ORIGINAL PAPER

J Health Inequal 2016; 2 (2): 163–171

Submitted: 07.08.2016, accepted: 12.09.2016

DOI: https://doi.org/10.5114/jhi.2016.65358

JOURNAL of Health Inequalities

Assessment of quality of life among participants of PURE Poland study

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ABSTRACT

Introduction: The aim of this study was to assess the quality of life of participants enrolled in PURE Poland study.

Material and methods: Anonymous survey of quality of life was carried out between 2007 and 2010 as an additional study among population of Lower Silesia in Poland enrolled in PURE Poland study. Survey covered 1053 people of PURE Poland study population, who agreed to complete the survey. Three age groups were distinguished. The research was conducted with use of international quality of life questionnaire WHOQOL–BREF. Data was analyzed in respect to gender, age, civil status, level of education, and current sense of being diseased or diseased free.

Results: The majority of respondents assessed their subjective quality of life (S-QoL) as good or very good. Males assessed S-QoL significantly higher than females, married people evaluated it higher than people living alone, people with higher education rated it higher than people with primary education. Respondents showed highest results in physical domain of quality of life and lowest in the environment domain of quality of life. The S-QoL was correlated with all domains but mostly with psychological domain of quality of life.

Conclusions: Quality of life of the majority of respondents was good or very good. Further research should be conducted with the use of a set of different epidemiological variables (social, institutional, and general environment) and tests, and obtained results could become a base for constructing a model of self-assessed quality of life by the citizens of Wroclaw.

KEY WORDS: quality of life, PURE study, adults.

KEY FINDINGS

1. Quality of life of the majority of the respondents was good or very good.
2. Factors that significantly differentiated assessment of quality of life were gender, civil status, level of education, and subjective perception of being healthy or diseased.
3. Respondents had highest satisfaction of quality of life in physical domain and lowest in the domain of the environment.

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INTRODUCTION

Naturalistic model of medicine focuses only on curing diseases and prolonging life; therefore health, from this perspective, is perceived as an absence of a disease. The disease, on the other hand, is the result of biological dysfunction or a risky behavior. However, health from this perspective, is regarded as an absence of the disease, which on the other side is a result of a biological dysfunction or a risky behavior. This approach is not including constitutive characteristics of human nature [1] to expand and explain the concepts of health and disease.

Prolonging life became an important measure of health care effectiveness, therefore indicators like surviving rates became a reflection of therapeutic successfulness [2]. Along this, quality of living was always perceived as important yet not directly formulated goal of medical practice [3]. Recently it was stressed that medicine cannot be limited only to its biological approach, and adequate focus should also be implemented on patient's quality of life. In some circumstances, it may be even more important than biomedical results [3, 4].

The quality of life came into play in the 1970s, when evaluations of medical and non-medical consequences of medical interventions on health/disease related states started to include assessment of quality of life in areas like oncology, internal medicine (especially circulatory system diseases) rheumatology, psychiatry, and gerontology [5]. This was a part of general change in approach to patient from just biomedical to model of holistic medicine. The objective of today's medicine, besides prolonging life in a biomedical way, is to make patient's life similar to other healthy people of the same age.

In the WHO definition of health, based on bio-socio-ecological model, health is a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity [6]. Patient's subjective perception of health is considered to be equally important with the traditional bio-medical evaluation of body functioning.

According to the above-mentioned definition of health, the quality of life started to be associated with subjective comfort, and dividing it into cognitive and emotional parts. Quality of life judged in that perspective, is related to other factors: socio-demographic factors, economic factors, personality, and to life events [7].

Discussions on how to understand and evaluate the quality of life in medicine are on today's clinical and public health agenda. The fundamental point is to define quality of life, so it can be used in practice. In objective approach, the quality of life is understood as an object with its characteristics or a process defined descriptively. In subjective approach, the characteristics of quality of life have assigned values.

TABLE 1. Ratings of subjective quality of life (S-QoL)

Very good or good	Neither good nor bad	Bad or very bad
3	2	1

In 1984, Till, McNeil, and Bush have stated that the quality of life is more a general concept, and should include psychological, social, and physical activities aa well as beneficial aspects of well-being, as much as negative aspects caused by diseases and infirmity [8].

WHOQOL Group (World Health Organization Quality of Life Group, 1993) defines quality of life as an individual perception of one's life situation in context of culture and system of values, in which he/she lives and also relations with his/her objectives, standards, expectations, and needs [9]. In the scope of quality of life (with its objective and subjective factors), WHO includes: 1. physical state, 2. psychological state, 3. level of independence, 4. social relations, 5. environment, 6. religion, faith, and beliefs.

The aim of our study was to assess the quality of life among Wroclaw's agglomeration adult inhabitants.

MATERIAL AND METHODS

PURE (Prospective Urban Rural Epidemiology) study covers 21 countries with different status of economic development, and enrolls over 150 000 people overall [10]. All participants were tested in accordance to the PURE project protocol. The baseline of PURE Poland study covers group of 2036 people divided in three age groups (< 45, 45-64, > 64 years old), 1277 women and 758 men inhabitants of both urban and rural areas from Lower Silesia. The study was conducted between 2007-2010. During the study, all patients after 3, 6, 9, and 12 years of project cycle have been invited for a follow-up.

Presented data apply to 1053 individuals, who agreed to complete the survey regarding the quality of life. The survey was completed individually by the patients, who undergone examination in PURE study centers, which are located in Wroclaw Medical University for urban dwellers and in the medical centers in Węgry and Wierzbna for rural dwellers. Women significantly more often agreed to complete the survey than men (62.0% of women vs. 38.0% of men).

Three age groups were distinguished: 30-49 years old (27.1%), 50-59 years old (40.6%), and 60 years and over (32.3%).

The clear majority of respondents were married (73.7%), followed by people living alone (26.3%), and included: singles – 7.4%, divorced – 10.8%, and widowed – 8.1%. In respect to education, 41.5% respondents had secondary education, 40.3% had higher education, and 11.1% vocational education; people with primary or lower secondary level of education accounted for 7.1%.

The research was conducted with use of an international quality of life questionnaire WHOQOL–BREF. It contains 26 questions, each rated by the respondent on a descriptive five-point scale. Two questions related to the subjective assessment of quality of life (S-QoL), and

satisfaction of one's health are rated on five-point scale. This five-point scale was further transformed to three-point scale (Table 1).

The remaining 24 questions form four separate domains of quality of life were related to physical, psychological, environment, and social relations. The final score in each domain varied between 0-100 points, higher values corresponded to a higher quality of life. Each domain was built with set of components (Fig. 1).

The result in the physical domain is a reflection of the level of satisfaction or dissatisfaction from ability to execute tasks of daily living, dependence on medicinal substances, and medical aids, energy and fatigue, mobility, pain and discomfort, rest and sleep, and the ability to work.

Result in psychological domain reflect ones feeling/sense of meaning in life, joy of life and satisfaction with oneself, positive and negative feeling, ability to concentrate, bodily image and appearance.

The result in the domain of environment consists of sense of security in everyday life, sense that the environment, in which one lives is healthy, sense of having enough money to meet personal needs, the availability of information needed in everyday life, adequate leisure time opportunities, satisfaction with housing conditions, satisfaction with the availability of health services, and satisfaction with the personal ability to move (mobility).

In case of the field of social relations, the score is the result of the level of satisfaction with personal relationships, intimate life, and with the support received from friends.

Calculations focused on statistical differences in rating subjective quality of life (S-QoL) and quality of life (QoL) in four domains in respect to socio-demographic characteristics.

Distribution of S-QoL and its ratings was explained by single factor variance analysis ANOVA with such variables like QoL in the domains and socio-demographic characteristics. Regression analysis helped to build model explaining ratings of S-QoL. Mann Whitney test was used to disclose other significant differences in rating quality of life, in respect to chosen socio-demographical characteristics like: age, gender, marital status, and level of education.

For calculations, statistical package STATISTICA 10.0 PL was used and the minimal statistical significance (p) was set at a level of 0.05.

RESULTS

The majority of respondents (77.4%) assessed their S-QoL as good or very good. Only less than 3.0% of the respondents declared that their S-QoL is bad or very bad. Males assessed their S-QoL significantly better than females ($F_{1.1047} = 5.656$, $p = 0.02$). Marital status significantly differentiated S-QoL ($F_{1.1038} = 10.744$, $p = 0.00$). Married people rated the quality of life significantly higher than people living alone (singles, widowed, divorced, or in separation). Most frequently, people with higher education rated their quality of life as very good or good (82.2%). The least likely to rate quality of life as very good or good were people with primary education (70.3%). These differences were statistically significant ($F_{1.1042} = 5.079$, $p = 0.00$). No significant differences in the assessment of quality of life was found due to the age of the respondents. In case of all socio-demographical variables, more than three-quarters of respondents assessed their quality of life as good or very good. S-QoL significantly differentiated the current sense of health or disease ($F_{1.1034} = 11.161$, $p = 0.00$). People who defined themselves as healthy, more often defined

Activities of daily living Dependence on medicinal substances and medical aids Energy and fatigue Mobility Pain and discomfort Sleep and rest Work capacity	Bodily image and appearance Negative feelings Positive feelings Self-esteem Concentration
Personal relationships Social support Intimate life	Financial resources Freedom, physical safety and security Health and social care Home environment Opportunities for acquiring new information Participation in leisure activities Physical environment Ability to move (mobility)

Physical domain of life quality (physical-QoL)	Psychological domain of life quality (psychological-QoL)
Social relations domain of life quality (social relations-QoL)	Environment domain of life quality (environment-QoL)

FIG. 1. Quality of life in four domains

TABLE 2. Subjective assessment of the quality of life of the inhabitants of Wroclaw, considering gender, age, marital status, level of education, and a sense of health or disease

		Subjective assessment of quality of life S-QoL (%)			
		Bad or very bad	Neither good or bad	Good or very good	*p*
Gender	Males	2.0	16.8	81.2	< 0.05
	Females	3.4	21.5	75.1	
Age groups	30-49 years old	3.5	16.5	80.0	> 0.05
	50-59 years old	2.1	20.5	77.4	
	60 years old or more	3.2	21.4	75.4	
Marital status	Single	7.8	26.0	66.2	< 0.05
	Married	1.8	16.8	81.4	
	Divorced/in separation	5.3	25.7	69.0	
	Widowed	4.8	33.3	61.9	
Education	Primary	6.8	23.0	70.2	< 0.05
	Vocational	1.7	18.3	80.0	
	Secondary	3.7	23.2	73.1	
	Higher	1.7	16.1	82.3	
Self-perceived health status	Perceiving oneself as healthy	2.3	16.8	80.9	< 0.05
	Perceiving oneself as ill	3.9	24.3	71.8	
Total		2.9	19.7	77.4	

p – statistical significance for single factor variance analysis ANOVA

their quality of life as good or very good comparing to people perceiving themselves as ill (Table 2).

In order to estimate the impact of satisfaction in each of the domains of quality of life on the S-QoL, a linear regression model was used. Constructed model of regression was statistically significant ($F_{1.1038}$ = 87.266, p = 0.00), and all predictors together explained about 25% of the independent variable S-QoL (R^2 = 0.252). Significant impact on S-QoL had the result in each domain: psychological domain (β = 0.286, t = 8.233, p = 0.00), social relations (β = 0.163, t = 5.224, p = 0.00), environment (β = 0.115, t = 3.457, p = 0.00), and physical domain (β = 0.068, t = 2.088, p = 0.04).

Out of all four domains of quality of life, the satisfaction in psychological-QoL had highest impact on subjective assessment of quality of life. In order to estimate the impact of the individual components of the domains (individual questions in the questionnaire) on S-QoL, a linear regression model was used. Regression model was significant ($F_{1.1042}$ = 59.839, p = 0.00), and all predictors together explained about 25% of the independent variable (R^2 = 0.256). Significant impact on S-QoL had joy of life (β = 0.228, t = 6.333, p = 0.00), frequency of positive and negative feelings in life (β = 0.190, t = 6.321, p = 0.00), self-esteem (β = 0.147, t = 4.447, p = 0.00), and a sense of meaning in life (β = 0.112, t = 3.126, p = 0.00).

Domain of social relations explained 14% of S-QoL distribution ($F_{1.1039}$ = 58.471, p = 0.00, R^2 = 0.144). In this domain, two components were significant in explanation of S-QoL distribution – satisfaction with personal relationships (β = 0.281, t = 7.796, p = 0.00), and satisfaction with the support received from friends (β = 0.132, t = 4.389, p = 0.00).

Domain of environment explained nearly 19% of the S-QoL distribution ($F_{1.1040}$ = 29.799, p = 0.00, R^2 = 0.186), 6 components of the domain were significant: sense of security (β = 0.226, t = 7.132, p = 0.00), having adequate amount of money to meet personal needs (β = 0.177, t = 5.332, p = 0.00), satisfaction with housing conditions (β = 0.130, t = 4.189, p = 0.00), satisfaction with personal mobility (β = 0.076, t = 2.478, p = 0.01), the possibility of spending leisure time in the preferable way (β = 0.069, t = 2.21, p = 0.03), and a sense of the healthiness of inhabited neighborhood (β = –0.063, t = –2.088, p = 0.04).

Out of all analyzed domains, the result in physical domain quality of life has the least influence on S-QoL. Regression model ($F_{1.1034}$ = 35.123, p < 0.000) showed that for ca. 21% of S-QoL distribution (R^2 = 0.213) was explained by the following components of the domain: ability to perform activities of daily living (β = 0.278, t = 7.719, p = 0.000), ability to work (β = 0.129, t = 3.712, p = 0.000), satisfaction with health (β = 0.116, t = 3.412, p < 0.001), energy and fatigue (β = 0.103, t = 3.021, p < 0.003), and dependence on medicinal substances and medical aids (β = –0.097, t = –2.862, p < 0.002).

TABLE 3. Distribution of the results of the four domains of quality of life by gender, age, marital status, and education level

Physical domain of QoL										
		Mean	Median	Mode	Minimum	Maximum	SD	First tercile	Second tercile	*p*
Gender	Males	72.2	69	81	25	100	14.1	69	81	< 0.05
	Females	69.6	69	69	19	100	14.3	63	75	
Age groups	30-49 years old	74.0	75	75	31	100	13.0	69	81	< 0.05
	50-59 years old	71.5	69	81	31	100	14.1	69	81	
	60 years old and more	66.7	69	69	19	100	14.8	63	75	
Marital status	Single	70.5	69	69	19	100	14.4	63	81	< 0.05
	Married	71.4	69	81	25	100	13.8	63	81	
	Divorced/in separation	69.5	69	81	31	100	15.1	63	81	
	Widowed	66.0	69	69	19	100	16.8	63	75	
Education	Primary	61.3	63	69	25	100	14.9	69	75	< 0.05
	Vocational	68.4	69	multiple mode	31	94	13.0	63	75	
	Secondary	69.2	69	69	19	100	14.4	63	75	
	Higher	74.4	75	81	38	100	13.3	69	81	
Total		70.6	69	81	19	100	14.3	63	81	
Psychological domain of QoL										
		Mean	Median	Mode	Minimum	Maximum	SD	First tercile	Second tercile	*p*
Gender	Males	66.7	69	69	38	94	12.1	56	69	< 0.05
	Females	62.5	63	69	19	94	12.7	56	69	
Age groups	30-49 years old	64.8	69	69	19	94	12.4	56	69	> 0.05
	50-59 years old	64.4	69	69	19	94	12.1	56	69	
	60 years old and more	63.1	63	69	19	94	11.8	56	69	
Marital status	Single	58.5	56	56	19	88	12.2	56	63	< 0.05
	Married	65.2	69	69	19	64	11.6	63	69	
	Divorced/in separation	62.7	63	69	19	94	13.1	56	69	
	Widowed	60.0	63	69	18	88	13.1	56	69	
Education	Primary	59.7	56	56	19	94	14.1	56	69	> 0.05
	Vocational	66.1	69	69	38	94	10.6	63	69	
	Secondary	63.6	66	69	19	94	11.9	56	69	
	Higher	64.7	69	69	19	94	12.1	56	69	
Total		64.0	69	69	19	94	12.1	56	69	

TABLE 3. Cont.

Social relations domain of QoL										
		Mean	Median	Mode	Minimum	Maximum	SD	First tercile	Second tercile	*p*
Gender	Males	68.1	69	75	25	100	14.3	56	75	> 0.05
	Females	66.4	69	75	6	100	16.4	56	75	
Age groups	30-49 years old	67.6	69	75	6	100	17.3	56	75	> 0.05
	50-59 years old	67.5	69	75	6	100	15.5	56	75	
	60 years old and more	66.1	69	75	19	100	14.3	56	75	
Marital status	Single	58.1	56	56	25	81	15.0	69	75	< 0.05
	Married	69.4	75	75	6	100	14.5	69	75	
	Divorced/in separation	58.9	56	56	6	100	18.8	50	69	
	Widowed	65.5	69	69	31	100	15.1	56	75	
Education	Primary	62.3	69	69	6	94	15.9	56	69	> 0.05
	Vocational	69.7	75	75	19	100	13.8	69	75	
	Secondary	67.7	69	75	6	100	15.4	69	75	
	Higher	66.5	69	75	6	100	16.2	56	75	
Total		67.0	69	75	6	100	15.7	56	75	
Environment domain of QoL										
		Mean	Median	Mode	Minimum	Maximum	SD	First tercile	Second tercile	*p*
Gender	Males	63.7	63	63	25	94	11.1	56	69	> 0.05
	Females	62.4	63	69	13	94	11.9	56	69	
Age groups	30-49 years old	62.4	63	63	25	94	10.9	56	69	> 0.05
	50-59 years old	62.6	63	69	13	64	12.1	56	69	
	60 years old and more	63.6	63	69	25	94	11.8	56	69	
Marital status	Single	60.8	63	69	25	94	13.0	56	69	> 0.05
	Married	63.7	63	63	13	94	11.4	63	69	
	Divorced/in separation	59.2	56	56	31	88	11.9	56	63	
	Widowed	62.1	63	69	38	88	11.1	56	69	
Education	Primary	63.2	63	63	25	94	12.3	56	69	< 0.05
	Vocational	62.9	63	multiple mode	38	94	10.5	56	69	
	Secondary	61.6	63	63	13	94	11.6	56	69	
	Higher	64.2	63	69	13	94	11.8	56	69	
Total		62.9	63	multiple mode	13	94	11.6	56	69	

p – statistical significance for Mann-Whitney test

The distribution of the results in each of the four domains of quality of life were presented in respect to gender, age, marital status, and education level (Table 3).

DISCUSSION

The average life expectancy is systematically prolonging. As a result, new problems emerge: concerning the functioning of individuals in all spheres of life and the influence on the perception of quality of life. In order to identify these issues, it is necessary to conduct systematic research on the quality of life in selected populations.

Level of satisfaction with the quality of life among our respondents, residents of Wroclaw, is very high, both compared to overall Poland's results and other countries' results. The proportion of people declaring at least a good quality of life was 77.4% and only 2.9% believed their quality of life is bad or very bad. The results are higher than those in the report – Philips-index published in 2010, in which a good or very good health status and well-being was declared by 67% of respondents [11]. Moreover, our results are also higher than those in the population of economically active people aged 45-60 years, citizens of the Upper Silesia agglomeration, among which the percentage of people declaring good quality of life was 64.9% [12]. Previous report shows that Poles have higher overall sense of well-being than people in France, Germany, Spain, United States, and Turkey, in which the percentage of people declaring well-being are respectively 55%, 52%, 54%, 55%, and 34% [11]. It is worth noting that the mean values obtained in three out of four domains of quality of life for investigated residents of Wroclaw are higher than those obtained in the economically active population of Upper Silesia agglomeration (respectively: the physical domain 70.6 vs. 54.9; psychological one 64.0 vs. 60.8; environmental one 62.9 vs. 57.1) [12]. In search for the causes of such a high level of quality of life of the inhabitants of Wroclaw, it is worth noting, that in the PolSenior study in Poland, the percentage of people evaluating their quality of life to at least a well-degree was the highest in the southern macro region, in which Wroclaw is located. Residents of the southern macro region were characterized by the highest level of quality of life in the physical and the psychological domains [13, 14]. Moreover, it should be emphasized that subjective assessment of the quality of life of our surveyed residents of Wroclaw in the highest degree translates to satisfaction in the field of psychological quality of life and social relations. As other studies show, the joy of life, the frequency of feeling negative and positive feelings, and satisfaction with social support are important factors in the assessment of quality of life [15, 16]. In our study, 58.7% of respondents felt the joy of life, 69.4% had negative feelings rarely or very rarely, and 68.0% of satisfied or very satisfied with their personal relationships. The percentage of people satisfied or very satisfied with the support received from friends and loved ones was 70.5%.

Our investigations indicate that among the factors determining the quality of life of the surveyed residents of Wroclaw are mainly sex, marital status, education level, and current health status.

In the population of our study, men rated the quality of life higher than women. Moreover, men were characterized by a higher level of satisfaction with the quality of life in domains such as: physical, psychological, and environmental. Our findings are consistent with the results obtained in the study PolSenior. 64.1% of men vs. 54.4% of women assessed their quality of life as at least good [13]. Significantly higher mean values were obtained in males than females in the physical domain (13.62 vs. 12.67, respectively) and psychological (14.47 vs. 13.72, respectively) domains [14]. Therefore in the Philips-index report, men assessed their health and well-being as good or very good more often than women (69% vs. 65%) [11]. Lower assessment of the emotional state of women than men were reported already in many previous studies [17]. Our results indicate a higher quality of life of men than women, which is consistent with findings of study of Gholami *et al.*, in which a significantly higher quality of life in the psychological domain characterized men not women (14.11 vs. 13.41), and a higher mean score of all aggregated domains of quality of life was reported (71.62 vs. 69.76) [18]. Significantly higher quality of life of men than women in the psychological domain has also been demonstrated in other studies domains [19, 20].

Another factor in determining the quality of life of surveyed residents of Wroclaw is marital status. Those who were married assessed the quality of their lives significantly higher than those living alone (bachelors/Misses, person after divorce/persons living in separation, widowers/widows) and they presented significantly higher level of quality of life in the following domains: physical, psychological, and social relationships. Analogical significance has been shown in study of Kowalska *et al.* [12]. Better quality of life of married people rather than of people living alone has also been noted by the authors of other studies [21, 22].

The presence of statistically significant differences in quality of life due to level of education were observed in many studies conducted among Polish citizens, as well as other countries worldwide [12, 21-23]. Our results show an increase in the subjective assessment of the quality of life with increasing level of education and different levels of quality of life in the physical and environmental domains. Hence, the results of research conducted by Skevington [23] among residents of 12 countries, showed a rise in the subjective assessment of the quality of life with increasing level of education, and an increase of the quality of life in all four domains. Also Kowalska *et al.* showed a significant growth in the quality of life in all four domains but in that study, education was analyzed only in a higher/lower system [12]. Indication of the

reasons for the lack of significant differences in the level of quality of life due to the level of education in the psychological and social relations domains of inhabitants of Wroclaw, requires further research.

In the European Union, quality of life is recognized as a priority of social policy and public health, the level of which reflects a wider range of social issues [24]. The European Pact for Mental Health and Well-being, signed in Brussels in 2008, concluded that the mental health and well-being of the residents play an important role in the social and economic success of the European Union [25].

Quality of life is not only important variable but also enables the prediction of undesirable effects of its deterioration. For example, poor quality of life in the community of people aged 65 years or over, can be a predictor for the necessity to locate a person in a social welfare, after previous assessment of disability and dependence [26]. Therefore, from the preventive measures point of view, it is important to attempt to predict the quality of life and propose timely action to improve it.

CONCLUSIONS

1. Quality of life of the majority of the respondents was good or very good.
2. The obtained results of quality of life depended on gender, civil status, level of education, and current sense of being healthy or diseased.
3. Respondents had highest satisfaction of quality of life in physical domain and lowest in the domain of the environment.
4. From all domains, the result in the psychological domain had highest influence on subjectively assessed quality of life (S-QoL).
5. Further research should be conducted with the use of a set of different epidemiological variables (social, institutional, and general environment) and tests. Obtained results could become a base for constructing a model of self-assessed quality of life by the citizens of Wroclaw.

STUDY LIMITATIONS

PURE study is a longitudinal prospective cohort study, which has been continued in follow-ups every three years. The baseline of PURE Poland study covers group of 2036 people divided in three age groups (< 45, 45-64, > 64 years old), 1277 women and 758 men inhabitants of both urban and rural areas from Lower Silesia. In presented article, we show the results of 1053 individuals, who agreed to complete the quality of life survey. Because of the aim and character of the study, the results can be biased due to the method of sampling. Either in comparison to overall population of Poland or population of Lower Silesia, our study population is characterized by overrepresentation of men; overrepresentation of individuals with higher education and underrepresentation of individuals with primary education. Presented distribution of socio-demographic factors indicates, that the quality of life survey was more frequently completed by individuals with higher than average level of education, higher social and material status and greater interest in health issues. This population could be characterized by higher than average indicators of health and quality of life.

DISCLOSURE

Authors report no conflict of interest.

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AUTHORS' CONTRIBUTIONS

KPZ and AS prepared concept and design of the publication. MW collected data. KPZ, JE and DGD analysed data. KPZ wrote the article. DGD, AB and KZ participated in critical revision of the article. KZ and AS finally approved it.