

# LUNG CANCER RISK IN WORKERS EXPOSED TO SILICA IN THE CZECH REPUBLIC

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## INTRODUCTION

In 1997 the International Agency for Research on Cancer (IARC) evaluated dust containing crystalline silica and its thermal modifications, cristobalite and tridymite, as carcinogenic to humans (Group 1). The results of a great number of epidemiological studies confirm a statistically significant increase of lung cancer in the workers from various production areas with the risk of silicosis. The possibility of the increased risk of lung cancer in black-coal miners cannot be explicitly, according to the present knowledge, either confirmed or eliminated. Epidemiological investigation on silica exposure and lung cancer risk is the goal of two studies supported by grant of Czech Ministry of Health - Nr. 6578 Assessment of the carcinogenic risk in employees exposed to dusts containing quartz (2001 – 2003) and Nr. 8556 Longitudinal prospective study on carcinogenic risk in workers exposed to dust with content of crystalline form of silica dioxide in the Czech Republic (2005 – 2009).

## AIM OF THE STUDY

The goal of the presented study was analysed lung cancer risk between workers with and without pneumoconiosis.

## MATERIAL AND METHODS

The first sample (S1) included 7,772 ex-miners who were working in the mining profession for at least 8 years. Coal workers' pneumoconiosis was diagnosed in about 10 % of miners.

The second sample (S2) included 3,330 workers with pneumoconiosis from all industries and settings with occupational exposure to silica (74 % coal miners). These workers were registered in the National Register of Occupational Diseases in 1992 – 2001.

The data on individual and occupational history of workers (S1, S2) were linked with the data from the National Cancer Register and the National Population Register.

In presented study the sample included 3,330 workers with pneumoconiosis (PN1) and 6,827 without pneumoconiosis (PN0).

Logistic regression model was used through program Stata v.9 for analysis of association between lung cancer risk and pneumoconiosis controlled for age and smoking habits. Differences between workers with and without pneumoconiosis were tested by  $\chi^2$  test and t-test on the level of significance 5 %.

## RESULTS

In total, the sample included 10 157 workers:

- workers with pneumoconiosis (PN1) - 3 330
- workers without pneumoconiosis (PN0) - 6 827

The basic characteristics of age (in consideration of diagnosed lung cancer, death and time of study) and exposure are included in Table 1. Persons with pneumoconiosis are significantly older and their exposure is significantly shorter (Table 1).

Table 1 Basic characteristics

	Group	Mean	SD	p (t-test)
Age	PN0	53.0	7.6	p < 0.001
	PN1	60.1	11.7	
Exposure (years)	PN0	22.9	5.9	p < 0.001
	PN1	21.9	8.8	

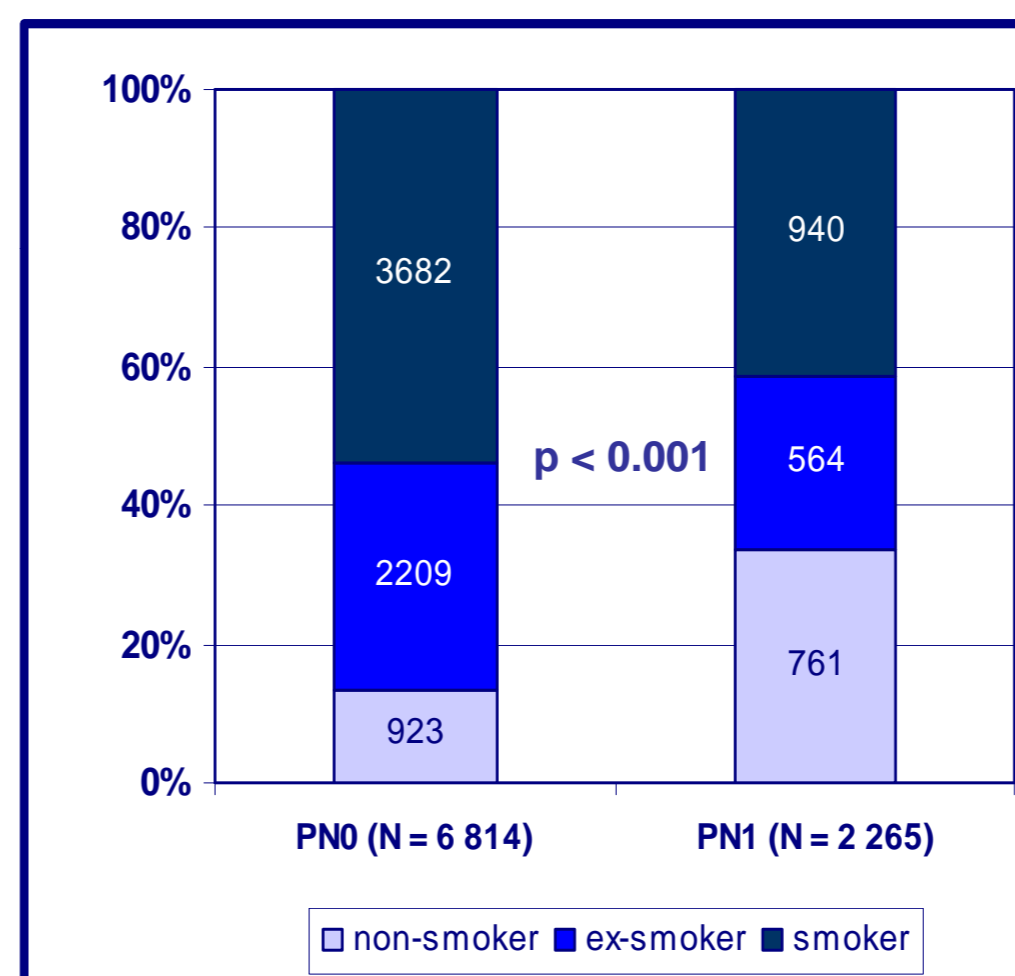


Figure 1 Smoking habits

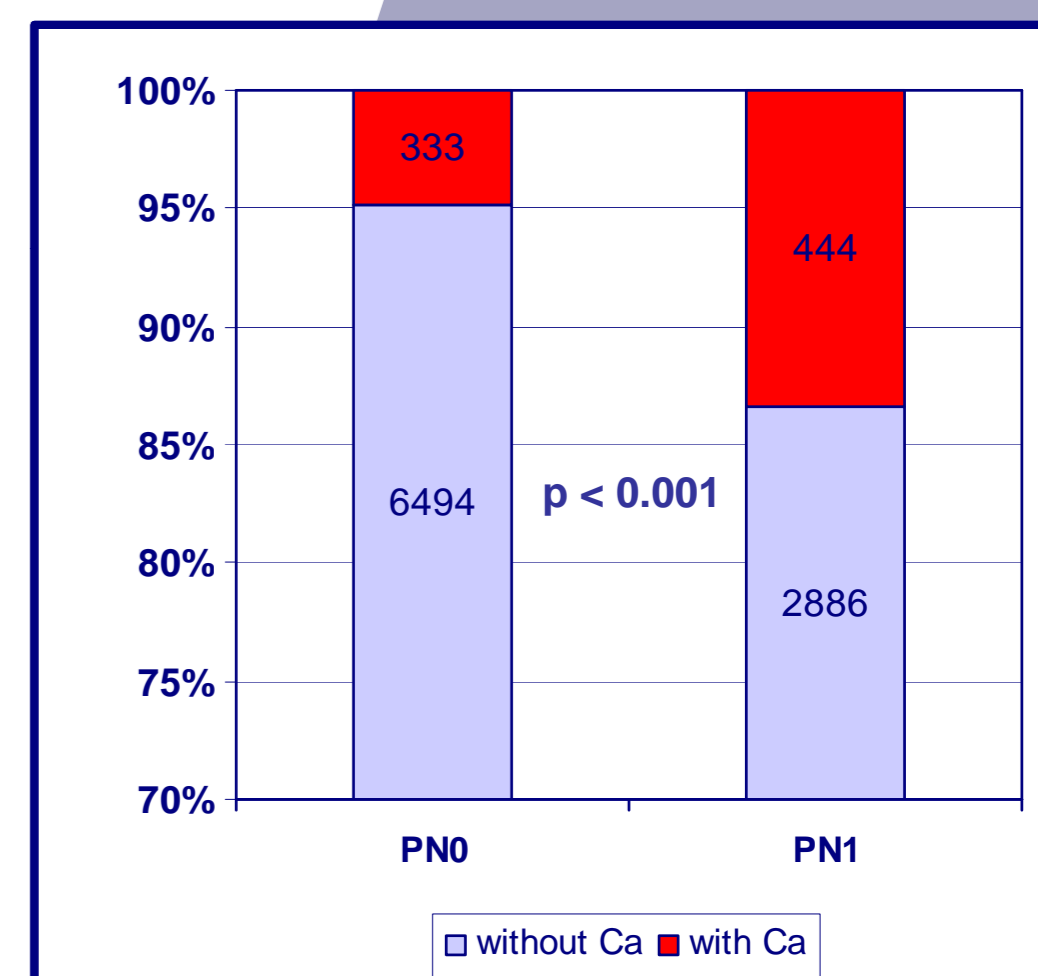


Figure 2 Malignant tumor diseases

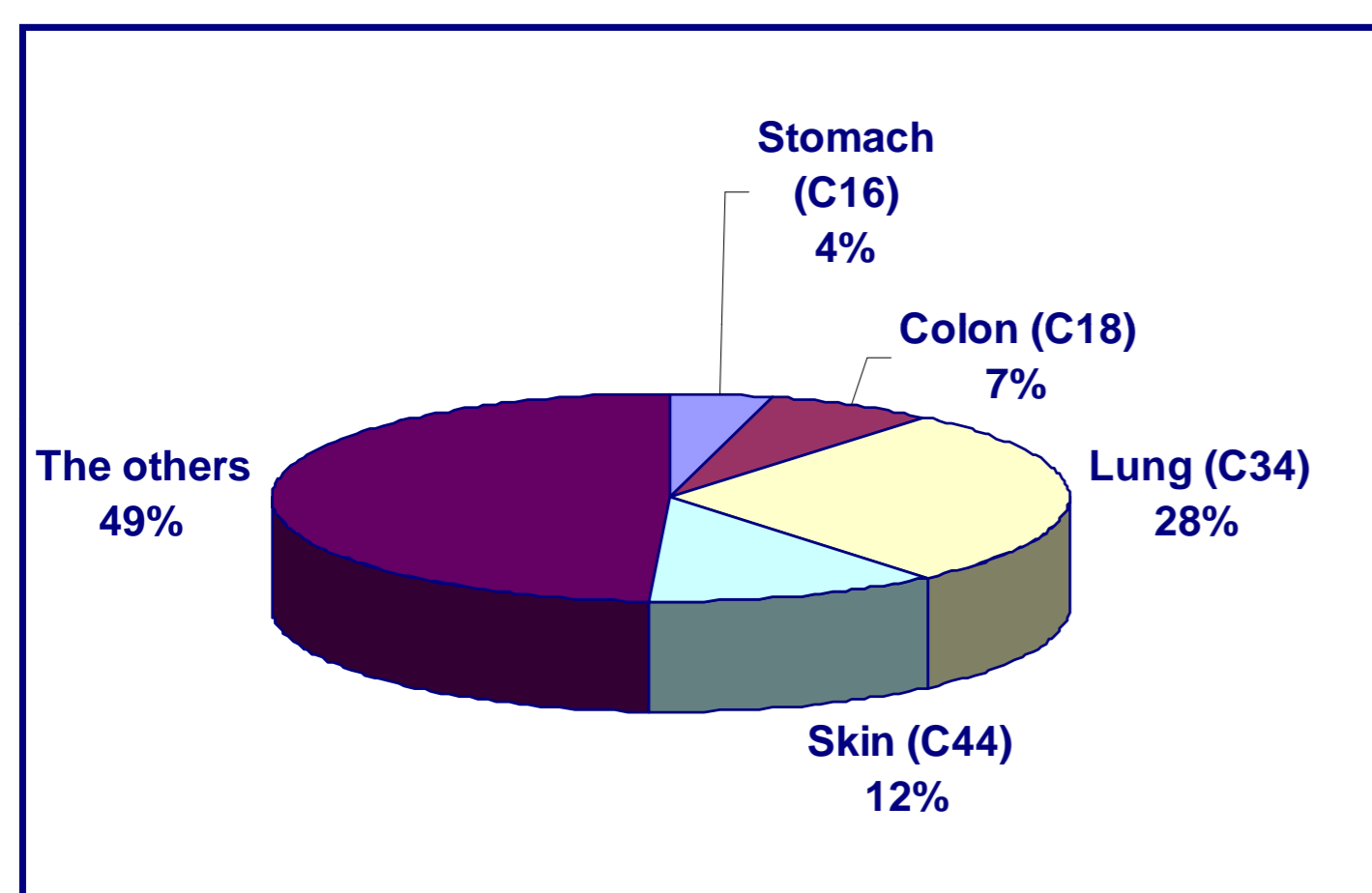


Figure 3 Distribution of malignant tumor diseases by site

Smoking habits were found out for 98 % of the workers without pneumoconiosis and for 68 % of the workers with pneumoconiosis. These groups are significantly different by smoking habits (Figure 1). Only 14 % of non-smokers were in the group PN0 and 34 % in the group PN1.

Silicosis was diagnosed in 27.4 % and coal workers' pneumoconiosis in 72.6 % of the workers with pneumoconiosis.

In total 777 cases of malignant tumor diseases were diagnosed. The proportional difference of these diseases between groups (42.9 % in PN0, 57.1 % in PN1) was statistically significant (Figure 2). Proportion of lung cancer from all malignant tumorous diseases was 28 % (Figure 3). Proportions of malignant tumor diseases by site and groups are statistically significant. Proportion of lung cancer was 21 % in the group PN0 and 33 % in the group PN1 (Figure 4).

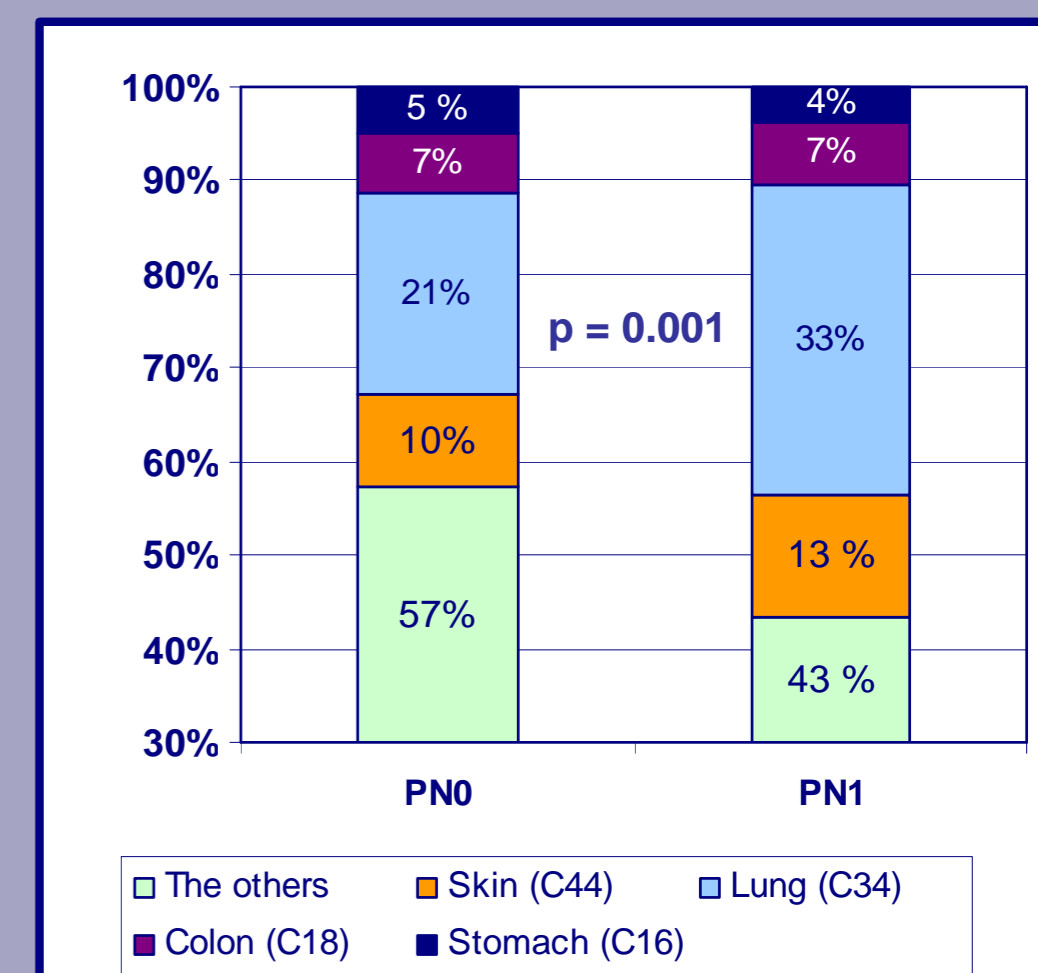


Figure 4 Distribution of malignant tumor diseases by site and groups PN0 and PN1

Table 2 Results of logistic regression

Lung cancer (Sample N = 10 157)	Crude OR	p	95% CI
Pneumoconiosis: no	1+		
yes	4.40	0.000	3.3 - 5.9
<sup>1</sup> Model adjusted for age			
Lung cancer (Sample N = 10 157)	OR <sup>1</sup>	p	95% CI
Pneumoconiosis: no	1+		
yes	3.20	0.000	2.4 - 4.3
Age (years): - 40	1+		
41 – 50	2.3	0.253	0.6 – 9.7
51 – 60	2.7	0.172	0.7 – 11.1
61 and more	6.4	0.010	1.6 – 26.2
<sup>2</sup> Model adjusted for age, smoking habits			
Lung cancer (Sample N = 9 051)	OR <sup>2</sup>	p	95% CI
Pneumoconiosis: no	1+		
yes	2.41	0.000	1.7 - 3.5
Age (years): - 40	1+		
41 – 50	2.1	0.302	0.5 – 9.0
51 – 60	2.3	0.248	0.6 – 9.6
61 and more	6.1	0.013	1.5 – 25.1
Smoking habits: non-smoker	1+		
exsmoker	0.7	0.172	0.3 – 1.2
smoker	2.2	0.001	1.4 – 3.6

+ basic category



Results of logistic regression models (Table 2) performed significantly higher lung cancer risk for workers with pneumoconiosis than for workers without pneumoconiosis. Crude OR is 4.4 (CI: 3.3 - 5.9). The risk stayed statistically significant after adjustment for age OR<sup>1</sup> = 3.2 (CI: 2.4 - 4.3) and also in model controlled for age and smoking habits OR = 2.4 (CI: 1.7 - 3.4).

## CONCLUSION

Preliminary results of this study support conclusions of previous epidemiological investigation. Workers with pneumoconiosis are in higher lung cancer risk than workers without pneumoconiosis working in exposure to silica (OR = 2.4). Future analysis of this sample by occupation branches and more detail analysis of other risk factors will follow.

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