

## Prevalence and duration of social security benefits allowed to workers with asthma in Brazil in 2008\*

Prevalência e duração dos benefícios auxílio-doença decorrentes de asma no Brasil em 2008

Anadergh Barbosa de Abreu Branco, Simone de Andrade Goulart Ildefonso

### Abstract

**Objective:** To determine the prevalence and duration of social security benefit (SSB) claims granted to registered workers with asthma in Brazil by the Brazilian National Institute of Social Security in 2008. **Methods:** This was a retrospective, descriptive study, based on information obtained from the Brazilian Unified Benefit System database, on the number of SSB claims granted to registered workers with asthma in 2008. The reference population was the monthly mean number of workers registered in the Brazilian Social Registry Database in 2008. The variables studied were type of economic activity, gender, age, and type/duration of the SSB allowance. The relationship between work and asthma was evaluated by the prevalence ratio (PR) between work-related and non-work-related SSB claims for asthma. **Results:** In 2008, 2,483 SSB claims were granted for asthma, with a prevalence of 7.5 claims per 100,000 registered workers. The prevalence was higher among females than among males (PR = 2.1 between the sexes). Workers  $\geq 40$  years of age were 2.5 times more likely to be granted an SSB allowance for asthma than were younger workers. The prevalence was highest among workers engaged in the following types of economic activity: sewage, wood and wood product manufacturing, and furniture manufacturing (78.8, 22.4, and 22.2 claims/100,000 registered workers, respectively). The median (interquartile range) duration of SSB claims for asthma was 49 (28-87) days. **Conclusions:** Asthma is a major cause of sick leave, and its etiology has a strong occupational component. This has a major impact on employers, employees, and the social security system. Being female, being  $\geq 40$  years of age, and working in the areas of sewage, wood and wood product manufacturing, and furniture manufacturing increase the chance of sick leave due to asthma.

**Keywords:** Asthma; Social security; Prevalence; Occupational exposure; Occupational health.

### Resumo

**Objetivo:** Determinar a prevalência e a duração dos benefícios auxílio-doença (BAD) decorrentes de asma concedidos pelo Instituto Nacional de Seguro Social aos empregados no Brasil em 2008. **Métodos:** Estudo descritivo e retrospectivo a partir do banco de dados do Sistema Único de Benefícios sobre os BAD decorrentes de asma concedidos em 2008. A população de referência consistiu da média mensal dos empregados registrados no Cadastro Nacional de Informações Sociais em 2008. Foram estudadas as variáveis ramo de atividade econômica, sexo, idade, tipo e duração dos BAD. A relação trabalho-doença foi avaliada por razão de prevalência (RP) entre BAD acidentários e previdenciários. **Resultados:** Em 2008, foram concedidos 2.483 BAD por asma, com prevalência de 7,5 BAD por 100.000 empregados. A prevalência foi maior em mulheres que em homens (RP = 2,1 entre os sexos). Empregados com  $\geq 40$  anos tinham 2,5 vezes maior probabilidade de receber BAD por asma do que aqueles com  $< 40$  anos. Os ramos esgoto e atividades relacionadas, fabricação de produtos de madeira e fabricação de móveis tiveram as maiores prevalências (78,8; 22,4; e 22,2 BAD/100.000 empregados, respectivamente). A mediana (intervalo interquartilico) da duração dos BAD foi de 49 (28-87) dias. **Conclusões:** A asma é uma importante causa de afastamento do trabalho com forte componente ocupacional na sua etiologia, resultando em grande impacto para empregadores, empregados e previdência social. Ser mulher, ter  $\geq 40$  anos e trabalhar nos segmentos de esgoto, fabricação de produtos de madeira e de fabricação de móveis aumentam a probabilidade de afastamento do trabalho por asma.

**Descritores:** Asma; Previdência social; Prevalência; Exposição ocupacional; Saúde do trabalhador.

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\* Study carried out in the Department of Collective Health, University of Brasilia School of Health Sciences, Brasilia, Brazil.

Correspondence to: Anadergh Barbosa-Branco. 22 Cedar Springs Grove, M3H 5L2, Toronto, ON, Canada.

Tel. 1 416 901-1243. E-mail: anadergh@hotmail.com

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## Introduction

Asthma is a major cause of work disability in various countries. In the USA, with the exception of musculoskeletal diseases, asthma is the disease that is most frequently associated with work disability among individuals in the 18-44 year age bracket, more so than are conditions such as diabetes and arterial hypertension. This is due to the fact that asthma is a disease that is chronic and highly prevalent, being characterized by frequent exacerbations and habitually affecting working-age individuals.<sup>(1,2)</sup>

Another factor that should be taken into consideration is that the work environment is a source of exposure to a wide variety of inhaled agents that can trigger or worsen asthma. In 2000, it was estimated that there had been 38,000 deaths from asthma worldwide and 1,621,000 disability-adjusted life years attributable to occupational exposure to airborne particulates, over 400 agents having been reported as causing occupational asthma.<sup>(3)</sup> Those agents have been implicated in 9-15% of all cases of adult asthma in industrialized countries, asthma having become the most common occupational respiratory disease in those countries.<sup>(4)</sup>

Asthma-related work disability (ARWD) has major socioeconomic consequences, having high direct and indirect costs. The number of lost workdays, vocational rehabilitation, changes in the number of hours worked per day, and the need for changing jobs (onset or worsening of symptoms due to exposure to aerosols) have all been used in order to quantify ARWD, which can lead to work cessation (disability retirement).<sup>(1,5)</sup>

In Brazil, data related to occupational asthma and ARWD are scarce. In 1995, the incidence of occupational asthma in the city of São Paulo, Brazil, was reported to be 17/1,000,000 workers, an incidence that was unquestionably underestimated.<sup>(6)</sup> Occupational asthma is underdiagnosed, partly because many health professionals are unaware of or underestimate the occupational component of the etiology of asthma. The fact that many of the clinicians who manage adults with newly diagnosed asthma do not ask their patients about their occupations or take incomplete occupational histories constitutes an obstacle to establishing the correct diagnosis.<sup>(7)</sup>

In this context, the objective of the present study was to determine the prevalence and duration of social security benefit (SSB) claims granted to

registered workers with asthma in Brazil in 2008, as well as to identify personal and occupational factors related to ARWD.

## Methods

This was a retrospective, descriptive study on the number of SSB claims granted by the Brazilian *Instituto Nacional de Seguro Social* (INSS, National Institute of Social Security) in 2008 to workers whose disability was attributed to a clinical diagnosis of asthma in accordance with the tenth revision of the International Classification of Diseases (ICD-10; code J45). The data were obtained from the INSS Unified Benefit System database.

The study variables were type of economic activity, as defined by the National Classification of Economic Activities (NCEA, version 2.0.), gender, age, and type/duration of the SSB allowance. The reference population was the monthly mean number of workers registered in the Brazilian Social Registry Database in 2008. The Brazilian Social Registry Database is managed by the Brazilian National Ministry of Social Security. Companies are required by law to update the Brazilian Social Registry Database monthly (online) using the payment form of the Social Security Severance Pay Indemnity Fund. Although some workers had two or more jobs concurrently (or several jobs consecutively) in 2008, the number of such individuals was low and we therefore considered each employment record separately.

In Brazil, when workers who are insured by the Social Security system have a health problem resulting in work disability for more than 15 days, they are entitled to receive an SSB allowance, which can be classified as non-occupational (non-work-related) or occupational (work-related).

Each SSB allowance request resulting in an SSB allowance granted is registered in the Brazilian Unified Benefit System database under a single identification number that allows access to information regarding the company and its type of economic activity (as defined by the NCEA), as well as information regarding the worker (including the clinical diagnosis in accordance with the ICD-10), the type of SSB allowance, and the duration of the SSB allowance. The SSB claims under study were those granted by the INSS in 2008.

We determined the prevalence of ARWD by type of economic activity (as defined by the

NCEA), gender, age, type of SSB allowance, and duration of the SSB allowance. The relationship between work and work disability (or lack thereof) was evaluated by the prevalence of non-work-related and work-related SSB claims (by type of economic activity, gender, and age group), as well as by the prevalence ratio (PR) between the two types of SSB claims.

The prevalence of SSB claims (per 100,000 registered workers) was calculated by summing all of the SSB claims granted to workers with asthma in 2008 and dividing the sum by the monthly mean number of workers registered in the Brazilian Social Registry Database in 2008. The duration of the SSB claims was evaluated by measures of central tendency (first quartile, median, and third quartile).

## Results

In 2008, 2,483 SSB claims were granted for asthma. Those claims were granted to a population of 32,590,239 registered workers, with a prevalence of 7.5 claims/100,000 registered workers.

Table 1 shows the prevalence of SSB claims for asthma by gender, age, and type of economic activity. The prevalence was higher among females than among males, the PR between the genders being 2.1.

With regard to the effect of age on the prevalence of SSB claims for asthma, we found that workers  $\geq 40$  years of age were 2.5 times more likely to be granted an allowance than were younger workers ( $< 40$  years of age).

The prevalence was highest among workers engaged in the following types of economic activity: sewage, wood and wood product manufacturing, and furniture manufacturing (78.8, 22.4, and 22.2 claims/100,000 registered workers, respectively). Individuals working in those areas were, respectively, 10.4, 3.0, and 2.9 times more likely to be granted an SSB allowance for asthma than were those working in other areas.

Table 2 shows the prevalence of SSB claims for asthma by type of economic activity, type of benefit, and gender. The prevalence of non-work-related SSB claims for asthma was higher than was that of work-related SSB claims (5.3 claims/100,000 registered workers vs. 2.2 claims/100,000 registered workers), the PR between the two types of claims being 2.4. The technical relationship between work and asthma was stronger among males than among females (PR = 2.2 vs. PR = 2.6). The

strength of the technical relationship between work and asthma varied widely across types of economic activity. We found high PRs (a weak relationship between work and asthma) for the following types of economic activity: provision of health care services to individuals in collective and private households (PR = 11.6); radio and television broadcasting (PR = 7.4); and postal service and other delivery services (PR = 6.5). In contrast, we found low PRs (a strong relationship between work and asthma) for the following types of economic activity: textile manufacturing (PR = 0.8); chemical manufacturing (PR = 0.9), and machinery and equipment manufacturing (PR = 0.9).

Table 3 shows the median (interquartile range [IQR]) duration of the SSB claims for asthma by type of economic activity, gender, and type of SSB allowance. The overall median duration of the SSB claims for asthma was 49 days (IQR, 28-87 days). In general, the duration of the work-related SSB claims was longer than was that of the non-work-related claims. The median duration of SSB claims was highest for the following types of economic activity: clerical services, administrative support, and other services provided to companies; and wood and wood product manufacturing. The median duration of the SSB claims granted to males was longest for those working in the area of construction and infrastructure. The median duration of the SSB claims granted to females was longest for those working in the area of motor vehicle manufacturing. The duration of non-work-related SSB claims was longest for those granted to registered workers engaged in wood and wood product manufacturing. The duration of work-related SSB claims was longest for those granted to registered workers engaged in the manufacturing of plastics and rubber products.

## Discussion

The present study revealed certain particularities and limitations that should be taken into consideration so that the results can be fully understood. It should be emphasized that the results of the present study refer to SSB claims granted to registered workers (in accordance with the Consolidation of Labor Laws), meaning that individuals working in the informal sector (individuals who are probably exposed to worse working conditions and who have higher levels

**Table 1** – Prevalence (per 100,000 workers) of social security benefit claims granted to registered workers with asthma,<sup>a</sup> by type of economic activity,<sup>b</sup> gender, and age bracket, Brazil, 2008.

Economic activity	Age bracket				Total				Total
	< 40 years		≥ 40 years		By age bracket		By gender		
	M	F	M	F	< 40 years	≥ 40 years	M	F	
Sewage and related activities	26.4	144.8	75.5	544.3	42.0	147.1	44.5	308.2	78.8
Wood and wood product manufacturing	13.3	50.0	28.5	69.4	19.2	33.8	17.9	54.8	22.4
Furniture manufacturing	11.0	35.7	50.3	26.6	16.1	45.3	20.7	33.4	22.2
Radio and television broadcasting	0.0	62.9	13.3	6.1	22.3	8.3	5.5	20.9	21.0
Textile manufacturing	9.8	34.7	9.6	47.8	18.8	23.4	9.8	38.4	19.2
Building construction	10.2	13.4	35.8	2.1	10.7	13.4	19.8	3.6	19.1
Garment manufacturing	6.7	16.5	4.0	29.0	13.8	24.9	6.2	20.2	15.8
Services for buildings and landscaping	2.8	23.5	7.4	13.2	10.1	11.4	4.7	15.9	15.1
Home health care <sup>c</sup>	0.0	12.4	10.2	16.7	8.4	15.6	3.9	15.0	15.1
Other personal services	5.1	9.5	19.9	8.8	7.8	10.2	9.2	9.0	13.4
Plastics and rubber products manufacturing	7.7	18.7	19.3	18.1	10.8	19.0	10.5	18.6	12.2
Lodging	0.0	13.5	16.1	8.0	7.4	9.3	4.8	10.0	12.0
Food manufacturing	7.4	14.7	14.0	37.2	9.5	19.5	9.1	19.6	11.4
Infrastructure construction	8.0	17.6	14.9	1.2	9.0	5.6	10.4	2.8	11.0
Forest products manufacturing	4.4	11.2	18.0	102.4	5.2	26.0	8.4	33.7	10.6
Chemical manufacturing	6.7	15.2	6.7	43.1	9.1	13.5	6.7	21.7	10.2
Postal service and other delivery services	4.5	4.2	20.9	1.1	4.4	8.0	11.4	1.8	9.7
Agriculture, livestock production, and related activities	2.7	9.1	19.5	40.0	3.9	23.2	7.9	18.1	9.4
Human health	1.1	7.7	9.4	7.0	6.0	7.3	3.8	7.3	9.3
Leather goods preparation and manufacturing	4.4	12.0	11.4	19.1	8.1	14.9	6.0	13.4	8.9
Metal manufacturing and production, except for M/E	5.8	12.7	11.9	34.5	6.9	14.6	7.6	17.8	8.7
M/E manufacturing	5.9	16.0	10.4	32.4	7.2	12.3	7.3	19.7	8.6
Feeding	2.6	5.8	6.6	6.7	4.2	6.7	3.4	6.4	8.5
Non-metallic mineral product manufacturing	5.4	20.2	9.3	31.8	7.3	11.6	6.6	23.0	8.3
Surveillance, security, and investigation	6.9	11.0	9.7	0.3	7.3	3.0	7.8	1.3	8.0
Motor vehicle manufacturing	3.6	7.3	18.1	33.6	4.2	19.7	7.5	12.0	8.0
Selection, representation, and leasing of HRs	2.7	6.1	20.0	3.1	4.1	5.4	6.4	4.0	7.7
Brazil	3.6	8.2	9.8	20.0	5.4	13.4	5.6	11.6	7.5

M/E: machinery and equipment; and HRs: human resources. <sup>a</sup>Code J45, in accordance with the tenth revision of the International Classification of Diseases. <sup>b</sup>As defined by the National Classification of Economic Activities, version 2.0. <sup>c</sup>Health care provided to individuals in collective and private households.

of exposure) were not included in our study. In addition, we limited the study population to adults (in the 16–65 year age bracket). Furthermore, it should be taken into consideration that studies involving populations of workers are vulnerable

to the “healthy worker effect”, in which there is a selection of susceptible individuals outside the workforce. This fact could underestimate the exposure effects. The working population usually has high levels of exposure and therefore

**Table 2** – Prevalence (per 100,000 workers) of social security benefit claims granted to registered workers with asthma,<sup>a</sup> by type of economic activity,<sup>b</sup> gender, and type of allowance, Brazil, 2008.

Economic activity	Type of allowance					
	Non-work-related			Work-related		
	M	F	Total	M	F	Total
Sewage and related activities	36.1	256.7	64.9	8.3	51.3	13.9
Wood and wood product manufacturing	12.3	24.0	13.4	5.6	30.8	9.0
Furniture manufacturing	10.6	17.8	11.6	10.0	15.6	10.7
Radio and television broadcasting	3.7	53.1	18.5	1.8	4.1	2.5
Textile manufacturing	3.3	18.2	8.3	6.5	20.2	10.9
Building construction	14.9	11.8	14.0	4.9	7.8	5.1
Garment manufacturing	1.4	13.3	9.7	4.8	7.0	6.1
Services for buildings and landscaping	3.3	20.8	9.4	1.3	13.9	5.7
Home health care <sup>c</sup>	3.9	18.9	13.9	0.0	1.7	1.2
Other personal services	5.5	10.2	8.0	3.7	6.8	5.3
Plastics and rubber products manufacturing	5.8	14.0	7.7	4.8	4.7	4.6
Lodging	4.8	13.2	9.2	0.0	5.1	2.8
Food manufacturing	7.0	14.8	8.7	2.1	4.8	2.7
Infrastructure construction	6.3	15.5	7.0	4.0	5.2	4.0
Forest products manufacturing	7.3	25.3	8.9	1.0	8.4	1.8
Chemical manufacturing	3.4	10.0	4.9	3.4	11.7	5.3
Postal service and other delivery services	10.5	2.7	8.4	0.9	2.7	1.3
Agriculture, livestock production, and related activities	6.1	9.0	6.4	1.8	9.0	3.1
Human health	2.7	9.6	7.6	1.1	1.8	1.6
Leather goods preparation and manufacturing	3.0	7.5	4.8	3.0	5.9	4.1
Metal manufacturing and production, except for M/E	5.0	9.7	5.4	2.6	8.1	3.3
M/E manufacturing	3.0	12.3	4.0	4.3	7.4	4.6
Feeding	2.9	12.0	7.3	0.5	2.0	1.2
Non-metallic mineral product manufacturing	3.1	15.3	4.4	3.5	7.7	3.8
Surveillance, security, and investigation	7.2	6.0	7.0	0.5	6.0	1.0
Motor vehicle manufacturing	4.7	7.5	5.0	2.8	4.5	3.0
Selection, representation, and leasing of HRs	4.2	7.2	5.2	2.1	3.4	2.5
Brazil	3.8	8.3	5.3	1.7	3.2	2.2

M/E: machinery and equipment; and HRs: human resources. <sup>a</sup>Code J45, in accordance with the tenth revision of the International Classification of Diseases. <sup>b</sup>As defined by the National Classification of Economic Activities, version 2.0. <sup>c</sup>Health care provided to individuals in collective and private households.

provides a poor estimate of the impact of the disease on the general population.<sup>(8)</sup>

It should also be highlighted that our data refer exclusive to disease that had moderate to severe clinical consequences, i.e., disease that led to work disability for more than 15 days. In addition to the severity of the disease/injury, the administrative operationalization capacity of the social security institution and even legal issues for the recognition of the technical relationship between work and the disease/injury can have an impact on the duration of the SSB claims. Furthermore, the number of SSB claims granted might not represent the number of registered workers with ARWD covered by social security,

given that SSB claims might have been granted more than once to the same workers in the study period.

The prevalence of SSB claims for asthma was found to be 7.5 claims/100,000 registered workers. Worldwide, the prevalence of asthma has increased in the last decades,<sup>(2,3,9,10)</sup> which results in a higher number of asthma patients joining the workforce. This poses new challenges to the industries that traditionally excluded asthma patients from their workforce.<sup>(3)</sup> In Brazil, the high prevalence of asthma is the primary cause of excessive sick leave due to respiratory diseases and, consequently, ARWD. Asthma accounts for 350,000 annual hospitalizations in the country,

**Table 3** – Duration of the social security benefit claims granted to registered workers with asthma,<sup>a</sup> by type of economic activity,<sup>b</sup> gender, and type of allowance, Brazil, 2008.

Economic activity	Claims granted, n	Duration of the allowance, days <sup>c</sup>					Total
		Gender		Type of allowance			
		M	F	Non-work-related	Work-related		
Retail	303	47 (30-95)	48 (29-84)	47 (30-83)	52 (29-119)	47 (30-91)	
Public administration, defense, and social security	204	59 (32-93)	50 (29-80)	50 (26-77)	59 (35-99)	51 (29-81)	
Food manufacturing	147	45 (18-76)	54 (32-77)	48 (27-80)	45 (21-76)	47 (25-77)	
Services for buildings and landscaping	145	51 (30-93)	56 (29-91)	52 (31-93)	58 (25-92)	53 (29-93)	
Human health	97	39 (32-84)	47 (20-74)	46 (20-72)	46 (36-95)	46 (21-76)	
Garment manufacturing	96	41 (6-48)	38 (22-71)	39 (20-71)	38 (23-61)	39 (20-70)	
Feeding	84	40 (27-62)	52 (31-84)	48 (30-85)	56 (39-64)	49 (31-83)	
Land transportation	76	48 (35-77)	48 (36-90)	48 (37-84)	60 (29-69)	51 (33-82)	
Building construction	75	51 (35-84)	57 (34-64)	47 (33-71)	65 (49-86)	52 (35-78)	
Wholesale, except for vehicles	67	45 (16-90)	46 (26-65)	52 (25-97)	45 (17-56)	46 (20-77)	
Office services and administrative support for companies	66	65 (30-148)	64 (41-105)	55 (32-97)	97 (54-120)	64 (33-108)	
Education	63	65 (38-180)	37 (17-82)	36 (16-68)	65 (30-166)	46 (17-89)	
Activities of associations and societies	61	49 (33-84)	47 (32-85)	47 (32-72)	60 (32-147)	47 (31-85)	
Textile manufacturing	58	43 (33-94)	58 (35-80)	58 (37-87)	46 (34-75)	55 (34-85)	
Plastics and rubber products manufacturing	51	41 (24-77)	43 (28-94)	32 (21-49)	115 (40-174)	41 (26-84)	
Furniture manufacturing	50	45 (24-76)	31 (20-69)	44 (21-95)	43 (22-59)	43 (21-73)	
Wood and wood product manufacturing	45	59 (46-101)	91 (33-135)	64 (33-108)	66 (49-139)	64 (45-123)	
Infrastructure construction	44	69 (39-90)	32 (19-51)	51 (37-81)	77 (29-121)	59 (33-89)	
Trade and repair of motor vehicles	41	45 (33-86)	34 (22-45)	40 (27-57)	62 (37-88)	45 (30-70)	
Agriculture, livestock production, and related activities	40	65 (45-119)	32 (28-68)	60 (34-129)	45 (31-74)	56 (31-95)	
Brazil	2,458	48 (29-93)	49 (28-83)	46 (27-81)	57 (30-100)	49 (28-87)	

<sup>a</sup>Code J45, in accordance with the tenth revision of the International Classification of Diseases. <sup>b</sup>As defined by the National Classification of Economic Activities, version 2.0. <sup>c</sup>Values expressed as median (interquartile range).

being the fourth leading cause of hospitalization via the Brazilian Unified Health Care System. In 2005, hospitalizations for asthma accounted for 18.7% of all hospitalizations for respiratory diseases and for 2.6% of all hospitalizations in the period. In 2005, the Brazilian Unified Health Care System spent 96 million Brazilian reais on hospitalizations for asthma, which accounted for 1.4% of the overall expenditures on all diseases.<sup>(9)</sup>

In addition to the high prevalence of asthma, we should consider the characteristics of the disease; asthma is a chronic inflammatory disease characterized by frequent exacerbations and

limiting symptoms, such as dyspnea, wheezing, and chest tightness,<sup>(9)</sup> affecting working-age individuals and having a major impact on ARWD rates.

In addition to the abovementioned factors, the present study clearly shows that occupational risk factors can have a major impact on ARWD. The types of economic activity observed in our study sample confirmed that occupational exposure to chemicals, endotoxins, and sawdust plays an important role as potential causative agents of asthma. These results are supported by the scientific literature.<sup>(6,10,11)</sup>

Disease severity is another important predictor of ARWD. We had no direct contact with the disabled workers investigated in the present study. Therefore, we were unable to evaluate disease severity by clinical history taking or functional tests. However, we believe that the long sick leave periods, as evidenced by the SSB claims granted, constitute indirect evidence of the severity of the clinical profiles.

Cohort studies involving asthma patients found the prevalence of complete work disability to be 7–14%.<sup>(2,12)</sup> Among registered workers, the prevalence of ARWD was found to be 10–38%, ARWD having been characterized as sick leave, reduced work productivity, and need for changing job functions.<sup>(2,12)</sup> Of the unemployed workers, 26% left their jobs because of asthma.<sup>(12)</sup> Risk factors associated with ARWD were smoking,<sup>(1,12)</sup> occupational exposure,<sup>(2,12)</sup> disease severity,<sup>(2,12)</sup> and physical exertion at work.<sup>(2)</sup>

In the present study, the PR between non-work-related and work-related SSB claims was found to be 2.4, which clearly shows the impact that the implementation of the *Nexo Técnico Epidemiológico Previdenciário* (NTEP, Technical-Epidemiological Social Security Benefit Nexus) system had on the characterization of SSB claims. The NTEP system is regulated by Decree no. 6042, which was issued on February 12, 2007, and which established a complementary way of characterizing the technical and epidemiological nexus of disabling diseases/injuries (> 15 days) for each type of economic activity. Before the implementation of the NTEP system, the relationship between work and disease was determined exclusively by the *Comunicação de Acidente do Trabalho* (CAT, Occupational Accident Report), which was issued exclusively by the employer, although the legislation provided a wider range of possibilities. By issuing a CAT, employers formally take responsibility for the disease/injury. Therefore, it is clear that employers have no interest in issuing a CAT characterizing a disease/injury as being work-related (occupational accident). The NTEP system was implemented with the objective of correcting existing distortions in the process of characterizing the relationship between work and a given disease/injury. Therefore, the analysis of the SSB claims granted for asthma in 2008 allows a more realistic view of the epidemiological profile of ARWD in Brazil, as well as of the relationship between asthma and work.

A study analyzing the prevalence of SSB claims granted to workers with respiratory disease in the 2003–2004 period clearly showed that the relationship between work and diseases, particularly chronic diseases, is underestimated.<sup>(13)</sup> The study in question found the PR between non-work-related and work-related SSB claims for asthma to be 41.5.

The fact that work disability due to respiratory disease is more common in females than in males might be primarily due to the fact that the prevalence of asthma is higher in females than in males, particularly among working-age adults.<sup>(10)</sup> It is known that gender influences the distribution of occupational lung diseases because there are activities that are performed exclusively by one gender or the other. Therefore, there are differences between the genders in terms of exposure to the causative agents. Exposure to cleaning products, biological agents, and textile fibers is significantly greater among females than among males. Among females, the risk of developing asthma is higher after exposure to paper dust and textile materials, whereas among men, the risk of developing asthma is higher after exposure to wheat flour, solder, synthetic mineral fibers, and solvents.<sup>(4)</sup> A study involving 779 asthma patients found that the female gender was associated with a higher risk of ARWD (OR = 2.8).<sup>(14)</sup>

The finding of a higher prevalence of respiratory disease in individuals over 40 years of age might be due to the duration of exposure to risk factors and to the fact that asthma is a chronic disease that can manifest at any age. One study demonstrated that 11–20 years of employment correlated positively with work absenteeism due to respiratory disease in groups of workers with high-risk occupational exposure, including welders.<sup>(15)</sup> In older individuals, there is the possibility of longer occupational exposure or even non-occupational exposure, including smoking and air pollution. In addition, the workforce is aging, particularly in European countries, where the prevalence of respiratory symptoms has been reported to be higher in workers over 55 years of age than in younger workers.<sup>(3)</sup>

We found that the prevalence of asthma was highest among individuals working in the areas of sewage, wood and wood product manufacturing, and furniture manufacturing, in which risk factors

for asthma have been reported. The area of sewage includes collection and transportation of domestic or industrial sewage and storm water; management of sewer networks; operation of treatment plants, sewage treatment through physical, chemical, and biological processes; wastewater treatment for pollution prevention; emptying and cleaning infiltration tanks, septic tanks, sinks, and sewage pits; cleaning sewage holding tanks, storm sewer, and pipelines; and chemical toilet sludge removal and cleaning.<sup>(16)</sup> Chemicals include chlorinated organic solvents, pesticides, polycyclic aromatic hydrocarbons, petroleum hydrocarbons, nitrosamines, heavy metals, asbestos, dioxins, and radioactive material.<sup>(17)</sup> In addition, organic waste generates bioaerosols containing bacteria, fungal spores, and microbial components, such as endotoxins and  $\beta(1-3)$  glucans, which can induce an inflammatory response in the lower airways. Endotoxin inhalation induces inflammation characterized by neutrophil influx and IL-8 secretion, both of which cause changes in lung function.<sup>(18)</sup> The presence of flies of the family Psychodidae in environments rich in organic waste might be associated with respiratory allergies.<sup>(17)</sup>

Sawdust (especially from hardwoods), is one of the most common causative agents of occupational asthma. Carpenters, lumberjacks, and workers in the furniture industry are considered to be at risk.<sup>(6,10)</sup> Various types of wood are associated with asthma, including red cedar, white cedar, oak, Brazilian walnut, mahogany, trumpet-tree, *pau-marfim*, sequoia, and cedar of Lebanon.<sup>(10,11)</sup> Exposure can occur during planting and deforestation (felling trees and transporting timber), as well as in sawmills, wood plank industries, and furniture manufacturing facilities, as well as in workspaces for cabinet makers and carpenters. In wood and wood product manufacturing, production processes include wood preservation and treatment, which involve immersing the wood in or injecting oil-based pesticides, metal salts, and organic compounds, production of boards or panels, in which wood chips are mixed with glue and pressed at high temperatures; use of machines such as saws, planers, and slotters to work on natural woods or boards that release barbs/chips and dust; and finishing (sanding, bleaching, varnishing, and painting). These processes expose workers to sawdust and chemical substances that are

associated with occupational asthma. A study conducted in woodworking facilities in the city of São Paulo and employing symptom questionnaires showed that 3, 7, and 10 of the 58 workers under study presented with symptoms that were consistent with chronic bronchitis, asthma, and sinusitis, respectively.<sup>(19)</sup>

In the context of work disability, it is likely that the prevalence of asthma is underestimated because of comorbidities. The present study was based on secondary data and on the primary cause of disability (as diagnosed by medical expert examination). Therefore, it is likely that many cases of asthma were diagnosed as being cases of diseases that are associated with asthma, including pneumonia and bronchitis.

We found that the duration of the SSB claims was longest among workers engaged in economic activities in which the prevalence of occupational asthma was highest, including wood and wood product manufacturing (risk factors mentioned above), plastics and rubber products manufacturing (exposure to phthalic anhydride, formaldehyde, ethylene, toluene, and other agents), and motor vehicle manufacturing (exposure to diisocyanates and fumes/metal dust). Exposure to occupational factors is associated with a more severe clinical course of asthma,<sup>(20)</sup> which is possibly why the duration of the work-related SSB claims for asthma was longer.

In conclusion, asthma is a major cause of sick leave, being strongly related to the type of economic activity. Asthma seems to be related to its prevalence in the population and to occupational risk factors. Improved management of asthma in the population and the control of risk factors and occupational exposure will have a positive impact on social, occupational, and social security spheres.

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## About the authors

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### Anadergh Barbosa de Abreu Branco

Associate Professor. Department of Collective Health, University of Brasília School of Health Sciences, Brasília, Brazil.

### Simone de Andrade Goulart Ildefonso

Pulmonologist. Department of Collective Health, University of Brasília School of Health Sciences, Brasília, Brazil.