. In the state of Arizona in the United States, more than half of the adult Pima Indians are known to have diabetes, and other Native Americans from the United States and Canada also have an increased prevalence of diabetes. Other ethnic and minority groups in the United States, such as Mexican-Americans and non-Hispanic blacks, are also disproportionately affected by diabetes (28).

In most urban populations of Latin America and the Caribbean, the prevalence of diabetes among adults is between 6% and 8%. While the Mapuche Indians of Chile were practically free of diabetes in 1985, they showed prevalence rates of 3.2% among males and 4.5% among females in 2000. These results suggest that an acculturation process, with the predominance of a lack of physical activity and a hypercaloric diet, may be occurring in this native community, and the same process may be occurring across Latin America.

It is evident from the results of various surveys in LAC that diabetes is particularly affecting people from the lower socioeconomic classes, as evidenced by higher prevalence rates for people with lower educational levels in Bolivia (8) and in Jamaica (6). This may be because of higher exposure to major risk factors such as hypercaloric diet, low physical activity, and obesity.

According to new evidence from the Finnish Diabetes Prevention Study (62) and elsewhere, more than half of the diabetes cases can be prevented among those at higher risk. Diabetes prevention and control programs are urgently needed and are potentially cost-effective strategies that can reduce the huge burden of diabetes (63). Disease control programs should address the comparatively higher prevalence of diabetes reported among women, the less educated, and low-income populations in the Americas. Despite economic constraints, there is a clear need for intervention. A coordinated action plan to deal with the current epidemic of diabetes is critical in order to take the available technological advances in the field of diabetes prevention and control and to translate them into affordable public health actions.

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RESUMEN

Incidencia y prevalencia de la diabetes en América

Objetivo. Describir la incidencia y prevalencia de la diabetes sacarina en el continente americano, de acuerdo con los resultados de una revisión exhaustiva de la literatura publicada acerca de este tema.
Métodos. Los datos se obtuvieron mediante una completa revisión de las bases de datos MEDLINE y BIREME. Además se contactaron las organizaciones gubernamentales y no gubernamentales y otras instituciones para identificar las publicaciones gubernamentales y los informes de conferencias y reuniones. Las tasas de incidencia y prevalencia se ajustaron por edad y sexo, utilizando, siempre que fuera posible, el método directo, con la población de Segi como estándar. Los intervalos de confianza del 95% se calcularon utilizando la distribución de Poisson o la distribución normal.
Resultados. La diabetes constituye un importante problema de salud pública en América y hay pruebas de que su prevalencia está aumentando en algunos países.
Conclusiones. Dado que la mayoría de los países latinoamericanos y caribeños están sufriendo una transición demográfica, es de esperar que la prevalencia de la diabetes siga aumentando rápidamente en un futuro próximo. Pese a las limitaciones económicas de muchos países, hay una evidente necesidad de realizar un mayor esfuerzo en el campo de la prevención y control de la diabetes.