CARDIOVASCULAR MEDICINE

Trends in mortality from coronary heart and cerebrovascular diseases in the Americas: 1970–2000

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Objective: To describe trends in mortality from coronary heart disease (CHD) and cerebrovascular accidents (CVAs) over the period 1970 to 2000 in the Americas.

Methods: Age standardised mortality rates were derived from the World Health Organization database and grouped according to the *International classification of diseases*, ninth revision. Joinpoint analysis was used to identify changes in trends.

Results: In the USA and Canada, CHD mortality rates declined by about 60% in both sexes. In Latin America, falls in CHD mortality were observed for Argentina, Brazil, Chile, Cuba, and Puerto Rico. In 2000, mortality rates among men were highest in Venezuela (137.3/100 000) and lowest (apart from Ecuador) in Argentina (63.5/100 000). For women, the rates were highest in Cuba (79.4/100 000) and lowest in Argentina (26.5/100 000). For CVA mortality, a decline by about 60% was observed in the USA and Canada for both sexes. The falls were smaller (about −25% to −40% among men and −20% to −50% among women) in Puerto Rico, Argentina, Chile, and Costa Rica and only minor in Ecuador, Mexico, and Venezuela. Around 2000, CVA mortality in Latin America was highest in Brazil (85.5/100 000 among men and 61.7/100 000 among women) and lowest in Puerto Rico (29.3/100 000 among men and 24.1/100 000 among women).

Conclusions: Recent falls in CHD and CVA were less favourable in Latin America than in the USA and Canada. This may reflect unfavourable changes in nutrition (including obesity), physical activity, and smoking in most Latin American countries, together with less effective control of hypertension and management of the diseases.

Trends in mortality from coronary heart disease (CHD) and cerebrovascular accidents (CVAs) have been analysed in detail for the USA and Canada[1–3] but less information is available from Latin America.

In the USA, age standardised CHD mortality rates in adults aged 35 to 74 years declined from 79.1 in 1971–82 to 53.0/100 000 in 1982–92, and incidence decreased from 293.5 to 225.1/100 000. The 28 day case fatality rate for cardiovascular disease declined from 15.7% to 11.7%.[1] In the Framingham study, the relative risk for non-sudden CHD death was 0.36 in 1990–99 as compared with 1950–69.[2] In Olmsted county, Minnesota, the incidence of myocardial infarction and sudden death combined declined by 17% between 1979 and 1998.[3] Thus, the more than halved CHD mortality in the USA over the past four decades has been attributed both to decreased incidence and to improved management of the disease.[4] Mortality from stroke declined by about 60% in both sexes between 1965–69 and 1995–98 in the USA (that is, from 77.7 to 29.3/100 000 men and from 66.8 to 27.5/100 000 women) and Canada.[5] The reasons that are most often cited for such a decline in industrialised Western countries are a fall in risk factors such as smoking, physical inactivity, improved control of hypertension and hyperlipidaemia.[5 6]

The pattern of mortality trends from CHD and CVA was less clear in Latin American countries. For CHD, some countries such as Argentina started from relatively high risk rates that declined substantially, whereas other countries such as Mexico started from lower rates and showed upward trends in both sexes. Mortality from CVA declined in all Latin American countries but to a systematically smaller degree than in North America.[5 7]

To provide comprehensive documentation of patterns of mortality trends from CHD and CVA in the Americas, we analysed available data from 10 Latin American countries, including the first available data from Brazil, plus the USA and Canada for comparative purposes over the period 1970–2000. We also used joinpoint regression models to define changes in trends over subsequent time periods.[8]

MATERIALS AND METHODS

Official death certification numbers for CHD and CVA for 12 American countries, including the USA and Canada, were derived from the World Health Organization (WHO) database.[9] For Latin America, only countries with more than two million inhabitants and with age stratified mortality and population figures of sufficient detail were included (that is, Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Puerto Rico, and Venezuela). All population and mortality data were used as found at their respective sources (WHO and Pan American Health Organization (PAHO)). For Brazil, population data were available for the whole country only before 1986; between 1986 and 1995 only population data for southern, southeastern, and central western regions were available. During the calendar periods considered (1970–2000), three revisions of the *International classification of diseases* (ICD) were used.[10–12] Classification of deaths for all calendar periods and countries was thus grouped according to the ninth revision of the ICD.[11] To minimise problems of classification and data comparability over time, in the present analysis all CHD classifications recorded as a group of the eighth and ninth revisions of the ICD (ICD codes 410–414) were combined with those of the 10th revision (ICD codes I20–I25). Codes 430–438 from the

Abbreviations: CHD, coronary heart disease; CVA, cerebrovascular accident; EAPC, estimated annual percentage change; ICD, *International classification of diseases*; PAHO, Pan American Health Organization; WHO, World Health Organization

eight and ninth revision and codes I60–I69 from the 10th revision were pooled in a category of all CVA. For calendar years missing mortality data, no extrapolations were made. To account for possible ICD revision related mortality discontinuities, we checked changes in rates in subsequent calendar periods; none of them were relevant and no adjustments were made. Estimates of the resident populations for the corresponding calendar period, usually based on official censuses, were extracted from the same WHO databank whenever available and from the PAHO when the WHO data were unavailable.[9 13] Since the PAHO database provides data for broad age groups, subsequent quinquennia of age were estimated by interpolating from the WHO distribution of the last year available for each country.

From these data, age specific rates for each five year age group and calendar period were obtained for men and women. Age standardised rates per 100 000 at all ages and truncated at 35–64 years were computed by the direct method on the basis of the world standard population.

Joinpoint regression analysis was used to identify points where the linear slope of the trend changed significantly.[8] In joinpoint analysis, the best fitting points (the ''joinpoints'') where the rate changes (increases or decreases) significantly are chosen. The analysis starts with the minimum number of joinpoints (for example, no joinpoints, which is a straight line), and tests whether one or more joinpoints (up to three, corresponding to four distinct period segments identified by trend 1 to trend 4) are significant and must be added to the model. In the final model each joinpoint (if any) informs of a significant change in the slope. The estimated annual percentage change (EAPC) was then computed for each of those trends by fitting a regression line to the natural logarithm of the rates by using calendar year as a regressor variable (that is, given $y = a + bx$, where y is ln(rate) and x is calendar year, the EAPC is estimated as $100^{*}(e^{b} - 1)$). Joinpoints were analysed with the Joinpoint software from the Surveillance Research Program of the US National Cancer Institute (Bethesda, Maryland, USA; srab.cancer.gov/joinpoint).

RESULTS

Table 1 gives for each country and sex the three year average age standardised mortality rates per 100 000 for CHD in three subsequent decades and the percentage change from the 1970s to the end of the 1990s.

Figure 1 shows the corresponding trends over the whole period 1970–2000 (all ages, plus truncated 35–64 years). CHD mortality decreased steadily and substantially in the USA and Canada (by about −60% or more in both sexes). Among Latin American countries, only Argentina had a steady and comparable fall in CHD mortality between 1970 and 2000 (63% among men and 68% among women). Smaller falls (between −18% and −33% among men and between −18% and −45% among women) were observed in Brazil, Chile, Cuba, and Puerto Rico. Upward trends were observed over the last three decades in Colombia, Costa Rica, and mostly in Mexico and Ecuador, countries characterised by the lowest CHD mortality in 1970s. Thus, overall CHD mortality rates in Mexico rose from 42.2/100 000 in 1970–1972 to 82.0/100 000 in 1998–2000 among men and from 28.4/100 000 to 53.9/100 000 among women. Consequently, the overall variation in CHD mortality across the 12 American countries considered was much smaller in 2000 than in 1970. Trends in truncated rates (35 to 64 years) were similar to those for all ages in most American countries.

Figure 2 displays the CHD mortality rates ranked in reversed order for men and women during 2000 or the most recent calendar year available (1995 for Brazil, 1999 for Chile and Colombia) presented side by side (to allow comparison). The highest rates for men were from Venezuela (137.3/100 000), the USA (119.6/100 000), and Cuba (115.6/100 000) and the lowest ones from Chile (73.3/100 000), Argentina (63.5/100 000), and Ecuador(34.4/100 000). For women, the highest mortality rates for CHD were from Cuba (79.4/100 000), Venezuela (78.6/100 000), and the USA (67.6/100 000) and the lowest ones from Ecuador (21.3/100 000), Argentina (26.5/100 000), and Chile (38.1/100 000). Consequently, about a fourfold gradient was observed between the highest and the lowest CHD mortality rates among men and women from the Americas.

Table 2 shows for each country and sex the three year average age standardised mortality rates per 100 000 for CVA in three subsequent decades and the percentage change from the 1970s to the end of the 1990s.

Figure 3 shows the corresponding trends over the overall period 1970–2000 (all ages, plus truncated 35 to 64 years). A steady and substantial decline was observed in the USA and Canada, by about 60% in both sexes. The falls were smaller (from −20% to −45% for both sexes) in Puerto Rico, Argentina, Costa Rica, Chile, and Colombia, whereas changes were only minor for Ecuador, Venezuela, and Mexico (between −1% and −10% among men and between −12% and −20% among women).

Table 1 Three year average trends in age standardised (world population) death certification rates for coronary heart diseases in the Americas, 1970–2000

	Men					Women				
Country	1970–72	1979–81	1989–91	1998–2000	% Change 1970–72 v 1998–2000	1970–72	1979–81	1989–91	1998–2000	% Change 1970–72 v 1998–2000
Argentina	182.1	117.5	81.5	67.4	−63	89.2	55.6	35.5	28.3	−68
Brazil*	NA	108.0	100.4	88.1	−18†	NA	62.9	57.6	51.4	−18†
Chile*	110.9	95.1	82.0	74.1	−33	74.0	54.2	47.2	38.2	−48
Colombia*	94.9	104.8	89.1	93.4	−2	63.1	67.1	56.7	60.9	−3
Costa Rica	72.7	103.5	107.6	99.9	37	55.1	65.6	63.8	59.9	9
Cuba	138.8	151.3	149.4	123.3	−11	107.2	113.2	106.1	87.0	−19
Ecuador	32.5	35.6	36.8	36.7	13	22.4	23.1	23.5	21.2	−6
Mexico	42.2	55.6	72.1	82.0	94	28.4	33.8	45.3	53.9	90
Puerto Rico	142.6	116.4	104.2	95.9	−33	99.8	72.5	61.6	55.3	−45
Venezuela	119.7	99.8	117.5	136.4	14	75.2	62.1	70.3	78.5	4
Canada	267.1	210.2	137.5	97.9	−63	124.1	96.2	66.0	47.9	−61
USA	316.6	214.2	144.7	118.6	−63	157.4	103.0	76.8	67.2	−57

*For Brazil 1986 was used for 1980 and 1995 for 2000; for Chile 1999 was used for 2000; and for Colombia 1972 was used for 1970, 1984 for 1980, 1991 for 1990, and 1999 for 2000.
†Changes between 1995 and 1986.
NA, not available.

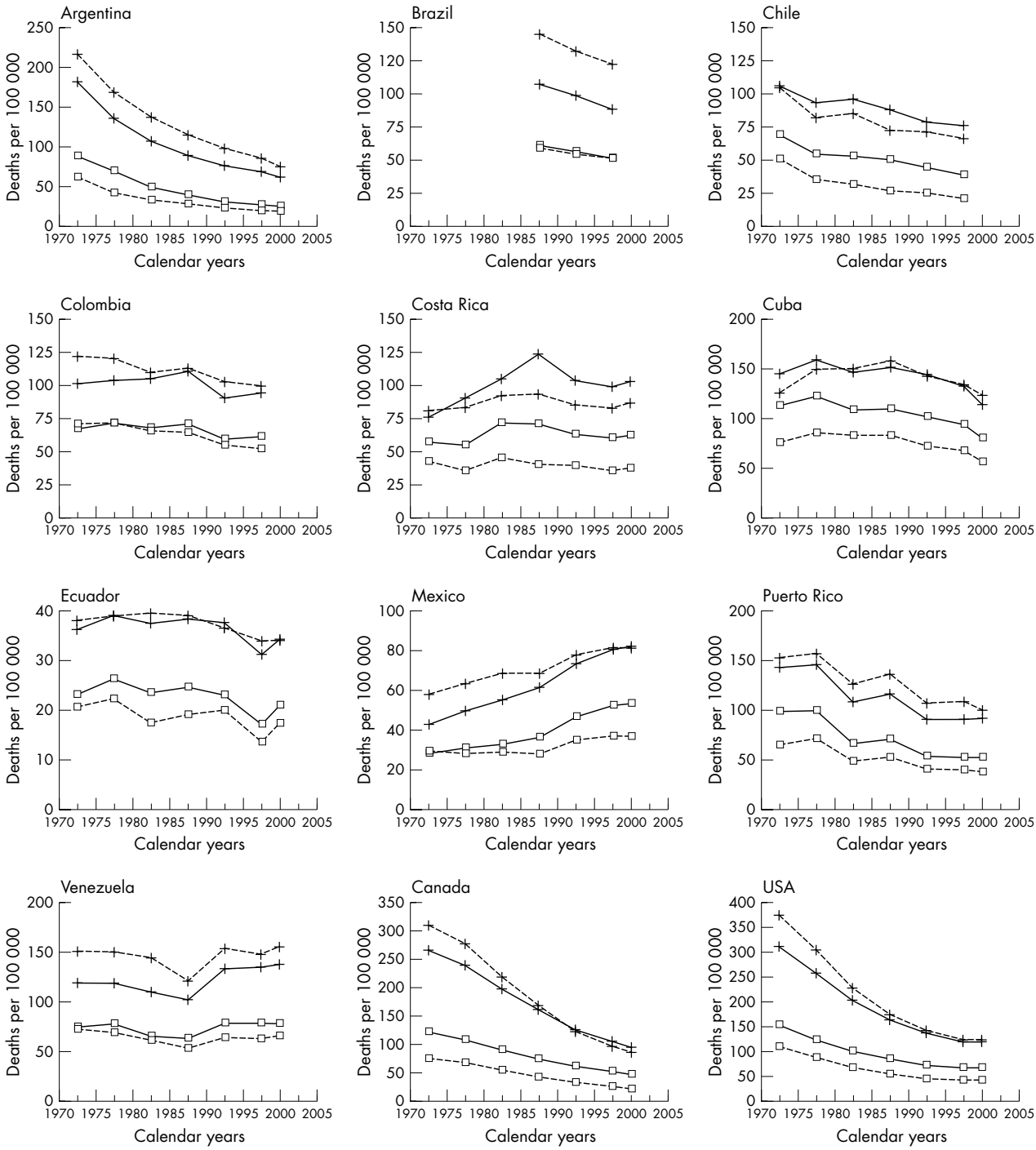

Figure 1 Trends in age standardised (world standard, all ages, and truncated) death certification rates per 100 000 for coronary heart diseases in 12 countries of the Americas, 1970–2000. Plus sign, men; squares, women; solid line, all ages; dashed line, truncated 35–64 years.

As for CHD, trends over time in CVA mortality were less favourable in Latin American countries, which had the lowest mortality rates in the 1970s. Trends in truncated rates (35 to 64 years) were consistent with all age rates in most countries.

Figure 4 shows histograms for overall CVA mortality during 2000 (1995 for Brazil, 1999 for Chile and Colombia) among men and women in the 12 countries of the Americas that were considered. The rates among men were highest in Brazil (85.5/100 000), Chile (63.3/100 000), Venezuela (59.3/100 000), and Argentina (56.0/100 000) and lowest in Canada (24.0/100 000), the USA (27.7/100 000), and Puerto Rico (29.3/100 000). For women, mortality rates for CVA were highest in Brazil (61.7/100 000), Cuba (50.2/100 000), Venezuela (48.7/100 000), and Colombia (46.4/100 000) and lowest in Canada (21.4/100 000), Puerto Rico (24.1/100 000), and the USA (26.7/100 000). Consequently, about a threefold gradient exists between the highest and the lowest CVA mortality rates in American countries in both sexes.

Table 3 gives the results of the joinpoint analysis for CHD mortality in the Americas between 1970 and 2000 (except Brazil, for which data were inadequate). Table 3 reports the calendar periods during which mortality trends changed

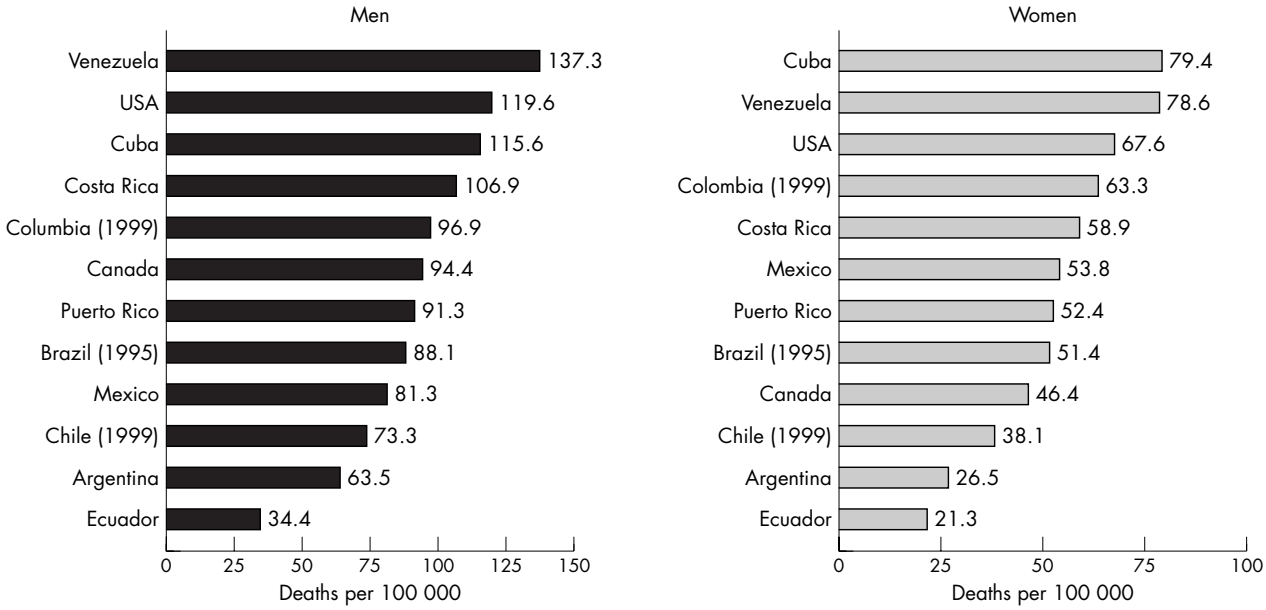

Figure 2 Age standardised (world standard) death certification rates per 100 000 for coronary heart diseases in 12 countries of the Americas in 2000 (unless otherwise specified).

significantly and the corresponding EAPC for men and women are reported separately. Whereas in Canada and the USA substantial falls in CHD mortality were registered since the early 1970s, the pattern was less consistent for most of Latin America, with the exception of Argentina. CHD trends were upwards for both sexes in Mexico up to recent calendar years and variable for Chile, Cuba, Puerto Rico, and Venezuela. The declines were steady but moderate in Colombia for all calendar periods.

Table 4 gives the corresponding figures for CVA mortality. In the USA, major declines were observed in the 1970s. These became smaller in subsequent calendar periods during the 1990s. In Canada, major declines were observed yearly until 1985–1987; in the 1990s, although smaller, the decline persisted in both sexes. Major falls in the 1980s and early 1990s were observed in Argentina, Chile, Colombia, Puerto Rico, and Venezuela, whereas the falls were minor and inconsistent in Cuba and Mexico.

DISCUSSION

This report of trends in mortality from cardiovascular diseases in the Americas over the past three decades confirms the substantial decline (by about −60%) in mortality from cardiovascular diseases in the USA and Canada.[5 14]

The pattern of trends is more complex in Latin America. In general, the magnitude of changes was related to the initial mortality. For CHD, only Argentina—which had high rates in the 1970s—had falls in rates comparable with those reported in North America.[15] Declines were smaller in Puerto Rico, Chile, Cuba, and Brazil.[15 16] CHD trends were unfavourable in other Latin American countries, particularly Costa Rica, Ecuador, and Mexico, characterised by the lowest rates in the 1970s. Consequently, over more recent calendar years CHD mortality varied less between countries of the Americas than in the past, reflecting a more uniform pattern of lifestyle habits and risk factor exposure across various American countries. In more detail, lifestyle factors acting on CHD

Table 2 Three year average trends in age standardised (world population) death certification rates for cerebrovascular accidents in the Americas, 1970–2000

	Men					Women				
Country	1970–72	1979–81	1989–91	1998–2000	% Change 1970–72 v 1998–2000	1970–72	1979–81	1989–91	1998–2000	% Change 1970–72 v 1998–2000
Argentina	94.8	80.1	73.3	58.9	−38	69.3	58.9	51.4	38.0	−45
Brazil*	NA	106.7	97.4	85.5	−20†	NA	78.1	69.8	61.7	−21†
Chile*	91.1	80.2	67.0	62.8	−31	84.6	66.4	49.9	43.3	−49
Colombia*	61.7	67.2	45.3	47.1	−24	68.0	65.2	42.6	45.4	−33
Costa Rica	53.7	44.5	41.6	37.5	−30	52.7	45.2	37.7	34.1	−35
Cuba	63.7	54.2	53.6	53.0	−17	64.0	53.1	48.9	51.0	−20
Ecuador	39.1	48.2	43.9	35.4	−10	37.7	40.7	37.4	30.0	−20
Mexico	40.5	39.7	40.6	40.3	−1	42.6	40.6	37.6	36.6	−14
Puerto Rico	53.9	40.9	29.2	32.8	−39	46.3	36.7	21.3	25.6	−45
Venezuela	60.2	59.5	54.1	58.9	−2	56.6	59.7	48.3	49.8	−12
Canada	63.9	46.2	31.1	24.7	−61	54.1	39.2	26.6	22.2	−59
USA	73.9	45.3	30.6	27.7	−63	61.9	39.8	28.1	26.8	−57

*For Brazil 1986 was used for 1980 and 1995 for 2000; for Chile 1999 was used for 2000; and for Colombia 1972 was used for 1970, 1984 for 1980, 1991 for 1990, and 1999 for 2000.
†Changes between 1995 and 1986. NA, not available.

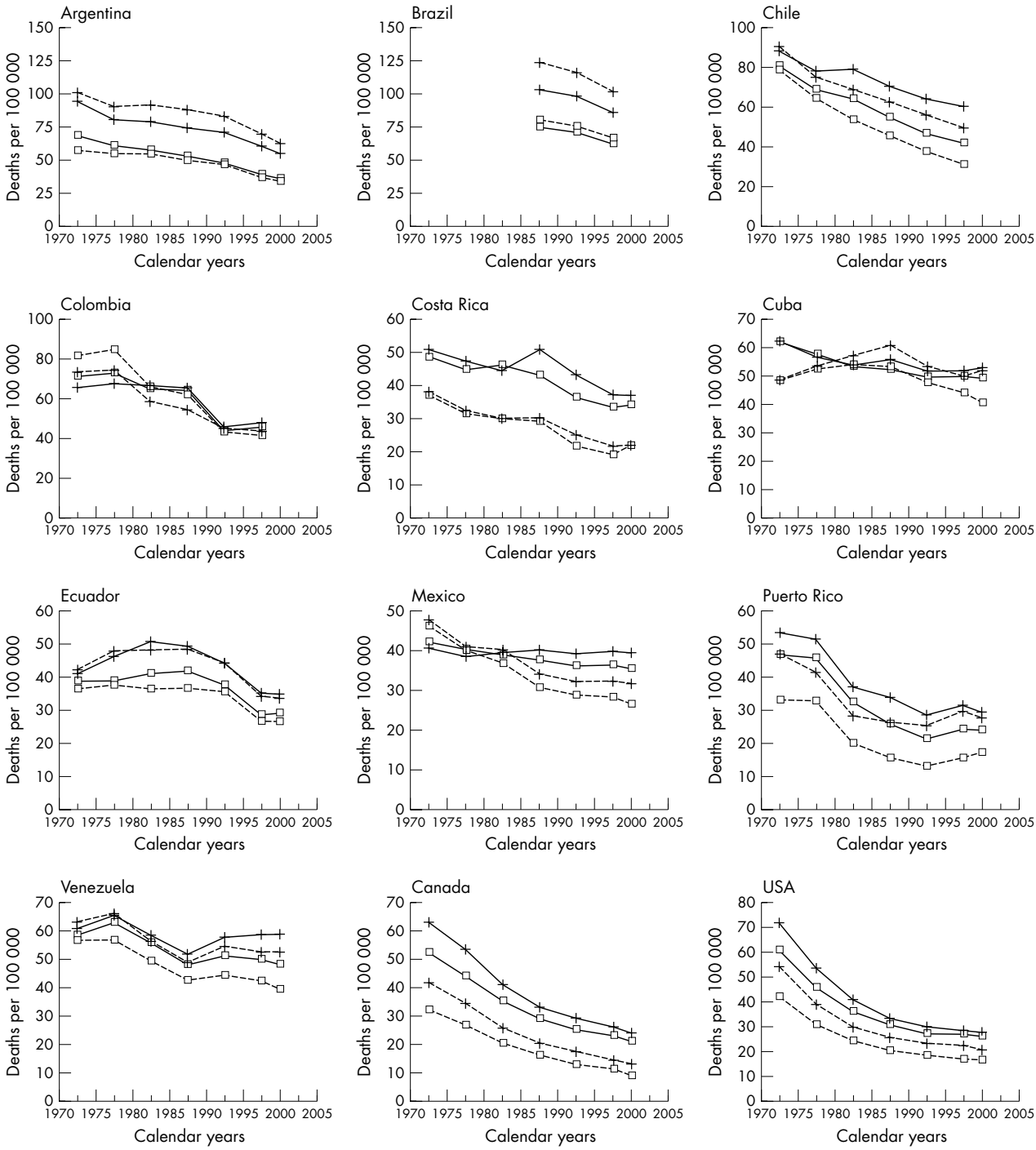

Figure 3 Trends in age standardised (world standard, all ages, and truncated) death certification rates per 100 000 for cerebrovascular accidents in 12 countries of the Americas, 1970–2000. Plus sign, men; squares, women; solid line, all ages; dashed line, truncated 35–64 years.

mortality are geographically independent, in particular cigarette smoking, dietary habits (obesity control, daily consumption of fruit and vegetables), and physical activity (to a lesser extent).[17]

It has also been suggested that in countries with a substantial fall in CHD mortality, about three quarters of the fall can be attributed to a reduction in event rates (risk factor improvements are relevant) and the remaining quarter to improvements in case fatality (mainly attributable to medications).[17 18]

A recent study conducted in the UK suggested that about 60% of the fall in CHD mortality registered in the past two decades can be attributed to declines in major risk factors and 40% to medical treatments, with hypertension control playing a relatively small part.[19] Since part of the decline in CHD mortality in North America may also be attributed to improved management and treatment, the less favourable trends in Latin America may in part reflect inadequate or delayed adoption of effective treatment for the disease, including thrombolytic agents, aspirin, β blockers, and ACE inhibitors, but also angioplasty.[4 20–28]

Changes in trends may also be due to changes in diagnosis and treatment methods, in recoding of disease, and in completeness of certification or to a combination of these

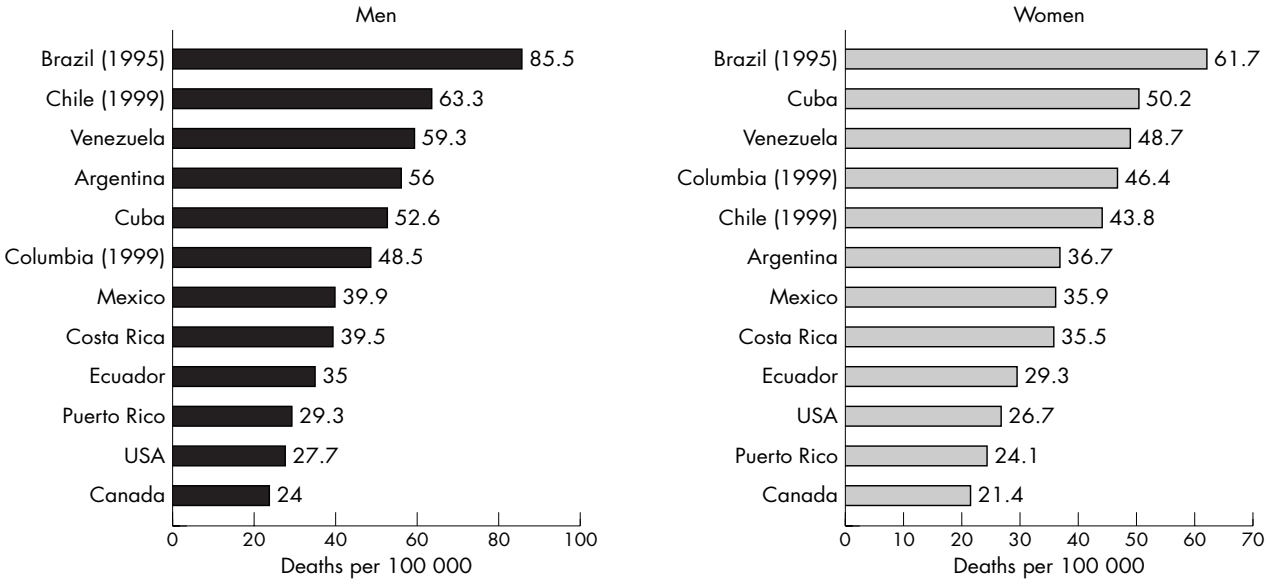

Figure 4 Age standardised (world standard) death certification rates per 100 000 for cerebrovascular accidents in 12 countries of the Americas in 2000 (unless otherwise specified).

factors. However, the similar pattern of trends in middle age and in overall age standardised rates weighs against a major role for changes in diagnosis and certification rates, since the improvement in certification would be larger among the elderly.

The main risk factor for CVA is hypertension, and the falls by 60% or more registered in the USA and Canada in the past three decades are largely due to improved control of hypertension on a population-wide scale.[5 29 30] Declining trends were also observed in most countries of Latin America, although the magnitude of the falls was much smaller and the overall rates were relatively stable in men in Mexico and Venezuela. Brazil, on the other hand, registered the highest mortality for CVA for both sexes but these rates were lower than those reported by another study between 1979 and 1997.[31] As a consequence, CVA mortality during 2000 was two- to fourfold higher in Latin America (except Puerto Rico) than in North America.

The increasing mortality in some countries of Latin America is likely to reflect unfavourable changes in diet, nutrition (including more widespread obesity), physical activity, and tobacco smoking. Over the past few decades, in several areas of Latin America, a large proportion of the rural population migrated to urban areas. This brought important changes in lifestyle, diet, and physical activity patterns, with a consequent increase in overweight and obesity mainly among low income populations.[32]

Table 3 Joinpoint analysis for coronary heart diseases in the Americas, 1970–2000

	Trend 1		Trend 2		Trend 3		Trend 4	
	Years	EAPC	Years	EAPC	Years	EAPC	Years	EAPC
Men								
Argentina	1970–78	−3.31*	1978–82	−7.54*	1982–2000	−2.68*		
Chile	1970–75	−4.89*	1975–84	1.03	1984–87	−5.32	1987–1999	−1.14*
Colombia	1972–99	−0.55*						
Costa Rica	1970–85	3.73*	1985–2000	−1.48*				
Cuba	1970–78	2.51*	1978–82	−4.27	1982–88	1.74	1988–2000	−2.00*
Ecuador	1970–2000	−0.43						
Mexico	1970–97	2.64*	1997–2000	−0.28				
Puerto Rico	1970–90	−1.84*	1990–94	−6.46	1994–2000	3.65		
Venezuela	1970–87	−1.27*	1987–92	6.03	1992–2000	−0.07		
Canada	1970–76	−1.35*	1976–88	−3.93*	1988–91	−5.65*	1991–2000	−3.42*
USA	1970–73	−1.16	1973–88	−4.55*	1988–98	−2.91*		
Women								
Argentina	1970–78	−2.72*	1978–81	−10.41	1981–96	−4.31*		
Chile	1970–76	−6.23*	1976–84	0.36	1984–1999	−2.70*		
Colombia	1972–99	−0.70*						
Costa Rica	1970–84	2.70*	1084–2000	−1.54*				
Cuba	1970–74	5.45	1974–2000	−1.34*				
Ecuador	1970–93	−0.18	1993–96	−15.89	1993–2000	13.21*		
Mexico	1970–87	1.30*	1987–90	9.17	1990–2000	1.90		
Puerto Rico	1970–95	−3.17*	1995–2000	2.64				
Venezuela	1970–77	1.80	1977–80	−9.53	1980–2000	1.44*		
Canada	1970–75	−1.52*	1975–2000	−3.67*				
USA	1970–82	−4.38*	1982–97	−2.82*				

*Significantly different from 0 ($p<0.05$).
EAPC, estimated annual percentage change.

Table 4 Joinpoint analysis for cerebrovascular accidents in the Americas, 1970–2000

	Trend 1		Trend 2		Trend 3		Trend 4	
	Years	EAPC	Years	EAPC	Years	EAPC	Years	EAPC
Men								
Argentina	1970–92	−1.07*	1992–2000	−2.98*				
Chile	1970–76	−3.30*	1976–80	1.67	1980–97	−2.05*		
Colombia	1972–84	0.54	1984–91	−5.91	1991–1999	0.66		
Costa Rica	1970–2000	−1.04*						
Cuba	1970–82	−1.71*	1982–86	2.29	1986–94	−1.74		
Ecuador	1970–84	2.32*	1984–2000	−2.91*				
Mexico	1970–2000	−0.01						
Puerto Rico	1970–92	−3.46*	1992–2000	2.20				
Venezuela	1970–77	1.98	1977–85	−3.20*	1985–2000	1.03*		
Canada	1970–74	−0.45	1974–85	−5.16*	1985–2000	−2.35*		
USA	1970–73	−1.03	1973–79	−7.04*	1979–89	−4.05*	1989–2000	−0.97*
Women								
Argentina	1970–89	−1.36*	1982–2000	−3.48*				
Chile	1970–85	−2.19*	1985–96	−3.47*	1996–1999	2.59		
Colombia	1972–84	−0.57	1984–91	−6.31	1991–1999	0.72		
Costa Rica	1970–73	−8.69	1973–82	0.89	1982–2000	−2.17*		
Cuba	1970–91	−1.19*	1991–2000	0.26				
Ecuador	1970–93	0.02	1993–96	−12.45	1996–2000	3.04		
Mexico	1970–2000	−0.56*						
Puerto Rico	1970–76	0.67	1976–91	−5.64*	1991–2000	2.94*		
Venezuela	1970–77	2.59*	1977–85	−3.66*	1985–2000	0.19		
Canada	1970–75	−2.42*	1975–87	−4.30*	1987–2000	−2.01*		
USA	1970–73	−1.23	1973–79	−6.48*	1979–91	−3.28*	1991–2000	−0.02

*Significantly different from 0 ($p<0.05$).

This is a descriptive analysis, and hence no inference is made on the statistical significance of rates and trends. It is also useful to consider problems of random variation, which are greater in smaller populations, and of death certification reliability and validity, which may well vary across countries of the Americas.[33 34] Even if validity and reliability of death certification data were not specifically analysed, in general, countries included in this analysis had adequate validity and data completeness.[15]

These cautions notwithstanding, the results and implications of the present analysis indicate an urgency for improved control of hypertension in addition to interventions on other major risk factors for cardiovascular diseases, such as smoking, overweight, and obesity (with their influence also on cholesterol and lipoprotein concentrations) at a population level throughout Latin America.[35]

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IMAGES IN CARDIOLOGY

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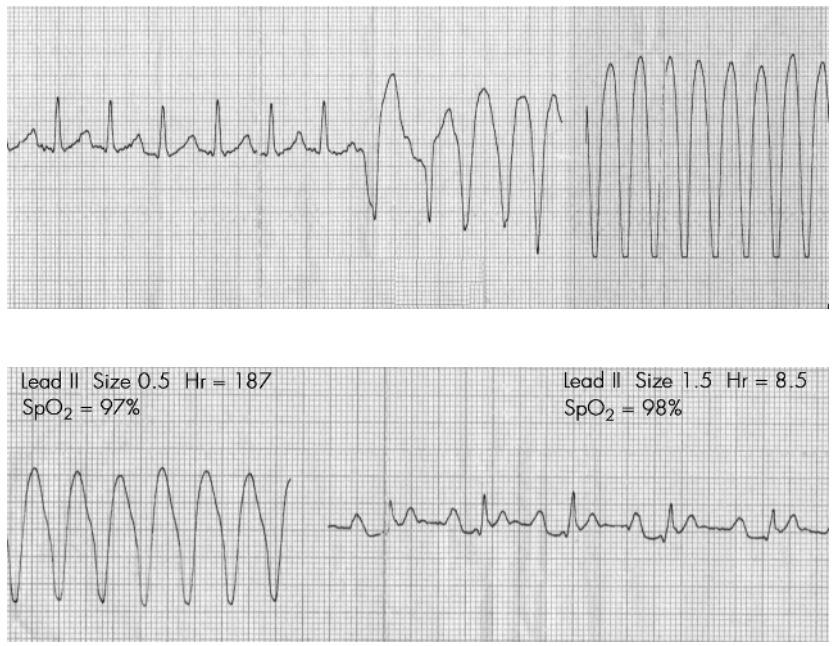
A case of ''sleeping PC'' cardioversion

A 75 year old man developed sudden onset, central, crushing, chest pain at rest. He was brought into hospital by ambulance. Cardiac monitoring in the ambulance captured the onset of asymptomatic ventricular tachycardia (VT) (upper panel). Intravenous amiodarone was drawn up and about to be administered when the ambulance drove over a speed bump at 5 mph. The patient was cardioverted into sinus rhythm by the jolt from the ''sleeping policeman'' (lower panel). On admission to hospital the patient was in sinus rhythm but was transferred to coronary care for monitoring. The VT was asymptomatic and the patient's only recollection of the journey was the extremely bumpy ride.

A precordial thump, which produces an electrical depolarisation of 2–5 J, can cardiovert ventricular tachyarrhythmias. Coughing or Valsalva induced cardioversion has also been reported. Indeed, any acute mechanical stimulation can trigger ectopic myocardial excitation which, depending on timing and circumstance, may either initiate or terminate VT.

Thus, a correctly timed, moderate precordial mechanical impact can cause sudden arrhythmic cardiac death without causing structural damage to the heart (commotio cordis). This could be due to mechanical activation of cation selective channels and swift, impulse-like mechanical stimulation over relatively small areas (4–5 cm) of the precordium early in the T wave are most arrhythmogenic.

In contrast, slow compression or violent shaking of the chest, as occurred in this case, is usually unable to trigger the ectopic excitation necessary for cardioversion, making this case unusual.



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