



Research article

A SYSTEM FOR CREATING HEALTHY LIFESTYLE IN EDUCATIONAL ESTABLISHMENTS AS A WAY TO PREVENT HEALTH DISORDERS IN CHILDREN**V.V. Vasilyev^{1,2,3}, M.V. Perekusikhin⁴, E.V. Vasilyev⁵**¹Penza State University, 40 Krasnaya Str., Penza, 440026, Russian Federation²The Penza Institute for Doctors' Advanced Training, a brunch of Russian Medical Academy for Continuous Occupational Training, 8a Stasova Str., Penza, 440060, Russian Federation³N.N. Burdenko's Penza Regional Clinical Hospital, 28 Lermontova Str., Penza, 440026, Russian Federation⁴The Federal Service for Surveillance over Consumer Rights Protection and Human Well-being, Penza Regional Office, 35 Lermontova Str., Penza, 440026, Russian Federation⁵The Center for Hygiene and Epidemiology in Penza Region, 3 Marshala Krylova Str., Penza, 440026, Russian Federation

The paper focuses on morbidity among children that was examined as per medical aid appealability and prevailing behavioral factors among children aged 10–14 who attended schools with different systems for healthy lifestyle creation. In 2008, when a continuous system for healthy lifestyle formation was just being introduced, there were only slight differences in primary and overall morbidity among children aged 10–14 who attended test schools and reference ones; 10 years later, in 2018, primary and overall morbidity was substantially lower among children who attended test schools than among those who went to reference ones. Primarily, it concerns such «school-induced» diseases as diseases of the eye and adnexa; diseases of the respiratory system; gastric diseases; diseases of the musculoskeletal system and the connective tissue; injury, poisoning and certain other consequences of external causes. Data obtained via questioning that was performed among schoolchildren and concentrated on them assessing their health are well in line with official data on morbidity obtained as per medical aid appealability. Children from test schools estimated their health as poor much less frequently than children from reference schools; they were significantly less irritable, and bad mood was also not so frequent among them.

Healthy lifestyle recommended for children included an obligatory combination of 5 basic components: fruit and vegetables should be consumed every day; sleep should be not shorter than 8 hours; physical activity was to be 1 hour a day or longer not more than 2 hours a day should be spent working or playing on a PC, laptop, or a smartphone; no alcohol intake and no smoking either. Assessment of this lifestyle revealed that a share of children who pursued it was higher in test schools than in reference ones; in the 5–6th grades, 18.7±1.62 % and 11.0±1.43 % ($t=3.56$) accordingly; in the 7–8th grades, 19.2±2.09 % and 11.8±1.41 % ($t=2.93$).

Key words: children, secondary schools, a continuous system for healthy lifestyle formation, morbidity, questioning, health self-assessment, behavioral factors prevalence, healthy habits.

At present primary and secondary prevention unfortunately don't provide the results they should [1]; it is confirmed, among other things, by absence of any positive trends regarding schoolchildren's somatic and mental health [2–4]. Given that, it seems vital to make the school environment a useful resource for improving their health and increasing welfare for everyone [5, 6]; to achieve that, greater at-

tention should be paid to examining and analyzing various factors that provide children's and teenagers' health instead of simple risks reduction [7].

Factors that can be considered as a resource for schoolchildren's health improvement primarily include the following: medical support provided at an educational establishment [8, 9], creating a motivation among

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schoolchildren to pursue healthy lifestyle [10–13], supporting positive changes in behavior, physical activity, nutrition, and health self-assessment [14, 15].

Sanitary and hygienic education provided by educational establishments (EE) via building up knowledge and convictions, developing abilities and skills to make a choice on healthy behavior can prevent multiple behavioral risk factors from occurring [10, 16]. A success here depends on interaction between EE and primary medical care [17], families and variable partners [18].

Children should be introduced to preserving and improving their health via creating attitudes towards healthy lifestyle and it should be done starting from early age in the course of their education taking into account peculiarities of their behavioral attitudes towards their own health and places where they live [19–21]. Given that, it seems vital to examine experience gained in organizing an educational process in such a way so that it helps preserve health of schoolchildren who attend secondary schools. It can allow determining what interventions or adjustments are necessary in the sphere.

Our research goal was to comparatively assess two educational processes that were organized in a different way regarding medical support and a system for healthy lifestyle creation.

Data and methods. Our research objects were 6 educational establishments located in Penza city; and schoolchildren who attended these establishments were our units under observation. In accordance with the set goal, we examined morbidity among children in 2008 and 2018 via analyzing data taken from statistical reports (Statistical Form No. 025/u “Medical records of a patient who applies for outpatient care”). We performed a retrospect study of morbidity among children aged 10–14 who attended three test schools (1,087 people in 2008; 1,126 in 2018) and three reference schools (982 and 1,018 people accordingly). Morbidity parameters were calculated as per data on applications for medical aid. In November

and December 2018 a questioning was performed at the same schools; a questionnaire consisted of 30 questions on lifestyle, screening assessments of health, and attitudes towards school (as per an international questionnaire entitled Health Behavior in School-aged Children). 1,935 schoolchildren took part in voluntary anonymous questioning; 1,054 out of them attended the test schools (TS) (579 attended the 5–6th grades; 475, 7–8th grades); 881 attended the reference schools (RS) (355 attended the 5–6th grades; 526, the 7–8th grades).

The test schools were the Secondary School No. 74, “SAN” Gymnasium, and Gymnasium No. 13; in 2008 prevention and rehabilitation offices were opened in all three of them [22], and in the same year a system for continuous education on healthy lifestyle creation was implemented in the educational processes in all three TS. Schoolchildren got access to health-improving procedures, dentist’s aid, and consultations on behavior corrections via visiting a physiotherapeutic or a massage room, training facilities and facilities for exercise therapy that were opened in the TS; it could be done basing on a therapist’s recommendations and without any breaks in the educational process. These test schools where medical support, together with conventional medical offices, includes additional prevention and rehabilitation facilities can be considered a resource for health improvement and it allows providing a health-preserving educational process and preserving schoolchildren’s health that is ranked among the most important tasks the state has to fulfill [23].

Attitudes towards healthy lifestyle are created among schoolchildren attending the TS basing on interdepartmental interactions and sectoral partnership and with parents actively participating in the process; necessary components in healthy lifestyle creation are built into children’s activities during classes, beyond them, and in their project activities (Figure).

In the TS there is a system for continuous education on healthy lifestyle creation including classes on “Healthy lifestyle” in junior

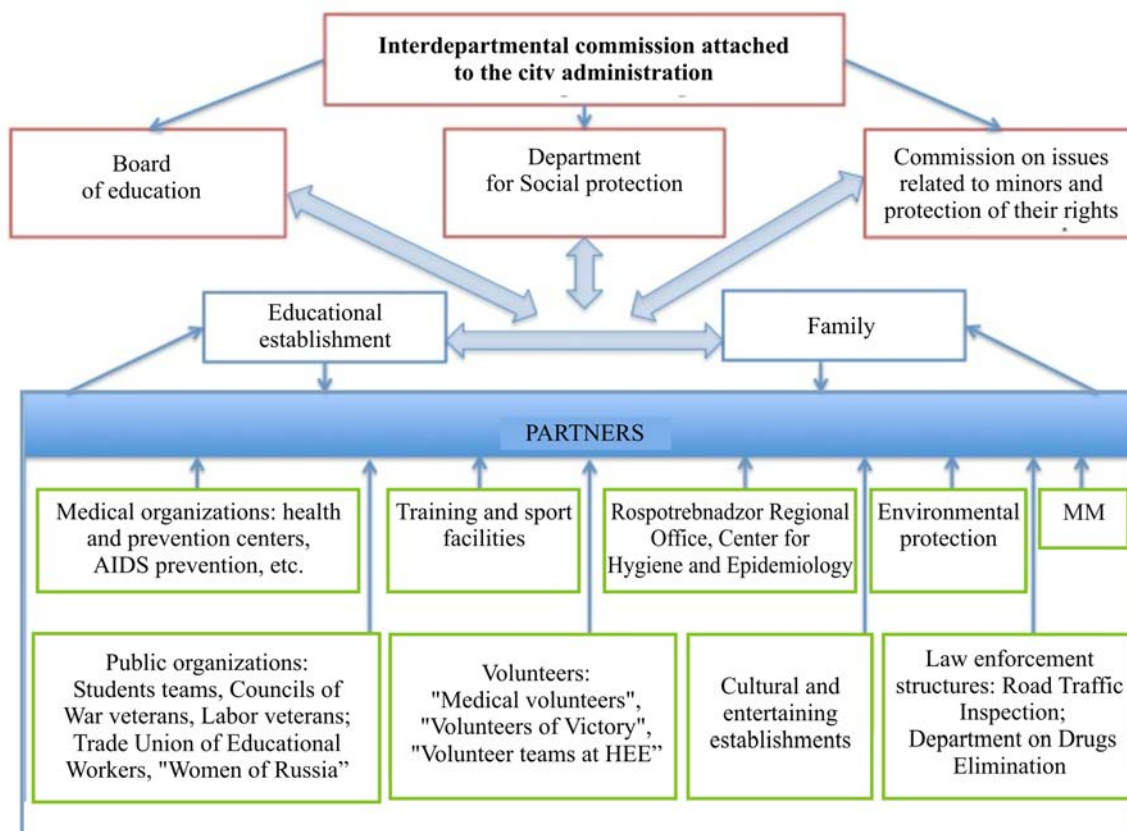


Figure. Interdepartmental interaction and social partnership in creating hygienic culture and healthy lifestyle

and middle grades and “Basics of healthy lifestyle” in senior grades; these classes are taught within a regional component in educational programs. Skills and abilities regarding healthy lifestyle are also trained during lessons in ordinary school subjects such as physical training, biology, chemistry, physics, geography, as well as basics of safe life activities. Continuous education on healthy lifestyle creation is aimed at developing value orientation at health and relevant behavioral stereotypes. Continuous education provided for schoolchildren from the 1st to 11th grade is based on an author’s methodology approved by the Penza regional administration and developed by scientists in a close cooperation with experts from Rospotrebnadzor’s regional office in Penza and schoolteachers. In 2008–2009 the authors’ team created a teaching methodological complex consisting of 11 manuals and textbooks including electronic ones that contained developing and role games. Apart

from conventional education techniques, the educational process utilizes variable technologies such as communication, volunteering, and partnership. All this together allows better communication on risk factors for schoolchildren and their parents, teachers, and school personnel and provides motivation and creating conditions for developing skills of healthy lifestyle.

Our reference schools were the Secondary School No. 52, Secondary School No. 56, and Gymnasium No. 42 where the educational process didn’t provide available prevention and rehabilitation facilities (medical support at school was provided via conventional medical offices) and there was no continuous education on healthy lifestyle creation.

All six schools were located in the Oktyabrskiy district in the city where there were no industrial enterprises and medical aid for minors was provided at a single polyclinic for children, namely the municipal children’s polyclinic No. 6.

All the data were statistically processed with a statistics calculator. Student's t-test was applied to determine statistical significance of values obtained for the examined samplings.

Results and discussion. Having examined applications for medical aid by children in 2008, we detected that primary morbidity and overall morbidity among children aged 10–14 didn't have authentic differences between the test and reference schools ($t_1=1.67$; $t_2=1.22$). Primary morbidity among children aged 10–14 in 2018 went down authentically against 2008, both among school-children from the test schools and the reference ones (Table 1). But morbidity growth in 2018 against 2008 amounted to (-6.47 %) among children attending the TS whereas it was only (-1.37 %) among those attending the RS. Overall morbidity also decreased

over 10 years and its growth amounted to (-6.61 %) among children from the TS and only (-3.11 %) among those from the RS.

In 2018 primary and overall morbidity were authentically lower among children attending the test schools than among those from the reference ones (Tables 2 and 3). Primary morbidity among children attending the test schools was significantly lower than among their counterparts attending the RS as per such nosologies as diseases of the eye and adnexa; diseases of the respiratory system; diseases of the digestive system; diseases of the musculoskeletal system and connective tissue; injury, poisoning and certain other consequences of external causes (Table 2). We didn't reveal any authentic differences in morbidity among children as per other nosologies.

Table 1

Morbidity among children aged 10–14 in 2008 and 2018 (per 1,000 children of the relevant age)

Morbidity	TS		<i>t</i>	RS		<i>t</i>
	2008	2018		2008	2018	
Primary	2,547.43 ± 60.22	2,382.54 ± 54.08	15.4	2,528.91 ± 62.75	2,494.31 ± 60.50	3.1
Overall	3,056.27 ± 76.03	2,854.17 ± 68.65	16.8	3,071.52 ± 80.49	2,976.19 ± 76.01	7.6

Table 2

Morbidity among children aged 10–14 first detected in their life in 2018
(per 1,000 children of the relevant age)

Nosology	TS	RS	<i>t</i>
	$M \pm m$	$M \pm m$	
Diseases cases, overall	2382.54 ± 54.08	2494.31 ± 60.50	10.44*
Certain infections and parasitic diseases	69.06 ± 7.55	67.42 ± 7.8	0.42
Neoplasms	4.63 ± 2.02	5.13 ± 2.24	0.24
Diseases of the blood and blood-forming organs	3.46 ± 1.75	3.86 ± 1.94	0.20
Endocrine, nutritional, and metabolic disorders	10.90 ± 3.09	13.72 ± 3.64	1.09
Diseases of the nervous system	29.22 ± 5.02	30.87 ± 5.42	0.51
Diseases of the eye and adnexa	68.16 ± 7.51	87.03 ± 8.83	4.67*
Diseases of the ear and mastoid process	48.0 ± 6.37	44.14 ± 6.44	1.08
Diseases of the circulatory system	11.25 ± 3.14	12.98 ± 3.55	0.67
Diseases of the respiratory system	1,483.86 ± 25.25	1,519.26 ± 27.84	4.86*
Diseases of the digestive system	247.77 ± 12.86	266.53 ± 13.86	3.63*
Diseases of the skin and subcutaneous tissue	61.73 ± 7.17	62.07 ± 7.56	0.30
Diseases of the musculoskeletal system and connective tissue	66.61 ± 7.43	81.56 ± 8.58	3.73*
Diseases of the genitourinary system	73.02 ± 7.75	68.13 ± 7.90	1.23
Congenital malformations	6.73 ± 2.43	6.65 ± 2.58	0.19
Injury, poisoning and certain other consequences of external causes	198.14 ± 11.8	224.96 ± 13.09	5.37*

Note: here and in the table 3 * means there are authentic differences in morbidity among children from the TS and RS ($t > 2$).

Table 3

Overall morbidity among children aged 10–14 in 2018 (per 1,000 children of the relevant age)

Nosology	TS	RS	<i>t</i>
	<i>M ± m</i>	<i>M ± m</i>	
Diseases cases, overall	2.854,17 ± 68.65	2.976,19 ± 76.01	10.15*
Certain infections and parasitic diseases	88.31 ± 8.45	79.04 ± 8.46	1.09
Neoplasms	7.44 ± 2.56	8.18 ± 2.82	0.32
Diseases of the blood and blood-forming organs	8.08 ± 2.66	7.59 ± 2.72	0.21
Endocrine, nutritional, and metabolic disorders	31.16 ± 5.18	35.52 ± 5.80	1.31
Diseases of the nervous system	41.08 ± 5.91	45.56 ± 6.53	1.27
Diseases of the eye and adnexa	96.47 ± 8.80	107.17 ± 9.69	2.48*
Diseases of the ear and mastoid process	48.26 ± 6.38	44.49 ± 6.46	1.05
Diseases of the circulatory system	28.09 ± 4.92	25.38 ± 4.93	0.86
Diseases of the respiratory system	1,542.4 ± 27.25	1,598.59 ± 30.66	7.38*
Diseases of the digestive system	441.36 ± 14.79	470.14 ± 15.64	5.22*
Diseases of the skin and subcutaneous tissue	74.18 ± 7.81	70.56 ± 8.02	0.91
Diseases of the musculoskeletal system and connective tissue	96.67 ± 8.80	111.34 ± 9.86	3.39*
Diseases of the genitourinary system	130.38 ± 10.03	121.39 ± 10.23	1.99
Congenital malformations	22.15 ± 4.38	23.28 ± 4.72	0.37
Injury, poisoning and certain other consequences of external causes	198.14 ± 11.8	224.96 ± 13.09	5.37*

Prevalence of such disorders as diseases of the eye and adnexa, diseases of respiratory system, diseases of the digestive system, diseases of the musculoskeletal system and connective tissue, injury, poisoning and certain other consequences of external causes was authentically lower among children who attended the test schools than among those from the reference ones (Table 3).

Therefore, school-related diseases were much less frequent in 2018 than in 2008 among children who attended the test schools where a contemporary model of school medical aid was implemented into the educational process starting from 2008 than among those who attended the reference ones. This model envisages opening prevention and rehabilitation facilities at an EE together with a conventional medical office and providing continuous education on healthy lifestyle creation from the 1st to 11th grade. We should note that primary morbidity among children aged 10–14 who are classified as junior teenagers by the World Health Organization was substantially higher than among senior teenagers (aged 15–17); in Penza primary morbidity among the latter amounted to 1,495.2 and 2,308.7 per 1,000 teenagers of the relevant age on average in 2016 and in

2017. It calls for greater attention being paid to health of children aged 10–14, including studying and analyzing factors that influence their health.

Our questioning revealed that health parameters of children from two compared types of schools had certain differences regarding some questions; thus, 16.4 % children from the 5–6th grades and 18.3 % children from the 7–8th grades in the TS assessed their health rather as “poor” than “satisfactory” and the share of such children was even higher in the RS, 25.6 % and 24.9 % accordingly ($t = 3.67$ and $t = 2.37$). Neurotic disorders were more frequent among 5–6th grade children in the RS: one third of them had bad mood or felt irritated more often than one a week whereas it was so only for each fourth child in the 5–6th grades in the TS ($t = 4.65$); anxiety appeared in 29.8 % and 24.8 % accordingly ($t < 2$). Each third schoolchild (33.8 %) from the 7–8th grades in the RS mentioned bad mood and irritability; in the TS, only each fourth (24.4 %) ($t = 3.03$); anxiety was mentioned by 26.0 % and 28.5 % children accordingly ($t < 2$). Gender analysis revealed that girls from the 7–8th grades, both in the TS and RS, tended to have bad moods and headaches and feel irritated more frequently than boys

($t = 2.19$); they also gave lower assessments of their health ($t = 3.15$).

Having assessed what complaints about health schoolchildren usually had, we didn't reveal any authentic differences excluding headaches prevalence among children from 5–6th grades, 17.6 % and 22.8 % ($t = 2.06$); overall, regardless of age, almost each fifth child complained about headaches; each tenth had difficulty in falling asleep. Aches in other places were mentioned by 15.7 % children from the 5–6th grades in the TS and 16.9 % in the RS ($t < 2$); 15.4 % and 17.5 % accordingly among children from the 7–8th grades ($t < 2$) (Tables 4 and 5).

Self-assessment of health by children from the 5–6th grades coincided with their mental perception of their school: schoolchildren from the TS had positive attitudes towards school much more frequently (75.8 %)

than their counterparts from the RS (67.0 %) ($t = 3.17$). Answers to questions regarding difficulties in the educational process differed only slightly between respondents from the TS and RS. Children from the 7–8th grades in both types of schools stated that the educational program was difficult more frequently than children from the 5–6th grades ($t = 3.06$ and $t = 2.47$).

Optimal nutrition should always include meat and milk products consumed 5 days a week or more and fruit and vegetables consumed daily. Our questioning results indicate that only two thirds of respondents consumed milk products and meat 5 days a week or more. There were no authentic differences regarding meat and milk products consumption by children from the 5–6th grades in the TS and RS. But a share of children from the 7–8th grades who consumed meat not less than

Table 4

Attitudes to educational activities among children from the 5–6th grades and data on their health and prevalence of factors that influence it, %

Parameters	TS	RS	<i>t</i>
Poor health	16.40 ± 1.54	25.63 ± 2.00	3.67*
Headaches (more often than once a week)	17.61 ± 1.58	22.81 ± 1.92	2.06*
Other aches (more often than once a week)	15.71 ± 1.51	16.90 ± 1.72	0.49
Bad mood, irritability (more often than once a week)	25.56 ± 1.81	38.87 ± 2.24	4.65*
Anxiety (more often than once a week)	24.87 ± 1.80	29.86 ± 2.10	1.82
Insomnia (more often than once a week)	10.01 ± 1.25	12.95 ± 1.54	1.43
Positive attitudes towards school	75.82 ± 1.78	67.04 ± 2.16	3.17*
Difficulties in studies	14.16 ± 1.45	17.46 ± 1.74	1.46
Everyday breakfast on workdays	77.20 ± 1.74	77.75 ± 1.91	0.19
Hot meals 2 times a day or more	69.77 ± 1.91	54.46 ± 2.28	5.12*
Fruit consumed every day	72.54 ± 1.85	62.25 ± 2.22	3.53*
Vegetables consumed every day	69.95 ± 1.91	59.72 ± 2.25	3.45*
Milk products consumed 5 days a week or more	67.36 ± 1.95	63.38 ± 2.21	1.35
Meat consumed 5 days a week or more	68.05 ± 1.94	63.94 ± 2.19	1.10
Daily physical activities (1 hour and longer)	67.0 ± 1.95	54.46 ± 2.28	4.15*
Every day sleep for less than 8 hours	42.66 ± 2.06	47.89 ± 2.29	1.67
More than 2 hours every day spent with a PC or a gadget	51.64 ± 2.08	56.34 ± 2.28	1.55
Smoking every week	1.38 ± 0.49	4.22 ± 0.92	2.72*
Drinking beer every week	1.9 ± 0.57	2.82 ± 0.75	0.89
Drinking strong spirits every week	1.21 ± 0.45	1.97 ± 0.63	0.89
Participating in fights over the previous year	23.66 ± 1.64	23.67 ± 1.95	1.66
Bullied their classmates over the last 3 months	19.17 ± 1.64	21.97 ± 1.90	1.09
Were victims of bullying in school	18.65 ± 1.62	21.13 ± 1.87	0.97

Note: here and then in Table 5 * means there are authentic differences between answers given by respondents from the TS and RS ($t > 2$);

Table 5

Attitudes to educational activities among children from the 7–8th grades and data on their health and prevalence of factors that influence it, %

Parameters	TS	RS	<i>t</i>
Poor health	18.31 ± 2.05	24.90 ± 1.89	2.37*
Headaches (more often than once a week)	16.74 ± 1.98	19.23 ± 1.72	0.99
Other aches (more often than once a week)	15.47 ± 1.92	17.56 ± 1.66	0.79
Bad mood, irritability (more often than once a week)	24.47 ± 2.28	33.84 ± 2.06	3.03*
Anxiety (more often than once a week)	26.07 ± 2.33	28.52 ± 1.97	0.85
Insomnia (more often than once a week)	10.10 ± 1.60	12.23 ± 1.43	0.94
Positive attitudes towards school	75.47 ± 2.28	73.54 ± 1.92	0.64
Difficulties in studies	22.26 ± 2.21	23.89 ± 1.86	0.59
Everyday breakfast on workdays	76.84 ± 2.24	64.83 ± 2.08	3.95*
Hot meals 2 times a day or more	66.74 ± 2.50	60.84 ± 2.13	1.8
Fruit consumed every day	79.58 ± 2.15	59.70 ± 2.14	6.52*
Vegetables consumed every day	74.74 ± 2.31	60.46 ± 2.13	4.52*
Milk products consumed 5 days a week or more	66.32 ± 2.51	67.30 ± 2.13	1.74
Meat consumed 5 days a week or more	66.53 ± 2.51	56.84 ± 2.16	2.91*
Daily physical activities (1 hour and longer)	42.68 ± 2.62	35.70 ± 2.09	2.03*
Every day sleep for less than 8 hours	50.99 ± 2.65	56.27 ± 2.16	1.54
More than 2 hours every day spent with a PC or a gadget	51.83 ± 2.65	58.94 ± 2.15	2.08*
Smoking every week	2.21 ± 0.79	5.09 ± 0.96	2.32*
Drinking beer every week	2.8 ± 0.88	3.80 ± 0.83	0.81
Drinking strong spirits every week	1.64 ± 0.68	2.17 ± 0.62	0.43
Participating in fights over the previous year	16.84 ± 1.99	23.73 ± 1.86	2.52*
Bullied their classmates over the last 3 months	14.31 ± 1.86	22.51 ± 1.82	3.10*
Were victims of bullying in school	14.53 ± 1.86	15.32 ± 1.57	0.42

5 days a week was substantially higher in the TS than in the RS, 66.5 % and 56.8 % accordingly ($t = 2.91$). Children from the TS consumed fruit more frequently than their counterparts from the RS: 72.5 % and 62.2 % accordingly in the 5–6th grades ($t = 3.53$) and 79.5 % and 59.7 % in the 7–8th grades ($t = 6.52$); and vegetables, 69.9 % and 59.7 % in the 5–6th grades ($t = 3.45$) and 74.7 % and 60.4 % in the 7–8th grades ($t = 4.52$). When fruit and vegetables are not consumed in sufficient quantities, it can result in so called latent hunger or micronutrients deficiency and cause a risk of cardiovascular diseases, cancer, diabetes, and obesity. Children from the 7–8th grades in the TS had breakfast on workdays more frequently than their counterparts from the RS, 76.8 % against 64.8 % ($t = 3.95$). A share of schoolchildren from the 5–6th grades who had breakfast every day on workdays didn't differ between the compared schools. A number of schoolchildren from the 5–6th grades who had hot meals 2 times a day or more was signifi-

cantly higher among children from the TS than RS, 69.7 % and 54.4 % accordingly ($t = 5.12$). A share of schoolchildren from the 7–8th grades who had hot meals 2 times a day or more amounted to 66.7 % in the TS and 60.8 % in the RS ($t < 2$).

Health of children in puberty is influenced significantly by such behavioral factors as intensity of physical activity, amount of time spent with a PC or a gadget, and amount of sleep [17, 24]. There were significantly more children with moderate physical activity (not less than 1 hour a day) in the TS than in the RS: 5–6th grades, 67.0 % and 54.4 % accordingly ($t = 4.15$); the 7–8th grades, 42.6 % and 35.7 % ($t = 2.03$). A share of children with daily physical activity being longer than 1 hour was lower among children from the 7–8th grades than among those from the 5–6th grades in both types of EE ($t = 7.39$ and $t = 6.07$ accordingly). Each second schoolchild spent more than 2 hours with a PC or any other digital device. A difference in this

parameter was only slight for children from the 5–6th grades but it was authentic for children from the 7–8th grades, 51.8 % in the TS and 58.8 % in the RS ($t = 2.08$). Each second child from the 7–8th grades, 51 % in the TS and 56.3 % in the RS slept for less than 8 hours and it was authentically different from figures obtained for children from the 5–6th grades, 42.6 % and 47.8 % ($t = 2.48$ and $t = 2.69$).

Our study on behavioral risk factors revealed that more children from the TS smoked every week against the same parameter in the RS, accordingly in the 5–6th grades ($t = 2.72$); in the 7–8th grades, ($t = 2.32$). We didn't reveal any authentic differences as per weekly intake of beer or strong spirits in two compared types of schools.

The data on health and prevalence of factors that influence it as well as on schoolchildren's attitudes towards school studies that we obtained via questioning schoolchildren in Penza predominantly coincide with data obtained via questioning performed by S.B. Sokolova among schoolchildren from 7–8th grades in Moscow [25].

Aggressive behavior that is typical for two out of ten respondents is rather alerting. Schoolchildren from the 7–8th grades in the RS participated in fights ($t = 2.52$) and bullied their classmates ($t = 3.10$) more frequently than their counterparts from the TS. Meanwhile, health self-assessment, contentment with life, and subjective complaints about one's health are closely connected with psychosocial environment at school and relationships between classmates [19, 26]. As per data obtained via questioning, 81.7 % schoolchildren from the 5–6th grades in the TS and 72.2 % in the RS ($t = 3.63$) were quite content with their life; 77.9 % and 70.4 % accordingly in the 7–8th grades ($t = 2.59$). As it has already been mentioned, health self-assessment was higher among children who attended the TS and they had subjective complaints less frequently than their counterparts from the RS. It indicates that psychosocial environment at school plays an exceptionally vital role in maintaining children's health and it is advis-

able to examine it in detail when characterizing schoolchildren's health.

Healthy lifestyle that children should pursue involves daily consumption of fruit and vegetables, night sleep lasting not less than 8 hours, physical activity for not less than 1 hour a day, time spent with a PC or any other electronic device not exceeding 2 hours, and total abstention from alcohol and smoking. Having performed complex assessment of children's actual lifestyles, we revealed that a number of children who adhered to all the above-mentioned behavior patterns was significantly higher in the TS than in the RS: 18.7 ± 1.62 % and 11.0 ± 1.43 % accordingly in the 5–6th grades ($t = 3.56$); 19.2 ± 2.09 % and 11.8 ± 1.41 % accordingly in the 7–8th grades ($t = 2.93$). These parameters obtained via questioning performed among schoolchildren in Penza differ from results obtained via questioning performed among junior schoolchildren in Europe and America where only about 5 % children aged 11 and 35 children aged 13 adhered to all 5 above mentioned components of healthy lifestyle every day [20, 27].

Conclusion. Our research allowed determining that implementation of a new model for school medicine and a system of continuous education on healthy lifestyle creation into the educational process in a secondary school yielded certain positive results. Thus, 10 years after the system for healthy lifestyle creation had been implemented there were more children aged 10–14 pursuing healthy lifestyle in the test schools than in the reference ones. It concerned nutrition in particular since there was a greater share of children who had breakfast every day on workdays, had hot meals two times a day or more and consumed fruit and vegetables in the test schools. The share of children who had physical activities for 1 hour a day or longer was also higher in the tests schools; and the share of children with such behavioral risk as tobacco smoking was lower among them. Aggressive behavior was equally frequent among children from the 5–6th grades in both types of schools, but the share of such children was authentically lower in the

7–8th grades in the test schools than in the reference ones.

An increase in number of children who pursued healthy lifestyle allowed achieving prevention effects that became apparent via a decrease in morbidity. Thus, in 2008 there was only slight difference in primary morbidity among children aged 10–14 from both test and reference schools; in 2018 morbidity among children who attended the TS was significantly lower than among their counterparts from the RS. We detected authentic differences in primary and overall morbidity among children from the compared groups as per such school-related diseases as diseases of the eye and adnexa, diseases of the respiratory system, diseases of the digestive system, diseases of the musculoskeletal system and connective tissue, injury, poisoning, and certain other consequences of external causes. Data obtained via questioning schoolchildren regarding their health coincided with morbidity that was officially registered as per applications for medical aid: children from the TS assessed their health as poor much less frequent than their counterparts from the RS, they also had bad mood and got irritated less frequently; children from the 5–6th grades in the TS complained about headaches more rarely.

Healthy lifestyle includes 5 obligatory components that should be pursued: daily physical activity for not less than 1 hour, night sleep being not less than 8 hours, daily consumption of fruit and vegetables, less than 2 hours spent every day with a PC or any other electronic device, and total abstention from alcohol and tobacco. Having assessed actual

children's lifestyle, we revealed that there were still a lot of reserves for preserving children's health due to potential decrease in morbidity since a share of children who pursued healthy lifestyle in its integrity as a combination of 5 basic components was rather low even in the test schools, namely 18.7 ± 1.62 % of children from the 5–6th grades and 19.2 ± 2.09 % among children from the 7–8th grades. It was even lower in the reference schools, 11.0 ± 1.43 % and 11.8 ± 1.41 % accordingly.

Conclusions:

1. When a system for continuous education on healthy lifestyle formation was implemented into the educational process at secondary schools via opening prevention and rehabilitation facilities in them, it resulted in an increase in a share of children who pursued healthy lifestyle and a decrease in a share of children with risky behavior. It allowed achieving prevention effects that became apparent via a significant decrease in primary and overall morbidity, predominantly with school-related diseases, taken in dynamics over 10 years.

2. In order to preserve schoolchildren's health, it is advisable to use this experience of opening prevention and rehabilitation facilities and implementing a system for continuous education on healthy lifestyle creation in other cities in the region and other regions in the country as well.

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