Use of nexus-approach principles in M&E systems of national nutrition and quality of life programs

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Abstract. Contemporary nutritional approaches to nutritional rationalization make it necessary to constantly evaluate and analyze the impact of consumed diets on the human body and the environment from the standpoint of sustainable development. The scale of water and energy resources used in food systems makes us think about the directed change of food stereotypes. A system for monitoring and evaluating the catering of target groups can be a tool that can help with the implementation of the task. This article gives an example of the developed software tool for the implementation of the M&E system, the principle of its design and functioning suggests options for using the information obtained during the evaluation to establish new behavioral stereotypes of a healthy lifestyle in relation to young people.

1 Introduction

Worldwide, there is a growing demand for healthier food, which must be produced with sustainability in food systems in mind. The concept of sustainable development, a synergy of economic, social and environmental factors, has been operationalized through an interdisciplinary approach, which has subsequently led to the emergence of the nexus approach. It represents a fundamental transition from an exclusively sector-based approach to a cross-sectoral, coherent and integrated way of socio-economic development of countries, regions and individual territories, which can be implemented at all levels of governance and at any scale. The nexus approach as a method of complex solution of sustainable development problems, which takes into account several variables simultaneously, leads to the development of new conceptual solutions and the emergence of new tools for their implementation, which integrate the aspect of human health within the framework of the food-energy-water nexus (FEW) [1]. The FEW nexus "is an essential element of human survival, as well as the basis for sustainable development of the regional economy and ecological environment... " [2].

The sustainability-driven revision of production and consumption in food systems in their relation to determinant resources is changing nutritional patterns, both globally and within individual local and regional actors. The challenges of modern food systems and the rethinking of the use of the planet's basic resources from a sustainability perspective are

creating the conditions both for the emergence of many new food groups and for changes in the methodological approaches to determining the "healthiness" or "usefulness" of the foods consumed by humans and the diets based on them. The ongoing evolution of food consumption is the subject of numerous studies that examine its relationship with socioeconomic and demographic factors, impact on the quality of life and indicators of human development [3]. The peculiarities of the implementation of systemic, directed changes in consumption patterns are presented in the works that model specific problems of food and nutrition security as priority results of food systems progress [4-6], investigate the organization of local institutional food systems [7], study the impact of the spread of vegetarianism [8] and the demand for alternative protein [9], including in the framework of the global diet recommended by the EAT-Lancet Commission on healthy eating based on sustainable food systems.

Contemporary nutritional approaches to the rationalization of population nutrition require assessment and analysis of the impact of consumed diets on both the sustainability of the world food system and on human health and quality of life. Under such conditions, food products or complex diets become not only a set of nutrients that provide coverage of the body's energy requirements, but also a resource for managing the nation's health and improving the quality of life.

Monitoring and evaluation systems are a reliable tool for managing such programs and sets of activities [10]. The principle of building such systems can be defined as constant tracking of progress on the project's target indicators and ensuring the possibility of operational control with the implementation of management interventions in case of detection of deviations beyond the specified intervals for the controlled parameters. In the case of school health programs, as an essential element of health-saving technologies, effective monitoring and evaluation is necessary both to expand and support comprehensive school health programs and to ensure the effectiveness and sustainability of such programs. If school feeding is considered within the paradigm of creating new behavioral stereotypes of healthy lifestyles in young people and building sustainable food systems that support biodiversity, then the creation of an M&E system becomes not just a necessary element of change, but its starting point.

2 Materials and Methods

The study used a triple approach, which includes three stages: the first - literature review, the second - creation of the M&E system and implementation of data collection and aggregation, case studies and surveys, and the last - implementation of analysis and formation of measures to improve both the elements of the M&E system and the implemented program set of measures.

At the first stage, we turned to analyzing the most relevant literature in the field of sustainable development management, health saving and quality of life.

The second stage considered the solution of the issues of developing indicator scales for the achievement of program goals and objectives and was successfully implemented based on the use of qualimetric tools. When developing scales and methods of measuring both the values of the monitored indicators and their progress, the criteria for determining the effectiveness of the decisions were taken ensuring not only the accuracy, simplicity of the procedure, systematicity, systematicity and reliability of the obtained measurement results, but also the economic efficiency of such monitoring of indicators. Planning methods suitable for a result-oriented approach of the M&E type are LogFrames or Logic Charts or the more flexible Theory of Change [11,12] (M&E, are logical frameworks, logic diagrams or a more flexible theory of change).

At the third stage, complexes of interrelated data were obtained, which determined in the course of analysis and processing significant dependencies between different groups of factors, which made it possible to increase both the probability of development forecasts and identify the most effective solutions for specific tasks.

In the monitoring and evaluation system developed on the basis of the Novosibirsk Research Institute of Hygiene of Rospotrebnadzor, the primary goal was to monitor and evaluate the relationship between the state of the organization of nutrition and other hygienic factors of the educational process and the health status of students. Data collection is based on indicators contributed by 6,852 registered organizations and, depending on the type, may include data on: children's characteristics (height, weight, gender, age, presence of diseases, hand strength, etc.), organization of food processing units (area of premises, availability of equipment and its quantity), menus used at the enterprise (number of meals, products, flow charts, etc.), as well as sources of funding for education authorities.

Further analysis and aggregation of data is carried out automatically, based on the required task, and the final report can be presented on: the physical development of children in educational organizations, the number of registered organizations and the completeness of the data entered by them, types of food processing units and their compliance with current regulatory documentation, compliance of menus with sanitary and hygienic standards, as well as on the assessment of the effectiveness of children's health improvement.

The data can be analyzed at the level of various constituent entities of the Russian Federation and allow for a rapid assessment of possible shortcomings in the area of interest and, consequently, for the development of a group of measures to eliminate the problems encountered in order to address the challenges of changing health and creating conditions for its preservation.

3 Results and Discussion

The software tool used in the developed M&E system represents a unified interdepartmental information system and provides for a three-level system of users-participants of monitoring and evaluation. The first level is educational organizations. The second level is food operators. The third level is education authorities and Rospotrebnadzor. Work at the first and second level provides for entering information and its operational analysis. Work at the third level determines the ability to view and analyze information and form operational management decisions based on it. All indicators collected in the course of monitoring are synchronized with the information planned to be collected at the federal level. After approval of the federal forms, the report provides for their formation in the automatic mode, for incorporation into the information block of the federal software tool.

The compilation of the software tool is based on the basic principles of database formation, which include: the exclusion of redundancy and insufficiency of data, the speed of the software tool, minimizing the number of tables stored in the database, standardization of construction and operation, as well as the adequacy of data display. In addition to the above, the database should be secure, that is, it should be resistant to destruction and destruction arising from system errors, user errors or malfunction of the technical means used.

The developed M&E system provides for the possibility of forming databases on the state of nutrition organization - from the list and state of resources used (material, financial, labor, raw materials) to the specifics of health status and existing restrictions in target groups eating in educational institutions. This allows to significantly automate the work of the food service staff in terms of development and implementation of the current cyclic

menu, its adaptation for feeding both healthy children and those suffering from diabetes, food allergies, disabilities, celiac disease, phenylketonuria, cystic fibrosis and metabolic syndrome. All menus in the software tool on the basis of which M&E tasks are realized, undergo an automated hygienic assessment for compliance of menus with the principles of healthy eating and current sanitary legislation (an example of one of the comparisons is shown in Table 1), based on the results of the assessment, a conclusion is formed, if any, violations and possible recommendations for their elimination are indicated.

Table 1. Comparative characteristic of actual values in comparison with normative indicators on the example of menu for organization of nutrition of healthy children 7-11 years old

Indicators	Actual menu values on average per cycle day	Recommended menu values on average per cycle day	Specific value of the recommended value per	
			Breakfast (%)	24 hours (%)
Weight, g	501.7	500	100%	21%
Caloric value, kcal	498.9	470-675.6	101%	20%
Amount of protein, g	19.84	15.4	129%	26%
Amount of fat, g	17.63	15.8	112%	22%
Amount of carbohydrates, g	65.21	67	97%	19%
Vitamin C, mg	13.96	12	116%	23%
Vitamin B1, mg	0.22	0.24	92%	18%
Vitamin B2, mg	0.26	0.28	129%	26%
Vitamin A, mcg. re.	393.21	140	281%	56%
Calcium, mg	296.45	220	135%	27%
Magnesium, mg	89.12	50	178%	36%
Iron, mg	4.78	2.4	199%	40%
Potassium, mg	720.17	220	327%	65%
Iodine, mcg	52.13	20	261%	52%
Selenium, mcg	20.77	6	346%	69%

In addition to the menu evaluation functions, the software provides for the possibility of further monitoring of menus entered by educational organizations and caterers and parental control over the organization of meals. The software tool automatically evaluates both static and dynamic indicators of the quality of the actual organization of catering at the level of the organization, locality, municipality and constituent entity of the Russian Federation.

The given statistics makes it possible to identify subjects where menus do not meet the specified norms, which makes it possible to establish and adjust measures to eliminate emerging problems with the composition of food rations in educational organizations, including at the level of individual schools or kindergartens.

Education authorities can monitor nutrition both in the whole subject and in individual municipalities, localities and organizations. The software tool has a filter system for more convenient operation: a sample by type of organization (organization of recreation, educational organization, organization for orphans, institution for children with round-the-clock stay, organization of preschool education), location, age category of those who eat, characteristics of those who eat (the presence of diseases requiring individual approach to catering). When monitoring, it is possible to view the compliance of the menu of each subject of monitoring with the current requirements and principles of healthy eating, as well as to see the presence of deviations and inconsistencies for each parameter (Table 2).

Table 2. Monitoring of compliance of diets with current requirements and principles of healthy nutrition

Menu code	Indicators															Hygienic assessment
	Weight, dev. (0-no, 1 –yes)	Energy value, dev.	Vitamins, dev. (0-no, 1 – yes)				Minerals, dev. (0-no, 1 – yes)					Exceeding the content (0-no, 1 – yes)		Violation of repeatability		
			C	B1	B2	A	Ca	Mg	Fe	I	Se	Salt	Sugar	(0-no, 1 –	Quantity	
55969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
57359	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
57411	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
54140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
54243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
54246	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

The program's functionality also provides for the possibility of using the M&E program, for example, to assess the effectiveness of health improvement programs. This is implemented through the collection and assessment of the following physical characteristics of children: height, weight, existing diseases, hand strength, vital capacity of lungs. Observation of the target group is carried out at the beginning and end of shifts, which further makes it possible to assess the progress and effectiveness of health improvement measures on the basis of the parameters obtained.

At the moment, the program functionality is limited and allows conducting research only for children (0-18 years old), as it relies on the regulatory framework that regulates the requirements for the organization of hygienic factors at the place of study, which do not apply to other groups of people. In the future, it is planned to use the approaches developed in this M&E system to implement health and quality of life management programs for different target groups, which require a unique approach to compiling the necessary diets based on the specifics of the work process, climatic conditions, risk factors, etc. This approach will allow not only to improve the physical health of the target group, but also to fulfill the state plan to improve the quality and duration of active life of the population of different regions . In addition, in the future, it is envisaged to assess diets in terms of not only energy, but also nutritional and biological value, as well as to create opportunities for their adjustment towards the formation of more stable nutritional stereotypes in the younger generation.

4 Conclusions

Since human health and quality of life is based not only on proper nutrition, but also on other factors, such as: air quality, oxygen content in the premises, greening of the territory and premises, physical activity and conditions for its realization, water condition and compliance with drinking regime, etc., further development and complication of the created M&E system is expected. Inclusion of these parameters, their comprehensive assessment, and control over changes in the interrelated indicators in the studied population groups will make it possible to achieve progress in the quality of life of the population, taking into account economic, environmental and other aspects of sustainable development.

Another promising area of adaptation of the developed M&E system is its use in the formulation of diets for the residents of the Arctic zone. The northern territories of the Russian Federation are an important source of natural resources, the intensive development of which leads to the influx of a large number of different groups and contingents of the population, which, due to the negative impact of climatic conditions, require replenishment of micronutrient deficiencies and increased protein content in the consumed rations [13,14]. The possibility of selecting solutions that simultaneously take into account the possibility of preserving the health and quality of life of the population during the conquest of the Arctic and taking into account external requirements within the framework of the "food-water-energy" relationship. The logical framework of the monitoring and evaluation system based on the principles of the nexus approach will help to create a basis for decision-making in the field of sustainable development of the regional economy and ecology and will make it possible to realize the interrelation of determining resources and given target indicators of the quality of life of the region's population.

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