

Years of Productive Life Lost to Premature Mortality from Cardiovascular Diseases¹

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Cardiovascular diseases exact a major toll in both developed and developing countries in terms of death, ill health, and premature incapacitation. This presentation concerns itself with the economic cost—expressed in terms of years of economically active life lost to premature mortality—imposed by cardiovascular diseases in relatively developed and undeveloped regions of Brazil.

The purpose of this article is to estimate the economically productive years lost in Brazil, using 1985 data, as a result of premature mortality caused by cardiovascular diseases.

Two decades ago these diseases were the leading cause of death in Brazil (1, 2). Since then the morbidity and mortality picture has changed; and while the nation's infrastructure for prevention and control of diseases typical of underdevelopment is still weak, Brazil is starting to implement programs to prevent and control chronic and degenerative diseases.

Within this context it should be noted that Brazil's leading health care provider, the National Institute of Medical Care and Social Security (Instituto Nacional de Assistência Médica e Previdência Social—INAMPS) has always tended to emphasize curative over preventive medicine (3). From 1978 to 1984, for example, the lion's share of all federal expenditures for

health—84%—went to the medical and hospital care program, while public health programs responsible for providing basic health services and communicable disease control received less than 5.5% (4).

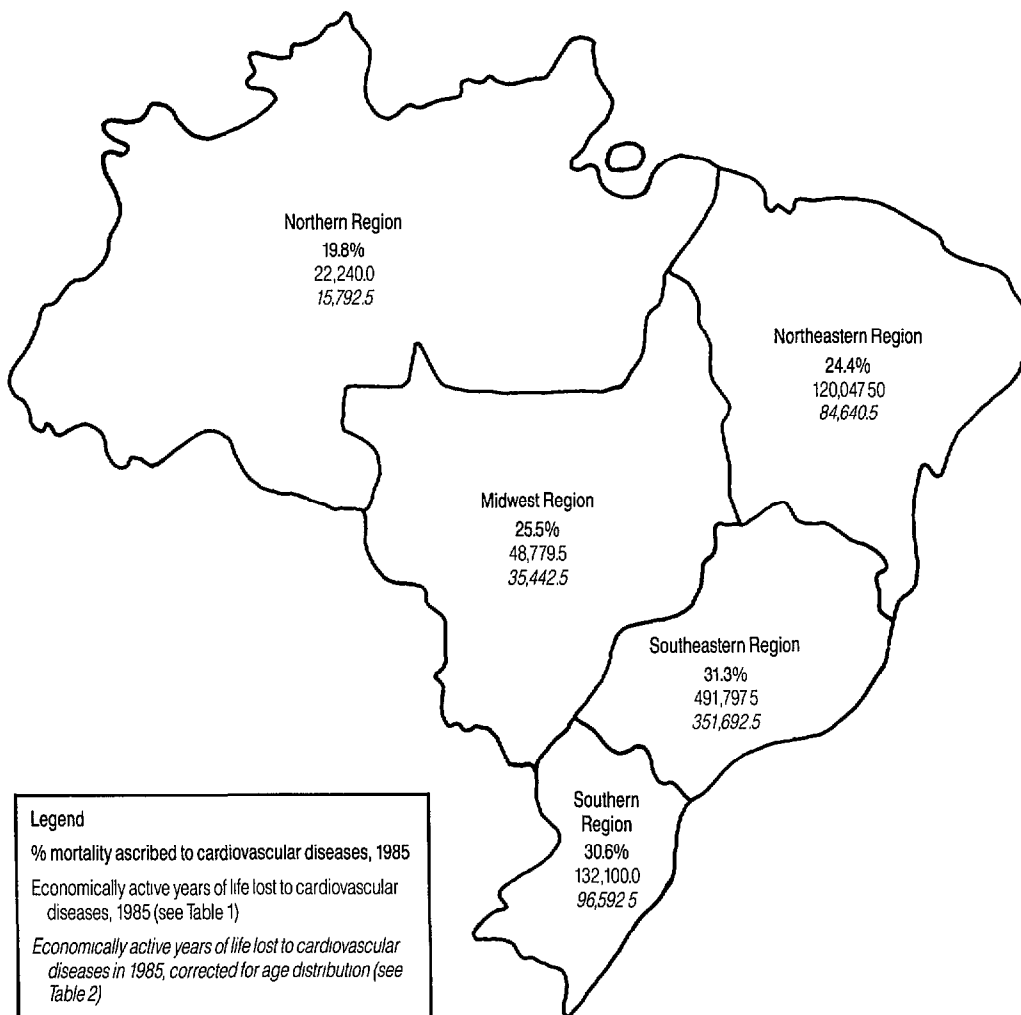
As a result, many cardiovascular disease deaths and retirements have occurred prematurely, cutting off the productivity of a sizable contingent of people at an economically active age. Considering only one problem, high blood pressure, this has ranked as the fourth leading cause of sick leave in the country and the leading cause of retirement due to illness (5). Furthermore, quite aside from the individual and family hardships involved and the lost productivity just mentioned, cardiovascular diseases have levied a high social cost in terms of prematurely initiated benefits and expensive hospitalizations.

To help improve the prevailing cardiovascular disease picture in Brazil, in 1988 a Health Ministry advisory committee completed a plan with well-defined aims and strategies for a National Arterial Hypertension Education and Control Program (6). This plan was subsequently presented to all of the state health secretaries for adaptation and implementation by the states.

¹This article has been published in Portuguese in the *Boletín de la Oficina Sanitaria Panamericana*, 110(2):118–125, 1991.

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Figure 1. A map of Brazil showing the country's five regions, the percentage of 1985 mortality ascribed to cardiovascular diseases in each region (bold type), and the economically active years of life lost to cardiovascular diseases in 1985 (both uncorrected and corrected for age distribution) (7).



MATERIALS AND METHODS

Using the official 1985 government statistics on mortality (7) and the economically active population (8), estimates were made of the following:

1. The number of economically active years lost to premature mortality (deaths among people 15 to 59 years old) caused by cardiovascular diseases in each of the country's five regions—
2. The average number of economically active years lost per person dying;
3. The numbers of economically active years lost to premature mortality from cardiovascular diseases as a percentage of those lost to mortality from all causes except ill-defined causes; and
4. The excess of productive years lost in the North, Northeast, Southeast, South, and Midwest regions;

particular regions (as compared to other regions) and among women (as compared to men), estimated according to the formula used by Laurenti et al. (9).

The initial calculations (yielding the number of economically active years lost to cardiovascular disease) were made using the formula employed by Romeder and McWhinnie (10) to estimate potential years of life lost and reducing that formula's upper limit from 70 years to 60. The resulting figures were then modified by multiplying the number of deaths from cardiovascular diseases in each of our specific age, sex, and regional groups by the respective proportions of the population actually engaged in economic activity according to the official data (see Tables 1 and 2 and Annexes 1 and 2).

The original formula's upper limit of 70 years was reduced to 60 for two reasons. The official statistics stop breaking down the economically active population by age group after age 59, the oldest age category being "60 years and older"; and this hinders modification of the data to consider economic activity within the 60-70 year age group. Also, age 70 would appear to be a high nationwide limit for productivity—especially in view of marked social inequalities and different life expectancies in different regions. In this vein, it is noteworthy that the average age of retirement eligibility for "time of service" is around 65, while 70 is the point of retirement for age.

Regarding economic activity, certain terms used in this presentation are defined as follows:

- The "economically active population" is defined in the same official publication (8) that provides the data on economic activity used here.
- The "true economically active population" of 1985 was that portion of

the population 15 to 59 years old that was actually in the work force that year.

- The population "rightfully active economically" corresponded to the entire 1985 population 15 to 59 years old.
- The terms "economically active years of life lost," "economically active years lost," "productive years lost," and "years lost from the work force" are all regarded as synonymous.

RESULTS

The raw 1985 data in Table 1 and Figure 1 show the economically active years lost to mortality from cardiovascular diseases among people 15 to 59, the totals being 481,052.0 years for men and 333,912.5 for women. As may be seen, in all the regions women appear to have lost more years of productive life per person dying than men. Both men and women suffered slightly higher average losses of economically active life per person dying of cardiovascular diseases in the less developed regions (the North, Northeast, and Midwest) than in the South and Southeast. However, cardiovascular diseases caused higher mortality in these two relatively developed regions; and so in these regions, as Table 1 shows, cardiovascular diseases accounted for a relatively high percentage of all years of economically active life lost to premature mortality.

Modification of the data to reflect economic activity by age group, as shown in Table 2 and Figure 1, raised the average number of years lost per person dying of cardiovascular disease. The increase was especially marked among women, ranging from 1.0 to 2.8 years per woman dying of cardiovascular disease in the various regions, as compared to an increase of 0.2 to 0.8 years per man.

Table 1. Economically active years of life lost to cardiovascular disease mortality among Brazilians 15–59 years old in 1985, by sex, age group, and region. The data shown assume that all people 15–59 were economically active.

Age group (years)	Region											
	North		Northeast		Southeast		South		Midwest		Brazil (total)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15–19	680	935	3,952.5	3,825	9,987.5	8,330	3,400	2,635	1,742	977.5	19,762.0	16,702.5
20–29	1,925	2,625	11,585.0	11,900	38,710.0	31,605	10,465	9,030	4,550	4,165.0	67,235.0	59,325.0
30–39	3,425	2,425	17,225.0	14,350	81,550.0	55,125	18,550	13,950	7,700	6,050.0	128,450.0	91,900.0
40–49	4,155	2,250	20,610.0	16,425	104,160.0	62,940	27,225	17,880	9,525	6,405.5	165,675.0	105,900.0
50–59	2,395	1,425	11,635.0	8,540	62,925.0	36,465	18,380	10,585	4,595	3,070.0	99,930.0	60,085.0
Total	12,580	9,660	65,007.5	55,040	297,332.5	194,465	78,020	54,080	28,112	20,667.5	481,052.0	333,912.5
Mean ^a	13.0	15.4	13.5	14.5	12.3	13.1	11.8	12.9	13.8	14.5	12.5	13.4
% ^b	10.5	18.0	13.4	24.4	18.5	30.1	19.4	28.1	14.8	25.5	17.0	27.3

^a Average number of economically active years lost per person dying.

^b Percentage of economically active years lost to premature mortality that is attributed to cardiovascular disease mortality.

Table 2. The data shown in Table 1, corrected to reflect the age distribution of the work force (see Annex 2).

Age group (years)	Region											
	North		Northeast		Southeast		South		Midwest		Brazil (total)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15–19	382.5	255	2,805	1,317.5	7,310	3,782.5	2,762.5	1,360	1,275	382.5	14,535	7,097.5
20–29	1,750.0	1,190	10,815	5,390.0	36,645	16,450.0	10,080.0	4,725	4,375	1,715.0	63,665	29,470.0
30–39	3,375.0	1,250	16,775	7,125.0	79,275	27,125.0	18,150.0	7,375	7,550	3,900.0	125,125	46,775.0
40–49	3,975.0	1,095	19,628	7,485.0	96,660	26,505.0	25,755.0	8,190	9,045	2,430.0	155,063	45,705.0
50–59	2,080.0	440	10,225	3,075.0	47,950	9,990.0	14,850.0	3,345	3,990	780.0	79,095	17,630.0
Total	11,562.5	4,230	60,248	24,392.5	267,840	83,852.5	71,597.5	24,995	26,235	9,207.5	437,483	146,677.5
Mean ^a	13.2	16.8	13.7	15.4	13.1	15.5	12.4	14.9	14.1	17.3	13.1	15.5
% ^b	11.3	18.7	14.0	25.2	18.7	28.5	21.0	26.6	15.2	28.7	17.3	27.0

^a Average number of economically active years lost per person dying.

^b Percentage of economically active years lost to premature mortality that is attributed to cardiovascular disease mortality.

Table 3. Overburden of years of economically active life lost to cardiovascular disease mortality (as a percentage of all mortality) in the South and Southeast regions compared to other regions, as indicated by both the uncorrected (Table 1) and corrected (Table 2) data.

Regions compared	Overburden (%) ^a indicated by uncorrected data		Overburden (%) ^a indicated by corrected data	
	Men	Women	Men	Women
South/North	+84.8	+56.1	+85.8	+42.2
South/Northeast	+44.8	+15.2	+50.0	+5.5
South/Midwest	+31.1	+10.2	+38.1	-7.9
Southeast/North	+76.2	+67.2	+65.5	+52.4
Southeast/Northeast	+38.0	+23.4	+33.6	+13.1
Southeast/Midwest	+25.0	+18.0	+23.0	-0.7
South/Southeast	+ 4.9	-7.1	+12.3	-7.1

^a Percentage shown = 100 (first region's percentage - second region's percentage) / smallest percentage.

On the other hand, this correction did not notably increase the role of cardiovascular diseases relative to other diseases, despite a slight apparent decline in their role among women in the South and Southeast. In Brazil as a whole, cardiovascular disease deaths in the 15-59 age group accounted for 17% of the productive years lost to men and 27% of those lost to women.

The large role played by cardiovascular diseases relative to other diseases in the South and Southeast—as compared to their role relative to other diseases in the North, Northeast, and Midwest regions—is shown in Table 3. Overall, it can be clearly seen that the relative role of cardiovascular mortality among both men and women was greatest in the South and Southeast, the interregional differences generally being less among women than among men, and that the differences between their role in the South versus the Southeast (see the South/Southeast data on the bottom line) were relatively slight. These findings emerged from both the uncorrected (Table 1) and corrected (Table 2) data,

though correction reduced interregional differences and gave cardiovascular disease among women a greater apparent role in the Midwest Region (see negative figures) than in the South or Southeast.

Similar comparison of cardiovascular diseases' role relative to other diseases in men versus women (Table 4) demonstrated that this role was considerably greater in women than in men. Correction of the data reduced the apparent disparity in all areas except the Midwest Region.

DISCUSSION AND CONCLUSIONS

A closer approximation to reality could be achieved by replacing the upper limit on economically productive life (60 years) with the average retirement age (based on length of service) of men and women in each region—if only these data were readily available. However, such data could not be corrected to reflect the proportion of each age group in the work force.

Within the age range studied, the uncorrected (Table 1) data treat the entire

Table 4. Overburden of years of economically active life lost to cardiovascular disease mortality (as a percentage of all mortality) in females compared to males, as indicated by both the unmodified (Table 1) and modified (Table 2) data.

Region	Overburden (%) ^a indicated by uncorrected data	Overburden (%) ^a indicated by corrected data
	Women/men	Women/men
North	+71.4	+65.5
Northeast	+82.1	+80.0
Southeast	+62.7	+52.4
South	+44.8	+26.7
Midwest	+72.3	+88.8
Brazil	+60.6	+56.1

^a Percentage shown = 100 (female percentage – male percentage) / smallest percentage.

population as “economically active,” even though in 1985 the work force included only 89.6% of the men and 44.5% of the women. The corrected data, though open to criticism, appear to more clearly approximate real losses from the work force. They also make it possible to evaluate part of the measurable social costs of premature mortality from cardiovascular diseases—costs that accumulate from year to year in the form of pensions begun, on the average, 13.1 years (for men) and 15.5 years (for women) before the sixtieth birthdays of those afflicted. An approximate calculation of these costs shows that if a monthly pension equivalent to one minimum wage (US\$70)³ were paid the family of each cardiovascular disease victim dying prematurely in 1985, the gross cost would be about US\$53 million per year (according to the uncorrected data) or US\$36 million per year (according to the corrected data).

Mortality in 1985 from cardiovascular diseases (see Annex 1) was lower in the three less developed regions (2); but the average number of economically active

years lost per person to premature mortality was higher there for both sexes than in the South and Southeast, because death from these diseases tended to come somewhat earlier in the North, Northeast, and Midwest regions. The fact that the average number of economically active years lost increased when modified to reflect the age distribution of the work force (see Tables 1 and 2) suggests that the portion of the population in the work force tended to experience more premature death from cardiovascular disorders than the portion of the population outside the work force.

One reason why death from cardiovascular diseases tended to come earlier in the less developed regions than in the South and Southeast is the fact that socioeconomic conditions—including the quality, quantity, and range of medical care available to the population—tended to be poorer in the less developed regions. The previously noted increase in the average number of years lost when the Table 1 data were corrected to reflect the age distribution of the work force could be partly accounted for by the presence in the workplace of factors that cause and aggravate diseases of the circulatory system.

The fact that the cardiovascular dis-

³Figure effective as of 31 July 1989. The dollar value of the minimum wage varies with current wage policy and the exchange rate.

eases contributed less to economically active years of life lost by those 15 to 59 in the North, Northeast, and Midwest regions than in the South and Southeast suggests the presence of other important causes of premature death (for example, various external causes) prevailing in the populations of those three regions, especially among males.

McGreevey, in his critical analysis of Brazil's high health costs, draws attention to the country's emphasis on curative medicine (3). Excluding hospitalization costs tied to obstetric causes, chronic and degenerative diseases accounted for fully half the cost of admissions to the hospital network under contract with INAMPS in 1985 (2). Of this major share, 77% was paid to cover the 980,568 hospitalizations that year for cardiovascular diseases.

The data gathered for this study indicate that 69.8% of the 1985 deaths from cardiovascular diseases among males and 66.3% of those among females were attributed to hypertensive disease, cerebrovascular disease, and acute myocardial infarction. However, the role of hypertension is larger, because arterial hypertension is strongly associated with morbidity and mortality from the other two causes (11-13). All of this clearly indicates an urgent need for state governments to support implementation of the current National Arterial Hypertension Education and Control Program in order to reduce the toll of cardiovascular disease—not only to save lives but also to improve productivity and promote economic growth.

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ANNEX 1. All deaths and deaths from cardiovascular diseases (latter italicized) among Brazilians 15–59 years old in 1985, by sex, age group, and region.

Age group (years)	Region											
	North		Northeast		Southeast		South		Midwest		Brazil (total)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15–19	453	248	1,698	835	5,266	1,735	1,411	658	630	286	9,458	3,762
	<i>16</i>	<i>22</i>	<i>93</i>	<i>90</i>	<i>235</i>	<i>196</i>	<i>80</i>	<i>62</i>	<i>41</i>	<i>23</i>	<i>465</i>	<i>393</i>
20–29	1,290	537	5,061	1,880	15,295	4,875	3,907	1,410	2,002	699	27,555	9,401
	<i>55</i>	<i>75</i>	<i>331</i>	<i>340</i>	<i>1,106</i>	<i>903</i>	<i>299</i>	<i>258</i>	<i>130</i>	<i>119</i>	<i>1,921</i>	<i>1,695</i>
30–39	1,231	522	4,989	2,257	16,220	6,867	4,013	1,896	1,893	805	28,346	12,347
	<i>137</i>	<i>97</i>	<i>689</i>	<i>574</i>	<i>3,262</i>	<i>2,205</i>	<i>742</i>	<i>558</i>	<i>308</i>	<i>242</i>	<i>5,138</i>	<i>3,676</i>
40–49	1,168	516	5,253	3,155	20,015	9,988	5,684	2,971	2,203	1,122	34,323	17,752
	<i>277</i>	<i>150</i>	<i>1,374</i>	<i>1,095</i>	<i>6,944</i>	<i>4,196</i>	<i>1,815</i>	<i>1,192</i>	<i>635</i>	<i>427</i>	<i>11,045</i>	<i>7,060</i>
50–59	1,347	696	6,181	4,027	28,281	15,819	8,691	4,630	2,454	1,460	46,954	26,632
	<i>479</i>	<i>282</i>	<i>2,327</i>	<i>1,708</i>	<i>12,585</i>	<i>7,293</i>	<i>3,676</i>	<i>2,117</i>	<i>919</i>	<i>614</i>	<i>19,986</i>	<i>12,014</i>
Total	5,489	2,519	23,182	12,154	85,077	39,284	23,706	11,565	9,182	4,372	146,636	69,894
	<i>964</i>	<i>626</i>	<i>4,814</i>	<i>3,807</i>	<i>24,132</i>	<i>14,793</i>	<i>6,612</i>	<i>4,187</i>	<i>2,033</i>	<i>1,425</i>	<i>38,555</i>	<i>24,838</i>
Mean ^a	46.5	44.1	46.0	45.0	47.2	46.4	47.7	46.6	45.7	45.0	47.0	46.1
% ^b	17.6	24.8	20.8	31.3	28.4	37.6	27.9	36.2	22.1	32.6	26.3	35.5

Source of raw data: Ministério da Saúde (7).

^a Average age at death from cardiovascular disease.^b Percentage of overall mortality ascribed to cardiovascular disease.**ANNEX 2.** Percentages of the Brazilian population 15–59 years old in the work force in 1985, by sex, age group, and region.

Age group (years)	Region											
	North		Northeast		Southeast		South		Midwest		Brazil (total)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15–19	56.5	28.4	71.2	34.5	73.1	45.3	81.3	51.6	74.0	37.7	73.3	41.7
20–29	91.8	45.3	93.4	45.4	94.7	52.0	96.2	52.4	96.1	41.3	94.6	49.3
30–39	98.4	51.6	97.4	49.7	97.2	49.2	97.9	52.8	98.0	45.5	97.4	49.7
40–49	95.8	48.9	95.2	45.6	92.8	42.1	94.6	45.9	95.0	37.9	93.9	43.5
50–59	86.8	31.3	87.9	36.0	76.2	27.4	80.8	31.6	86.8	25.4	80.8	30.3
Total	85.7	42.2	88.9	43.0	89.2	45.6	91.8	48.9	91.1	39.6	89.6	44.5

Source of raw data: Fundação Instituto Brasileiro de Geografia e Estatística (8).