THE ASSOCIATION BETWEEN INCOME, EDUCATION, CONTROL OVER LIFE AND HEALTH IN A LARGE URBAN POPULATION OF POLAND

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Abstract.

Objectives: The objective of our study was to examine the relation of income, education and control over life with health self-evaluation and chronic diseases, e.g., hypertension, back illness, hypercholesterolemia, gastritis, coronary heart disease, and diabetes. **Materials and Methods:** The data were collected in Łódź, a large industrial city of Poland, between 2001 and 2002, as a part of the Countrywide Integrated Noncommunicable Diseases Intervention Programme. The surveys were directed at random samples of the adult population, 1837 men and women aged 18–64 years. A questionnaire completed during a doctor's visit was used for data collection. **Results:** All chronic illnesses were age-related. A strong association was also seen between chronic illnesses and poor control over life. People who reported poor control over life were more likely to suffer from any of the studied chronic illnesses; this relationship was mostly pronounced in case of gastritis. The incidence of coronary heart disease and back illnesses was very strongly related with low education, whereas low income with hypertension, back illnesses and coronary heart disease, however this relation was not so strongly manifested. Seventy percent of the study population rated their health as "good" and 30% as "poor". The worst results of health self-evaluation were found in older people with low education, low income, poor control over life and chronic illnesses. **Conclusions:** Poor control over life was associated with chronic illnesses. Our study suggest that higher education and higher income in the period of socioeconomic changes are the explanatory variables for good health.

Key words:
Education, Income, Control over life, CINDI

INTRODUCTION

Mortality and morbidity rates are much more favorable in West Europe than in the countries of Central and Eastern Europe [1,2]. A similar gap between these two regions of Europe has been reported in self-rated health [3]. Health behavior and socioeconomic status have been suggested to be important contributors to the East-West differences in mortality and health status. Many arguments that speak for healthy behaviors also apply to psy-chosocial factors and these are connected to economic factors, the contribution of which still remains unclear [4]. The socioeconomic status (SES) is one of the most reliable and consistent predictors of morbidity [5,6]. This finding applies to all diseases with few exceptions. SES continues to exert its effect throughout the entire life span, and is associated with numerous health risk factors [7]. The significant impact of SES on the disease occurrence makes its definition and measurement of critical

importance. SES is represented by a broad spectrum of variables, often conceptualized as a combined effect of financial, occupational, and educational factors [7]. Although these dimensions of SES are interrelated, income seams to be very important as it reflects the purchasing power, housing, diet, and medical care. Over time, education has become the most common measure of SES in epidemiological studies [8]. The level of education indicates the need to acquire better social, intellectual, and economic position [7].

Data on risk factors are collected in numerous countries, but there is a need to improve the system of their comparison between individual countries. Through participating in the Countrywide Integrated Noncommunicable Diseases Intervention Programm (CINDI) [9], some countries have developed standardized approaches to data collection and risk factor surveys. Initiatives, such as the CINDI Health Monitor survey, based on the Finbalt (Finland Baltic) Health Monitor survey [10], methodology and instruments for health interview surveys, have also contributed to setting standards and protocols for the collection of data on risk factors and health behavior.

Until now, there have been limited data on changes in the socioeconomic system and their impact on the health status in the former soviet block countries, like Poland, where unemployment is one of the consequences of the ongoing transformations of the political and economic systems [11]. The aim of the present study was to examine the effect of income, education and poor control over life on subjective and objective evaluation of health in the population of Łódź, a large industrial city in the central part of Poland, where the unemployment rate is even above the country average [12].

MATERIALS AND METHODS

Data collection

The data were collected as a part of the CINDI Program, for the World Health Organization Regional Office for Europe. The study was conducted from September 2001 to January 2002. Methods were standardized according to the WHO guidance for CINDI Program [9].

The CINDI Health Monitor surveys are based on a common core questionnaire [10,13]. The participating area for this project was Łódź. The surveys were directed at random samples of the adult population based on health insurance registration. Invitations were mailed to 2000 men and women (aged 18–64 years) to visit the Medical Academy.

The data were collected by means of a questionnaire administered at interviews, followed by a doctor's visit. Repeated invitations were mailed to non-respondents. Non-respondents were not replaced by other individuals.

Questionnaire data were coded and entered into the same file with the sample data. The questionnaire included the following groups of information:

■ personal data, family status, education, income, employment;

■ frequency of doctor's visits;

■ questions regarding control over life;

■ medical history on chronic diseases diagnosed by a specialist in the last 12 months prior to the survey.

Diagnosis of chronic diseases was confirmed by medical examination and basic laboratory tests (blood pressure, total and LDL cholesterol, sugar blood level) performed in all responders.

Study area

Łódź is the second largest city of Poland. At the end of 2001, Łódź had a population of 785 000 [11]. With a rapid growth triggered off by the development of the textile industry in the nineteenth century, Łódź became the Polish center of this industry. Today, the textile industry is still heavy, however many of the old plants are closed up. The unemployment rate decreased in 2002 (18.5%), but was still above the country average (17.4%). The mean income in Łódź is also lower than in the rest of the country [11]. The proportion of inhabitants who have not completed any school is lower (4.6%) than the country average (6.3%) [11].

Study variables

Information on education, and income was ascertained through questionnaires; education was divided into four

categories: primary school graduate, skilled, high school graduate, and college/university graduate. Income, defined as gross monthly household income per person, was divided into five categories ranging from less then EUR 75 to EUR 375 or more.

Participants were asked to complete the control over life questionnaire, composed of 4 questions on meeting the demands of everyday life, the answers were distributed evenly on the overall poor control over life score. This score, as a continues variable was taken for analysis. The poor control over life score is presented in Table 1.

Subjective outcomes of the self-rated health were measured on the basis of answers to the question: "How would you assess your present state of health?". There were two possible answers "poor" or "good".

The impact of SES on the frequency of doctor's visits (free or paid) was also assessed on the basis of the response to the question: "Have you visited the doctor during the last 12 month?" (including hospitalization or visits to the outpatient department; visits to the dentist exluded). Two answers "yes" or "no" were provided.

Statistical analysis

The purpose of this study was to compare demographic data, socioeconomic status, and poor control over life score with prevalence of chronic illnesses, self-rate health and frequency of doctor's visits. In the first model, chronic illnesses, in the second self-rated health and in the third model free or paid doctor's visits were defined as dependent variables, and other variables (age, gender, marital status, education, income, poor control over life score) were considered independent in the three models. All three models were tested using logistic regression analysis. In the first phase, logistic regression was used to assess the relationship between the dependent variable and one of the independent variables (Tables 2, 3 and 4). In the second phase all independent variables were included into one model to point out the best predictor of the dependent variable (Tables 5, 6 and 7). In Tables 5, 6 and 7 only significant statistical predictors are presented. All statistical analyses were performed using SPSS, STATISTICA for Windows release 6.0 software; $p < 0.05$ was considered to reflect statistical significance.

Table 1. Poor control over life score for poor health

Questions:	Points
"How would you assess your everyday activity, e.g., work, learning, home duties?"	
There is no problem	0
Sometimes I have some problems	1
I cannot manage to deal with them	2
"Do you often have the feeling of not being able to fulfil the demands of everyday life?"	
Never/seldom	0
Quite often	1
Most of the time	2
"Have you been feeling tense, stressed, or under high pressure during the last month?"	
Not at all	0
Seldom	1
Yes, my life is almost unbearable	2
"Do you feel psychological discomfort?"	
Never	0
Seldom	1
Often	2
Total min: 0 points (best) max: 8 points (worst)	

Table 2. Effect of age, gender, marital status, education, income and poor control over life score on chronic illnesses prevalence in univariate model: logistic regression analysis

	Hypertension				Back illness				Hypercholesterolemia				Gastritis				Coronary heart disease				Diabetes			
	OR	-95% CI	+95% CI	P	OR	-95% CI	+95% CI	P	OR	-95% CI	+95% CI	P	OR	-95% CI	+95% CI	P	OR	-95% CI	+95% CI	P	OR	-95% CI	+95% CI	P
Age (continues)	1.08	1.07	1.10	<0.0001	1.08	1.07	1,09	<0.0001	1.07	1.05	1.08	<0.0001	1.04	1.03	1.05	<0.0001	1.14	1.12	1.17	<0.0001	1.09	1.06	1.11	<0.0001
Females	0.97	0.77	1.22	0.7	1.62	1.28	2,04	<0.0001	1.27	0.97	1.66	0.08	1.17	0.86	1.61	0.3	0.88	0.62	1.25	0.5	0.98	0.58	1.64	0.9
Marital status:																								
single	1				1				1				1				1				1			
married	4.60	3.14	6.75	<0.0001	6.23	4.01	9,68	<0.0001	4.11	2.58	6.54	<0.0001	2.83	1.73	4.65	<0.0001	10.18	4.13	25.11	<0.0001	3.14	1.22	8.03	0.01
divorced	3.72	2.16	6.41	<0.0001	6.24	3.51	11,06	<0.0001	4.14	2.20	7.78	<0.0001	3.86	1.98	7.53	<0.0001	6.61	2.18	20.07	0.0009	3.56	1.02	12.48	0.04
widowed	11.42	6.37	20.48	<0.0001	13.71	7.33	25,66	<0.0001	9.94	5.14	19.24	<0.0001	4.26	1.94	9.37	<0.0001	24.31	8.52	69.35	<0.0001	20.37	7.02	59.13	<0.0001
Education:																								
primary	1				1				1				1				1				1			
skilled	0.77	0.54	1.12	0.1	0.52	0.36	0,75	0.0004	0.70	0.45	1.07	0.1	0.60	0.37	0.98	0.04	0.47	0.29	0.75	0.002	0.54	0.26	1.12	0.09
high school	0.66	0.47	0.92	0.01	0.49	0.35	0,67	<0.0001	0.64	0.43	0.95	0.02	0.57	0.37	0.88	0.01	0.30	0.19	0.47	<0.0001	0.42	0.22	0.81	0.01
college/university	0.49	0.32	0.75	0.001	0.39	0.25	0,59	<0.0001	0.70	0.43	1.12	0.1	0.50	0.28	0.89	0.02	0.27	0.15	0.51	<0.0001	0.21	0.07	0.63	0.005
Income:*																								
<75	1				1				1				1				1				1			
75–124	0.67	0.47	0.96	0.03	0.65	0.45	0,95	0.02	0.87	0.55	1.37	0.5	0.60	0.38	0.93	0.02	0.53	0.31	0.93	0.02	0.58	0.26	1.32	0.2
125–249	0.74	0.53	1.03	0.07	0.89	0.64	1,24	0.5	1.08	0.72	1.63	0.7	0.41	0.27	0.63	<0.0001	0.84	0.52	1.34	0.5	0.85	0.42	1.72	0.7
250–374	0.73	0.44	1.19	0.2	0.49	0.28	0,86	0.01	0.92	0.50	1.69	0.8	0.53	0.27	1.02	0.06	0.44	0.19	1.05	0.06	0.47	0.13	1.70	0.2
>374	0.53	0.29	0.95	0.03	0.47	0.25	0,88	0.01	0.94	0.48	1.84	0.8	0.31	0.13	0.75	0.009	0.50	0.20	1.26	0.1	0.20	0.03	1.59	0.1
Poor control over life score (continues)	1.28	1.19	1.39	<0.0001	1.28	1.17	1,60	<0.0001	1.31	1.20	1.43	<0.0001	1.38	1.25	1.53	<0.0001	1.37	1.22	1.52	<0.0001	1.22	1.04	1.44	0.02

* Gross income per month/per person/per household in EUR.
Data are presented as odds ratio with 95% confidence intervals (CI).

Table 3. Effect of age, gender, marital status, education, income, poor control over life score and presence of chronic illnesses on poor self-rated health in univariate model: logistic regression analysis

	OR	–95%CI	+95%CI	P
Age (continues)	1.08	1.07	1.09	<0.0001
Females	1.01	0.82	1.23	0.9
Marital status:				
single	1			
married	3.58	2.66	4.83	<0.0001
divorced	5.33	3.45	8.23	<0.0001
widowed	9.03	5.28	15.45	<0.0001
Education:				
primary	1			
skilled	0.51	0.37	0.71	<0.0001
high school	0.31	0.23	0.41	<0.0001
college/university	0.23	0.15	0.33	<0.0001
Income:*				
<75	1			
75–124	0.59	0.43	0.81	0.001
125–249	0.68	0.51	0.91	0.009
250–374	0.51	0.33	0.81	0.004
>374	0.19	0.10	0.36	<0.0001
Poor control over life score	1.66	1.54	1.79	<0.0001
Chronic illnesses:				
absence	1			
presence	7.18	5.74	9.00	<0.0001

* Gross income per month/per person/per household in EUR.
Data are presented as odds ratio with 95% CI.

Table 4. Effect of age, gender, marital status, education, income, poor control over life score, presence of chronic illnesses and self-rated health on free and paid doctor's visits in univariate model: logistic regression analysis

	Free doctor's visits				Paid doctor's visits			
	OR	–95%CI	+95%CI	P	OR	–95%CI	+95%CI	P
Age	1.02	1.01	1.03	<0.0001	0.99	0.99	1.00	0.3
Females	1.51	1.23	1.85	<0.0001	1.99	1.52	2.59	<0.0001
Marital status:								
single	1				1			
married	1.19	0.93	1.52	0.2	1.28	0.94	1.75	0.1
divorced	1.92	1.29	2.86	0.001	0.77	0.41	1.41	0.4
widowed	1.36	0.79	2.32	0.3	0.71	0.31	1.63	0.4
Education:								
primary	1				1			
skilled	0.58	0.41	0.83	0.002	1.18	0.65	2.14	0.6
high school	0.73	0.54	1.00	0.05	2.26	1.33	3.83	0.002
college/university	1.01	0.70	1.45	0.9	4.52	2.58	7.91	<0.0001
Income:*								
<75	1				1			
75–124	1.04	0.73	1.46	0.8	1.51	0.92	2.50	0.1
125–249	1.21	0.88	1.67	0.2	1.68	1.05	2.68	0.03
250–374	1.15	0.72	1.82	0.6	2.51	1.39	4.54	0.002
>374	1.18	0.71	1.95	0.5	2.83	1.51	5.28	0.001
Poor control over life score	1.36	1.26	1.46	<0.0001	1.16	1.06	1.26	0.0009
Chronic illnesses:								
absence	1				1			
presence	3.12	2.53	3.85	<0.0001	1.49	1.15	1.94	0.003
Self-rated health:								
good	1				1			
poor	2.59	2.09	3.21	<0.0001	1.58	1.27	1.79	0.03

* Gross income per month/per person/per household in EUR.
Data are presented as odds ratio with 95% CI.

Table 5. Effect of age, gender, education, income and poor control over life score on chronic illnesses prevalence in multivariate model: logistic regression analysis

	Hypertension				Back illness				Hypercholesterolemia				Gastritis				Coronary heart disease			
	OR	−95%CI	+95%CI	P	OR	−95%CI	+95%CI	P	OR	−95%CI	+95%CI	P	OR	−95%CI	+95%CI	P	OR	−95%CI	+95%CI	P
Age	1.09	1.08	1.10	<0.0001	1.08	1.07	1.10	<0.0001	1.06	1.05	1.08	<0.0001	1.04	1.03	1.06	<0.0001	1.15	1.12	1.18	<0.0001
Females	–	–	–	–	1.68	1.29	2.18	0.0001	–	–	–	–	–	–	–	–	–	–	–	–
Education:																				
primary	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
skilled	–	–	–	–	0.69	0.30	1.16	0.1	–	–	–	–	–	–	–	–	0.81	0.40	1.92	0.2
high school	–	–	–	–	0.73	0.40	0.90	0.05	–	–	–	–	–	–	–	–	0.74	0.54	0.94	0.01
college/university	–	–	–	–	0.55	0.23	0.76	<0.0001	–	–	–	–	–	–	–	–	0.53	0.33	0.81	0.008
Income:*																				
<75	1	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–
75–124	0.65	0.44	0.98	0.04	0.61	0.40	0.92	0.02	–	–	–	–	0.63	0.40	1.00	0.05	0.48	0.25	0.89	0.02
125–249	0.49	0.33	0.71	0.0002	0.64	0.44	0.94	0.02	–	–	–	–	0.35	0.23	0.56	<0.0001	0.44	0.26	0.77	0.004
250–374	0.74	0.41	1.32	0.3	0.43	0.23	0.81	0.009	–	–	–	–	0.59	0.30	1.16	0.1	0.38	0.15	0.98	0.04
>374	0.56	0.28	1.12	0.1	0.49	0.25	0.98	0.04	–	–	–	–	0.34	0.14	0.83	0.02	0.52	0.19	1.40	0.2
Poor control over life score (continues)	1.21	1.12	1.32	<0.0001	1.27	1.16	1.50	<0.0001	1.31	1.20	1.43	<0.0001	1.32	1.18	1.44	<0.0001	1.27	1.14	1.43	<0.0001

* Gross income per month/per person/per household in EUR.
Data are presented as odds ratio with 95% CI.

Table 6. Effect of age, gender, education, income, poor control over life score and presence of chronic illnesses on poor self-rated health in multivariate model: logistic regression analysis

	OR	-95%CI	+95%CI	P
Age	1.05	1.04	1.06	<0.0001
Education:				
primary	1			
skilled	0.95	0.64	1.41	0.8
high school	0.57	0.39	0.83	0.003
college/university	0.41	0.25	0.67	0.0003
Income:*				
<75	1			
75–124	0.67	0.46	0.99	0.04
125–249	0.68	0.47	0.98	0.04
250–374	0.80	0.46	1.40	0.4
>374	0.30	0.14	0.63	0.002
Poor control over life score	1.59	1.46	1.74	<0.0001
Chronic illnesses:				
absence	1			
presence	7.18	5.74	9.00	<0.0001

* Gross income per month/per person/per household in EUR.
Data are presented as odds ratio with 95% CI.

Table 7. Effect of age, gender, education, income, poor control over life score, presence of chronic illnesses and self-rated health on free and paid doctor's visits in multivariate model: logistic regression analysis

	Free doctor's visits				Paid doctor's visits			
	OR	−95%CI	+95%CI	P	OR	−95%CI	+95%CI	P
Females	1.48	1.18	1.84	0.0006	1.75	1.33	2.31	<0.0001
Education:								
primary	–	–	–	–	1			
skilled	–	–	–	–	1.56	0.83	2.93	0.2
high school	–	–	–	–	2.82	1.60	4.96	0.0003
college/university	–	–	–	–	5.66	3.11	10.31	<0.0001
Income:*								
<75	–	–	–	–	1			
75–124	–	–	–	–	1.62	0.93	2.70	0.1
125–249	–	–	–	–	1.75	0.95	2.81	0.05
250–374	–	–	–	–	2.61	1.28	4.41	0.003
>374	–	–	–	–	2.73	1.75	5.15	0.002
Poor control over life score	1.21	1.12	1.31	<0.0001	1.11	1.01	1.22	0.03
Chronic illnesses:								
absence	1				1			
presence	2.66	2.08	3.41	<0.0001	1.56	1.18	2.07	0.002
Self-rated health:								
good	1				1			
poor	1.50	1.17	1.94	0.002	1.68	1.37	1.89	0.04

* Gross income per month/per person/per household in EUR.
Data are presented as odds ratio with 95% CI.

RESULTS

Population characteristics

The questionnaire was completed by 1836 participants. The distribution of study population by age, socioeconomic status, poor control over life score, self-rated health, doctor's visits and chronic illnesses is shown in Table 8.

Nearly 45% of participants reported income corresponding with the country average (125–249 EUR per month/ per person). In every seventh household, the income was lower than 75 EUR per month/per person. Among chronic diseases, hypertension was most frequently reported (20.7%). This was followed by back illnesses (19.8%), hypercholesterolemia (13.6%), gastritis (9.3%), coronary heart disease (7.8%), and diabetes (3.3%). In the group of diabetic patients, 97% of them suffered from type 2 diabetes mellitus.

It was found that 64% of participants did not visit doctor's office during the last year, prior to the survey, and 28.7% visited their doctor (free visits) during the past year. Only 14.5% of participants visited private surgeries. Health was rated by 70.3% of respondents as "good" and by 29.7% as "poor". Mean poor control over life score for our respondents was about six.

Effect of age, gender, marital status, education, income, and control over life on chronic illnesses

The results of univariate analysis are presented in Table 2, and of multivariate analysis in Table 5.

Univariate model showed that the occurrence of hypertension was related to older age, lower educational level, higher poor control over life score and the lowest income. Logistic regression analysis in multivariate model showed that poor control over life, older age and the lowest income were the best statistical predictors of hypertension. Back illnesses were more prevalent among women and older participants with lower education, lower income, and poor control over life (univariate- and multivariate models).

We observed that hypercholesterolemia was related to age and poor control over life. Older people who reported poor control over life were more likely to be affected by this illness. Thus in the multivariate model, these two variables were the best statistical predictors of hypercholesterolemia.

The association between gastritis and age, gender, education, income and poor control over life was similar to that of hypertension.

Coronary heart disease was related to age, education, income, and poor control over life. Older people with the lowest income, lower education, and poor control over life were more likely to suffer from coronary heart disease.

Diabetes was associated with age, education and control over life. Multivariate model showed that only age was associated with diabetes, which was more often reported by older than by younger participants.

According to the aim of our study, chronic illnesses were defined as dependent variables in the presented models. We found that poor control over life is the explanatory variable for many of the studied chronic illnesses, however it is impossible to state whether reverse causation may be excluded.

Effect of age, gender, education and income, control over life and chronic illnesses on self-rated health

Tables 3 and 6 present the results of univariate and multivariate models, respectively.

They show that self-rated health was related to age, education, income, poor control over life and any of chronic illness. In general, older people with lower education, lower income, poor control over life, and chronic illness exhibited the worst self-rated health.

Effect of age, gender, education and income, control over life, chronic illnesses, and self-rated health on free and paid doctor's visits

Tables 4 and 7 present the results of univariate and multivariate models, respectively.

We observed that free doctor's visits were related to age, gender, education, poor control over life, presence of chronic illnesses and low-rated health. The multivariate model showed that women with poor control over life, with chronic illness, and poor self-rated health showed an enhanced tendency to visit doctor's office (free visits).

Table 8. Distribution of study population by age, socioeconomic status, poor control over life score, self-rated health, free and paid doctor's visits and chronic diseases

	Female N = 836		Male N = 1001		All respondents N = 1837	
	N	%	N	%	N	%
Age (years) mean ± SD	39.9 ± 13.8		41.1 ± 13.8		40.6 ± 13.8	
Marital status:						
single	203	24.3	272	27.3	475	25.9
married	498	59.7	648	65.0	1146	62.6
divorced	74	8.9	63	6.3	137	7.5
widowed	59	7.1	14	1.4	73	4.0
Education:						
primary	95	11.4	136	13.6	231	12.6
skilled	146	17.5	294	29.4	440	24.0
high school	451	53.9	431	43.1	882	48.0
college/university	144	17.2	140	14.0	284	15.5
Income:*						
<75	114	13.6	135	13.5	249	13.6
75–124	247	29.5	249	24.9	496	27.0
125–249	374	44.7	468	46.8	842	45.8
250–374	65	7.8	77	7.7	142	7.7
>374	36	4.3	72	7.2	108	5.9
Poor control over life score mean ± SD	6.3 ± 1.5		5.8 ± 1.4		6.0 ± 1.5	
Self-rated health:						
good	704	70.3	587	70.2	1291	703
poor	297	29.7	249	29.8	546	29.7
Free doctor's visits:						
no	750	75.15	557	66.71	1307	71.30
yes	248	24.85	278	33.29	526	28.70
Paid doctor's visits:						
no	892	89.4	674	80.9	1566	85.5
yes	106	10.6	159	19.1	265	14.5
Chronic diseases:						
hypertension						
absence	665	79.5	791	79.0	1456	79.3
presence	171	20.5	210	21.0	381	20.7
back illness						
absence	636	76.1	838	83.7	1474	80.2
presence	200	23.9	163	16.3	363	19.8
hypercholesterolemia						
absence	710	84.9	878	87.7	1588	86.4
presence	126	15.1	123	12.3	249	13.6
gastritis or ulcer						
absence	752	90.0	914	91.3	1666	90.7
presence	84	10.0	87	8.7	171	9.3
coronary heart disease						
absence	775	92.7	919	918	1694	92.2
presence	61	7.3	82	8.2	143	7.8
diabetes						
absence	809	96.8	968	96.7	1777	96.7
presence	27	3.2	33	3.3	60	3.3

* Gross income per month/per person/per household in EUR.

We observed that paid doctor's visits were related to gender, education, income, poor control over life, presence of chronic illnesses and low-rated health. The multivariate model showed that women with higher education, higher income, poor control over life, chronic illness, and poor self-rated health tended to visit private surgeries more often.

In previous models, significant association between chronic illness and poor self-rated health was found. In the present study these variables were included into one model. Due to multicollinearity of independent variables odds ratios could be distorted.

Marital status had no effect on the analyzed dependent variables in all multivariate models.

DISCUSSION

This study is a part of the CINDI Program designed to decrease morbidity and mortality due to noncommunicable diseases by focusing on lifestyle changes and preventive interventions [9]. In 2001, the CINDI Program strengthen its position in Poland as one of the most important and useful national initiatives for health promotion and disease prevention [13]. The first randomized surveys, under the CINDI program were performed in Łódź in 1990/91 [14] and then in 1995/1996 [15]. This is the third study under the CINDI program conducted in the countries undergoing the process of industrial, economic and social transition. Although this project is a part of an intervention program, the selection of the study population and the survey preceded the intervention program and the results may be regarded as representative for the Polish urban population. It is also worth noting that in Poland health insurance registration is free and thus almost all people are registered hence the study population is representative for population of Łódź.

In the presented study, the association between income, education, poor control over life and health in an urban area was examined, whereas some studies use only one indicator of SES which may yield misleading results or provide less information than the use of multiple measures.

In our analyses, older people were less educated and their state of health was worse. The frequency of chronic diseases in our sample seems to be surprisingly high. Although all chronic illnesses were related to older age, they were quite frequent among young and employed participants. An association was also observed between chronic illnesses and the poor control over life; this relationship was mostly pronounced in case of gastritis. Laaksonen et al. [4] showed in their study that the level of stress was higher in Poland than elsewhere. In the same study, the perception of lack of control was slightly more frequent in Eastern Europe due to a large proportion of Russian and Polish respondents. It is important to mention that Łódź is a representative area for this study and for Poland. After 1989, Eastern Europe witnessed an increase in both poverty and inequality. Many authors believe that the effect of poor economic situation is mediated by psychosocial factors [4,16–19]. According to this hypothesis, economic dissatisfaction and inability of people to influence their own situation by participating in political and public life have contributed to their deprivation as compared with Western European countries. In our study, the frequent presence of psychological factors could be due to changes in the economic situation, loss of jobs, and high unemployment rate, mainly among older people with low education.

Education is available for all individuals, regardless of employment status, has high reliability and validity and is generally stable. Several different mechanisms by which education may positively influence health have been proposed. It has been suggested that both education and health are markers for wealth [7]. Others have argued that education may simply serve as a marker for intelligence [20]. Some have suggested that higher education may improve health by conferring economic advantages [21,22]. In our study, the strongest relationship was seen between education and coronary heart disease and back illnesses; lower education was correlated with higher prevalence of diseases. An earlier multivariate analysis [7] showed that higher education reliance promoted positive health behaviors, higher self-esteem and self-efficacy. Marmot et al. [17] found evident association between education and risk of myocardial infarction: the higher the education, the lower the risk. Cardiovascular disease studies have shown

that lower education is associated with hypertension [23,24] and high cholesterol [23,25]. The Czech, Russian and Hungarian studies showed that the higher the place in the social hierarchy, the lower the mortality [26–28]. This was also similar to the gradients that have been investigated in the Whitehall studies [29–32]. In conclusion, education may be important not because it provides varied information in early life, but because it is an avenue to better social position in adult life which in turn is related to health determinants.

In our study, income showed high association with hypertension, back illnesses, gastritis, and coronary heart disease; people with lower income were more likely to suffer from any of the studied chronic illnesses. It could be argued that measures of material situation fail to predict ill health because they are poor measures [23]. There are potential limitations in using education and income as sole indicators of SES; their stability may mask important changes in living conditions of individuals. On the other hand, high level of education and high income may protect against some chronic diseases by influencing life-styles or problem-solving abilities. They may also facilitate the acquisition of positive social and psychological factors and insulate from adverse effects [8].

We found that participants with high education tended to have more paid doctors' visits than those with lower education; this phenomenon was not reflected in the frequency of free visits. It may be suggested that the knowledge of health issues combined with higher education may explain the relationship between education and proper health behavior. We found strong association between gender and doctors' visits; women visited doctors (including paid and free visits) more often than men.

Perceived control over life appear to significantly mediate some of the effects of material deprivation. Bobak et al. [33] in their study, carried out in seven post-communist countries, showed that like in the western populations, education and material deprivation are strongly related to self-rated health. Bobak et al. [34] reported that perceived control over life was strongly related to age, sex, and physical functioning. In the same study, material deprivation strongly related to both outcomes and education

was inversely related to self-rated health. These results are consistent with a hypothesis that poor health in Russia is related to dysfunction of social structures, socioeconomic deprivation, and perceived control. In our study, chronic illnesses, poor control over life, income and education had impact on self-rated health. People with chronic illness, with poor control over life, low income, low education reported their health as "poor". Seventy percent of studied population rated their health as "good", and 30% as "poor". This finding was really unexpected since people in the countries of Eastern Europe perceive their health worse than people in West Europe [3]. Laaksonen et al. [4] in their study showed the remarkable East-West difference gap; among both men and women the ratings were consistently lower in Russia and Poland. Less than 20% of Czech men and women, aged 55–64 years, rate their health as "good" or "very good", compared with around 80% of people in Switzerland [35]. This may be explained by the fact that our population was younger (age range, 18–64 years), about 80% of the population was below 55 years. Young people are much better adjusted to the new economic situation (have more skills, work harder and longer) than people raised under the communist regime before 1989.

Our study has some limitations. The response rate was relatively low, although, similar to that observed in the first mailing (47%) in the Finbalt Health Monitor Survey [36]. The follow-up mailings were an effective way to increase the total response rate (70%), but it is doubtful whether they are good enough to reach "hard core" non-respondents [37]. Self-selection (people with higher educational attainment and higher income) in epidemiological studies may lead to an overestimation. It is typical of surveys that they provide limited information on non-respondents, hence great difficulties in measuring the exact magnitude of the bias [37].

The methods of data collection used in the study (self-reported, face-to-face interview) have some disadvantages: interviewers may influence answers and sensitive questions are difficult to ask. We used the term "control over life" to assess the problem of "psychosocial stress" in our population, since the psychological literature refers to "stress" as

a rather complex concept. The study was carried out in a community with high unemployment rate thus its results cannot be simply extrapolated to other communities, although the area may be rather considered typical of the country. Despite these limitations, the data reported here may represent a larger population from industrial areas of Poland and point to the factors which might contribute to the East-West health gap during socioeconomic changes in the countries of Central and Eastern Europe.

To our knowledge, there are only few Eastern European studies investigating associations between SES dimensions, stress, health behavior, and chronic diseases. Because of different methods used in those studies, it is difficult to compare their results. There may be also a cohort effect that distort the differences between populations of different age groups and local conditions.

CONCLUSIONS

This study showed that poor control over life was strongly associated with chronic illnesses. Unsatisfied everyday needs, lack of work satisfaction, hard work with little or without hope of reward, low control over one's own life style could be in turn responsible for poor control over life frequently observed in our participants. Although we showed the relationship between education, coronary heart disease and back illnesses as well as between income, hypertension and gastritis, there may be no sole SES measure with universal validity suitable for our population. However, our study suggest that higher education and higher income are strongly associated with good health during the period of socioeconomic transformation. We found that education and income are strongly associated with health self-rate. It could be useful to adopt our understanding of the effect of SE status on health in attempts to improve the access to health care, shape positive health behavior through health promotion, and reform the health care system. Research carried out in societies in transition may indeed help to understand how societal factors contribute to health inequalities.

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