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Research article

FACTORS OF SELF-PRESERVATION AND RISKY BEHAVIOR OF EMPLOYABLE POPULATION IN AN INDUSTRIAL MEGALOPOLIS

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Socio-economic stability of any state is determined by the health of employable population, formed by an individual's behavior, which can be aimed both at preserving health (self-preservation) and at its destruction (risky behavior).

Based on literature analysis, three groups of factors have been identified that determine an individual's behavior in the field of health: socio-biological, socio-economic, and socio-psychological. These factors gave grounds for developing a mathematical model of multifactorial causation of self-preservation and risky behavior pursued by employable population living in an industrial megacity. The empirical base was formed by data from a formalized survey conducted in 2025 among residents of Perm city (n = 582). The data were analyzed using the SPSS Statistics software. The model was built using the neural network procedure of the multilayer perceptron (MLP).

The study has found that health behavior of employable population living in Perm is characterized by a moderate risk profile. This is reflected in a moderate level of commitment to physical activity and medical practices, as well as relatively low manifestation of addictions. The factors identified in the study have a complex interrelationship. At the same time, there is a lack of an unambiguous link between health attitudes and actual implementation of consistent health-preserving behavior. Social support functions as a factor contributing to health preservation, but only with moderate intensity; its excessive manifestation can negate an individual's personal responsibility. In addition, influence of social connections has a bilateral effect: they can both provide support and contribute to formation of unhealthy behaviors through normative pressure. A high level of subjective security perception contributes to increased inclination for self-preservation behavior, while a decrease in this perception initiates the opposite process.

The study highlights complex mechanisms of interaction between factors and self-preservation behavior pointing out that practices aimed at preserving health do not always manifest themselves in a systematic and sustainable form. The results substantiate the necessity to conduct investigative search for additional components forming the structure of self-preservation behavior in addition to behavioral practices. Preventive approaches to reducing risky behavior among employable population should take into account specific factors, which determine this behavior in various social groups, and adapt to their specific needs.

Keywords: *risky behavior, self-preservation behavior, health, employable population, multifactorial causation, neural network modeling.*

Given the ongoing social and economic transformation and unfavorable demographic trends, health of working age population becomes a key element of the human capital, which provides the most vital grounds for reproduction of social structures, functioning of social institutions and competitiveness of the society in general. Sustainable Development Agenda up to 2030[1], which was developed with the WHO participation, aims to decrease the global disease burden and reduce likelihood of untimely deaths of employable population due to diseases predominantly caused by behavioral risk factors by one third [1]. These factors do not only affect population health, in particular, that of working age population but

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[1] Sustainable Development Goals. *UN: official web-site*. Available at: https://www.un.org/sustainabledevelopment/ (April 29, 2025).

also endanger employment stability, especially given workforce ageing [2]. Thus, in many cases, chronic diseases result in sick leaves, lower workforce productivity, and an increase in allowances given to disabled people. All this creates substantial financial burdens for employers, state budgets and national economies [3]. People who live in industrial megacities can be additionally exposed to unfavorable sanitary-epidemiological factors, including working conditions that do not conform to safe standards, low quality of drinking water and ambient air [4]. Under negative environmental exposures, risky behaviors lead to more serious health impairments in working age population. Therefore, social and behavioral aspects of protecting working age population's health in industrial regions play a crucial role in labor market formation, acceleration of GDP growth and rise in the welfare of the society as a whole.

Self-preservation as a behavioral practice is closely connected with 'health' as a category acting as its system-forming element. Positive self-preservation behavior is usually called health promotion or health protection [5], whereas negative self-preservation behavior is risky or self-destructive [6]. In scientific discourse, health behavior is described from various theoretical positions including medical, psychological, and sociodemographic approaches [7, 8]. In sociology, this category is mostly described within the behavioral approach through a system of actions taken by an individual and aimed at protecting or destructing one's health during the whole lifespan [9], as well as choices made by an individual as regards their health [10]. It includes various behavioral practices such as eating habits, physical and medical activity, addictions, etc. [11]. Self-preservation is not considered as a simple individual phenomenon; it is built in a wider social context and acts as a fundamental norm of a social order in various societies being 'formed genetically and supported socially' [12].

Health behavior is determined by many factors; they act at macro- and micro-levels and have both positive and negative effects. Macro-factors are social-political, socioeconomic and sociocultural contexts. For example, smoking can be associated with socializing, sharing, and male identity in some South Asian cultures; this illustrates how sociocultural norms can make a norm out of behavioral practices, which are potentially hazardous for health [13]. Micro-factors of self-preservation are a set of individual traits, which determine a person's health behavior. These traits differ depending on a study and cover the following: sex, age, education, income, social environment [14], employment, religion, health [15], marital status, health attitudes [16] etc. This study focuses on micro-factors, which can promote preservation of physical health or hamper it.

Health Belief Model (HBM)[2] can give theoretical grounds for analyzing how *sex and age* influence health behavior. For example, some researchers give evidence that female sex correlates with lower risks of using psychoactive substances, tobacco in particular; refusal from such practices becomes more common in older age groups [17]. However, if we look at some other self-preservation practices, for example physical activity, then we can see that the study by M. Helgesson and others [18] shows that a considerable part of people aged older than 50 years have lower adherence to such practices against younger age groups due to *poor physical health* and limited mobility.

According to the so called Marriage Protection Theory[3], *marital status* is a significant factor of self-preservation since married people tend to have better health due to mutual social and financial support provided by a partner as well as due to taking care of each

[2] Rosenstock I.M. The Health Belief Model and Preventive Health Behavior. *Health Education Monographs*, 1974, vol. 2, no. 4, pp. 354–386. DOI: 10.1177/109019817400200405

[3] Ross C.E., Mirowsky J., Goldsteen K. The Impact of the Family on Health: The Decade in Review. *Journal of Marriage and the Family*, 1990, vol. 52, no. 4, pp. 1059–1078. DOI: 10.2307/353319

other's health. According to several studies, living with a partner correlates with more likely refusal from tobacco smoking, which can manifest itself both through less frequent smoking and through giving up smoking completely [19].

Material well-being as a health behavior factor has a rather complicated effect: a higher income provides better access to sport infrastructure, variable food products and healthcare services including prevention [20]. Limited financial resources lead to a situation when a person can't afford individual medical procedures or more expensive drugs [21]. When financial resources are limited, taking care of one's health often ceases to be a priority and only serious health issues can return it into the focus of attention.

According to the Human Capital Theory[4], *education* improves knowledge, skills, and other mental abilities that can be employed to promote health. As a rule, educated people have better understanding how important it is to protect health and this may result in more active involvement in prevention and overall health improvement [22]. As reported by some American researchers, higher health literacy allows people to reconsider a 'conventional' lifestyle characterized with unhealthy diets and low physical activity [23].

Analysis of work practices, their organization and peculiarities provides a theoretical and methodological framework for getting an insight into interrelations between an occupational environment and health behavior. *Occupational activities*, on one hand, give more opportunities to certain groups of working age population to pursue self-preservation; for example, some employers provide better access to qualitative healthcare services for their employees. In addition, providing workers employed at industrial enterprises with optimal diets at workplace is a highly effective measure for preventing occupational diseases and promoting health and work capacity [24]. On the other hand, long and intensive work hours can result in higher stress levels and this affects a person's health [25]. Some researchers [26] believe that workers who have to deal with intensive physical labor face higher risks of unhealthy behaviors against other occupational groups.

Another significant factor of self-preservation is *health protection intention*, which includes both assessment of current health and an intention to make it better acting as a direct determinant of behavioral intentions aimed at health protection and promotion [27]. As some researchers put it [28], people who take good care of their health usually tend to have more healthy eating habits and are less prone to stick to unhealthy diets.

Social support provided by family and friends also promotes commitment to health protection. For example, in diabetes treatment, high family support promotes more affective adherence to self-assistance [29]. Moreover, peer emotional support correlates with keeping recommended levels of physical activity in free time [30]. Interactions at workplace can also create unique contexts able to form both individual and team decisions as regards health protection behaviors. This research [31] suggests that social / organizational characteristics of the workplace environment, particularly feeling the company values the workers' health and seeing co-workers engaging in healthy behaviors, may be related to nutrition and PA behaviors and obesity.

We should remember that individual health behavior is also shaped by effects of a person's perception of health threats and their severity as well as by estimating potential advantages and barriers associated with taking health protection measures[5] [18]. *Subjective perception of safety* is an individual process, through which people identify risks and make decisions regarding them. Some studies [32] show that using safety belts in the front seat to protect health is, as a rule, less frequent inside

[4] Becker G.S. Human capital: a theoretical and empirical analysis, with special reference to education. Cambridge, MA, National Bureau of Economic Research Publ., 1964.

[5] Rosenstock I.M. The Health Belief Model and Preventive Health Behavior. *Health Education Monographs*, 1974, vol. 2, no. 4, pp. 354–386. DOI: 10.1177/109019817400200405

the city than that outside it. This is probably due to lower risk perception inside the city.

Following the research literature review, factors associated with health protection or destruction were systematized as follows for further empirical check: a) social and biological (sex and age); b) socioeconomic (marital status, having children, education, employment, and income); c) social-psychological (health intentions, social support, subjective perception of safety).

The aim of this study was to develop a mathematical model to describe multifactorial causation of self-preservation and risky behavior of working age population living in an industrial megacity.

Materials and methods. The empirical base of the study was the data obtained by a formalized survey, which was conducted in March 2025 on a sample made of Perm city residents[6]. This city is among the key industrial megacities in Russia where several huge enterprises are located including LUKOIL-Permnefteorgsintez (petrochemical production), Kamteks-Khimprom JSC (chemical production), ODK-Permskie Motory (production of aircraft engines) and others.

Working age men aged 18–62 years and women aged 18–57 years were selected from the total sample for further analysis. Bounds of the working age range were identified using the approach by the Federal Statistics Service, Perm regional office[7]. Officially, working age starts from 16 years in the Perm region just as in the country as a whole. The lower bound of the range was moved to 18 years due to absence of any people below this age among the survey participants.

Working age population was selected as the research object due to its key role in providing economic and social stability of the country; another factor is its numerical superiority, which makes it possible to spread behavioral models typical for this group, including health-related ones, onto other population groups through social interactions. According to PernStat data, as of January 01, 2024, the number of working age population in the Perm region equaled 1412.8 thousand people (for comparison: the age group younger than this age included 499.5 thousand people; older, 583.0 thousand people).

The analyzed sample included 582 people. For further computations, the sample was adjusted per sex to reach conformity with the age structure of the working age population in Perm where men accounted for 49.8 % and women for 50.2 %. The prevailing sample characteristics were as follows: 53 % of the respondents were married or lived with a partner, 59 % stated they didn't have children, 56 % had higher education, and 66 % were employed.

The behavioral concept [33] suggests the most common approach for identifying self-preservation behavior (both its positive and negative orientation). Empirically, it is interpreted as a set of behavioral practices aimed at preserving or destructing physical health and is operationalized through the following components: a) physical activity (*"how often do you do exercises or sports?"*); b) diets (*"Can you consider your diet healthy?"*); c) addictions (smoking – *"Do you smoke, even if just from time to time, cigarettes, electronic cigarettes, tobacco heating systems, vapes, hookahs, etc.?")*; alcohol intake – "*Do you drink alcohol? If yes, then how often?"*); d) medical activity *("How often do you have check-ups or periodical health examination?"*). An aggregated index S, which described individual self-preservation behavior, was created based on the consistency of these variables (confirmed with the Cronbach's alpha) and considering their transformation. Each of the component value was assigned relevant scores, the sum of which (between 5 and 25 scores) made it possible to identify a respondent's individual level of self-preservation. Higher scores indicated a respondent adhered to health protection; lower

[6] Conducted by the authors of the present study.

[7] Statisticheskii ezhegodnik Permskogo kraya. 2024: Statisticheskii sbornik [Statistical annual bulletin of the Perm region. 2024: Statistical data collection]. Perm, Federal Statistics Service, Perm regional office (PermStat), 2024, 337 p. (in Russian).

scores meant a respondent tended to pursue risky behavior. When working with the variables, we transformed the S index data into percentage descriptions of intensity of specific behavioral practices in the respondents from 0 to 100 to make the results more perceivable.

The following questions were used to measure self-preservation factors established by the literature review; for social-biological factors, *"What is your sex?", "How old are you?"*; for socioeconomic factors, *"What is your marital status?", "Do you have children younger than 18 years?", "What is your education?", "What do you do for a living?", "Please, tell, what description fits your financial position the best"*. In addition, some other questions were used in the analysis to establish whether a respondent had sufficient financial resources for health protection: *"Can you afford to apply for chargeable healthcare services in case of necessity?"*. To investigate social-psychological factors, the following questions were selected: *How would you describe your attitudes towards your health?"*, *"How well do you feel support (emotional, financial, or informational) provided by your family members and friends as regards health and safety issues?"* and *"Can you say you feel yourself completely safe?"*.

All data were analyzed with SPSS Statistics software package. We employed descriptive statistics methods, correlation and regression analysis to describe self-preservation and its relationships with the identified factors. The neural network procedure of the multilayer perceptron (MLP) was used to create a mathematical model, which reflected multifactorial causation of self-preservation behavior. In this procedure, hidden neurons were formed based on the linear combinations of categorical inputs, which were automatically transformed into dummy variables by dummy coding. Attributes were normalized for variables in the form of an absolute scale, for example, age.

Results and discussion. Our investigation results obtained for some specific health behaviors among working age population in Perm (hereinafter Perm residents) indicate that positive trends are prevailing. The half of the respondents does sports every day (12 %) or several times a week (38 %). In addition, 43 % of the respondents have annual check-ups or periodical medical examinations. Those who do not visit a doctor even when something is obviously wrong account for not more than 6 %. When estimating diets, most Perm residents (48 %) give it the medium score of 3, but the odds are to the positive, that is, 31 % choose the score of 4 per the scale where 1 means the diet is totally unhealthy and 5 means completely healthy. In addition, addictions are not so prevalent among Perm residents since smoking is reported by less than a half of the respondents (42 %) and the average frequency of alcohol intake is once a month or even rarer; 16 % report they do not drink alcohol at all.

The mean value of the *S* index, which describes an individual level of self-preservation behavior based on the sum of the above given components, equals 67 % out of 100 %. This means that working age Perm residents tend to pursue moderately risky health behavior. Based on this index, the respondents were divided into groups; some of them were mostly oriented at self-preservation while the others were prone to having risky health behavior (Table 1).

The next research task was to empirically test the theoretical factor structure and its feasibility as regards self-preservation. The identified social-biological factors confirmed their influence on self-preservation intensity in the sample made of Perm residents. Sex appeared to have stronger influence (Pearson's $r = 0.256$ at $p < 0.001$) than age (Pearson's $r = 0.082$ at $p < 0.05$). Only education remained a significant predictor among socioeconomic factors (Spearman's $\rho = 0.173$ at $p < 0.001$). The income level did not appear to have an expected significant effect; therefore, having financial resources for health protection was used as an indicator for the correlation (Pearson's $r = -0.139$ at $p < 0.001$). The social-psychological factors also confirmed their significance for self-preservation behavior: social support (Pearson's $r = 0.139$ at $p < 0.001$) and subjective perception of safety (Pearson's $r = 0.105$

Table 1

Description of groups with different levels of health preservation behavior

	Critically risky	Risky	Moderately risky	Health-preserving	Maximum self-preservation
Frequency of physical activity*	The group is empty, No data on mean values available	4 (rarer than once a week)	3 (once a week)	2 (several times a week)	2 (several times a week), 35 % do it every day
Estimating one's diet as healthy[8]		2.7	3.2	3.4	4.4
Smoking (%)		96 % smoke	62 % smoke	5 % smoke	100 % do not smoke
Alcohol intake*		2 (once a week)	4 (several times a months)	6 (rarer than once a month)	7 (do not drink alcohol)
Frequency of medical check-ups*		4 (when something is wrong)	2 (once every 2–3 years)	1 (every year)	1 (every year)
S index value (%)	0–10	11–50	51–70	71–90	91–100
Proportion of the respondents (%)	0	14	38	43	5

Note: * median values of the characteristics were used.

at $p < 0.001$). Health protection intention turned out to be the strongest predictor in the whole factor structure (Spearman's $\rho = -0.405$ at $p < 0.001$). The status of dependent and independent variables in the 'Factor – Self-Preservation' pair was confirmed using the Somers' *D* at $p < 0.001$. We also established a significant correlation between social-psychological and socioeconomic factors (Spearman's $\rho > 0.2$ at $p < 0,001$).

Correlation analysis became the preliminary stage in selecting relevant predictors in neural network modeling with the aim to exclude variables without significant linear relations with the dependent variable. Despite non-linearity of models built using a multilayer perceptron, preliminary filtration per correlation signs makes a model easier to interpret, mitigates a risk of over-learning, and makes further network training simpler. To minimize limitations in multi-collinearity, regression analysis was additionally performed; it confirmed its absence and allowed estimating significance of the chosen predictors.

The dependent variable was created based on the *S* index; it was represented by belonging to one of two groups: 1) the group that predominantly demonstrated risky health behavior and combined risky and moderately risky levels (see Table 1); 2) the group pursuing health preservation behavior (it combined health-preserving level and maximum health preservation level from Table 1). These groups were tentatively called 'risky' and 'self-preserving'. When estimating the explanatory power of the model, we divided the data into the training sample (70 % of the valid data[9]) and testing sample (30 % of the valid data).

The neural network model includes six hidden neurons; each of them is activated based on the linear combination of predictors with relevant weights and shift. Weights reflect a contribution made by a predictor into neuron activation. Interpretation covers the variables that are the most significant per weight; however, it is noteworthy that effects produced by the predictors on the model output are non-linear and depend on activation of other neurons and their weights in subsequent layers (Table 2).

[8] The respondents estimated their diets as 'healthy' using the scale from 1 to 5, where 1 means a diet is totally unhealthy, 5 means a diet is completely healthy (the Table provides the simple mean value).

[9] Ninety observations were excluded from computation of the multilayer perceptron; therefore, valid data are represented by 85 % of the respondents (493 people) and not the whole sample.

Table 2

Assessment of neural network model parameters

Predictor		Predicted							
		Hidden layer 1						Output layer	
Input layer		H(1:1)	H(1:2)	H(1:3)	H(1:4)	H(1:5)	H(1:6)	[O12=1]	[O12=2]
	Shift	0.229	0.408	-0.359	0.422	-0.185	-0.131		
Sex	[Q3=1]	-0.335	-0.024	-0.240	-0.342	0.637	0.601		
	[Q3=2]	-0.066	-0.316	0.088	-0.132	-0.081	-0.407		
Education	[Q8=1]	0.296	-0.188	-0.541	0.413	-0.087	0.105		
	[Q8=2]	0.362	-0.077	0.419	0.264	0.205	0.388		
	[Q8=3]	0.312	0.218	-0.281	0.339	-0.058	-0.069		
	[Q8=4]	0.236	-0.163	0.250	0.175	0.252	-0.103		
Health preservation intention	[Q13=1]	-0.126	0.299	0.156	0.411	-0.344	-0.470		
	[Q13=2]	-0.049	-0.444	0.426	-0.406	-0.353	0.308		
	[Q13=3]	0.134	0.520	-0.353	-0.415	0.311	0.352		
	[Q13=4]	-0.307	0.505	-0.512	0.034	0.395	0.515		
	[Q13=5]	0.219	0.463	0.313	-0.126	0.275	-0.166		
Perception of safety	[Q51=1]	0.083	-0.345	-0.189	-0.112	-0.042	0.301		
	[Q51=2]	-0.276	0.111	0.304	-0.011	-0.080	-0.053		
	[Q51=3]	-0.212	0.085	0.106	-0.195	0.329	-0.290		
	[Q51=4]	-0.142	0.187	-0.265	-0.349	-0.617	-0.033		
	[Q51=5]	0.413	0.454	-0.021	0.104	-0.203	-0.049		
Social support	[Q54=1]	0.223	0.465	0.337	0.241	-0.171	-0.372		
	[Q54=2]	0.008	-0.075	-0.322	0.499	-0.163	0.511		
	[Q54=3]	-0.005	-0.459	-0.177	-0.205	-0.099	0.199		
	[Q54=4]	0.308	0.249	0.179	-0.040	-0.208	-0.547		
	[Q54=5]	-0.462	0.174	0.248	-0.452	-0.452	-0.446		
Financial possibilities	[Q59=1]	-0.200	0.272	0.447	-0.412	-0.556	0.089		
	[Q59=2]	-0.468	0.193	0.203	-0.371	0.167	-0.143		
Age	Q4	-0.483	0.148	0.189	0.036	-0.707	-0.110		
Hidden layer	Shift							0.382	-0.086
	H(1:1)							-0.407	-0.340
	H(1:2)							0.418	-0.173
	H(1:3)							-0.359	0.383
	H(1:4)							0.201	-0.138
	H(1:5)							0.743	-0.357
	H(1:6)							0.364	0.050

Activation of the *first neuron (H1:1)* is predominantly determined by education (Q8): the maximum contribution is made by 'vocational education' (0.362) and 'unfinished higher education' (0.312). Activation is suppressed by such variables as male sex (Q3 = 1; -0.335), age (Q4; -0.483) and absence of financial resources to pay for chargeable healthcare services (Q59 = 2; -0.468). Social-psychological factors demonstrate rather controversial influence thereby reflecting non-linearity of the model: feeling completely safe (Q51 = 5; 0.413) and moderate social support (Q54 = 4; 0.308) strengthen activation but absolute support provided by one's family and close friends (Q54 = 5; -0.462) reduces it. Activations is also reduced by absence of health preservation intention (Q13 = 4; -0.307). As a result, the combination of the above given predictors, considering other hidden layers, reduces the contribution made by the first neuron into classification of the respondents: there is declining likelihood of being assigned into the 'risky' group (-0.407) or 'self-preserving' group (-0.340).

Activation of the *second neuron (H1:2)* is enhanced by negative social attitudes towards health (Q13 = 3, 4, 5), feeling completely safe (Q51 = 5; 0.454) and absence of social support (Q54 = 1; 0.465). The opposite effect is pro-

duced by health protection intention (Q13 = 2; -0.444), feeling unsafe (Q51 = 1; -0.345), moderate support provided by close friends and family (Q54 = 3; -0.459), and female sex (Q3 = 2; -0.316). Analysis of the output layer shows that this neuron increases likelihood of belonging to the 'risky' group (0.418) but declines activation of the 'self-preserving' group (-0.173).

The third neuron (H1:3) is characterized with polar distribution of weight coefficients for mutually exclusive variables. In particular, activation of the third neuron is enhanced by completed vocational (Q8 = 2; 0.419)[10] or higher (Q8 = 4; 0.250) education and weakened by secondary (Q8 = 1; -0.542) and incomplete higher (Q8 = 3; -0.281) education. A similar picture is observed as regards health intentions where a pronounced intention to take care of one's health makes a substantial contribution to the neuron activation (Q13 = 2; 0.426), whereas its decline occurs due to such attributed as a reactive attitude towards health, that is, attention is paid only in case of health issues (Q13 = 3; -0.353) and absence of any care about health (Q13 = 4; -0.512). In addition, the neuron activation is influenced considerably by available financial resources (Q59 = 1; 0.447), feeling unsafe (Q51 = 2; 0.304) and total absence of social support (Q54 = 1; 0.337). The neuron has a double effect on the output layer as it increases likelihood of belonging to the 'self-preserving' group (0.383) and declines it as regards the 'risky' one (-0.359).

The fourth neuron (H1:4) is activated by a responsible attitude towards health (Q13 = 1; 0.411), secondary (Q8 = 1; 0.413) or incomplete higher (Q8 = 3; 0.339) education as well as low support provided by close friends and family (Q54 = 2; 0.499). This neuron is inhibited by male sex (Q3 = 1; -0.342), an attentive (Q13 = 2; -0.406) or reactive (Q13 = 3; -0.415) attitude towards health, elevated feeling of safety (Q51 = 4; -0.349) and absence of social support (Q54 = 5; -0.452). In comparison to other neurons, output weights of this one have a very weak effect on the ultimate classification reaching 0.201 for the 'risky' group and -0.138 for the 'self-preserving' one.

Activation of the *fifth neuron (H1:5)* is enhanced by male sex (Q3 = 1; 0.637), negative health intentions (Q13 = 3; 0.311, Q13 = 4; 0.395, Q13 = 5; 0.275), higher education (Q8 = 4; 0.252) and medium safety perception (Q51 = 3; 0.329). The neuron activity is weakened by an attentive (Q13 = 2; -0.353) and responsible (Q13 = 1; -0.344) attitude towards health, elevated feeling of safety (Q51 = 4; -0.617), social support (Q54 = 5; -0.452); age (Q4; -0.707) and available financial resources (Q59 = 1; -0.556). This neuron increases likelihood of belonging to the 'risky' group (0.743) and declines it as regards the 'self-preserving' one (-0.357).

The sixth neuron (H1:6) has elevated activation for men (Q3 = 1; 0.601) and weakened for women (Q3 = 2; -0.407). Among various health intentions, the highest weights are identified for an unconcerned (Q13 = 3; 0.515), reactive (Q13 = 2; 0.352) and attentive (Q13 = 1; 0.308) attitude towards health. In addition, enhanced neuron activation is associated with low level of feeling safe (Q51 = 1; 0.301) and moderate social support (Q54 = 2; 0.511). In addition to female sex, the neuron activation is weakened by the following attributes: a responsible attitude towards health (Q13 = 1; -0.470), medium level of feeling safe (Q51 = 3; -0.290) and strong social support (Q54 = 5; -0.446, Q54 = 4; -0.547). The sixth neuron makes a positive contribution to predicting belonging to the 'risky' group (0.364) and a minimal contribution to the 'self-preserving' group (0.050).

Following the analysis results, the mathematical model that describes multifactorial causation of self-preservation behavior adopted by working age population living in an industrial megacity (exemplified by Perm) can be given as an equation for input signals of output neurons corresponding to the groups:

[10] It is worth noting that it is enhanced due to the respondents being unable to define their attitude towards health (Q13 = 5; 0.313). This is likely to be associated with the limited sample.

- 'risky': $O1 = F$ (0.382 – 0.407 · H1:1 + 0.418 · H1:2 – 0.359 · H1:3 + 0.201 · H1:4 + 0.743 · H1:5 + 0.364 · H1:6);
- 'self-preserving': $O2 = F$ (-0.086 – 0.340 · H1:1 – 0.173 · H1:2 + 0.383 · H1:3 – 0.138 · H1:4 – 0.357 · H1:5 + 0.050 · H1:6).

The type of the function F in this model is a sigma (logistic) function, which is employed to transform the combination of all signals and weight coefficients into an output value determining likelihood of belonging to one of the groups.

The analysis conducted with using the multilayer perceptron revealed a set of interrelated factors that determine people's proneness to risky or self-preservation behavior. Based on significance of each attribute, social health intentions were found to be the most significant within the created model (99 %); they were followed by sex (61.6 %), social support (56 %), financial resources (37.2 %), education (28.2 %), feeling safe (27.8 %), and age (27 %).

The model showed its capability to classify initial attributes with accuracy reaching 70 %; its predictive capability equaled 83 % for the 'self-preservation' group and 45 % for the 'risky' one.

According to our findings, a health behavior adopted by working age people living in Perm can be described as moderately risky. This is consistent with data obtained by other researchers, in particular, using a sample of workers employed at industrial enterprises in the Perm region [6]. This study found that health behaviors were moderately risky in a large proportion of the respondents (53 %).

Our analysis of self-preservation behavior established the greatest influence exerted by such factors as health protection intention, sex, social support and financial resources a person can use to get chargeable healthcare services. These conclusions are also identified in public conscience. Thus, in a study conducted in 2023 [34], healthcare workers in Moscow mentioned responsibility for one's health (22 %) and availability of healthcare services, chargeable ones included (20 %), as basic determinants of adherence to self-preservation. In the respondents' opinion, absence of support provided by close friends or family reduces motivation to pursue a healthy lifestyle.

The architecture made of six hidden neurons revealed non-linear interactions between social-biological, socioeconomic and social-psychological variables, which create latent behavioral profiles. At the same time, social-psychological factors turned out to have a dualistic effect. First of all, despite high significance of health intention as a self-preservation factor, we should remember that intensity of this factor does not always correlate with actual implementation of persistent health protection behavior. A. Brügger and others established that the respondents who took great care of their health were less prone to search for information about health after they had implemented health protection practices [35]. This is due to the fact that previously taken health protection efforts can justify the following decline in health protection activities.

Second, family and peer support acts as a health protection factor only if it is moderately intensive; maximum intensity can level off personal responsibility. In addition, a person's social relations do not always provide support; in some cases, they have a negative effect promoting unhealthy behaviors. For example, many men consider smoking a good way to maintain social relationships (with friends or colleagues) [13].

Thirdly, high subjective perception of safety increases proneness to self-preservation but any decline in the level of perception induces the inverse process. Researchers explain this regularity by the fact that outer threats can be perceived by a person as uncontrollable as regards their health; therefore, a person does nothing in relation to the existing health risk factors, that is, continues to pursue passive health protection behavior [36].

The factors described in this study are interrelated. For example, social support correlates with financial resources as regards health protection. This is due to the fact that family or peer social support is a multi-dimensional construction, which includes several types; one of them is instrumental support, in particular, granting access to financial resources [37].

Although material welfare and education are separate variables, they, as a rule, are interrelated when influencing self-preservation [38]. Thus, the role played by education in determining such behavior grows especially in case when financial resources are limited since many health protection practices involve only minimal or even zero financial costs [39].

Conclusion. Health and self-preservation issues are of special importance since they influence a person's social interaction and individual priorities and occupy a significant place in the hierarchy of social norms and values [40]. Significance of research on health behavior is becoming more and more obvious in modern industrial megacities where various stress situations and changes in the urban space create additional psychoemotional burdens requiring adaptive reactions of the body and social institutions. Although urban environments offer such advantages as closeness to work, possibility to get better education and easier access to a developed social infrastructure, Russian researchers [41] report that other conditions of an industrial environment increase health risks substantially [42]. Given that, it is quite relevant to analyze factors of self-preservation and risky behavior pursued by working age population in industrial megacities. It will help develop effective strategies aimed at resolving socioeconomic issues, in particular, raising the quality of life and protecting people's health. The created model describing multifactorial causation of self-preservation emphasizes that it is important to find a balance between outer support and internal autonomy when forming such behavior. It helps optimize preventive and self-preservation programs for various sociodemographic groups.

The study highlights complex mechanisms of interaction between factors and self-preservation behavior pointing out that behavioral practices aimed at health protection do not always manifest themselves in a systematic and sustainable form. The results substantiate the necessity to conduct investigative search for additional components forming the structure of self-preservation behavior in addition to behavioral practices.

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