

# TRENDS IN THE INCIDENCE OF OCCUPATIONAL DISEASES IN LITHUANIA BETWEEN 1999 AND 2008

SAULIUS VAINAUSKAS<sup>1</sup>, RASA VENCKIENĖ, DANĖ KRISIULEVIČIENĖ<sup>1</sup>, ALGIRDAS CHOMENTAUSKAS<sup>1</sup>, VIDMANTAS JANUŠKEVIČIUS<sup>2</sup>, and PAULIUS VASILAVIČIUS<sup>2</sup>

<sup>1</sup> Institute of Hygiene, Vilnius, Lithuania

<sup>2</sup> Lithuanian University of Health Sciences, Kaunas, Lithuania  
Academy of Medicine

## Abstract

**Objectives:** The aim of the study was to investigate the trends in the incidence of occupational diseases in Lithuania during the period of 1999–2008. The analysis concerned both the individuals with diagnosed disease(s) and the number of diagnosed cases. **Material and Methods:** Incidence rates were calculated using data from the Republic of Lithuania National Register of Occupational Diseases and data on the employed population provided by the government Department of Statistics. The rates were age-standardized using the direct standardization method. The changes in the incidence rates throughout the study period were analyzed using segmented regression calculated with the JOINPOINT (v. 3.3.1) statistical software. We determined joinpoints in the dynamic lines of the incidence rates and calculated mean annual absolute change and mean annual relative (percentage) change for each period. **Results and Conclusions:** During the study period, the number of occupational diseases was, on average, 1.5 times as high as the number of individuals diagnosed with such diseases. Joinpoint positions in the dynamic lines of the incidence rates coincided for individuals with occupational diseases and for the cases of occupational diseases. The incidence was found to slightly increase during the period of 1999–2003, then to rise more rapidly during that of 2003–2006, and to decrease from 2006 to 2008.

## Key words:

Incidence rates, Occupational diseases, Joinpoints

## INTRODUCTION

In Lithuania, the occupational diseases are investigated, diagnosed, and registered according to the legal acts of the Republic of Lithuania [1–5]. The Law of the Republic of Lithuania on the Safety and Health at Work [1] defines an occupational disease as an acute or chronic health disorder of the worker caused by one or more hazardous and/or dangerous factors in the working environment, recognised as an occupational disease in accordance with the established procedure. In this sense, “occupational disease” is more a legal than a medical term [6]. The officially diagnosed occupational diseases are registered in the Republic of Lithuania National Register of Occupational Diseases. Workers are frequently affected by several different occupational hazards, e.g. motor vehicle drivers are affected by vibration and noise, healthcare workers — by chemical substances, infective agents, and ergonomic factors, and

tailors — by noise, dust, chemical agents, ergonomic factors, and moisture [7–9]. This may result in injury to various organs and systems, and the same person may be diagnosed with several occupational diseases (radiculopathy, polyneuropathy and hearing loss, dermatitis and bronchial asthma, etc.). In order to elicit information on the working conditions in the country and the effectiveness of occupational healthcare and the system for investigation, diagnosis, and compensation for occupational diseases, it is important to analyze both the number of individuals who have been diagnosed with occupational diseases and the number of cases (diagnoses) of occupational diseases.

The aim of this study was to describe the incidence trends of occupational diseases with respect to the number of individuals with diagnosed occupational diseases and of the cases of occupational diseases in Lithuania during the period of 1999–2008.

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Address reprint requests to R. Venckienė, Institute of Hygiene, Didžioji st. 22, Vilnius, Lithuania (e-mail: rasa.sidagyte@dmc.lt).

## MATERIAL AND METHODS

The present study employs data from the Republic of Lithuania National Register of Occupational Diseases and includes all cases of occupational diseases registered over the period of 1999–2008 (9276). The database was managed using MICROSOFT EXCEL 2003 software.

The incidence rates were calculated for 100 000 working population, based on data on the number of employed people provided by the government Department of Statistics [10,11]. The rates were age-standardized using the direct standardization method. To this end, we used the DESCRIBE module (v. 1.90) of the WINPEPI statistical package. The mean number of Lithuanian workers in 5-year age groups during the period of 1999–2008 was adopted as standard.

Changes in the incidence rates throughout the study period were analyzed using the segmented (joinpoint) regression calculated with the JOINPOINT (v. 3.3.1) statistical software [12]. The advantages of this technique have been previously discussed in Lithuanian scientific literature [13]. This technique has recently been applied to the analysis of trends in the incidence rates for occupational diseases [14].

We searched for joinpoints in the dynamic lines of the standardized incidence rates, which would divide them into separate periods according to the direction (increase or reduction) and the rate of changes. The dynamic line consisted of 10 observations (rates for the period of 1999–2008). To determine the maximal possible number of joinpoints, we adopted the minimal and maximal number of joinpoints as two (the maximal possible number for 10 observations).

We applied the linear method for smoothing the dynamic line, using the following formula:

$$y = x \times b \quad [1]$$

where

$y$  — the theoretical value of the modeled change in time,

$x$  — years,

$b$  — mean annual absolute change (AAC).

We calculated the AAC and mean annual relative (percentage) change (APC). The APC was calculated using the following formula:

$$APC = \left( \sqrt[n]{\frac{L}{F}} - 1 \right) \times 100 \quad [2]$$

where

$L$  is the theoretical (modeled) value of the last incidence rate,

$F$  — the theoretical (modeled) value of the first incidence rate,

$n$  — the number of years.

The statistical significance of changes in time was determined using the  $p$  value. The change was considered statistically significant at  $p \leq 0.05$ .

The results are presented in the figures and tables. The graphical presentation of the results was made using MICROSOFT EXCEL 2003 software.

## RESULTS

Table 1 shows that the lowest number and the lowest incidence rate of workers with occupational diseases were registered in 2001. The lowest number of cases of occupational diseases was registered in 2000–2001, while the lowest incidence rate for occupational diseases in 2000. The highest number of workers diagnosed with occupational diseases, the highest number of occupational diseases, and the highest incidence rates for both were noted in 2006.

Throughout the study period, the number of occupational diseases was, on average, 1.5 times as high as the number of individuals with such diseases. This means that every two individuals on average were diagnosed with two occupational diseases.

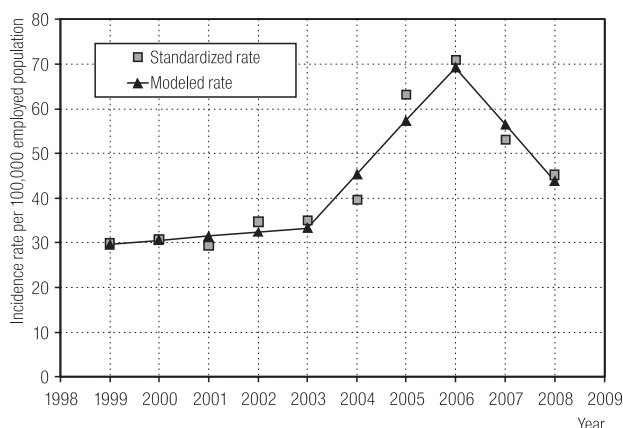
Joinpoint positions in the dynamic lines for incidence rates coincided for individuals with occupational diseases and for occupational diseases. The dynamic lines were divided into three periods (Figs. 1,2).

During the first period (1999–2003), a slight increase in the standardized incidence rates was observed: for individuals, on average, by 0.9 person per 100 000 employed population (3%) annually, and for cases of occupational

**Table 1.** The incidence rates for workers diagnosed with occupational diseases and for the cases of occupational diseases in Lithuania between 1999 and 2008

| Year | Individuals diagnosed with occupational diseases |       | Cases of occupational diseases |       |
|------|--|-------|--------------------------------|-------|
|      | N  | IR    | N                              | IR    |
| 1999 | 412  | 28.29 | 606                            | 41.61 |
| 2000 | 414  | 29.62 | 572                            | 40.92 |
| 2001 | 380  | 28.11 | 570                            | 42.17 |
| 2002 | 464  | 33.00 | 801                            | 56.97 |
| 2003 | 495  | 34.42 | 808                            | 56.19 |
| 2004 | 559  | 38.92 | 939                            | 65.38 |
| 2005 | 889  | 60.32 | 1 380                          | 93.63 |
| 2006 | 1 017  | 67.85 | 1 447                          | 96.53 |
| 2007 | 860  | 56.06 | 1 123                          | 73.20 |
| 2008 | 738  | 48.55 | 1 030                          | 67.76 |

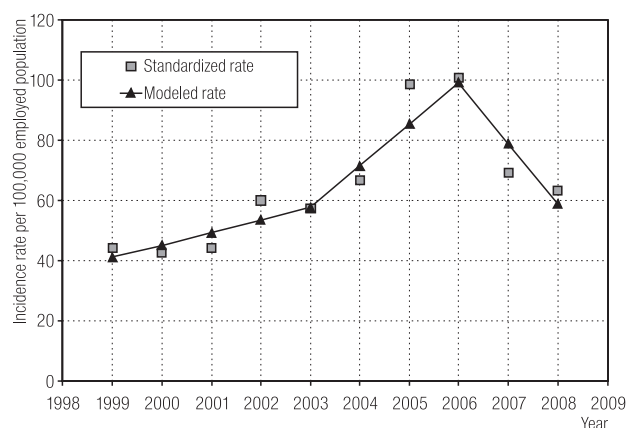
IR — incidence rates for individual workers / cases of disease per 100 000 employed population.

**Fig. 1.** Dynamics of standardized incidence rates for individuals diagnosed with occupational diseases in Lithuania between 1999 and 2008.

diseases, on average, by 4.2 cases per 100 000 employed population (8.9%) annually (Table 2).

During the second period (2003–2006), clearly increasing trends in the incidence rates were observed. The standardized rate for individuals with occupational diseases increased on average by 11.9 persons per 100 000 employed population (27.5%) annually, and the standardized rate for the cases of occupational diseases increased by 13.8 cases per 100 000 employed population (19.8%).

During the third period (2006–2008), clearly decreasing trends in the incidence rates were noted.

**Fig. 2.** Dynamics of standardized incidence rates for the cases of occupational diseases in Lithuania between 1999 and 2008.

The standardized incidence rate for individuals with occupational diseases decreased on average by 12.7 individuals per 100 000 employed population (20.4%), and the standardized incidence rate for the cases of occupational diseases by 20.2 cases per 100 000 employed population (23%) annually.

Table 2 shows that the trends were not statistically significant in either period. In the dynamic line for the incidence regarding individuals with occupational diseases, the difference between the changes within the first and the second period was not significant ( $p = 0.111$ ), while

**Table 2.** Main regression indices for the standardized incidence rates for workers diagnosed with occupational diseases and for the cases of occupational diseases in Lithuania between 1999 and 2008

| Period    | Dynamics of incidence rates for individual workers |       |       | Dynamics of incidence rates for the cases of occupational diseases |       |       |
|-----------|--|-------|-------|--|-------|-------|
|           | AAC  | APC   | p     | AAC  | APC   | p     |
| 1999–2003 | 0.9  | 3.0   | 0.441 | 4.2  | 8.9   | 0.286 |
| 2003–2006 | 11.9   | 27.5  | 0.091 | 13.8   | 19.8  | 0.356 |
| 2006–2008 | -12.7  | -20.4 | 0.068 | -20.2  | -23.0 | 0.169 |

AAC — mean annual absolute change for individual workers / cases of disease per 100 000 employed population.

APC — mean annual percentage change for individual workers / cases of disease per 100 000 employed population.

for the changes during the second and the third period, the difference was at the level of statistical significance ( $p = 0.042$ ). In the dynamic line for the incidence of occupational diseases, the difference between the changes during particular periods was not significant in either of the cases ( $p = 0.506$ , and  $p = 0.152$ ).

## DISCUSSION

During the 10-year study period, we detected two join-points in the dynamics of the incidence rates for workers diagnosed with occupational diseases and for the cases of occupational diseases; these were the years 2003 and 2006. Until 2006, morbidity indices were increasing: slightly between 1999–2003 and rapidly between 2003–2006. The values of the mean annual percentage change show that during the second period the incidence rates for individuals with occupational diseases increased more rapidly than did the incidence rates for the cases of occupational diseases. This means that the number of workers diagnosed with occupational diseases increased more rapidly than the number of cases of occupational diseases. These incremental trends might have been influenced by the workers' increased motivation to undergo examinations for occupational diseases, by improved qualifications of physicians in the field of occupational medicine, and a higher level of education and information about occupational diseases.

The incidence of occupational diseases tended to increase in Latvia as well. In 2000 it amounted to 83.6 cases per 100 000 employed population, and in 2004, it reached 184.5 cases per 100 000 employed population. Latvian specialists

presume that the number of cases of occupational diseases is likely to further increase due to improved diagnostics and registration procedures. This increase is also associated with better education and awareness of these diseases among the workers, as well as a growing number of occupational health-care specialists. An essential underlying factor could also be the possibility to receive financial compensation for occupational diseases. It is estimated that within the next 5–10 years, the incidence of occupational diseases in Latvia will rise up to 250 cases per 100 000 employed population. It is only when this level is reached that a stabilization or a slight decrease in incidence rates may be expected [15].

During the period of 2006–2008, decreasing trends were observed with respect to the incidence rates for individuals with occupational diseases and for the cases of occupational diseases. This may be due to the “exhaustion” of the number of workers who had previously been affected by hazardous working conditions, or to some other reasons. In Europe, the incidence rates for occupational diseases have been on the decline for some time, which is explained by improved working conditions. For instance, in Romania, during the period of 1996–2006, the number of new cases of occupational diseases fell from 2015 to 910, while the incidence rates for occupational diseases per 10 000 employed population from 204.2 to 51.2 [16]. In Poland in 1993, the number of the registered cases of occupational diseases was 11 300, whereas in 2005 the respective number was 3200 [17]. Although a slight decline in the incidence of occupational diseases in Poland could be seen until 2006, gradually rising incidence rates have been observed from 2007 onwards [18–21].

The statistical data on occupational diseases to a large extent depend upon the national legal acts and regulations and their enforcement as well as on the registration procedures. The advantage of the registers lies in that the data are collected continuously and systematically, and that data entry is obligatory. However, despite all this, not all the cases of occupational diseases are recorded in the registers as not all occupational diseases are diagnosed [22]. This may be due to several reasons: the procedures for the diagnosis of and compensation for occupational diseases are quite complex and confusing; the workers do not have sufficient information about occupational health risk and conditions of health insurance; a part of the workers still refuse to admit they have occupational diseases for fear of losing their job and income; general practitioners lack knowledge and skills to trace the deterioration of work capability; the patients themselves sometimes do not provide sufficient information about their working conditions; and there is an inadequate number of occupational physicians [23].

According to the requirements of the regulations regarding health and safety at work [24], as many as 170 occupational physicians should be employed in Lithuanian enterprises. However, until January 1, 2007, only 29 licenses for practice in occupational medicine were issued. Thus, concerning the number of occupational physicians, Lithuania severely falls behind other European countries, including our neighbors — Latvia and Estonia [25–26].

This article reports on the findings of a study on the trends in the incidence rates for occupational diseases in Lithuania, both with respect to the workers diagnosed with such diseases and the cases of occupational diseases. It has already been shown in Lithuania that the general incidence trends of occupational diseases are determined by the incidence rates for occupational musculoskeletal, nervous system and auditory diseases, or, in other words, they are influenced by the incidence of occupational diseases caused by physical and ergonomic hazards [14]. However, further research is needed to clarify which factors may have accounted for certain trends; for example, whether there were any changes in the compensation system for occupational

diseases that could have had influence on the workers' motivation to recognize their disease as occupational. Such research would make it possible to define recommendations for optimizing procedures on the investigation, diagnosis, and compensation for occupational diseases.

## CONCLUSION

The incidence trends for workers diagnosed with occupational diseases and for the cases of occupational diseases in Lithuania were found to slightly increase during the period of 1999–2003, then to rise more rapidly during that of 2003–2006, and to decrease from 2006 to 2008.

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