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RESPIRATORY DISEASES AND SICKNESS ABSENTEEISM IN COAL MINERS

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ABSTRACT

In two coal mines (A and B) of different geological structure of the coal seam and of the output technology 2 094 miners (mean age 37 years; mean length of service 15 years) in mine A and 1 846 miners (mean age 38 years; mean length of service 14 years) in mine B were medically examined. All the miners worked underground. The examination included the medical history data collected by means of the modified British Medical Research Council questionnaire for chronic bronchitis, a routine medical examination, an X-ray of the chest and a spirometric examination (VC, FEV_1).

In the course of two consecutive years, the sickness absenteeism of 8 005 miners from the two coal mines was studied. The structure of the staff with regard to age and place of work, surface or underground, did not differ statistically. Data for each miner were gathered on special cards and included: the type and duration of illness, basic personal information, working and housing conditions. The collected data were computer processed and statistically analysed.

Among the examined miners 16% had chronic bronchitis. In mine A with much worse work conditions and poor technology the percentage amounted to 19.14%, whereas in mine B, with better working conditions and technology, to 13.49%. A high positive correlation between tobacco smoking and the incidence of chronic bronchitis was noted. In smokers the incidence amounted to 86.0%, in ex-smokers to 7.5% and in non-smokers to 6.4%. The incidence of chronic bronchitis in smokers and ex-smokers was directly proportional to the number of cigarettes smoked daily.

In mine A, 28% of the miners had no sick absences whereas in mine B the percentage was 37%. The rates of absences were similar in both mines (although they differed in working and housing conditions of the miners) and equalled 6.5% for coal mine A, and 6.4% for coal mine B.

It is generally known that work in the mining industry, particularly underground work differs greatly from work in other industries. This is due not only to different conditions of the work environment (dust, noise, harmful gases, bad lighting, hard physical work in uncomfortable positions, often in oxygen deficit conditions and unfavourable microclimate), but also to stress factors usually related to the worker's isolation and constant consciousness of danger and risk to life. It is also known that both the general and specific sickness rate structure caused by respiratory diseases in the mining industry differs among workers employed in different mines. Many authors[1,2,5,6,9,10,12,15,19,23,24,26,31, [32,33,35,43], link differences in sickness rates in various mines in different countries with differences in coal exploitation technology and, in the case of respiratory diseases, with different biological properties of coal dust at workplaces. For this reason, the mortality rate among miners in certain countries is twice as high as that of the general working population and respiratory diseases occur five times more frequently. It does not seem, however, that such a high sickness rate is solely dependent on dust concentration, on its chemical composition differentiated by the geological properties of the seam. It is possible that also other factors such as the living conditions of the miners, family traditions of the mining profession, medical care, technical preventive measures at the most dangerous workplaces, natural selection etc., play a role here.

The purpose of the performed investigations was to determine the influence of the work environment and of other extraprofessional factors, on the level and sickness rate structure, and on sickness absenteeism due to respiratory and circulatory diseases.

SUBJECTS AND METHODS

The investigation program spanned the following elements: investigation of work conditions (dust concentration, microclimate), mineralogical examination of dust sampled from air at workplaces, medical examinations of miners employed underground, and a detailed survey of sickness absenteeism in all employees in both mines.

The subjects of the study i.e. the populations of miners, work conditions, dust concentrations and compositions in the two investigated mines are given in Table 1.

TABLE 1
Subjects of the study and work conditions in the investigated mines.

Parameter	Mine A	Mine B
Population	2094 (3999)*	1846 (4003)*
Work conditions	Low and slanting seams Low degree of mechanization Manually performed work Constrained position	High coal seams High degree of mechanization Small amount of manual work Free position
Air temperature	18–23 °C	14–17 °C
Humidity	95%	75%
Dust concentration (total)	3.6–15.6 mg/m³	46.0–262.0 mg/m³
SiO_2 in dust (%)	5.0–13.6	3.0–7.4
Ash in dust (%)	7.075	7.249
Cu in dust (ppm)	11.50	4.20
V in dust (ppm)	10.48	2.43
Ni in dust (ppm)	8.97	6.03
Pb in dust (ppm)	33.25	40.16
Zn in dust (ppm)	29.25	52.84
Co in dust (ppm)	4.93	6.08
Cr in dust (ppm)	25.87	8.12

* Population for sickness-absenteeism investigation

Respiratory diseases survey

A total of 3 940 miners working underground were subjected to medical examinations, 2 094 from mine "A" and 1 846 from mine "B". The miners were divided into 7 professional groups according to the type and place of work as shown in Table 2. The exposure to environmental factors (dust, microclimate) was defined according to their degree of harmfulness as: large (1), medium (2) and small (3).

TABLE 2
Professional groups according to the type and place of work.

Performed work	Professional group	Hazard group
forefield employees shot-firer holer face foreman miner junior miner underground helper	I	1
von-forefield employees pipe fitter carpenter conveyor shifter heavy transport	II	2
operating personnel carpenter brick-layer electrician locksmith	III	2
electric locomotive engine driver shaft personnel hanger-on holst engineer	IV	3
transport shunter track carpenter coupler	V	3
supervisors	VI	2
others supply equipment personnel welder turner warehouseman tractor personnel pump personnel tipper personnel	VII	3

The mean age and the mean length of experience by groups are given in Table 3. The age and experience structures of the two investigated populations

TABLE 3
Age and work experience averages of examined miners in respective professional groups.

Group	Mine A			Mine B			Total for both mines		
	Age (years)	Experience (years)	N	Age (years)	Experience (years)	N	Age (years)	Experience (years)	N
1	37	14	1484	39	15	880	38	15	2364
2	42	17	8	33	11	63	34	12	71
3	35	13	280	37	14	510	36	14	790
4	40	16	147	40	14	111	40	15	258
5	42	24	3	41	17	40	41	17	43
6	39	19	64	38	15	72	39	17	136
7	42	17	108	36	12	170	39	14	278
	37	15	2094	38	14	1846	38	14	3940

of miners were very similar even though essential differences in the professional group structures were observed.

The medical investigations included case histories and a survey on a specially prepared questionnaire. The portion of the questionnaire regarding chronic nonspecific respiratory diseases was based on the recommendation of the Medical Research Council's Committee on the Aetiology of Bronchitis; i.e. a general medical examination and additional examinations which included spirometry, chest radiography, and an ECG.

Spirometric examinations were performed on a British vitalograph. VC, FEV_1 were determined and compared to the "normal" values according to the C.E.C.A. (Communauté Européenne du Charbon et d'Acier). VC/VC_n(%) and FEV_1/VC (%) were calculated.

In chronic nonspecific respiratory disease (CNRD) diagnosis, the criteria proposed by Stuart and co-workers[37] were applied. In diagnosis, cases of chronic recurrent bronchitis were omitted and were classified either as simple chronic bronchitis (FEV_1 over 65% of normal value) or as obstructive chronic bronchitis (FEV_1 below 65% of normal value). Large format X-rays were taken with the hard radiation technique using 110–75 KV at 5 MAS. The radiographs were classified according to standard procedures[3,16].

The ECG was taken with an apparatus with 12 offtakes and a tape speed of 25 mm/sec. The determined changes were classified into 4 groups according to the "Minnesota" code: Group 1, no change; Group 2, changes in the Q and S range; Group 3, changes in the cardiac electrical axis and chamber repolarization period distortion and Group 4, conductivity distortion etc.

Sickness absenteeism survey

All employees working at the beginning of the investigation underground and on the surface, in mines A and B underwent examinations. The women employed in coal sorting were also examined. The characteristics of the investigated employees in relation to sex and age were similar in both mines and did not differ significantly. In all, 8 005 persons were investigated; 4 006 (12.7% women) in mine B and 3 999 (9.3% women) in mine A. In both mines the most numerous group consisted of individuals aged 35–45 years. Significant differences were discovered in welfare and living conditions. The mine B employees owned flats of which 73.4% were equipped with gas and 63.3% had bathrooms. The corresponding indices for the mine A employees were 58.0% and 34.2%.

The individual sickness absenteeism cards on which demographic data were recorded constituted the source material. The information collected involved the marital status, number of children, and data concerning work and housing conditions as well as information concerning sickness absenteeism. The investigations were conducted during two consecutive years. The collected data were processed statistically by means of a computer.

RESULTS

The frequency of CNRD in both investigated mines and in particular professional groups is shown in Table 4. The average frequency of CNRD for both populations was 16.5%. The frequency for the population employed in mine A was substantially higher (19.1%) than for the population employed in mine B (13.5%). Chronic bronchitis of the obstructive type constituted, on average, 1.7% of the total number of CNRD cases in both plants. The condition occurred more frequently in mine B (2.1%) where work was highly mechanized than in mine A

TABLE 4
Prevalence of chronic nonspecific respiratory disease in particular professional groups.

Professional groups	Both mines				Mine A				Mine B			
	C	D	E	F	C	D	E	F	C	D	E	F
I	2 364	442	394	48	1 484	308	285	23	880	134	109	25
II	71	3	3	–	8	1	1	–	63	2	2	–
III	790	101	94	7	280	30	29	1	510	71	65	6
IV	258	34	28	6	147	26	23	3	111	8	5	3
V	43	8	7	1	3				40	8	7	1
VI	136	20	18	2	64	15	15		72	5	3	2
VII	278	42	40	2	108	21	20	1	170	21	20	1
Total	3 940	650	584	66	2 094	401	373	28	1 846	249	211	38

C = number of examined workers; D = number of workers with CNRD; E = number of workers with simple CNRD; F = number of workers with obstructive CNRD

(1.2%) with a lower degree of mechanization. The largest percentage of CNRD in both mines was noticed in professional groups I and V. The first professional group consisted of forefield miners with the highest risk factor relating to exposure to harmful agents; whereas group V consisted of employees with the lowest risk factor. The number of personnel in group V, however, constituted only 1.1% of the total. The high CNRD ratios in this group could, therefore, simply be of a random nature, or the group could have consisted of the personnel transferred from other professional groups as a result of Health service preventive activities, due to the light character of work in this group.

The CNRD prevalence in relation to age and length of service is shown in Tables 5 and 6. The number of CNRD cases increases with age and length of service of the investigated miners. In the 20–29 years age group, CNRD cases

TABLE 5

Prevalence of chronic nonspecific respiratory disease in relation to age.

Age (years)	Both mines				Mine A				Mine B			
	C	D	E	F	C	D	E	F	C	D	E	F
< 19	115	1	1		5				60	1	1	
20–29	773	20	20		436	10	10		337	10	10	
30–39	1 099	139	130	9	594	91	87	4	505	48	43	5
40–49	1 452	337	306	31	773	214	197	17	679	123	109	14
50–59	498	152	126	26	235	85	78	7	263	67	48	19
> 60	3	1	3		1	1	1		2			
Total	3 940	650	584	66	2 094	401	373	28	1 846	249	211	38

C = number of examined workers; D = number of workers with CNRD; E = number of workers with simple CNRD; F = number of workers with obstructive CNRD

TABLE 6

Prevalence of chronic nonspecific respiratory disease in relation to length of service.

Length of service (years)	Both mines				Mine A				Mine B			
	C	D	E	F	C	D	E	F	C	D	E	F
< 4	574	21	21		286	10	10		288	11	11	
5– 9	444	20	20		241	11	11		203	9	9	
10–14	548	70	63	7	214	26	25	1	334	44	38	6
15–19	1 289	243	222	21	773	168	154	14	516	75	68	7
20–24	655	165	147	18	411	117	108	9	244	48	39	9
> 25	430	131	11	20	169	69	65	4	261	62	46	16
Total	3 940	650	584	66	2 094	401	373	28	1 846	249	211	38

C = number of examined workers; D = number of workers with CNRD; E = number of workers with simple CNRD; F = number of workers with obstructive CNRD constituted 2.6% of the miners examined, whereas in the 50–59 years age group they constituted 30.5%. The obstructive type of CNRD also exhibits a tendency to increase with age. A similar tendency for both types of CNRD, as already pointed out, is evident in relation to the length of service. Amongst miners with up to 4 years of service 3.7% had CNRD; whereas 30.5% with service exceeding 25 years had CNRD.

The dynamics of increase of CNRD, particularly in respect to the length of service was much greater in mine A than in mine B. The frequency of CNRD occurrence in smokers, ex-smokers and non-smokers is illustrated in Table 7. CNRD was 13.5 times more frequent in smokers than in non-smokers and 11.4 times more frequent than in ex-smokers. The obstructive form of CNRD constituted approximately 10% of all diagnosed CNRD cases in both the smoking and non-smoking groups.

TABLE 7
Prevalence of chronic nonspecific respiratory disease in relation to tobacco smoking (cigarettes).

Form of CNRD	Both mines				Mine A				Mine B			
	C	D	E	F	C	D	E	F	C	D	E	F
Total	650	559	49	42	401	336	34	31	249	223	15	11
Simple	584	503	43	38	373	312	32	29	211	191	11	9
Obstructive	66	56	6	4	28	24	2	2	38	32	4	2

C = number of examined workers; D = number of smokers; E = number of ex-smokers; F = number of non-smokers

The diagnosis of coal workers' pneumoconiosis was based on large format radiographs taken in standard conditions. Only simple forms of pneumoconiosis without functional disorders were detected. Sometimes coexistence of pneumoconiosis and tuberculosis was discovered.

The prevalence of pneumoconiosis in relation to length of service is illustrated in Table 8. On average, pneumoconiosis occurred in 3.7% of all examined miners. In mine A, the prevalence was 6.2% whereas in mine B, approximately 0.8% of the miners had pneumoconiosis. The effect of the length of service (as well as age) on the prevalence of pneumoconiosis was also determined. By eliminating the effect of the length of service and age on pneumoconiosis prevalence with statistical techniques, the existence of additional factors enhancing this phenomenon in both mines was discovered. Tuberculosis, as a complication of pneumoconiosis, was determined in 1.73% of all the miners studied. The percentage of tuberculosis, like that of pneumoconiosis, increased with the length of service and was two times higher in mine A than in mine B.

ECG changes were more frequent in the mine B personnel (76.3%), in comparison to similar data from mine A (67.0%). In miners working in mine A, changes in conductivity (17.1% of all investigated employees) were twice as rare as in miners from mine B. No effect of age on the frequency of ECG change in

TABLE 8
Prevalence of pneumoconiosis in relation to length of service.

Length of service (years)	Total		Mine A		Mine B	
	Examined	Ill	Examined	Ill	Examined	Ill
<4	574	3	286	3	288	0
5–9	444	0	241	0	203	0
10–14	548	6	214	2	334	4
15–19	1 289	50	773	43	516	7
20–24	655	56	411	56	244	0
>25	430	29	169	26	261	3
Total	3 940	144	2 094	130	1 846	14

the investigated miners was determined. The frequency and type of observed ECG changes in miners with CNRD was not different from those without CNRD.

The general and specific indices of sickness absenteeism due to various illnesses spanning a 2-year period for both mines are illustrated in Table 9. The sickness absenteeism rates were similar for mine A (5.21%) and mine B (5.98%). The underground employees, particularly in mine A, exhibited a higher absenteeism rate than surface employees 4.07% versus 1.14%. The corresponding percentages in mine B were 3.84% and 2.14%. In both mines, high specific indices were observed with regard to injuries, respiratory illnesses, digestive tract conditions and skin problems. Significant differences to the disadvantage of mine A were caused by absenteeism due to pneumoconiosis (0.12 and 0.07) and skeletomuscular diseases.

In both mines, the group of employees who were frequently ill over a prolonged period (over 40 days) and constituted over 5.5% of the personnel were responsible for over 1/4 of all absences. The percentages of absences attributed to this phenomenon were 28.8% in mine A and 26.7% in mine B. The group of persons rarely ill and over short periods (up to 10 days), which constituted approximately 36% of the employees in both mines was responsible for approximately 9% of sick absences. A clear increase in sickness absenteeism with age and length of service in both mines as well as an increase of sickness absenteeism following an increase in the number of children in the family was determined. In analysing the mode of transportation which the miners used to get to work, it was noticed that the highest absenteeism was recorded among the persons travelling by motocycle (7.1%) and by bicycle (6.3%). The persons working constantly on the same shift exhibited a higher rate of absenteeism than those working different shifts. A higher sickness absenteeism was also noticed for persons earning higher wages as well as in individuals with lower housing and living conditions. Also, particularly in mine A, a clear influence of work conditions on the sickness absenteeism rate was determined. The highest rates were observed in persons exposed to fibrogenic dust, unfavourable microclimate,

TABLE 9

General and specific sickness absenteeism indices for a 2-year period in the investigated mines with respect to working site.

Diseases groups	Mine A			Mine B		
	Total	Surface	Underground	Total	Surface	Underground
1. Tuberculosis	0.136	0.031	0.106	0.155	0.074	0.081
2. Neoplasms	0.055	0.024	0.030	0.114	0.075	0.038
3. Hemopoietic system diseases	0.003	0.001	0.001	0.014	0.009	0.005
4. Mental diseases	0.112	0.028	0.085	0.149	0.055	0.094
5. Nervous system diseases (without peripheral)	0.013	0.004	0.010	0.024	0.005	0.019
6. Peripheral nerves diseases	0.396	0.089	0.308	0.451	0.140	0.311
7. Sight organ diseases	0.059	0.018	0.041	0.152	0.045	0.106
8. Hearing organ diseases	0.058	0.009	0.050	0.123	0.037	0.086
9. Heart diseases including rheumatic fever	0.029	0.002	0.027	0.064	0.029	0.035
10. Hypertension	0.086	0.049	0.036	0.100	0.064	0.036
11. Other vascular and circulatory diseases	0.137	0.051	0.086	0.149	0.065	0.085
12. Respiratory acute inflammatory diseases (with angina) without influenza, pneumonia and bronchitis	0.349	0.093	0.256	0.470	0.147	0.323
13. Influenza	0.160	0.040	0.120	0.236	0.082	0.154
14. Pneumonia and acute bronchitis	0.036	0.088	0.028	0.104	0.035	0.069
15. Chronic pneumonia and bronchial asthma	0.200	0.060	0.140	0.216	0.087	0.129
16. Pneumoconiosis	0.118	0.001	0.116	0.007	0.005	0.003
17. Other respiratory diseases	0.086	0.011	0.075	0.104	0.041	0.063
18. Digestive system diseases (without gastroduodenal ulcer)	0.334	0.105	0.230	0.453	0.188	0.265
19. Gastric and duodenal ulcer	0.200	0.047	0.154	0.177	0.062	0.114
20. Skin and connective tissue diseases	0.292	0.037	0.255	0.371	0.110	0.261
21. Arthritis and rheumatic disease	0.174	0.046	0.128	0.235	0.126	0.109
22. Other bone and muscle diseases	0.449	0.062	0.387	0.212	0.066	0.146
23. Occupational (professional) accidents and injuries	0.000	0.000	0.000	0.000	0.000	0.000
24. Non-occupational accidents and injuries	1.292	0.146	1,147	0.947	0.223	0.724
25. Occupational poisonings	0.000	0.000	0.000	0.000	0.000	0.000
26. Non-occupational poisonings	0.002	0.001	0.002	0.005	0.001	0.004
27. Other diseases	0.433	0.179	0.254	0.952	0.371	0.581
Total	5.210	1.140	4.070	5.983	2.139	3.843

TABLE 10

Absenteeism indices due to diseases of the respiratory and circulatory systems with respect to tobacco smoking.

	Disease groups	Men			Women			Total		
		Total	Smokers	Non-smokers	Total	Smokers	Non-smokers	Total	Smokers	Non-smokers
Mine A	Respiratory acute inflammatory diseases	0.313	0.242	0.071	0.035	0.009	0.026	0.349	0.251	0.097
	Influenza	0.142	0.105	0.037	0.019	0.006	0.012	0.160	0.111	0.049
	Pneumonia and bronchitis	0.036	0.026	0.000	0.000	0.000	0.000	0.036	0.026	0.011
	Chronic bronchitis	0.178	0.154	0.024	0.022	0.010	0.011	0.200	0.164	0.036
	Other respiratory diseases	0.084	0.068	0.016	0.002	0.000	0.002	0.086	0.068	0.018
	Respiratory diseases together	0.753	0.595	0.159	0.078	0.026	0.052	0.831	0.620	0.211
	Heart diseases	0.028	0.021	0.007	0.000	0.000	0.000	0.029	0.021	0.007
	Hypertension	0.055	0.044	0.011	0.030	0.002	0.028	0.086	0.047	0.039
	Other vascular and circulatory diseases	0.120	0.083	0.038	0.016	0.002	0.014	0.137	0.085	0.052
	Circulatory diseases together	0.204	0.148	0.056	0.047	0.005	0.042	0.251	0.153	0.098
	Other diseases	3.836	2.970	0.867	0.292	0.070	0.222	4.128	3.040	1.089
	Total	4.794	3.712	1.081	0.417	0.100	0.316	5.210	3.813	1.397
Mine B	Respiratory acute inflammatory diseases	0.412	0.313	0.008	0.058	0.018	0.040	0.470	0.331	0.138
	Influenza	0.206	0.150	0.057	0.029	0.009	0.021	0.236	0.158	0.077
	Pneumonia and bronchitis	0.097	0.080	0.017	0.007	0.002	0.005	0.104	0.082	0.022
	Chronic bronchitis	0.204	0.156	0.048	0.013	0.006	0.007	0.216	0.162	0.055
	Other respiratory diseases	0.097	0.070	0.027	0.007	0.002	0.006	0.104	0.072	0.032
	Respiratory diseases together	1.016	0.769	0.247	0.114	0.037	0.077	1.130	0.806	0.325
	Heart diseases	0.047	0.024	0.023	0.017	0.000	0.017	0.064	0.024	0.040
	Hypertension	0.069	0.041	0.028	0.031	0.004	0.027	0.100	0.045	0.055
	Other vascular and circulatory diseases	0.118	0.103	0.014	0.032	0.008	0.023	0.149	0.112	0.038
	Circulatory diseases together	0.204	0.148	0.055	0.047	0.005	0.042	0.251	0.153	0.098
	Other diseases	3.907	2.911	0.996	0.633	0.150	0.483	4.540	3.061	1.479
	Total	5.157	3.848	1.309	0.826	0.199	0.627	5.983	4.047	1.936

and vibration. A clear indication of the influence of tobacco smoking on the increase of specific sickness absenteeism rates with respect to diseases of the respiratory and circulatory systems in men was also observed (Table 10).

COMMENTS AND CONCLUSIONS

Among coal miners' respiratory diseases the most commonly found were CNRD. The average sickness rate for these diseases in both mines was 16.5% and it was almost twice as high as that in the cotton industry[38,39,40]. However in comparison with Romanian[2] and American[21,23,25] data this sickness rate, in the Polish mining industry, is two times lower. The CNRD sickness rate increased with age and length of service, which coincides with the findings of other authors[14,34,38,39,40]. The mine dust content and hazard have a significant influence on the CNRD sickness rate, which is confirmed by other authors[2,21,29,30,34,38,40]. Among the examined populations, the largest number of CNRD was observed in groups of miners with the greatest exposure to dust and unfavourable climatic conditions.

Tobacco smoking plays a deciding role in the occurrence and development of CNRD. In the investigated populations CNRD occurred 13.5 times more frequently in smokers than in non-smokers, and the obstructive form constituted 10% of all diagnosed CNRD cases. Therefore the results of the investigation confirm our conclusion[39,40] as well as that of Romanian[2] and American[21] authors that tobacco smoking plays a greater role than exposure to dust.

The results of our investigation have also shown that the number of cigarettes smoked daily has a greater influence on the level and dynamics of development of CNRD than the length of the smoking period in life. The pneumoconiosis sickness rate was relatively low in comparison with the data of other authors[5,12,23,24,25,26,28,31,32,33,43]. This is probably a result of the lower retirement age in Polish mining (55 years) and of geological conditions mentioned by many other authors[3,4,22,24,25,42]. The geological conditions in mine A (6.2% pneumoconiosis) differed greatly from those of mine B (0.8% pneumoconiosis). This appears to confirm the conclusion of other authors[4,5,7,8,9,20,25,35,36], that SiO_2 and trace metal content can exert a significant influence on the level and development dynamics of pneumoconiosis in miners. This hypothesis however requires further experimental and epidemiological investigations. Despite tuberculosis frequently accompanying with miners' pneumoconiosis no PMF forms were determined. However, an analysis of the data relating to old age pensioners has shown that PMF occurs in approximately 10% of the cases in and around mine A, mainly in persons aged 65–75 years. In general the results of the sickness absenteeism survey have confirmed the results of medical examinations, particularly with respect to the effect of tobacco smoking on the respiratory and circulatory systems and of the correlation between the sickness rate and the absenteeism due to the same disease[11,13,17,27,39]. Another conclusion of other authors[18,27,41] has also been confirmed i.e. that a small group of persons frequently ill over long periods has a significant influence on the sickness absenteeism index of the mine and is responsible for approximately a half of the total sickness absenteeism. The influence of social, living and family conditions on the sickness absenteeism level mentioned by many authors[2,13,17,41] was also confirmed. Higher sickness absenteeism indices in persons working one shift appear to suggest that they used a sick leave more frequently in order to attend to family and social matters in state institutions which were open during morning hours. This hypothesis, however, requires confirmation by additional investigations specially adapted for this purpose.

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