Benefits granted due to cardiovascular disease in Recife, Pernambuco, Brazil, 2011-2015

Benefícios por doenças cardiovasculares na cidade do Recife, Pernambuco, no quinquênio 2011–2015

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ABSTRACT | Background: Social security benefits reflect the socioeconomic impact of work incapacity by disease. Cardiovascular diseases (CVD) are the main cause of mortality and mortality worldwide. **Objective:** To evaluate benefits granted due to CVD in Recife, Pernambuco, Brazil, from 2011 to 2015, from the clinical and economic perspective. **Methods:** Cross-sectional and descriptive study which collected and analyzed data on benefits granted for disability caused by CVD by the executive management of the National Social Security Institute in Recife, via the Unified System of Information on Benefits. **Results:** 186,058 benefits were granted from 2011 to 2015, 8,968 (4.8%) corresponded to CVD, of which 6,049 (67.5%) were selected for analysis because they corresponded to the most frequent diseases. About 78% of the beneficiaries were male and 63.8% were within age range 45 to 59 years old. Stroke and heart failure (HF) accounted for the longest sick leaves (133 to 138 days) and highest benefit amounts (about BRL 3,900.00 per month). **Conclusion:** While hypertension does not result in as long leaves and costs, it should be prevented for being a significant cause of stroke and HF, both of which account for longer sick leaves and higher social security costs. Improving the quality of life of the population seeks to reduce their impacts on the social security system, the world of work and society at large.
Keywords | insurance benefits; social security; cardiovascular diseases; insurance, disability; occupational health services.

RESUMO | Introdução: Os benefícios previdenciários refletem o impacto socioeconômico gerado pela incapacidade ao trabalho por motivo de doença. As doenças cardiovasculares (DCV) são as principais causas de mortalidade e morbidade no mundo. **Objetivo:** Avaliar, clínica e economicamente, os benefícios previdenciários concedidos por DCVs no Recife, Pernambuco, no quinquênio 2011–2015. **Métodos:** Estudo descritivo, de corte transversal, com coleta de informações e análise dos benefícios por incapacidade pelas DCVs na gerência executiva do Instituto Nacional do Seguro Social no Recife, por intermédio do Sistema Único de Informações de Benefícios. **Resultados:** No quinquênio 2011–2015 foram concedidos 186.058 benefícios. Destes, 8.968 (4,8%) foram por DCVs, entre os quais 6.049 (67,5%) foram selecionados por serem as doenças mais frequentes. Dos beneficiários, 78% são masculinos e 63,8% estavam na faixa etária entre 45 e 59 anos. O acidente vascular encefálico (AVE) e a insuficiência cardíaca (IC) foram responsáveis pela maior duração de afastamento ao trabalho (entre 135 e 138 dias) e pelo maior valor do benefício (próximo de R$ 3.900 mensais). **Conclusão:** Embora a hipertensão arterial sistêmica não acarrete um afastamento tão longo e não seja tão dispendiosa, ela deveria ser prevenida, por ser causa importante de AVE e IC, duas das principais DCVs responsáveis por maior custo e número de dias de absenteísmo. A melhoria da qualidade de vida da população visa à atenuação do impacto na Previdência Social, no mundo do trabalho e na sociedade como um todo.
Palavras-chave | benefícios do seguro; Previdência Social; doenças cardiovasculares; seguro por invalidez; serviços de saúde do trabalhador.

INTRODUCTION

The Brazilian social security system provides compensation or coverage for health problems that limit social performance. The National Social Security Institute (Instituto Nacional do Seguro Social – INSS) is the agency responsible for granting benefits, which consist of monthly payments made by the Social Security administration to the insured or their dependents[1].

Statistical data show that the annual amounts expended in sick pay increased by 24%, on average, from 1999 to 2003 and by about 36% from 2004 to 2013[2,3]. Social security benefits are reliable indicators of the main causes of disease that lead to sick leaves and higher risk of disability retirement and death[4].

Cardiovascular diseases (CVD) stand out among the disabling health problems. CVD are undergoing epidemiological transformation in Brazil since the past century, possibly due to changes in the lifestyle of people, also in the workplace[5-7]. Stroke is considered a CVD for sharing in the atherosclerotic pathophysiological process and risk factors[8]. According to estimates, the *per capita* cost of patients with CVD is significantly increasing as a function of the aging of the population, with consequent elevation of the prevalence of severe cases. Indeed, this phenomenon already has perceptible effects for the social security system, as the amounts expended in sick leaves due to CVD were BRL 354,809.849.44 in 2011 and BRL 380,402,308.87 in 2015[9,10].

CVD might be related to work through several Social Security Technical Nexus, rather than the Social Security Epidemiological Technical Nexus (Nexo Técnico Epidemiológico Previdenciário – NTEP) alone. NTEP consists in the statistical-epidemiological relationship between disease code and economic activity to which an employee's job corresponds. The basis for this relationship is the history of benefits grated by INSS and led to increase the reports of diseases presumably caused by work as indicated by the codes entered in medical certificates[11].

Considering that new studies might be operationally feasible, that a large number of countries is concerned with the amounts expended in disability benefits, that regional up-to-date studies on benefits granted due to CVD are scarce, that results might serve to improve social security assessments and that the investigator is a social security legal medical expert at the Executive Management (Gerência Executiva – GEX) of INSS, Recife, Pernambuco, Brazil, the aim of the present study was to analyze the benefits granted as a function of the five main types of CVD that affected the insured who requested social security benefits in the district of interest.

METHODS

For the present cross-sectional and descriptive study, data collection was performed at Northeastern Regional Superintendence, an INSS department located in the city where the investigator lives. The study also included analysis of the benefits granted for CVD in Recife from January 2011 to December 2015 recorded in the Unified System of Information on Benefits (Sistema Único de Informações de Benefícios – SUIBE) which is a kind of corporate informatics system.

In the present study we performed a clinical and economic analysis of social security disability benefits due to CVD. Next we selected the following International Classification of Diseases codes: I10 (essential (primary) hypertension), I20 (angina pectoris), I21 (acute myocardial infarction), I50 (heart failure) and I64 (stroke). Congenital malformations, valve diseases and secondary hypertension — which were the main types of CVD considered in other studies — were excluded.

Data for the following variables were extracted: benefit duration (days), benefit onset date (BOD), benefit end date (BED), enrolment occupational status, salary range, economic activity, sex, age range and previous monthly income.

Next we categorized the granted benefits as follows:
- social security sick pay, code 31: social security benefit granted after 15 days of sick leave;
- social security disability retirement, code 32: social security benefit of indefinite length granted independently from the fact the beneficiary receives or not sick pay;
- accident sick pay, code 91: social security benefit granted after 15 days of sick leave due to a work-related accident;
- accident disability retirement, code 92: social security benefit of indefinite length granted for a work-related accident.

The procedures for data collection were:

- document search: search in SUIBE database for benefits due to CVD granted by GEX – Recife and distribution of CVD per benefit code. This step was performed following the granting of a Letter of Consent, Authorization for Data Use and approval by the research ethics committee of Federal University of Pernambuco (Universidade Federal de Pernambuco – UFPE), Certificate of Presentation for Ethical Appraisal (Certificado de Apresentação para Apreciação Ética – CAAE) no. 54694416.7.0000.5208, final clearance ruling no. 2,324,172;
- structured forms with preset script designed on Excel spreadsheets containing the variables of interest

The present study did not have external funding.

STATISTICAL ANALYSIS

The data are expressed as absolute and relative frequencies in the case of categorical variables and mean, standard deviation and median were calculated; numerical variables are expressed as 25th and 75th percentiles. Association between two categorical variables was investigated by means of Pearson's χ^2 test. Categorical and numerical variables were compared by means of the Mann-Whitney (2 categories) or the Kruskal-Wallis (more than 2 categories) tests, especially distribution of sick leave length per ICD code and social security benefit code, and of monthly pay amount per the variables of interest (sex, age range, ICD code and benefit code). Normality of distribution was assessed by means of the Shapiro-Wilk test. The margin of error for decision on statistical tests was 5%. The data were entered into an Excel spreadsheet and analyzed with *Statistical Package for the Social Sciences* (SPSS) version 23[12,13].

RESULTS

A total of 186,058 social security disability benefits were granted in Recife from 2011 to 2015; 8,968 (4.8%) corresponded to CVD, of which 6,048 (67.5%) were attributed the ICD codes selected for the present study and were included for analysis.

Table 1 shows that most benefits were granted to males (77.6%) and the largest proportions to individuals aged 50 to 54 (23.5%), 55 to 59 (23.4%), 45 to 49 (16.9%) and 60

Table 1. Clinical and occupational characteristics of benefits granted due to cardiovascular disease in Recife, Pernambuco, Brazil, 2011–2015 (n=6.049).

Variable	n	%
Sex		
Male	4,694	77.6
Female	1,355	22.4
Age range (years)		
20 to 24	28	0.5
25 to 29	83	1.4
30 to 34	173	2.9
35 to 39	314	5.2
40 to 44	548	9.1
45 to 49	1,024	16.9
50 to 54	1,419	23.5
55 to 59	1,415	23.4
60 or 64	882	14.6
65 or 69	137	2.3
70 or older	26	0.4
Economic activity		
Commerce	5,834	96.4
Public sector	10	0.2
Rural	114	1.9
Industry	2	0.0
Unload	2	0.0
Freight transport	87	1.4
Social security affiliation		
Employed	3,361	55.6
Self-employed	1,043	17.2
Unemployed	1,052	17.4
Domestic	308	5.1
Facultative	89	1.5
Special insurance	111	1.8
Contractor	85	1.4
Income range (times the equivalent of the minimum wage)		
<1	2,890	47.8
1 to <2	2,178	36.0
2 to <3	610	10.1
3 to <4	223	3.7
4 to <5	120	2.0
5 or <6	27	0.4
6 or more	1	0.0
ICD-10 code		
I10	1,216	20.1
I20	826	13.7
I21	1,148	19.0
I50	1,097	18.1
I64	1,762	29.1
Social security code		
31	4,790	79.2
32	1,135	18.8
91	100	1.6
92	24	0.4

ICD: International Classification of Diseases.

to 64 (14.6%) years old, the frequency of other age intervals varied from 0.4% to 9.1%. The vast majority of cases (96.4%) corresponded to individuals involved in commerce. The most frequent categories of enrolment occupational status were employed (55.6%), self-employed (55.6%) and unemployed (17.4%). About 47.8% of the beneficiaries earned less than the equivalent of the minimum wage, 36.0% up to less than twice the equivalent of the minimum wage and 10.1% up to less than three times the equivalent of the minimum wage.

Table 1 further shows that among the analyzed ICD codes, the largest percentage corresponded to I64 (29.1%) and the lowest to I20 (13.7%), the frequency of the other 3 ICD codes varied from 18.1% to 20.1%. Almost half (49.2%) of the social security benefits granted corresponded to code 31, followed by code 32, 18.8%. A total of 124 (2.1%) accident benefits were granted, 1.6% corresponding to code 91 and 0.4% to code 92.

Table 2 shows that the mean and median benefit length was longer for the men compared to the women (mean: 119.69 vs. 112.17 days; median: 107.00 vs. 98.00 days), for individuals within age range 60 years old or older (mean: 132.91 days; median: 121.00 days), followed by 50 to 59 years old (mean: 119.03 days; median: 107.00); for the other age

ranges the mean length varied from 107.57 to 111.79 days and the median length from 87.00 to 97.00 days. The mean length was also longer for ICD I64 (149.85 days) followed by ICD I50 (146.28 days), while ICD I70 was associated with the shortest length (76.60 days). The median length was highest for ICD I50 (138.00 days) followed by ICD I64 (135.00 days) while the shortest was associated with ICD I10 (66.50 days). The mean and median length was longer for benefit code 31 compared to code 91 (mean: 118.41 vs. 93.73 days; median: 105.00 vs. 87 days).

Significant difference was found among the categories of all the analyzed variables (p<0.001). The multiple comparison tests evidenced significant difference: for age ranges 50 to 59 years old and 60 and older relative to all other age intervals and analyzed variables. Significant difference was found on paired comparison of all the analyzed ICD codes, except for I20 vs. I21 and I50 vs. I64.

Table 3 shows that the mean and median total benefit amounts were higher for the men compared to the women (mean: BRL 4,458.02 vs. BRL 2,992.01; median: BRL 3,462.04 vs. BRL 2,454.07) which denotes significant difference as a function of sex. The mean and median amounts increased together with age: mean of BRL 3,208.87 and median of BRL 2,421.70 for age range 20 to 29 years old, and BRL 4,840.25 and BRL 3,785.75, respectively, for age range 60 and older. The highest mean amount corresponded to ICD I64 (BRL 4,994.20) followed by I64 (BRL 4,712.94), while the lowest to I10 (BRL 2,504.12). The median value was highest for ICD I50 (BRL 3,952.94) followed by I64 (BRL 3,897.87) and lowest for ICD I10 (BRL 1,958.69). The corresponding mean and median values were higher for benefit code 31 compared to code 91 (mean: BRL 4,112.65 vs. BRL 3,881.82; median: BRL 3,204.53 vs. 3,129.69).

Significant difference was found among the categories of all the analyzed variables, except for benefit codes (p<0.001). Significant difference was found on paired comparison of all age ranges, except for 20–29 vs. 30–39, and on paired comparison of all ICD codes, except for I20 vs. I21 and I50 vs. I64.

Table 2. Distribution of sick leave length (in days) according to variables of interest (sex, age range, ICD code and social security benefit code), Recife, Pernambuco, Brazil, 2011–2015 (n=6,049).

Variables	Statistic measures		
	Median	P25	P75
ICD-10 code			
I 10	66.50 (A)	40.00	101.00
I 20	98.00 (B)	69.00	139.00
I 21	100.0 (B)	71.00	138.00
I 50	138.00 (C)	100.00	184.00
I 64	135.00 (C)	90.00	196.00
p value	p² <0.001*		
Social security code			
31	105.00	68.00	156.00
91	87.00	56.00	131.50
p value	p¹ <0.001*		

ICD: International Classification of Diseases; *significant difference at 5.0%; ¹Mann-Whitney test; ²Kruskal-Wallis test with multiple comparisons. Different letters between brackets indicate significant difference between the corresponding characteristics

DISCUSSION

According to the results of the present study, the rate of benefits granted for CVD in Recife from 2011 to 2015

was relative low (4.8%) compared to the national total recorded by the Social Security Technology and Information Company (Dataprev)[10] (8%). Two hypotheses might be put forward to account for this discrepancy: underreporting of the underlying disease and higher mortality by CVD due to difficult access to social security services and precarious health. One further hypothesis is low enrolment within the social security system in Recife for social and labor-related reasons.

The vast majority of sick pay benefits granted (almost 80%) points to high cardiovascular morbidity within the analyzed sample, while the rate of disability retirement

Table 3. Monthly benefit amounts per variable of interest, Recife, Pernambuco, Brazil, 2011–2015 (n=6,049).

Variables	Median	P25	P75
Sex			
Male	3,462.04	2,127.60	5551.47
Female	2,454.07	1,499.40	3,912.75
p value	p[1] <0.001*		
Age range (years)			
20 to 29	2,421.70 (A)	1,498.98	4,061.21
30 to 39	2,653.87 (A)	1,525.01	4,339.20
40 to 49	2,868.96 (B)	1,795.93	4,617.19
50 to 59	3,412.60 (C)	2,098.65	5,439.02
60 or older	3,785.75 (D)	2,250.49	5,892.38
p value	p[2] <0,001*		
ICD code			
I 10	1,958.69 (A)	1,114.60	3,176.54
I 20	3,342.67 (B)	2,060.45	5,697.50
I 21	3,256.10 (B)	2,124.23	5,017.97
I 50	3,952.94 (C)	2,709.48	5,580.52
I 64	3,897.87 (C)	2,405.07	5,977.12
p value	p[2] <0.001*		
Social security code			
31	3,204.53	1,954.80	5,148.27
91	3,129.69	1,722.42	5,086.87
p value	p[2] =0,354		

ICD: International Classification of Diseases; *significant difference at 5.0%; [1]Mann-Whitney test; [2]Kruskal-Wallis test with multiple comparisons. Different letters between brackets indicate significant difference between the corresponding characteristics.

was almost 20%. In two previous studies, the conditions analyzed were all CVD instead of some particular types, as in the present study. In a local study (Recife, Pernambuco), the rate of sickness benefits was close to 11% and the one of disability pension was 23.62%[14]. In a study conducted in another state (Campina Grande, Paraíba)[15] the rate of disability pension was 25.3%.

In regard to the clinical profile of the benefits granted for CVD, the predominant age range of the beneficiaries was 45 to 59 years old (about 64%) which is the one considered as of maximum professional development[16]. This finding is similar to the results of the aforementioned study conducted in Recife: almost 50% of the sick pay benefits and 60% of disability retirement cases corresponded to individuals aged 39 to 58 years old. It is also similar to the results of the study conducted in Paraíba[15], since almost 60% of the disability retirement benefits were granted to individuals aged 40 to 59 years old.

Stroke was the CVD associated with the largest rate of benefits granted (29.1%). Differently, in a local study[14] the most common cause was hypertension (about 25%). Hypertension is a less frequent cause of work incapacity in the present time, given the fast clinical recovery of patients. However, it is also a relevant cause of stroke, and thus it cannot be neglected.

In the present study, most beneficiaries were male. Similarly, one study conducted in Brazil and two in Europe found that most benefits for CVD were granted to men[16-18]. Also the rate of acute myocardial infarction and retirement was higher among men, while hypertension predominated among women. A metabolic difference between the sexes might be probably involved, either due to the hormonal factor (estrogen) favoring women, or to simultaneous risk factors (as e.g., dyslipidemia and unhealthy lifestyle) which make men more vulnerable to cardiovascular events. In addition, one might mention the resistance of men to seek treatment and rehabilitation, but continue working even when with pain and/or discomfort[8,19].

The length of sick leaves due to CVD varied from 60 to 150 days. The benefit duration might be possibly associated with the waiting time for diagnostic tests and procedures or with the access to specialists for appropriate treatment. One additional factor is the natural history of disease; recovery is faster for hypertension, usually occurring in less than 15 days, thus resulting in no benefit granting, while

it takes longer for stroke patients to recover from sensory-motor sequelae[4].

Also other characteristics analyzed in the present study exhibited significant results and reflected the enrolment occupational status of the insured granted benefits due to CVD. Individuals working in commerce predominated among the employed and self-employed.

Most of the benefits granted corresponded to social security sick pay (close to 80%) which is indicative of the degree of morbidity of CVD. This modality of benefit decreased, while social security disability retirement increased with age[4].

While the contribution of accident benefits was minimal, our results might not reflect the actual situation, as exposure to occupational hazards might be an independent risk factor for occurrence of CVD[11,20,21].

In regard to the previous salary, the results point to a clear concentration of beneficiaries among the individuals who earned up to the equivalent of three times the minimum wage per month. Reasons for this wage might be assistance factors or social security dependence. This situation has considerable impact on the total national tax revenue, since this is the income range of most taxpayers[22].

The number of cases of disability retirement due to CVD decreased in Brazil along the analyzed period, while the number of sick pay benefits increased. This phenomenon might be due to better social security evaluation criteria, including return to work by stabilization of the underlying disease and clinical control through optimized treatment.

As a function of the epidemiological transition Brazil is undergoing, together with the aging of the population, it is extremely necessary for studies to estimate health costs, in particular the ones associated with CVD for being the main cause of morbidity, mortality and sick leaves in Brazil.

The main limitations of the present study derive from the target population, which did not comprise the total number of workers, as the informal ones do not contribute to the social security system and thus are not included in the SUIBE database. This situation might be a source of selection bias and consequent underestimation of the actual occurrence of health problems, as active workers are considered to be healthier and fitter than susceptible people outside the workforce.

The results showed that the costs of CVD are increasing. Health promotion measures are essential to reduce the occurrence of premature deaths, morbidity and loss of workers while in their most productive stage, particularly in a Northeastern metropolitan area, such as Recife.

CONCLUSION

The direct and indirect costs of CVD increased in Brazil in the past five years, mainly the social security costs (66%) in addition to medication and morbidity. These data indirectly indicate that the population with CVD is increasing. The number of granted social security benefits increased in parallel to the sick pay benefits granted along the past five years, while the number of cases of disability retirement due to CVD has already begun to decrease.

The prevalent age range was the one from 45 to 59 years old, although sick leaves were longer for the individuals above 50 and the benefit amounts higher for the ones above 60. Most beneficiaries were male, and also the length and amounts of benefits were higher for the men. Stroke was the most frequent type of disease and accounted for longer length and higher amounts of benefits, on average. Absenteeism and costs were higher for stroke and heart failure, on average. In turn, hypertension might cause less work incapacity given the fast clinical recovery of patients, nonetheless it is a relevant cause of stroke and thus it should not be neglected.

The most common type of benefit granted was social security sick pay. Sick leaves lasted up to six months, the total cost of each benefit for the government was up to BRL 6.000,00. Most of the insured were employed and involved in commerce, with income up to three times the equivalent of the minimum wage, which thus corroborates the known contribution profile of the disabled insured.

Efforts for prevention and improvement of the quality of life of the population are urgently needed, mainly to reduce the occurrence of premature deaths, morbidity and loss of workers in their most productive stage. This particularly in a Northeastern metropolitan area, such as Recife, where resources are scarce, so as to reduce their impact on the social security system, the world of work and society at large.

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