

Investment Issues of Preventive Health Care of the Population of the Irkutsk Region

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Abstract – It is known that the economic well-being of any region depends primarily on the availability of healthy population. Protection of public health is one of the priorities of the state's social policy; and public health is defined as the basis of the state national security. However, the problem of raising funds to preserve and promote public health is always considered in the context of additional budgetary investments or the expenditure of financial resources of implementing health programs enterprises. The efficiency of health care and preventive activities depends particularly on the development of a mechanism to manage the process, which is based on the principles of utility and economic feasibility for all participants in the investment process.

Keywords – investments, health care, iodine deficiency disorders, economic damage, financing of prevention programs.

I. INTRODUCTION

The regional problem of the Irkutsk region is low food saturation with the most important micronutrients, iodine in the first place, that contributes to the development of a wide range of Iodine Deficiency Disorders (IDD) that is not only a medical, but also a social and economic problem [1]. The situation is aggravated by the lack of a coordinated regional IDD Prevention Program [2, 3].

The large-scale IDD preventative measures have been implemented in the Irkutsk region since 1998 by bringing iodine-enriched food products to the consumer market. Iodine-enriched food production is organized in 6 administrative territories of the region: in the cities of Irkutsk, Bratsk, Angarsk; and Usolsky, Ust-Ilimsky and Zalarinsky districts. At the same time, products of regional large dairy enterprises are enriched with iodine by only 1 - 43.5% of the production volumes; bakery products of regional large enterprises are enriched with iodine by only 2.6 – 15.2 %.

Such a low percentage of the regional iodine-enriched food production is caused by additional expenditures and low interest of producers in the production of iodine-enriched food products as a consequence [3]. Taking into account the significant volumes of food production by the majority of regional enterprises, as well as a small share of iodine-enriched food products, there is a possibility of further growth in the production of iodinated products.

The efficiency of programs implemented in the field of iodine prophylaxis is proved by the example of iodine-enrichment of bread. Studies of the dynamics of the frequency of neonatal hypothyroidism, performed by the Irkutsk State Medical University in 2006, showed that along with increase in

iodine saturation of the population due to the production of iodized baking yeast, the frequency of transient neonatal hypothyroidism in children decreased 3 times within the period from 2000 to 2004 ($r = - 0.95$; $p < 0.05$) [1, 3].

The lack of state subsidies to iodine-enriched food producers is a problem of IDD prevention in the Irkutsk region. As a result, the producers of these important for public health products are not motivated financially [4]. Therefore, there are only few producing iodine-enriched food products enterprises in the region. The population suffers as well: in the region, a significant number of people prefer to buy products not enriched with iodine, since they are cheaper.

The issue of eliminating the problem of IDD in the region remains unsolved. In all population groups, the risk of developing IDD is high due to iodine deficiency in the body. This situation is caused by the lack of a systematic approach to the mass prevention of IDD in the region. It is characterized by the following negative points [3]:

- 1) Low motivation of manufactures to produce iodine-enriched products and, as a result, negative dynamics of production and its insignificant share in the total production volume;
- 2) Low total iodine content in food products in the terms of percentage of the recommended daily allowance (PHI/RDA);
- 3) High cost of stated technologies in relation to iodine enrichment of certain types of products, resulting in higher prices on such products and refusal to consume them by a part of the population of the region;
- 4) Low percentage of region's population consuming iodine-enriched food products, especially in remote areas of the region.

There is an urgent need to develop an alternative approach to organizing mass prevention of iodine deficiency in the region, which would take into consideration the identified problems.

II. PURPOSE OF THE STUDY

To solve the problem, it is necessary to consider options for organizational IDD preventing approach, based on the introduction of innovative methods of iodine enrichment of food products of mass demand, to conduct their economic justification and develop a regional program to prevent IDD in the Irkutsk region.

III. PROBLEM STATEMENT

An alternative approach to organizing mass prevention of IDD in the region takes into account the identified problems. The key issue is the economic interest of all participants of the process, which includes the following [3, 4]:

- For the population: affordability of iodine enriched food products to be consumed daily;
- For manufacturers: reimbursement of the costs of iodine-enrichment of products;
- For the region: prevention of economic and social associated with IDD damage.

IV. RESEARCH QUESTIONS

The following works were devoted to the issues of health study, prevention and health improvement of the population: V.V. Bakutkin [2], E.V. Gafarova [4], L. Galkov [5], V.V. Uyba [6], E.K. Dzasokhova [7], V.V. Kolmakov [8], V.V. Haliulina [9], M.V. Tsukanov [10], I.P. Shibalkov [11], L.Y. Bukharbayeva [12], V.V. Zolotareva [13].

Research in the field of investment in public health is reflected in the scientific papers of the following scientists: E.I. Kulaeva [14], M.I. Karimova [15], L.A. Efimova [16], Ya.M. Roshchina [17], D.S. Prokhorova [18], T.V. Yakovleva [19].

Problems of Iodine Deficiency Disorders (IDD) were studied by: M.F. Savchenkov, S.I. Kolesnikov [1], T.T. Orlova, M.S. Ilyina [20], E.V. Gafarova [3], S.K. Belova [21].

The analysis of these scientific works has allowed to consider investment questions of prevention of iodine deficiency diseases of the population of Irkutsk region.

V. RESULTS AND DISCUSSION

The social significance of the prevention program is proved by the expected decrease in the IDD incidence rate. It is known that IDD is not only a pathology of the thyroid gland, but also a reproductive dysfunction; pregnancy complications; impaired mental and physical development in children; decrease in intellectual potential in adults; increasing disability of the elderly population, that causes the need for significant social benefits.

To predict the growth of IDD in the Irkutsk region, an adequate mathematical model is synthesized. The regression equation is based on the semi-logarithmic function.

$$y = 19050.76 - 10660.31 \lg x \quad (1)$$

where y - the number of cases of IDD; x - iodine consumption with food as a percentage of RDA.

Based on the initial data, the correlation index $R = 0.968$ is determined. A high correlation between the level of iodine consumption as a percentage of the recommended daily allowance of iodine (RDA) and IDD was found.

Prevention of IDD ultimately causes an increase in the quality of life and health of the population, as well as significant budgetary savings [5, 6, 8, 9, 11].

The economic importance of the program is manifested in the prevention of damage of the regional budget caused by IDD. It is expressed as an increase in:

- a) direct costs of medical care;
- b) non-medical care expenses and missed opportunity costs;
- c) losses in the gross domestic product of the region;
- d) losses in the tax part of the regional budget.

According to conservative estimates, the economic damage brought to the Irkutsk region by the presence of IDD in 2018 amounted to RUB 190,101.2 thousand. According to preliminary estimates for 2019, the amount of damages will increase up to RUB 244,412.9 thousand [3].

The essence of the innovation approach is as follows [3, 20]:

1) The minimum necessary for a person volume of food products of the first demand (bread, milk, egg), provided for by the regional consumer basket, based on the entire population of the region, is enriched with iodine;

2) A set of three recommended by a consumer basket food products of the first demand (bread, milk, egg) should contain 90% of recommended daily allowance of iodine (RDA) for each population group;

3) Distribution of the daily share of iodine in iodine-enriched food products should be equivalent and amount to 30% of the RDA for each type of product;

4) In order to minimize the cost of iodine-enrichment of food products of the first demand, yeast cell iodinated protein ("Iodine- drozhzhelisine", iodinated yeast) should be used as an enriching ingredient; baking yeast is the raw material. The cost of iodinated yeast is significantly lower than that of used today iodinated casein.

The proposed for the Irkutsk region IDD Prevention Program includes seven stages [13, 21]:

Stage 1. Monitoring of iodine deficiency in various population groups of the Irkutsk region using computer rapid assessment of micronutrient deficiencies (children, working-age population, retirees) on the example of the cities of Irkutsk, Angarsk, Zheleznogorsk, Bratsk, Ussolye-Sibirskoe.

Stage 2. Developing and conducting a sociological research in order to [3]:

- Study the attitude of the population to iodine-enriched food products;
- Develop an efficient marketing strategy to implement the Program.

Stage 3. Development of innovative technologies for iodine-enrichment of food products in conditions of large-scale production [20]:

- Yeast cell iodinated protein technology.
- Food products enrichment with yeast cell iodinated protein technology.

Stage 4. Comparison of production costs of existing and innovative technologies of iodine enrichment of food products

in order to choose an economically advantageous method of enriching products with iodine.

Stage 5. Development of a scientifically based program to prevent IDD at the regional level [10, 12]:

- Assessment of disadvantages of existing methods and technologies used in mass prevention of IDD.
- Justification of innovative methods and technologies for mass prevention of IDD.

Stage 6. Development of a methodology for quantitative assessment of economic damage due to the IDD incidence as exemplified by the Irkutsk region [7]:

- Analysis of the references on the assessment of socio-economic damages due to diseases;
- Development of algorithms and financial and economic models to assess caused by IDD damage;
- Calculation of socio-economic caused by IDD damage in the Irkutsk region.

Stage 7. Preparation of a draft paper of the regional IDD Prevention Program [14, 15]:

- Reports on the results of stages 1-6;
- Consolidation of the obtained research results into a draft paper of the regional IDD Prevention Program.

Sources of financing the program [16, 19]:

- 1) Regional and municipal budgets of the Irkutsk region;
- 2) Financing preventive activities reserve of the Territorial Compulsory Health Insurance Fund;
- 3) Resources of enterprises producing iodine-enriched food products (Fig. 1).

The scientific novelty of the proposed IDD Prevention Program is represented by 5 innovations:

1. The author's methodology for the quantitative assessment of socio-economic damage caused by IDD development.
2. The author's program of computer rapid assessment of micronutrient deficiencies in the human body.
3. A set of regulatory and technical documentation on the organic iodine-enrichment of food products of mass demand (edible salt, bread, pasta, confectionery, bakery yeast, milk and fermented milk products, chicken eggs).
4. Organic iodine-enrichment of food products of mass demand technologies protected by patents of the Russian Federation and the Ukraine.
5. Yeast cell iodinated amino acid and kelp production technologies (organic iodine-enriching food products of mass demand substances), protected by patents of the Russian Federation.

Indicated above makes possible to:

- substantiate scientifically innovative technology of the production of iodine-enriched food products to provide

all the population of the Irkutsk region, including remote areas;

- reduce the cost of iodine-enriched food products for consumers;
- save the funds required for iodine-enrichment of food products and bring the daily iodine dose consumed by the population to the recommended age physiological norm;
- develop IDD Prevention Program to organize and coordinate the activity of regional enterprises – producers of iodine-enriched food products;
- promote the production of iodine-enriched food products among food and processing enterprises of the region;
- according to calculations, reduce the impacts on the regional budget by 14.6 times due to reduced associated with IDD expenditures.

The economic analysis of the efficiency of the presented above approach to IDD prevention was performed in accordance with the methodology of the RF Industry Standard “Clinical and Economic Research. General provisions“ (OST 91500.14.0001-2002); conclusions are as follows [17, 18]:

- due to implementing new technologies, the cost of iodine-enrichment of food products of mass demand will make 13.4% of the cost of iodine-enrichment while using existing technologies;
- content of iodine in food products enriched using innovative technologies will increase by 20.5%;
- level of daily intake of iodine in the body due to consuming enriched food products will increase up to 90% of the RDA, in contrast to present 9.3%;
- return on a kopeck of invested in iodine-enrichment of food products will be 7.5 times higher than while using existing technologies;
- due to implementing of innovative technologies, the cost of iodine-enrichment of the annual volume of consumption of food products of the first demand by the population of the region, according to the norms of the consumer basket, will amount to 6173.6 thousand RUB, that is 30.8 times less than the economic damage caused by IDD.

VI. CONCLUSION

Thus, the proposed approach, taking into consideration the interests of all participants in the IDD Prevention Program, is based on an investment mechanism that provides enterprises with the reimbursement of the additional expenditures on iodine enrichment of food products. Investments are carried out at the expense of the regional budget and the financing preventive activities reserve of the Territorial Compulsory Health Insurance Fund, which are released as a result of lower costs of IDD treatment and their complications.

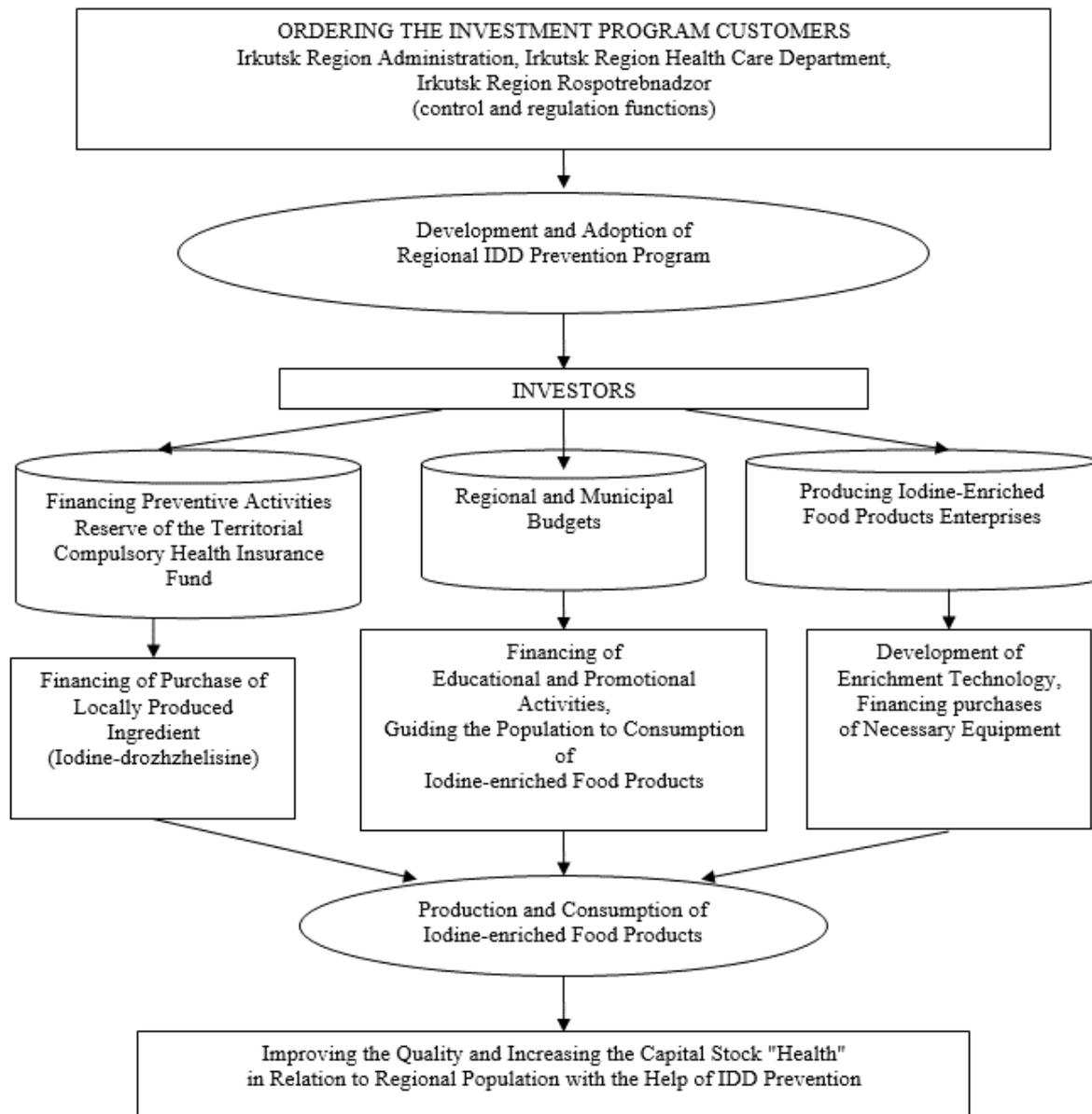


Fig. 1. Sources and directions of financing of the regional iodine deficiency in the population of the Irkutsk region prevention program

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