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Research article

COMPREHENSIVE ASSESSMENT OF SCHOOLCHILDREN'S DIETS

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For a comprehensive assessment of schoolchildren's diets, a methodology was developed using the diet quality index (DQI) based on data on frequency of food consumption.

The aim of this work is to develop a method for comprehensive assessment of schoolchildren's diets, to test it using data on frequency of food consumption and to investigate the relationship between DQI and various characteristics of the surveyed.

The method was developed using a database of diet monitoring data for students of secondary schools obtained by Rospotrebnadzor in 2023 within implementation of the Population Health Protection Federal Project of the Demography National Project in 2023 in 85 subjects of the Russian Federation. Data on frequency of food consumption were used to develop and test the method. Statistical data analysis was performed using the IBM SPSS Statistics 20.0, USA. To assess the statistical significance of differences between the groups, parametric methods of variance analysis were used: Student's t-test and ANOVA.

Based on data on frequency of food consumption, a method has been developed for comprehensive assessment of schoolchildren's diets using DQI. Nineteen groups of food products were selected: 9 groups of foods that are most important for formation of a healthy diet and 10 groups of foods with an excess content of critically important nutrients, consumption of which should be limited.

DQI below the average value (below 42.8 points) was detected in 52 % of schoolchildren. Almost half of the children (48.8 %) had DQI within the range of 35–50 points. In 27.5 % of children, DQI of less than 35 points was detected. The study also included analysis of relationships between DQI established for schoolchildren and sex, age and other socio-demographic characteristics.

The developed DQI makes it possible to quickly conduct comprehensive assessment of diet quality and can be used to analyze effectiveness of implemented measures aimed at NCDs prevention.

Keywords: *Diet Quality Index (DQI), actual diet, frequency of food consumption, food products, critically important nutrients, healthy diet, sex, age.*

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The age between 7 and 18 years involves the most intensive somatic growth accompanied with elevated mental and physical loads. Children especially need optimal nutrition in this period. A schoolchild's diet should include food products, which are major sources of necessary macro- and micronutrients. Furthermore, food products with excessive contents of critically significant nutrients (fats, including saturated fatty acids, salts, and added sugars) should be consumed in limited amounts. Non-optimal nutrition can lead to adverse health outcomes in schoolchildren and cause some mental and physical developmental delays thereby increasing risks of growth retardation, underweight or overweight, as well as obesity [1, 2].

It is quite relevant to develop a unified index for analyzing actual schoolchildren's diets. This index can be used to assess diet quality for children both as a whole and individually as well as to establish total effects produced on diet quality by frequency of consumption of food products necessary for a healthy diet and sources of critically important nutrients. This simplifies diet assessment and simultaneously makes it more comprehensive.

Analysis of large-scale epidemiological studies aimed at assessing diet quality and health is a complex multidisciplinary task. Having a tool, which allows prompt and effective assessment of diet quality and helps establish its interrelations with various characteristics of examined participants, for example, sociodemographic ones, makes it possible to solve the outlined task quite effectively.

Various diet quality indexes have been actively developed in many countries including the USA, China, South Korea, Thailand, Vietnam, and Malaysia [3–6]. Thus, the Healthy Eating Index (HEI) was first introduced in the USA in 1995; it is based on results obtained by analyzing food consumption with the 24-hour dietary recall (24HR) method. The index has been developed and updated several times since its introduction [7]. A similar Healthy Eating Index (HEI) was developed and implemented in Russia [8].

In world practice, another employed tool is the Diet Quality Index (DQI), which is calculated using data obtained with the Mediterranean Diet Score (MDS). This index is usually applied in countries where the Mediterranean Diet is quite common [9]. A similar approach was developed by the Federal Research Centre of Nutrition, Biotechnology and Food Safety and tested using micro-data obtained by sample observations of population's diets accomplished by Rosstat on national representative samples in 2013 and 2018 [10]. Data collection using a food frequency questionnaire is less time- and resource-consuming in comparison with the 24-hour dietary recall (24HR) method. Its basic advantage is relative simplicity of conducting a survey, which allows prompt assessment of diet quality in general or for various population groups.

The aim of this study is to develop a method for comprehensive assessment of schoolchildren's diets, to test it using data on food frequency and to investigate the relationship between DQI and various characteristics of the surveyed. Establishing relationships between DQI and various sociodemographic determinants (sex age, family incomes, etc.) as well as some other characteristics (schoolchildren's nutritional status, dietary patterns, adherence to healthy eating, etc.) is of particular interest.

Materials and methods. The method for comprehensive assessment of schoolchildren's diets has been developed based on data obtained by monitoring diets of schoolchildren by Rospotrebnadzor in 2023 within implementation of the Population Health Protection Federal Project of the Demography National Project in 85 Russian regions. Scientific and methodical support as well as the survey coordination was provided by the Federal Research Centre of Nutrition, Biotechnology and Food Safety, Rospotrebnadzor's Novosibirsk Research Institute of Hygiene and Rospotrebnadzor's Federal Center for Hygiene and Epidemiology. The study was accomplished in conformity with the Methodical Guidelines MR 2.3.0316-23 Nutrition Hygiene. Preparing and Conducting Monitoring of Schoolchildren's

Table 1

The sample profile

All children	Number, people			*p*-value
	137,184	Boys	65,517	< 0.001
		Girls	71,667	< 0.001
including:				
6–10 years old (primary school)	53,440	Boys	26,350	< 0.001
		Girls	27,090	< 0.001
11–15 years old (middle school)	47,753	Boys	23,297	< 0.001
		Girls	24,456	< 0.001
older > 15 years (high school)	35,990	Boys	15,869	< 0.001
		Girls	20,121	< 0.001

Diets[1]. The study protocol was approved by the local ethics committee of the Federal Research Centre of Nutrition, Biotechnology and Food Safety (the meeting protocol No. 5 dated April 30, 2019) as well as the local ethics committee of the Rospotrebnadzor's Novosibirsk Research Institute of Hygiene (the meeting protocol No. dated January 10, 2023)[2].

A sample representative for each Russian region and a plan for locating a sample were created based on the registers of secondary schools in Russian regions by Rospotrebnadzor's Federal Center for Hygiene and Epidemiology (OKVED (all-Russian Classification of Economic Activities) are 85.13 and 85.14). The minimal number of schools in a regional sample was 50. The study was conducted by interviewing schoolchildren and their parents. The total number of participating children was 137,184; the sample profile is provided in Table 1. Schoolchildren were distributed in age-specific groups within the categories *primary school, middle school and high school*.

The questionnaire included questions about how frequently a specific food product was consumed; they were formulated per the following categories: *'every day', '3–4 times a week', 'once a week', '2–3 times a month', 'once a month', 'never'*. The questions were then consolidated into four categories: *'everyday', '3–4 times a week', 'several times a month', 'once a month or practically never'*. Several variables were included in the analyzed data array to establish relationships between DQI and various sociodemographic and some other characteristics: sex, age, family income, parents' education, age-specific body mass index, having a meal before school, and adherence to healthy eating principles.

The research data were analyzed with IBM SPSS Statistics 20.0, USA. The internal consistency of the questions about frequency of consuming various food products was assessed using Cronbach's alpha. Its value was determined as equal to 0.75, which indicates sufficient consistency and reliability of the study results. DQI distribution was accomplished with QQ graph (for $n > 5000$). Since the data followed the normal distribution, the central tendency was estimated with DQI simple mean, standard error of mean, standard deviation (SD) and 95 % confidence interval (when calculating DQI distribution among all the surveyed children in %). Significance of intergroup differences was assessed with parametric dispersion analysis methods: the Student's t-test for a hypothesis about different mean values for two samples (sex, adherence to healthy eating principles); ANOVA for comparing mean values of three or more groups and establishing presence of significant intergroup differences (age, having a breakfast at home, parents' education, income level, a child's nutritional status). The significance threshold alpha (α) was fixed at 0.001.

Nineteen out of twenty four groups from the questionnaire have been selected for DQI

[1] MR 2.3.0316-23. Gigiena pitaniya. Podgotovka i provedenie monitoringa pitaniya obuchayushchikhsya obshcheobrazovatel'nykh organizatsii: metodicheskie rekomendatsii, utv. Federal'noi sluzhboi po nadzoru v sfere zashchity prav potrebitelei i blagopoluchiya cheloveka 28 fevralya 2023 g. [Nutrition Hygiene. Preparing and Conducting Monitoring of Schoolchildren's Diets: Methodical Guidelines, approved by the Federal Service for Surveillance over Consumer Rights Protection and Human Wellbeing on February 28, 2023]. *GARANT.RU: information and legal portal*. Available at: https://www.garant.ru/products/ipo/prime/doc/406449045/ (September 04, 2024) (in Russian).

[2] Monitoring data as regards schoolchildren's diets were obtained within implementation of the Population Health Protection Federal Project of the Demography National Project.

calculation[3]. Two clusters were created: 9 product groups, which are especially significant for making a healthy diet and mitigating risks of macro- and micronutrient deficiency, and 10 product groups, which are major sources of critically significant nutrients (salt, fats, including saturated fatty acids, and added sugars) and should be consumed in limited amounts. The first cluster included: 1) grain products (cereals and other grain-based foods); 2) meat products (beef, pork, etc.); 3) poultry; 4) milk and sour milk products (milk, kefir, ryazhenka and other liquid milk products); 5) curd and curd-based dishes; 6) eggs; 7) fish; 8) vegetables (except from potato); 9) fruits. The second cluster included: 1) variable sausages; 2) fast food; 3) chips, dried crust; 4) ketchup; 5) mayonnaise; 6) cakes and pastries; 7) chocolate candies; 8) buns and pies; 9) sweetened carbonated drinks; 10) sugary drinks.

Consumption of all product groups was estimated in scores per the foregoing frequency categories; the algorithm employed to assign scores is given in Figure 1. The maximum score 5 was given for daily consumption of food products from the first cluster or for absent consumption of products from the second cluster. Cereals and grain-based foods were the only exception. This group is large and includes many food products any healthy diet is based on and several portions of them should be consumed every day [11]. Daily consumption of products from this group was given 10 scores. If no products from the first cluster were consumed or products from the second cluster were consumed daily, the given

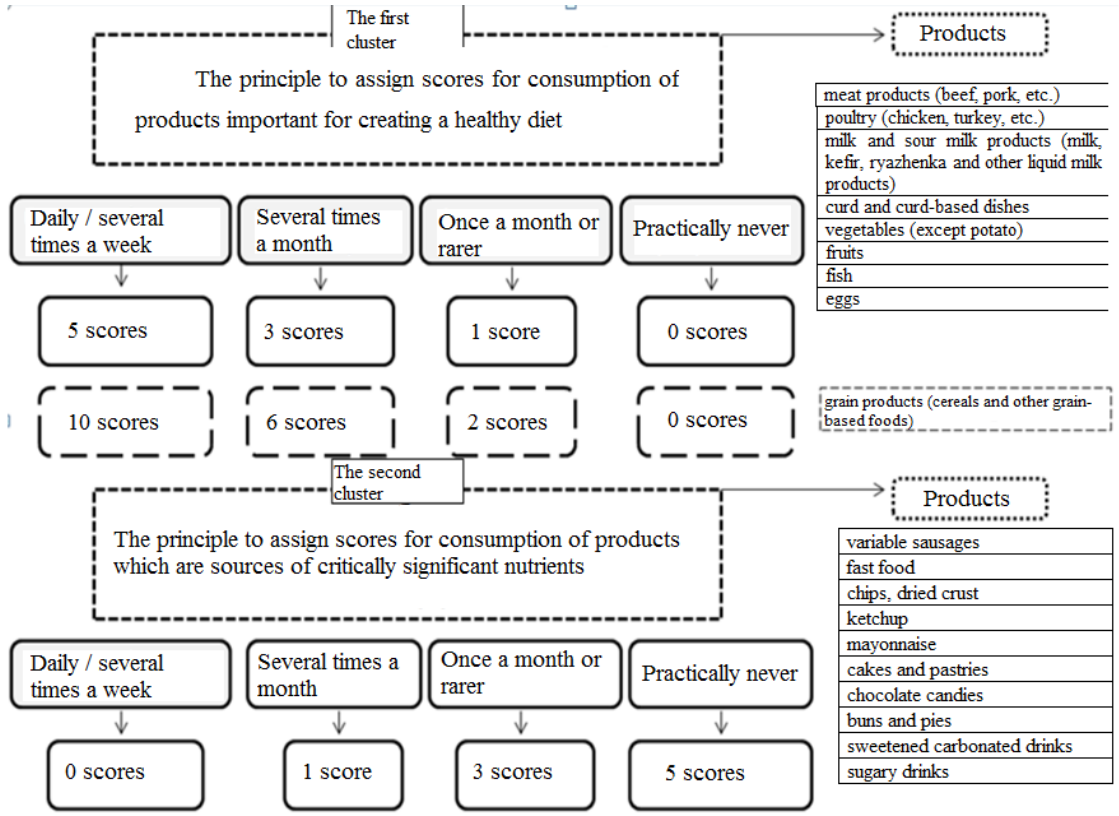

Figure 1. The algorithm for identifying scores necessary to calculate DQI

[3] MR 2.3.0316-23. Gigiena pitaniya. Podgotovka i provedenie monitoringa pitaniya obuchayushchikhsya obshcheobrazovatel'nykh organizatsii: metodicheskie rekomendatsii, utv. Federal'noi sluzhboi po nadzoru v sfere zashchity prav potrebitelei i blagopoluchiya cheloveka 28 fevralya 2023 g. [Nutrition Hygiene. Preparing and Conducting Monitoring of Schoolchildren's Diets: Methodical Guidelines, approved by the Federal Service for Surveillance over Consumer Rights Protection and Human Wellbeing on February 28, 2023]. *GARANT.RU: information and legal portal*. Available at: https://www.garant.ru/products/ipo/prime/doc/406449045/ (September 04, 2024) (in Russian).

score estimate was 0. Diet Quality Index (DQI) was calculated by summing up the scores given for consumption of products from all 19 groups. Its maximum value is 100 scores and indicates that all products, which are macro- and micronutrient sources, are consumed daily whereas products, which are sources of critically significant nutrients, are absent in a diet.

Mean DQI values were distributed into the categories *'low', 'medium', 'high'* and *'very high'* by ranking per percentiles, 25th, 75th and 99th. The DQI value below the 25th percentile was considered low (< 35 scores); between the 25th and 75th, medium (35–50 scores); between the 75th and 99th, high (51–73 scores). The DQI value above 73 scores was considered 'very high'.

To estimate the relationship between the DQI and schoolchildren's nutritional status, sex- and age-specific Z-scores were calculated for body mass index Z-score for age (BAZ) in conformity with the international standards for growth and development of children aged 5–18 years issued by the World Health Organization[4] (WHO) using ANTHROPlus[5]. Z-score measures the exact number of standard deviations or sigma (σ), by which an examined indicator deviates from a standard population median [12]. The following estimation criteria were used for the nutritional status of children aged 5–18 years: underweight at BAZ < -2, normal weight at -1 < BAZ < +1, overweight at +1 < BAZ < +2, obesity at BAZ > +2[6].

Results and discussion. Sex-dependent mean DQI values for children from all age groups are provided in Table 2. DQI was shown to be significantly higher for girls than for boys ($p < 0.001$).

Table 2 also provides the score estimate of consumption of all products groups that constitute DQI. The lowest mean score was revealed for frequency of consuming fish as well as curd and curd-based dishes (1.2 and 1.7 scores accordingly out of maximum 5 scores). Frequency of consuming cereals and grain-based foods was given 5.4 scores, the maximum possible score being 10. Frequency of consuming beef, pork and poultry was estimated as higher than the mean score (2.5), 2.8 and 2.9 scores accordingly. Consumption of milk and sour milk products was given 3.2 scores. Frequency of consuming products, which were sources of critically significant nutrients, was also given low scores; that is, these products were consumed regularly (daily or several times a week). Thus, frequency of consuming chocolate candies was given 0.8 scores; buns and pies, 0.9 scores; sugary drinks, 0.9 scores; cakes and pastries, 1.7 scores; variable sausages, 0.8 scores. In general, we established that schoolchildren did not consume sufficient amounts of grain-based foods, cereals, curd, and fish; instead, they regularly consumed products with high contents of critically significant nutrients, and this indicates that their diets were not balanced or healthy.

DQI above the mean index value (42.8 scores) was identified for 48 % (CI: [47.7–48.3]) of the schoolchildren. The DQI value was at the mean level, that is, within 35–50 scores for practically half of them (48.8 %, CI: [48.5–49.1]). Very high DQI (above 73 scores) was established only for 0.9 % (CI: [0.8–1.0]) of the schoolchildren. Low DQI (below 35 scores) was identified for 27.5 % (CI: [27.2–27.7] of the participants; children from this group had unhealthy diets due to excessive contents of products, which were sources of critically significant nutrients (Figure 2).

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[4] WHO Multicenter Growth Reference Study Group. WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height, and body mass index-for-age: Methods and development. Geneva, WHO, 2006.

[5] WHO AnthroPlus for Personal Computers Manual: Software for assessing growth of the world's children and adolescents. Geneva, WHO, 2009. Available at: https://cdn.who.int/media/docs/default-source/child-growth/growth-reference-5-19-years/who-anthroplus-manual.pdf?sfvrsn=ddd24b2_1 (September 06, 2024).

[6] MR 2.3.1.0253-21. Normy fiziologicheskikh potrebnostei v energii i pishchevykh veshchestvakh dlya razlichnykh grupp naseleniya Rossiiskoi Federatsii: metodicheskie rekomendatsii, utv. Federal'noi sluzhboi po nadzoru v sfere zashchity prav potrebitelei i blagopoluchiya cheloveka 22 iyulya 2021 g. [Physiological needs in energy and nutrients for various population groups in the Russian Federation: Methodical Guidelines, approved by the Federal Service for Surveillance over Consumer Rights Protection and Human Wellbeing on July 22, 2021]. *GARANT.RU: information and legal portal*. Available at: https://www.garant.ru/products/ipo/prime/doc/402716140/ (September 06, 2024) (in Russian).

Table 2

Mean score given in conformity with frequency of consuming various food products

Food products*	Mean (n = 137,184)	SD	Sex			
			Male (n = 65,517)		Female (n = 71,667)	
			Mean (n = 65517)	SD	Mean (n = 71667)	SD
Cereals and grain-based foods	5.4	3.3	5.6	3.3	5.4	3.3
Beef, pork, etc.	2.8	1.6	2.9	1.6	2.8	1.6
Poultry	2.9	1.4	2.8	1.4	2.9	1.4
Milk, kefir, ryazhenka and other liquid milk products	3.2	1.8	3.2	1.8	3.2	1.8
Curd and curd-based dishes.	1.7	1.5	1.7	1.5	1.7	1.5
Vegetables (except potato)	3.5	1.5	3.4	1.5	3.5	1.5
Fruits	3.9	1.4	3.9	1.5	4.0	1.4
Fish	1.2	1.1	1.3	1.2	1.2	1.1
Eggs	2.4	1.5	2.5	1.5	2.4	1.5
Variable sausages	0.8	1.2	0.7	1.1	0.8	1.2
Fast food	2.4	1.6	2.4	1.6	2.5	1.6
Chips and dried crust	2.2	1.7	2.1	1.7	2.2	1.7
Ketchup	2.1	2.0	2.0	2.0	2.2	2.0
Mayonnaise	2.1	2.0	2.0	2.0	2.1	2.0
Cakes and pastries	1.7	1.4	1.8	1.4	1.7	1.3
Chocolate candies	0.8	1.2	0.9	1.2	0.8	1.1
Buns and pies	0.9	1.1	0.9	1.1	0.9	1.1
Sweetened carbonated beverages напитки	1.8	1.8	1.7	1.7	1.9	1.8
Sugary drinks	0.9	1.1	0.9	1.4	1.0	1.5
Diet Quality Index (DQI)	42.8	11.4	42.7	11.4	43.0	11.5

Note: *product groups are given in conformity with the Methodical Guidelines MR 2.3.0316-23.

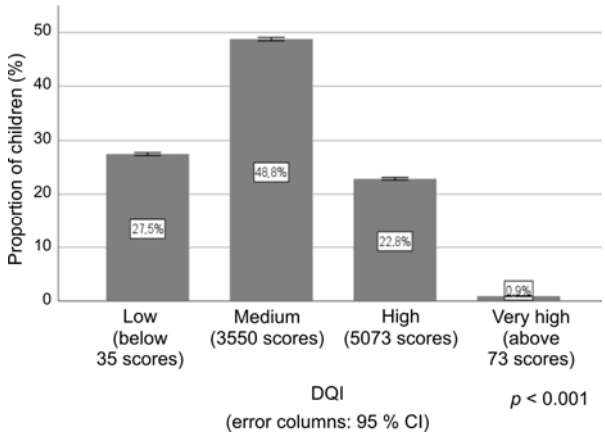

Figure 2. DQI distribution among all surveyed children

The highest DQI was established for primary schoolchildren, 44.6 among boys and 44.3 among girls (Figure 3). The mean DQI value was established to decline in the high school category, 41.0 and 41.7 scores accordingly.

Analysis of the relationship between DQI and having a meal at home before going to school established an authentically higher mean DQI value in children who had breakfast at home regularly ($p < 0.001$) (Figure 4). Thus, DQI was 45.9 scores for primary schoolchildren who had breakfast at home; 43.7 for middle schoolchildren; 43.0 for high school children. DQI values established for children from the same age groups who did not have breakfast at home were 41.9, 39.1 and 38.2 scores accordingly.

Analysis of the relationship between the mean DQI value and family incomes (the latter were estimated by schoolchildren's parents) established a higher mean DQI value for children from families with high incomes (45.4 scores for girls and 44.4 scores for boys) against their peers from families with lower incomes (42.2 scores for girls and 41.4 scores for boys) ($p < 0.001$). The graph that shows how the mean DQI values are distributed depending

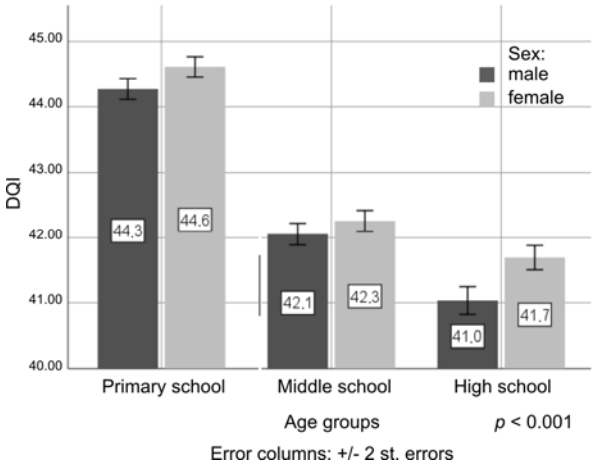

Figure 3. Sex- and age-specific distribution of mean DQI values

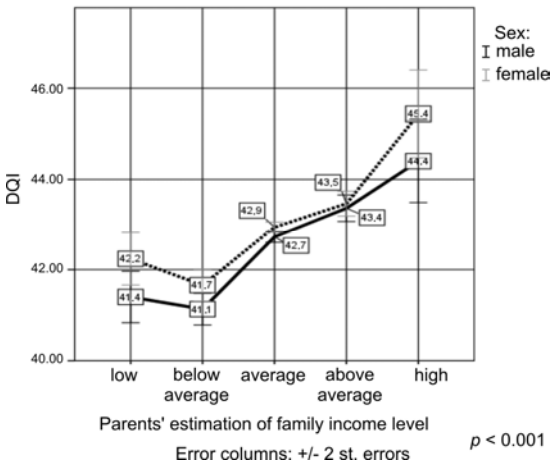

Figure 5. Mean DQI values depending on family income

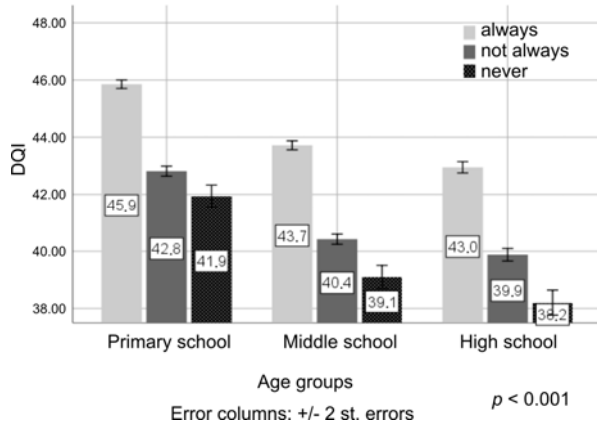

Figure 4. Distribution of mean DQI values depending on breakfast at home before going to school

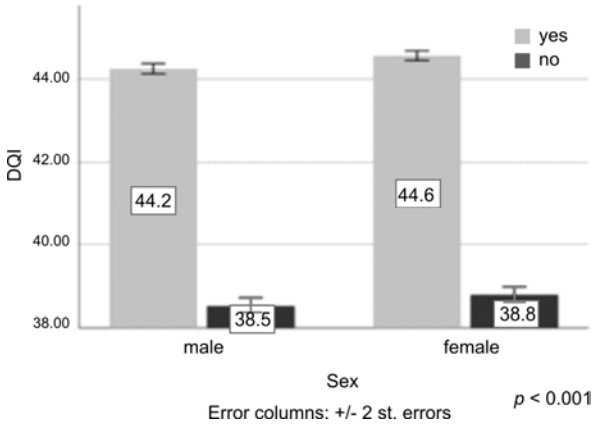

Figure 6. Mean DQI values depending on a family adherence to healthy eating

on family incomes is given in Figure 5. We did not establish any significant differences in DQI values between the children groups with 'low family incomes' and 'below the average family incomes' ($p > 0.001$).

Higher DQI, both among boys and girls, was established in families adhering to principles of healthy eating; 44.2 and 38.5, boys; 44.6 and 38.8, girls ($p < 0.001$) (Figure 6).

The developed DQI was tested depending on levels of awareness about healthy eating principles established in schoolchildren's families and readiness to adhere to them (Table 3). DQI equaled 43.2 scores for schoolchildren from families with some knowledge about healthy eating principles; it was 38.5 scores for schoolchildren from families without such knowledge. DQI values were also higher for those schoolchildren, whose families followed a basic recommendation to have vegetables in two or more meals, than for their peers, whose families did not adhere to this principle (44.0 and 39.5 scores accordingly). A similar result was obtained as regards all other basic recommendations on healthy eating included in the questionnaire: daily fruit consumption in quantity not less than 250–300 grams, giving preference to bread and bakery products made of whole grain flour or second quality flour, daily consumption of fish and 2–3 milk products (including milk-based dishes and drinks). The DQI value was higher for children from families adhering to these principles against their peers, whose families did not follow healthy eating principles (based on $p < 0.001$ in calculating the

Table 3

DQI depending on family adherence to healthy eating principles

Statements about healthy eating (HE)*	DQI			
	True	SD	False	SD
Is a child and his or her family aware of healthy eating principles?	43.2	11.4	38.5	10.2
Having vegetables (except form potato) in 2 and more meals every day	43.9	11.5	39.7	10.5
Fruits included in a daily diet of a family in quantity not less than 250–300 grams	44.0	11.4	38.8	10.5
When choosing bread and bakery products, preference is given to those made of whole grain or second quality flour with bran etc.	44.7	11.8	41.5	10.9
Daily diets include fish	44.2	11.4	41.8	10.9
Daily consumption of 2–3 milk products (including milk-based dishes and drinks)	44.2	11.4	40.1	11.0

Note: $p < 0.001$ between positive and negative answers per each foregoing healthy eating principle. Healthy eating principles are stated in conformity with the Methodical Guidelines MR 2.3.0316-23.

Table 4

Diet Quality Index depending on parents' education

Education		DQI	
		Mean	SD
Mother's education (n = 108,496)	Secondary	41.2	11.0
	Vocational	42.6	11.1
	Higher	44.3	11.8
Father's education (n = 95,911)	Secondary	41.2	11.1
	Vocational	42.6	11.2
	Higher	44.1	11.6

Student's *t*-test between positive and negative answers per each foregoing healthy eating principle).

Table 4 provides the results obtained by analyzing DQI depending on parents' education. Obviously, the higher education parents have, the higher DQI is established for their children. Thus, the DQI value is 44.3 scores for children, whose mothers have a higher education whereas it equals only 41.2 scores for those with mothers having only secondary education (differences are valid at $p < 0.001$). The similar trend can be traced when analyzing DQI depending on fathers' education.

We also analyzed the relationship between DQI and schoolchildren's nutritional status. DQI was 42.7 scores for boys and 43.0 for girls with normal body weight ($-1 \leq BAZ \leq 1$). The DQI value equaled 42.9 for boys and 43.3 for girls with overweight including obesity ($BAZ > +1$) ($p < 0.001$). We did not find any authentic differences between DQI values for children with underweight, normal body weight, overweight or obesity ($p > 0.05$) (Figure 7). A similar study with adult participants established higher DQI values for people with overweight and obesity [9]. This is likely due to people with overweight or obesity consuming products from all groups more frequently and in greater amounts, including products that are a significant component of a healthy

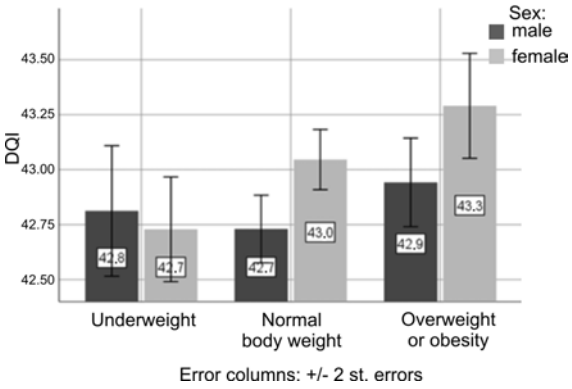

Figure 7. Mean DQI values depending on schoolchildren's nutritional status

diet and consumption of which was given the maximum scores.

DQI, which has been developed for comprehensive analysis of schoolchildren's diets, made it possible to assess their diet quality relying on consumption frequency established for various product groups. Such diet quality indexes are used worldwide to assess diet quality in many studies, including those focusing on children. Thus, diet quality was assessed for children in Australia using an index, which was developed based on food frequency [13, 14]. It allowed estimating diet diversity and finding children with diets not conforming to healthy eating principles. Participants who scored less than the median total food score of 36 were more likely to have suboptimal micronutrient intakes [15]. In our study, DQI below the mean value was established for more than a half (52 %) of the surveyed schoolchildren and low DQI values (below 35 scores) were found for approximately one quarter of the participants.

Mediterranean Diet Quality Index (KIDMED) is employed in European countries to assess diet quality among children and adolescents. It is considered a reliable instrument for assessing adherence to the Mediterranean diet in these age groups [16]. In the study [17], respondents took part in a survey answering 16 questions about consuming various products, both significant for a healthy diet and unhealthy ones [17]. In Spain, the KIDMED index turned out to be higher in large cities and only slight variations were seen for sex and age [18]. The authors showed that the mean index value was authentically higher in girls than in boys. These data are consistent with our findings. Next, DQI values tend to decline with age. This might be associated with stricter parents' control of food consumed by primary schoolchildren and resulting higher consumption of food products necessary for a healthy diet.

The HELENA European study on healthy eating and healthy lifestyles among adolescents assessed diets using the DQI-A index. The authors established a positive association between DQI-A scores and diet quality perception levels in children with normal weight, underweight and overweight. In the authors' opinion, special recommendation on diets for children should be developed in order to achieve better diet quality [19, 20]. In our study, the DQI value was higher in children, whose families were aware of healthy eating principles and adhered to them when making their diets, than in their peers, whose families were either not aware of these principles or did not adhere to them.

Our study found several groups of food products that were not consumed as frequently as they should within an optimal healthy diet such as cereals and grain-based products, fish, and curd. Insufficient consumption of cereals and grain-based products can be a risk factor of deficiency as regards vitamins B, minerals and dietary fiber. Low frequency of curd consumption can be a risk factor of lower bone tissue density. Fish is a major source of easily digestible proteins, polyunsaturated fatty acids omega-3 and phosphor; therefore, low fish consumption creates an elevated risk of deficiency as regards the foregoing nutrients. We also established that schoolchildren regularly consumed products, which were sources of critically significant nutrients. This may indicate that their diets are imbalanced, including excessive calorie contents (due to excessive consumption of fats and added sugars) and insufficient consumption of macro- and micronutrients important for a healthy diet.

Food frequency analysis as a method for assessing actual diets makes studies on dietary patterns much easier and also allows estimating a habitual diet over a short time. Use of DQI based on food frequency analysis makes it much easier to perform complex diet assessment and allows comparing diet quality in various population groups or changes in it in dynamics over time. It seems quite possible to assess diets using DQI both at the population and individual levels. Limitations of the developed method for complex diet assessment include the major disadvantage intrinsic to the frequency method of actual diet analysis; that is, subjectivity of data collection since they are obtained relying on a respondent's individual memory. However, the risk of getting inaccu-

rate data is minimized by conducting a survey competently.

Conclusion:

1. The schoolchildren's mean DQI was 42.8 scores. DQI values were below the mean score in 52 % of the participants and within the 35–50 score range in 48.8 %. However, the DQI value below 35 scores was established in approximately one quarter of the schoolchildren (27.5 %), which can be a risk factor of chronic non-communicable diseases. We should remember that BMI characteristics such as overweight or obesity themselves are risk factors causing such diseases. DQI was found to decline with age since the highest values were identified in the primary school category and the lowest in the high school category. DQI was higher for children in families with higher incomes (as estimated by parents) than in their peers from low-income families. In addition, DQI values were higher in children whose parents were better educated and had some interest in healthy eating principles.

2. Use of this index for individual diet quality assessment makes it possible to reveal what food products, when consumed, have a negative effect on a diet in each specific case. Thus, regular consumption of fruits and vegetables (products necessary for healthy eating) does not level daily consumption of products with excessive contents of fats, salt and / or added sugars; that is, low scores given for such consumption can affect the total score estimate. Therefore, DQI allows establishing combined effects produced on a diet by food products, which are necessary for healthy eating, and those, which are sources of critically significant nutrients.

3. DQI can be used for analyzing data obtained by large-scale epidemiological studies, which require comprehensive assessment of their results and can be important for these studies. The developed index makes it possible to conduct comprehensive assessment of diet quality and to develop necessary measures aimed at correcting an unhealthy diet. It can also be used to analyze effectiveness of implemented measures aimed at NCDs prevention.

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