

Economic Burden of Severe Cardiovascular Diseases in Brazil: an Estimate Based on Secondary Data

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Summary

Background: The scarce amount of data available in Brazil on the economic burden of cardiovascular diseases (CVD) does not justify the growing concern in regard to the economic burden involved.

Objective: The present study aims at estimating the costs of severe CVD cases in Brazil.

Methods: Cases of severe CVD were estimated based on hospitalized cases lethality and total CVD mortality rates. National data bases and sample studies were used to estimate costs of hospitalization, outpatient care, and social security benefits. Loss of income was estimated from the Burden of Disease in Brazil data.

Results: Approximately two million cases of severe CVD were reported in 2004 in Brazil. That accounts for 5.2% of the population over 35 years of age. The resulting annual cost was at least R\$ 30.8 billion (US\$1=R\$2.93; 2004) (36.4% for health care, 8.4% for social security and employers' reimbursements, and 55.2% due to loss in productivity). That corresponded to R\$ 500.00 per capita (considering 35 year-old and older population) and R\$ 9,400.00 per patient. Direct costs with health care from severe CVD cases accounted for 8% of total national expenditure on health and 0.52% of 2004 GNP (R\$ 1,767 billion = US\$ 602 billion). That corresponded to a yearly average direct cost of R\$182.00 per capita (R\$ 87.00 from public resources) and of R\$ 3,514.00 per case.

Conclusion: Total annual costs per severe CVD case were estimated to be significant. Costs per capita and total costs corresponding to this sub-group of CVD patients are expected to escalate as the population ages and the prevalence of severe cases increases. (Arq Bras Cardiol 2008;91(3):148-155)

Key words: Cardiovascular diseases/epidemiology; ischemic heart disease/epidemiology; cerebrovascular disease/epidemiology; health economics.

Introduction

In recent years, several authors and institutions involved in health promotion and disease prevention have recommended less developed nations to be more prepared to deal with chronic diseases, which are expected to significantly increase their burden on our populations in the next decades¹⁻⁶. Those public health alerts were more emphatic following a publication launched in 2003 by Leeder and cols: "A race against time"⁷. According to the authors, an analysis of the demographic transition taking place in less developed countries would identify a two-decade window opportunity to take action to prevent catastrophic cardiovascular disease (CVD) levels in twenty to forty years' time, as well as resulting economic consequences.

The present study was conducted to estimate the economic burden of cardiovascular diseases based on Brazilian data. With

the purpose of obtaining a (conservative) preliminary estimate of cardiovascular disease economic burden in the country, a group of severe CVD cases was designed. A stepwise approach was developed to estimate socioeconomic impact.

The choice to circumscribe the preliminary estimate to the group of severe CVD cases group exclusively was based on the following considerations:

- 1) the limited availability of data from the public health system and the non-existence of a registry of CVD cases in Brazil;
- 2) within a health-care system still mostly oriented to acute care, this would be the group expected to concentrate most of the disease-related costs in our country; and
- 3) studied sample based on mortality and hospitalization available data could serve as a reproducible estimate.

Methods

Source of data

Source of data included public available data bases on mortality (SIM)⁸, hospital morbidity (SIH-SUS)⁸ and social security (DATAPREV)⁹. Information was additionally gathered from privately conducted Brazilian studies to

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- 1) refine initial estimates of hospitalizations¹⁰;
- 2) estimate outpatient care costs¹¹ and refine hospital care cost estimates¹¹⁻¹²;
- 3) estimate cases and cost distribution across public, insurance and out-of-pocket systems^{10,13}; and
- 4) calculate CVD burden to social-security disability benefits as a whole^{14,15}.

Unless stated otherwise, data refer to individuals who were 35 years old and older in 2004, according to IBGE demographic distribution¹⁶, stratified by gender and 5 year age intervals. The cardiovascular disease category encompasses ICD10 codes I01-I99, also classified as Chapter IX or Diseases of the Circulatory System in the databases referred.

Cases

Cases of severe cardiovascular disease

Sample size for the cases of severe cardiovascular disease was based on the following strategy: severe cases were defined as those admitted to hospital care during reference year (assuming re-hospitalization=0), plus a hypothetical out-of-hospital diseased population with CVD lethality rate equal to inpatient cases. The total number of individuals would have to generate the same number of deaths as CVD inpatients every year estimated as the quotient between the total number of CVD deaths and the hospital lethality. Through this approach, a number of severe CVD cases for each successive 5-year interval from ages 35 to 80 and older was obtained and added up, resulting in the estimated number of severe CVD cases in Brazil, in 2004.

Cardiovascular disease hospitalizations

The number of hospital admissions obtained from the Hospital Information System (SIH-SUS) corresponds to that covered by the public health care system (SUS) only. Data referring to private system are not available. SUS is said to support 72.3% of hospital admissions from all causes (Table 1)¹⁰. This same rate was taken to represent the proportion of CVD hospitalizations covered by SUS. The total number of CVD-related hospitalizations (public plus private hospitals) was calculated by multiplying the SIH-SUS number by the 100/72.3 factor. The same correction was applied to estimate the total number of CVD deaths occurring among hospitalized patients with CVD (CVD hospital lethality).

Table 1 - Distribution of hospital and outpatient coverage and cost: across sectors in the Brazilian health care system

	Hospitalization (%)	Outpatient (%)	R\$ (million)	R\$ %
Public	72.3+	60.5+	66,348*	48
Health Insurance	21.8+	20.6+	26,710	19
Out-of-Pocket	5.9+	18.9+	45,942*	33
Total	100	100	139,000*	100

+ Ref 10; * Ref 13

* personal communication, Dr. Doris Leite, INSS, Porto Alegre

Outpatient assistance

Outpatient care was estimated for the whole population of severe CVD cases, for the whole year, irrespective of hospital admission.

CVD-related disability social - security benefits

The underlying medical causes corresponding to the disability benefits issued by the INSS are not made available by the institution. To estimate the number of CVD-related disability retirements paid for in 2004 we used the proportion CVD/total disability retirements paid in March 2006*. To estimate the number of CVD-related temporary disability benefits paid in 2004 we used the proportion (8.4%)¹⁴ and the average duration (one year)¹⁵ of the CVD-related benefits documented in the city of Porto Alegre in 1998.

Employers' supported sick leaves

According to the Brazilian legislation, disability benefits usually follow 15 days of employers' supported sick leaves. We thus estimated the number of employers' supported sick days as the total number of disability benefits initiated in 2004 multiplied by 15 days. We found no way of estimating the number of employers' supported sick days corresponding to sick leaves when not followed by a social security disability benefit.

Costs

To estimate costs, data preference was ranked, based on quality, as follows: original data focused on health economics; national registry data; national estimates from incomplete registries; and general estimates and extrapolations.

Direct costs

Costs were calculated in Brazilian currency (Reais-R\$) for 2004 (Exchange Rate; 2004: Brazilian Reais (BR R\$) per US\$ = 2.93; BR R\$ per International Dollar (PPP\$) = 1.18).

Hospital costs - public sector

SUS reimbursement values were obtained for each CVD category (IHD, Stroke, Heart Failure and other CVD) and added up, by sex and 5-year age-strata, to represent the cost attributable to all CVD hospitalizations among the population 35 and over for both sexes. Computed separately by the system were payments for specific procedures, like cardiac surgeries and other invasive procedures, not linked to individual medical records. Those values were then directly added to the initial age and sex weighted estimate based on reimbursement values.

A preliminary evaluation of the hospital costs obtained through this approach suggested greatly underestimated values. Informal inquiries made to public health officers and hospital administrators revealed other financial sources to the hospitals budget (significant but difficult to quantify) used to supplement SUS reimbursements to hospitalization costs (see Box 1).

Box 1 - Examples of other sources of financing used by hospitals (public, private, philanthropic, university) which also receive SUS reimbursements for individual hospitalizations

1) Ministry of Education - University Hospitals (manpower payment, construction, reform and equipment, other benefits)
2) Ministry of Health – Federal Hospitals (manpower payment, construction, reform and equipments)
3) State and City Health budgets (manpower payment, equipments)
4) Public budget (parliamentary amendments)
5) National Social Security System – Philanthropic hospitals (waiving of obligatory contribution upon salaries)
6) Private insurance companies (redistribution of money and technological resources between private and public patients)
7) Donations

To improve the estimates, we compared, for heart failure hospitalizations, the average value of SUS reimbursement extracted from the SIH-SUS with an estimate obtained through a detailed registry of all costs associated with the hospital care of heart failure patients hospitalized through the public health system¹¹. In this sample, the annual average length of hospitalization per patient was 19.3 days, corresponding to an annual average cost of R\$ 4,033.2, or an average daily hospital cost of R\$ 205.75. On the average, heart failure SUS reimbursements corresponded to R\$ 660.00 for 5.9 days of hospitalization. If these 5.9 days were remunerated according to the estimated sample values, their cost would amount to R\$ 1,213.00, or 1.8 times the value of the SUS reimbursement. Based on this comparison, we introduced a multiplicative correction factor of 1.8 to our initial estimate of SUS reimbursement from CVD hospitalizations and considered the costs of specific procedures contemplated within this new estimated value.

Out-of-hospital costs – public sector

Estimates of the average direct out-of-hospital cost by case were based in two economic health studies, one on heart failure – R\$ 1,935.30¹² and the other on ischemic heart disease - R\$ 1,488.00¹¹. Both studies used purchase costs for medications and personal expenditures, and public health reimbursement costs for laboratory tests and clinic visits. To estimate the annual out-of-hospital cost by case of severe cardiovascular disease attending the public system we used an interpolation between those values (R\$ 1,711.65). To estimate total outpatient costs supported by the public system, we multiplied the average cost by the SUS coverage of outpatients care: 60.5% (Table 1) of our estimated number of severe CVD cases.

Total CVD-related health care costs – Public sector

The total cost estimate for the public sector was given by the sum of the two previous estimates: hospitalization and outpatient care costs from SUS patients.

Total CVD-related health care costs – all sectors

There is no public-access information on hospitalizations and outpatient costs relative to the fractions of insured and

private practice patients. To estimate the total CVD-related expenses in these sectors we used two alternative strategies.

The first strategy (equal cost/case in all sectors), assumedly conservative, considered per case hospitalization and outpatient care costs relative to severe CVD cases to be equal in the three sectors, and based the total cost estimate on a extrapolation of the public sector cost – corresponding to 72.3% of the hospitalizations and 60.5% of the outpatient care (Table 1) – to the totality of hospitalizations (SUS cost/0.723) and of severe cases of CVD cases in need of outpatient care (SUS cost/0.605).

The second strategy (equal CVD relative budget in all sectors) took into account each sector's total annual health care budget (Table 1). The share corresponding to the care of severe CVD cases within each sector was obtained by applying to each sector total budget the proportion attributed to treating severe CVD cases estimated for SUS patients (8%). The sum of values corresponding to the estimated share of CVD costs within each sector was then taken to more realistically represent the annual total direct cost associated with the health care of severe CVD cases in Brazil.

Disability and early retirement costs

The estimated number of CVD-related disability retirements, and the number and average duration of CVD-related temporary disability benefits (person-years) explained above were multiplied by the corresponding average annual values paid to workers in disability leave or retirement (all causes) in 2004⁹.

Employer's supported sick leaves costs

Half of the monthly value of the temporary disability benefit was used as estimate of direct employer disbursement associated

Table 2 - Population, deaths, estimated numbers of severe CVD cases and annual hospitalizations due to CVD, age 35 and over, Brazil 2004

	Total
Population (35+ years and over)	61,614,117
All Causes Deaths	816,523
Cardiovascular Deaths (2003)	266,736
Proportion of Deaths due to CVD (2003) (%)	32.67
Public Health System (SUS)	
Total Adult Hospitalizations (except pregnancy-related)	5,123,785
Cardiovascular Disease Hospitalizations	1,110,881
Hospital Deaths due to Cardiovascular Disease	89,130
Hospital CVD Lethality (%)	5.68
Estimated All (gender and age standardized)	
Total CVD Hospitalizations (public + private system)	1,536,488
Number of Hospital CV deaths (SUS + private system)	121,770
% of CVD Deaths that occurred in-hospital	45.7
Total number of Severe CVD cases	3,195,516
Outpatients only Severe CVD Cases	1,659,028
Prevalence of Severe CVD cases (%)	5.19

with employee sick leave which has resulted in social security disability benefit (corresponding to the first 15 days of disability). Sick leaves lesser than 15 days were not considered.

Indirect costs

Since data to calculate indirect costs are less consistent, a more general strategy was employed. We used the total years of life lost (YLL) and years lost to disability (YLD) related to cardiovascular disease, according to data from the study Burden of Disease in Brazil¹⁷. The estimated losses were multiplied by the median national monthly wage¹⁶ and adjusted to account for the national unemployment rate in 2004 and the proportion of individuals with physical/mental handicap in the 2001 census data¹⁶.

Results

Cases

Table 2 presents numbers of population, hospitalizations, deaths (all causes and from CVD) and the estimated number of severe CVD cases (all and some specific CVD categories) referent to 2004. Of the 179,108,134 Brazilian inhabitants in 2004, 24,697,754 (13.8%) were men and 26,526,261 (14.8%) were women between 35 and 64 years of age; 4,579,833 (2.6%) were men and 5,810,269 (3.2%) were women 65 years and older. In the same year there were 5,123,463 hospitalizations of ages 30 and over (excluding pregnancy-related hospitalizations), 3,300,921 between the ages of 35 and 64, with 1,822,864 aged 65 and older. Cardiovascular diseases represented 24% of the hospitalizations in the youngest stratum and 49% in the oldest one.

In 2003, CVD responded for 27.4% of all deaths in the group aged 35-64 (26% in men and 30% in women) and 35.9% in the group 65 years and older (31% in men and 35% in women). Deaths occurring during hospitalization represented, respectively, 50.0% and 56.9% of all registered CVD deaths in men and women between the ages of 35 and 64, and 43% of CVD deaths in both sexes ages 65 and over. Using our strategy, we estimated a total of 1,508,125 individuals between the ages of 35-64 and 1,717,397 with ages 65 and over with severe CVD in 2004 (Table 2).

Direct costs

Steps for estimating health care expenditure with severe CVD cases in Brazil in 2004 are presented for the Public Sector (Table 3) and for all sectors (Table 4). In 2004, the public health system paid R\$ 1,139,363,988.84 in hospitalizations due to cardiovascular diseases. Additionally, it reimbursed separately as specific procedures 35,076 cardiac surgeries with a cost of R\$ 243,937,076.36; 40,686 interventional and electrophysiological procedures costing R\$ 202,563,413.43; 18,324 pacemaker related procedures costing R\$ 149,871,335.09 (including the implant of 515 cardioverter-defibrillator and multisite pacemaker devices, with a cost of R\$ 17,326,073.35) and 12,930 major vascular surgeries costing R\$ 26,610,405.45. The reimbursement of all those procedures totaled R\$ 622,982,230.31. After adjustments by the correction factor the total public health

Table 3 - Steps to estimate direct cost of treating severe CVD cases in the public sector (SUS), Brazil 2004

	Reais (R\$)
Hospitalization	
Average reimbursement per CVD hospitalization	1,025.64
Total reimbursement, CVD hospitalizations	1,139,363,988.84
CVD Surgeries & Interventional Procedures	622,982,230.31
Initial estimate, CVD hospitalizations	1,762,346,219.15
Adjusted average reimbursement per CVD hospitalization	1,846.15
Final estimate of the annual cost of CVD hospitalizations	2,050,855,179.91
Outpatient	
Estimated annual cost per patient	1,711.63
Estimated annual cost of outpatient care, severe CVD cases	3,309,072,335.90
Total	
Estimated annual cost of treatment, severe CVD cases - SUS	5,359,927,515.82

Table 4 - Direct health care cost of treating severe CVD cases for all sectors (SUS + Insured+ Out-of-pocket), Brazil, 2004

	Reais (R\$)
Strategy 1 (equal cost/case in all sectors)	
Annual cost of hospitalizations – SUS	2,050,855,179.91
Total hospitalization costs (SUS/72.3%)	2,836,590,843.58
Annual cost of outpatient care, severe CVD cases - SUS	3,309,072,335.90
Annual total cost of outpatient care, severe CVD cases - (SUS/60.5%)	5,469,540,051.07
Strategy 1: Annual total cost of care	8,306,130,894.65
Strategy 2 (equal CVD relative budget in all sectors)	
Public expenditure, all causes	66,348,000,000.00
Public expenditure, CVD	5,359,927,515.82
Proportion of expenditure CVD / all causes SUS (%)	8
Private insurance expenditure, all causes	26,710,000,000.00
Out-of-pocket expenditure, all causes	45,942,000,000.00
Total health-care expenditure, all causes	139,000,000,000.00
Annual cost of care, severe CVD cases – private insurance	2,157,769,090.00
Annual cost of care, severe CVD cases - out-of-pocket	3,701,142,747.00
Strategy 2: Annual cost of care	11,229,124,083.00

expenditure reached R\$ 2,050,855,179.91 in hospitalizations and R\$ 3.309.072.335,90 in outpatient care.

Estimated expenditure by privately insured and out-of-pocket sectors in hospitalization and outpatient care for

severe CVD cases using number of cases share strategy was R\$ 8,306,130,894.65 (Strategy 1). The chosen strategy based on total expenditure share resulted in an expenditure of R\$ 11,229,124,083.59 (Strategy 2) (Table 4; A in Box 2). Thus, according to the approach adopted, total yearly direct costs to the Brazilian society attributable to severe CVD cases corresponded to R\$ 11,229,124,083.00 distributed among public (R\$ 5,359,927,515.00), privately insured (R\$ 2,157,769,095.00) and out-of-pocket (R\$ 3,711,427,472.00) sectors in Brazilian health care system.

Disability and early retirement costs

In March 2006, 300,757 disability retirements attributed to underlying CVD causes were being paid for by the National Institute of Social Security (INSS) (personal communication). This number corresponds to 20% of the severe CVD cases estimated for the population aged 35-64. At values of 2004, their average annual cost would be R\$ 4,974.00. Considering an average retirement period of 3.7 years, a direct cost of at least R\$ 5,535,071,676.60 would be attributed to the current stock of CVD disability retirements of formal workers affiliated to the INSS, with average annual payments of R\$ 1,495,965,318.00 at 2004 values (B. in Box 2).

In addition to retirements, 1,726,000 temporary disability benefits (with an average duration of one year) were paid in 2004, 8.4% of them being attributed to CVD, corresponding to 144,984 benefits—representing an additional 10% of the estimated severe CVD cases among those aged 35-64. At 2004 values, each benefit would be expected to cost R\$ 7,176.00 per year, and the total annual cost of CVD temporary disability benefits would amount to R\$ 1,040,405,184.00 (C. in Box 2).

Box 2 - Cardiovascular disease economic impact: Calculation Pathways^a

A. Direct Costs of health care for Severe CVD cases:

[3,195,516 severe hospital and non hospital CVD cases]
[1,536,488 annual CVD hospitalizations]
R\$ 11,229,124,083.59

B. Costs of Social Security Disability Retirements:

[300,757 CVD disability retirements (2006)] x
[Mean annual benefit value (all causes-2004) ~ (R\$ 4,974.00)] =
R\$ 1,495,965,318.00

C. Costs of Social Security Temporary Disability Benefits:

[144,984 temporary disability benefits due to CVD (8.4% of 1,726,000)] x
[Average annual benefit value (R\$ 7,176.00)] =
R\$ 1,040,405,184.00

D. Employers Costs of Sick Leave:

[144,984 temporary disability benefits due to CVD (8.4% of 1,726,000)] x
[15 days employers cost] x [average daily wage R\$18.4] =
R\$ 40,015,584.00

E. Indirect Costs - Economic Burden Estimated from GBD-BR:

[4,989,406 DALYs attributed to CVD (1998)] x
[median national monthly wage (R\$ 380.00)] x
[adjusted for unemployment (11.40%) & handicap (15.6%) rates] =
R\$ R\$ 17,013,350,772.00

TOTAL costs of CVD (severe cases) in Brazil 2004

A+B+C+D+E = R\$30,818,860,941.59

^a see methods – costs.

Additionally to the social security benefits, employers are responsible for the payment of the first 15 days of temporary sick leave at worker's usual wages. Using national average wages, this resulted in an estimated cost of R\$ 40,015,584.00 per year (D. in Box 2).

Indirect Costs

According to the 1998 Brazilian Burden of Disease Study, ischemic heart disease was responsible for 1,679,821 YLL (years of life lost) and stroke for 1,475,019 YLL, the two major causes of YLL in Brazil, representing 17.4% of all YLL. Total cardiovascular disease corresponded to 4,465,827 YLL and an additional 523,579 YLD (years lost to disease) resulting in 4,989,406 DALYs (disease adjusted life-years) lost¹⁸. Considering a median monthly wage of R\$ 380.00¹⁶ and 4,989,406 DALYs, discounting for an unemployment rate of 11.40%¹⁶ and for an estimate of physically or mentally handicapped population of 15.6%¹⁶, the total yearly loss of income due to cardiovascular disease would represent R\$ 17,013,350,772.00 (E. in Box 2).

Potential economic impact on national economy

According to our estimates, it was possible to attribute a health expenditure of R\$ 11.2 billion and social security costs of R\$ 2.57 billion to severe CVD in 2004, representing roughly 0.64% and 0.16%, respectively, of the Gross National Product (of R\$ 1,766 billion). Moreover, an additional potential loss of 0.97% of the GNP was attributed to lost income (Table 5).

Considering these numbers, severe cardiovascular diseases represented a potential impact of R\$ 30.8 billion, corresponding to 1.74% of the GNP in that year. This amount corresponded to R\$ 500.00 per capita (considering the 35-year-old and older population) and R\$ 9,640.00 per patient. Direct costs with health care of severe CVD cases represented 8% of the total national expenditure on health and 0.52% of the 2004 GNP (R\$ 1,767 billion = US\$ 602 billion). This corresponded to an average annual direct cost of R\$182.00 per capita (R\$ 87.00 from public resources) and of R\$ 3,514.00 per case.

Discussion

Two aspects were critical in obtaining data to reach a final economic burden estimate of CVD in Brazil: lack of a reliable nationwide registry of cardiovascular disease cases, and paucity of available data from health insurance and out-of-pocket segments. Thus we developed stepwise strategies to develop reliable but probably conservative global estimates. Additionally, except for the population as a whole (target of health promotion strategies) and those who died from CVD within a specified period of time, it is difficult to establish the number of individuals presenting intermediate “levels” of the “natural history” of CVD diseases at any given moment. To estimate CVD-related costs, not only the choice of this sub-group of cases needs to make sense but also its estimate needs to be easily reproducible for comparisons across time and space.

The strategy of selecting severe CVD cases to initiate this analysis was based on the assumption that severe cases

would be expected to have great impact on health care costs. The strategy produced a curve of prevalence rates by age which was very consistent with an expected exponential rise of severe cases occurrence. Total prevalence estimate for the population over 35 years of age was low (only 5%). As it can be seen in Figure 1, this low overall rate is possibly explained by the age structure of our population. The alert from Leeder et al⁷ is easily projected from this figure: the aging of the Brazilian population must be expected to significantly increase the burden of CVD and related disabilities and deaths in the next decades. It must be emphasized that the strategy of assuming yearly re-hospitalizations equal to zero equaled the number of hospitalizations with the number of cases to which the hospital mortality was referred – resulting in the lowest possible hospital lethality and, correspondingly, the highest possible estimate of the number of severe CVD cases in the population.

The criteria adopted for selecting data sources and making assumptions were always conservative, placing economic estimates closer to the lowest possible costs. However, we found that estimates of hospitalization costs based on SUS reimbursements only were unrealistically low. Other variable and non-measurable funding sources were found to support hospitalization costs in addition to SUS reimbursements (Box 1). Thus, to reach more realistic estimates of hospitalization costs we adjusted the SUS reimbursement values using measured direct costs obtained in a survey with a selected sample of SUS patients¹².

Estimates of outpatients' treatment direct costs were based on purchase costs for medications and personal expenditures, and public health system reimbursements for laboratory tests and clinic visits. Public reimbursements are

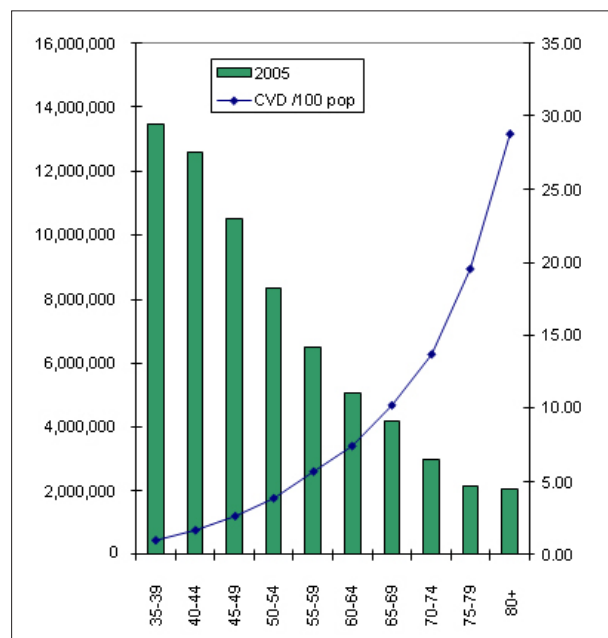


Figure 1 - Severe cardiovascular diseases rates (line) and size of correspondent population (bars) across 5-year age strata. Brazil, 2004

expectedly underestimated, but medication costs may be overestimated if purchase prices are negotiated, considering the huge amounts of medications bought by SUS.

From the privately insured and out-of-pocket segments only information on annual budgets and relative coverage of hospitalizations and out-of-patient care for all causes (Table 1) were made available. We had no access to CVD hospital and outpatient data. Even acknowledging the risks of proposing cost estimates based on such scarce information, the significance of private sector contribution to the general health care budget (R\$72 of 132 billion) and assistance (26.7% of the hospitalizations and 39.5% of the outpatient care) required an attempt had to be made. The disclosure of data available and of the strategies used to attain estimates of costs attributable to the care of severe CVD cases for each segment are expected to stimulate health administrators with access to better data to compare information and further contribute to making it better.

Approximately 300,757 disability retirements and 144,984 temporary disability benefits were due to CVD. Those numbers account for 30% of our estimated number of severe CVD cases in the 35-64-year-old range. The estimates seem adequate, considering the low coverage of our employed population by the National Social Security System (40%) and the healthy worker effect, which tends to expel the sick from the work force. Full disclosure of subjacent medical causes to social security temporary and definitive disability benefits would be a great contribution to estimate the burdens of different diseases.

The less severe cases were not included in the calculation. Their numbers could be roughly estimated aiming at building a preliminary draft to complete the epidemiologic scenario (Figure 2). Based on random domiciliary surveys of adult population limited samples¹⁹, the prevalence of symptomatic heart disease reached around 6% (approaching the value corresponding to the severe cases estimate) and the prevalence of hypertension (≥ 160 and/or ≥ 95 mmHg) was approximately 15%, making it logical to estimate that 10 to 15% of the adult population has CVD of clinically lower severity. According to this estimate, in three years, the HIPERDIA Program registered more than four million hypertensive patients in follow-up.

Even choosing conservative strategies to estimate costs - which included focusing this analysis on severe cases only - we found that CVD does have significant impact in Brazilian economy (Table 5). It is also evident from Figure 1 that its burden will increase in an accelerated pace in the next decades, keeping pace with current aging in our still young population.

The translation of the epidemiologic data into economic information is an interesting exercise. It helps us to cross-check validity data across both fields. We showed that total annual costs per severe CVD case are significant, even at still low rates of severe disease (5% of those older than 35 years of age) given the age-structure of our population. Costs per capita and total costs corresponding to this sub-group of CVD patients are expected to escalate as the population ages and the prevalence of severe cases increases. Through the estimates presented, the authors do expect to have provided more intelligible arguments for political decisions encompassing CVD prevention not only by the health sector but by the society as a whole.

Table 5 - Cardiovascular Diseases: Economic Impact. Brazil, 2004.

National Health Expenditure	Brazilian Reais (Millions)	% GDP	% THE
Gross Domestic product (GDP)	1,766,621	100	--
General government expenditure (GGE)	592,613	33.5	--
Total expenditure on health (THE)	139,000	7.80	100
General government expenditure on health	66,348	3.76	48.1 (THE) 11.2 (GGE)
Non-governmental expenditure on health	72,652	4.04	51.9 (THE)
Severe CVD Cases National Expenditure			
Direct Health Care Costs	11,229	0.64	8.08
Social security Costs	2,576	0.16	--
Disability retirements	1,495.9	0.08	--
Temporary disability benefits	1,040.4	0.06	--
Employers Expend. Sick leaves	40.0	0.02	--
Indirect Costs: GBD-BR Estimates	17,013	0.97	--
Total Costs	30,818	1.74	--
Annual Per Capita Expenditure on health care of severe CVD cases			
Total	182.20		
Government	87.00		
Annual Cost per Severe CVD Case			
Direct Health Care Cost	3,514.00		
Total Cost	9,644.13		

Exchange Rate (2004): Brazilian Reais (BR R\$) per US\$ = 2.93; BR R\$ per International Dollar (PPPS) = 1.18.

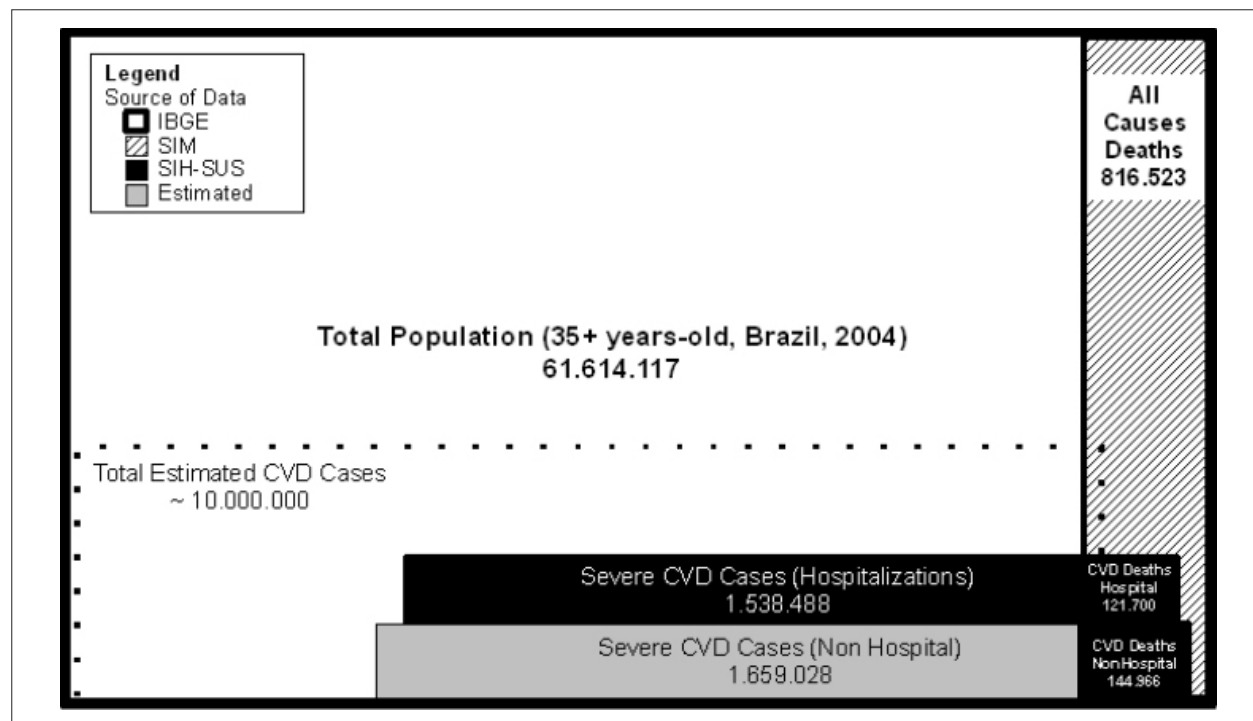


Figure 2 - Distribution of Cardiovascular diseases cases estimates in population aged 35 years and older, Brazil, 2004

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any graduation program.

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