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Children's health and development: results of a 20-year monitoring*



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Abstract. The analysis of the data from domestic and foreign theory and practice has shown that the monitoring of the cohort of children is the most effective method of studying and assessing the health and development of children in order to make efficient and adequate management decisions. The paper presents the results of the medical-and-sociological monitoring “Research into the conditions for the formation of a healthy generation”, performed by RAS Institute of Socio-Economic Development of Territories since 1995 with the active support on the part of the Vologda Oblast Department of Healthcare. The authors have found out that each age period is characterized by a specific set of factors influencing health. Infancy and early age are dominated by the impact of medico-biological and social factors (poor health of the parents; low level of hemoglobin during pregnancy; mother's smoking during pregnancy; labour conditions of the

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mother that do not meet sanitary standards; specifics of the infant's feeding). In preschool and primary school age greater importance is attached to environmental factors, lifestyle and standard of living of the family (comfort of living conditions, environmental conditions in the area of residence, level of socio-hygienic literacy and health-preserving activity of the parents). Using the cohort of children born in 2014 as an example, the authors show certain positive trends that emerged during the reforms of the economy and social sphere, reflected in the living conditions of families with children, in the level of satisfaction with their health, infant health, and key indicators of obstetrics system. In this regard, the authors substantiate the necessity of such monitoring to determine the correct vector of government policy.

Key words: monitoring; children's health; government policy; health factors; human potential.

At present, when the whole world is undergoing a transition from industrial to post-industrial society, human capital becomes the main factor in economic growth. Social wealth consists of three components, out of which 16% belongs to physical capital, 20% – to natural capital, and 64% – to human capital on average in the world [15, pp. 49-58].

Human factor is considered the basis for promoting the development of countries and regions. The development of human potential and, consequently, the readiness of territories (countries, regions) to implement modernization are directly related to the public administration of socio-demographic development. Therefore, the indicators of human development can be used as indicators of public administration efficiency.

The demographic resource of the society, within which the human potential and human capital are formed, can be assessed quantitatively and also qualitatively. Qualitative indicators include three fundamental components: health potential, professional-educational potential and qualification-intellectual potential, socio-cultural and spiritual and moral activity.

Health, combined with other factors, determines the abilities of an individual at the micro level, and the potential of a country at the macro level. Research findings indicate that deterioration of public health is associated with a particular vulnerability of new generations. It is therefore very important to study the quality of the child population and the effectiveness of state support in the sphere of health and development of the younger generation.

Federal and regional authorities, academic community and non-governmental organizations have been paying considerably more attention to the issues of childhood in the recent years. For instance, at the session of the Coordination Council on the Implementation of the National Strategy for Children which V.V. Putin held on May 27, 2014, the protection and promotion of adolescents' health was the main topic. The President outlined a number of top priority issues in this field and stressed that "the preservation and strengthening of children's health requires an integrated, interagency approach at all the levels of power..." [5].

Speaking on February 17, 2014 at the session of the Presidium of the State Council

of the Russian Federation [2], the Vologda Oblast Governor O.A. Kuvshinnikov highlighted a number of issues that require attention and coordinated action to handle them. These issues include small incomes in families with children; inadequate level of support to socially vulnerable families with children; housing problems; “decline” of traditional family values. He stressed that the government should enhance the status of the family, which is based on healthy maternity, children, and the strength of marriage bonds.

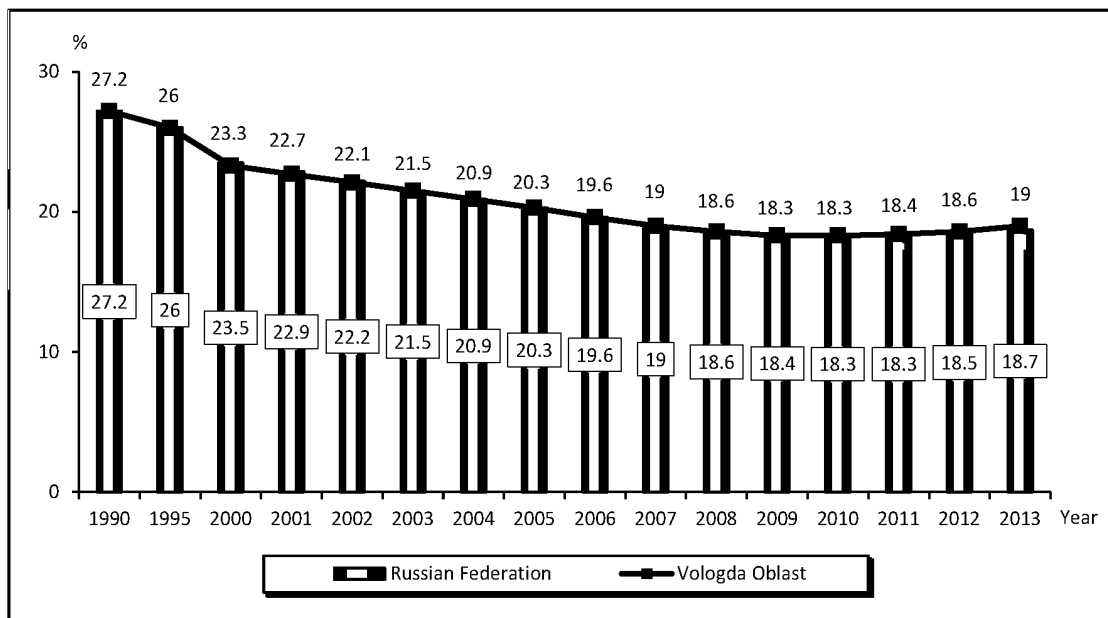
Since 2005 the country has been implementing a set of measures providing state support to families with children and preserving and strengthening child health (priority national project “Health”, “The National Strategy for Children for 2012–2017”, the Concept for demographic policy of the Russian Federation up to 2025, the Program for modernization of health care and others). During this period the lump-sum benefits at birth and monthly childcare allowances paid for up to one and a half years have increased significantly. For instance, in 2012, the annual indexation of state benefits was 6% (in 2010 – 10%; in 2011 – 6.5%). The lump-sum payment at birth averaged 12405.32 rubles (in 2011 – 11703.2 rubles; in 2010 – 10988.9 rubles) [3, pp. 15-17]. In 2011 the average monthly child care allowance for a first child, received by citizens subject to compulsory social insurance, amounted to 5.6 thousand rubles (more than 90% of the subsistence level), for a second and subsequent children it was over 6 thousand rubles (almost 100% of the subsistence level). For comparison: in 2007 the allowance was 700 rubles.

Maternal health and child health have been paid more attention, the quality of medical care has improved, and the availability of high-tech medical services has increased, etc. over the period under consideration. Currently there are 98 perinatal centers in Russia. Twenty-two regional perinatal centers and two federal perinatal centers were built and equipped in 2007–2011 [9]. There are 250 medical institutions that provide high-tech medical care in the federal cities and in the regions. Much attention is given to the enhancement of preventive health care (immunoprophylaxis, preventive medical examination of the population, etc.).

But these and other facts do not diminish the relevance of demographic challenges. For example, the UN experts consider trends in demographic processes on the basis of the criteria of territorial affiliation and socio-economic development. According to the first criterion, Russia is a developed country with a high income level; according to the second criterion, it is included in the group of countries with a medium level of income. It should be noted that birth rate in Russia is practically the same as in countries that have high income level (in 2012 they had the average total fertility rate of 1.7, in Russia it was 1.69); mortality rate is higher than in countries with low income (average total mortality rate for the group in 2012 was 9.0‰, in Russia – 13.3‰) [23].

According to the World Health Organization, the standardized mortality rates from the main classes of causes of death in Russia for 2012 are much higher than those in developed countries. For instance, mortality rate from infectious diseases in our country

Figure 1. Population aged 0–17 (as a percentage of the total number of population) [16]



is 3–5 times higher, mortality rate from non-communicable (chronic) diseases is 2–3 times higher, mortality rate from injuries – 4–6 times higher.

Life expectancy (LE) at birth is usually considered the main global indicator that characterizes the health status and quality of life and reflects the efficiency of actions aimed to protect and promote public health. For example, in 1990–2013 LE in Russia was highly volatile. The decrease in life expectancy was observed during the financial and socio-economic shocks. Life expectancy in the country began to grow in 2003, and in 2013 it reached 70.76 years (in the Vologda Oblast – 69.35 years), which is less than in the EU countries by almost 10 years¹. This gap has increased: in 1990 it was six years.

¹ For comparison: according to the Population Reference Bureau, this figure was 80 years in the EU countries in 2013 [22].

Besides, Russia is characterized by the following:

1. *Reduction in the child population* (0–17 years old) nationwide and in some regions – in 1990–2013 from 27% to 19% (fig. 1).

2. *Negative trends in the health status of children, characterized by high morbidity rate in newborns.* About 34% of children are born sick in Russia, and 29% – in the Vologda Oblast (fig. 2).

3. *High rates of premature mortality* (including maternal and infant mortality). Speaking about the dynamics of infant mortality, it is worth noting that in Russia it has decreased by 50% from 1990 to 2012. Throughout the whole period under consideration the excessive level of infant mortality in Russia compared to the EU countries decreased from three to two times (fig. 3).

Figure 2. Morbidity rate in newborn children (as a percentage of the number of live births) [6; 11]

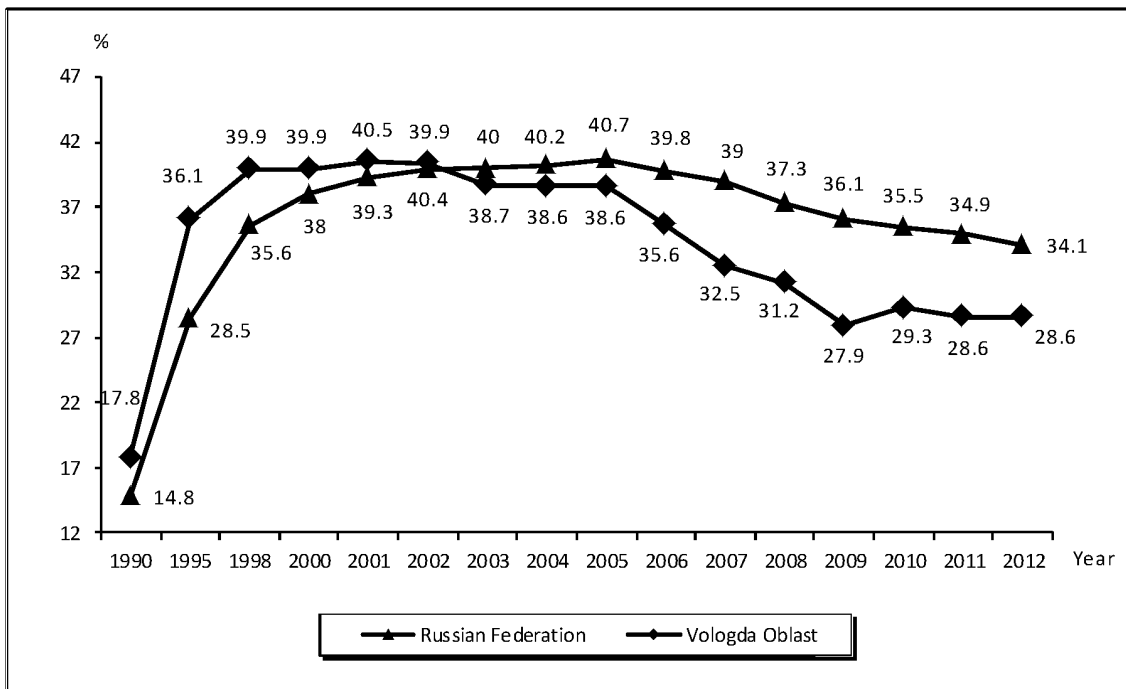
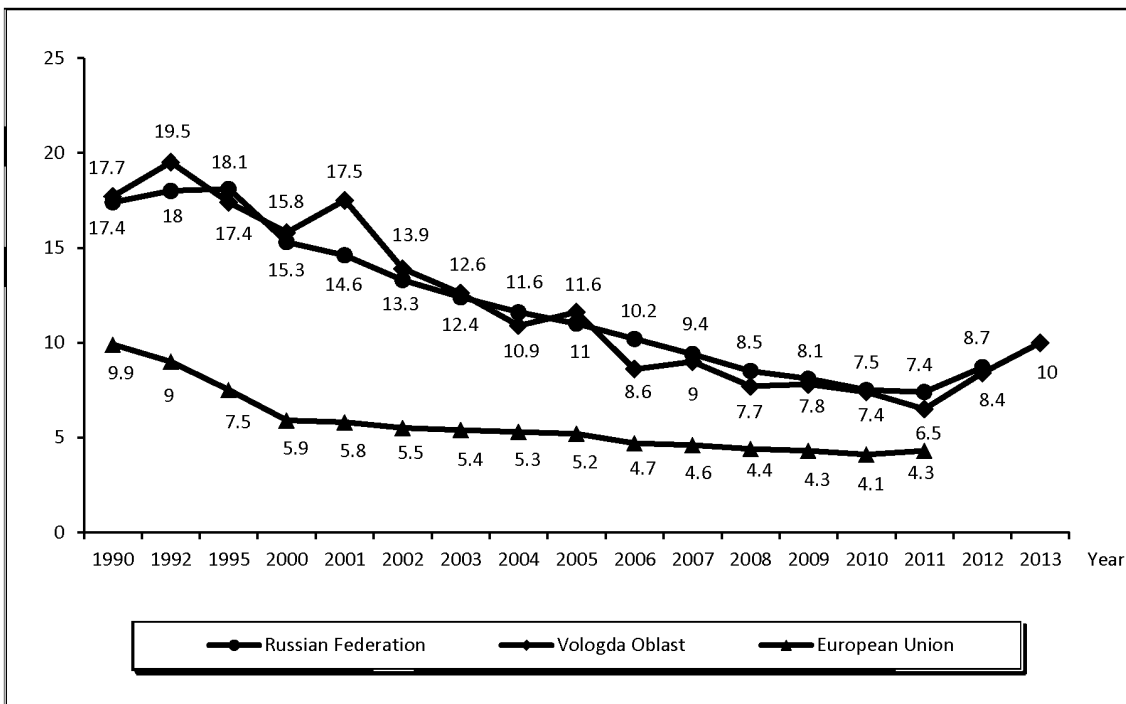


Figure 3. Infant mortality (aged under 12 months, per 1000 live births) [4; 16]



The Russian Federation ranks 160th out of 224 countries according to this indicator for 2014, being next to Chile and Kuwait (7.08 deaths before the age of 12 months per 1000 live births) [20]. It is necessary to emphasize that since 2012 this indicator has shown an improving trend in Russia and the Vologda Oblast, mainly due to the expansion of criteria for live births, namely the nursing of babies born at a gestational age of 22 weeks and weighing² 500 grams.

The above processes lead to large-scale economic losses in the territories; they can be prevented if there is comprehensive interaction between the state and society.

Thus, we can highlight three main reasons why Russia should carry out active state policy aimed to strengthen children's health.

First, it is important to preserve the life and health of every child under the lingering demographic crisis.

Second, there is no deterioration of the key indicators of children's health; their stagnation is pointed out.

Third, Russia adopted the United Nations Convention on the Rights of the Child [7]; this fact initiated the formation of a new, higher level of responsibility of the state and society for the exercise of children's right to life, health and development under favorable conditions [19, p. 7].

² A live birth is the moment of separation of the fetus from the mother's organism through the process of birth at the gestational age of 22 weeks and more, when the body weight of the newborn is 500 grams and more (or less than 500 grams for multiple births) or, if the child's weight at birth is unknown, when the length of the body of the newborn is 25 cm or more, if the newborn shows signs of live birth (breathing, heartbeat, umbilical cord pulsation, or the voluntary movements of muscles, regardless of whether the umbilical cord has been cut and the placenta separated) [10].

Analysis of departmental statistics is not enough to make effective and appropriate management decisions. It is important to carry out comprehensive research into the health and development of children on a real-time basis, revealing the risk factors that have the most significant impact. One of the most effective methods of analysis and evaluation of children's health and development consists in a prospective monitoring, which is used for the observation of the cohort of families with children.

An example of such monitoring is found in the long-term medico-sociological study of family cohorts, starting with the birth of children; it identifies the key determinants of health at different stages of life of children and young people. This study is carried out by the research team at ISEDT RAS with active support provided by the Vologda Oblast Department of Health Care. It should be noted that this study is unique for Russia.

Materials and methods. The idea of monitoring was proposed by RAS Corresponding Member N.M. Rimashevskaya, who borrowed it in England in 1980. The prototype was the National Child Development Study (NCDS) launched in the UK in 1958 by the National Children's Bureau (NCB), and continued by the Center for Longitudinal Studies (CLS) since 1985 [21, p. 13]. In 2008 the monograph "Now we are 50" was released in connection with the 50th anniversary of the study.

The ISEDT RAS survey sample included all the families that produced children during the above-mentioned period and that live in the region's large cities (Vologda, Cherepovets), towns – regional centers

Table 1. Stages of the monitoring

| Year when the research started | Period when the research began | Number of surveyed families |
|--------------------------------|--------------------------------|-----------------------------|
| 1995 | May 15 – May 30 | 100 |
| 1998 | March 1 – March 25 | 200 |
| 2001 | March 1 – March 25 | 200 |
| 2004 | March 1 – March 25 | 200 |
| 2014 | March 1 – March 21 | 370 |

(Veliky Ustyug, Kirillov) and in the urban-type settlement of Vozhega (*tab. 1*). To date, the monitoring involves five cohorts of families (children born in 1995, 1998, 2001, 2004 and 2014); this expands opportunities for identifying and analyzing the trends in the health and development of children, and factors contributing to these processes.

Monitoring is carried out with the help of special questionnaires that the respondents are to fill in. The research involves the use of complex tools, which include:

- questionnaires (filled in by the parents) that characterize the specifics of the family and household of the newborn, health of the parents and in detail – health of the mother, specifics of the delivery, main parameters of the health of the newborn or the cause of its death (filled with obstetricians-gynecologists on the basis of medical documentation);

- questionnaires that characterize the health status and development of the child, the conditions of its life at the age of four weeks, six months, twelve months, two years, three years and so on (the questionnaire has two parts: the first one for assessing the living conditions and development of children is filled in by the parents; the second one that characterizes and evaluates the child's health is filled in by pediatricians from the corresponding district);

- questionnaires that characterize the health and development of the children, their hobbies and interests (filled in by the children starting from the age of ten);

- software packages (SPSS, Statistica) for primary data processing and statistical and econometric analysis.

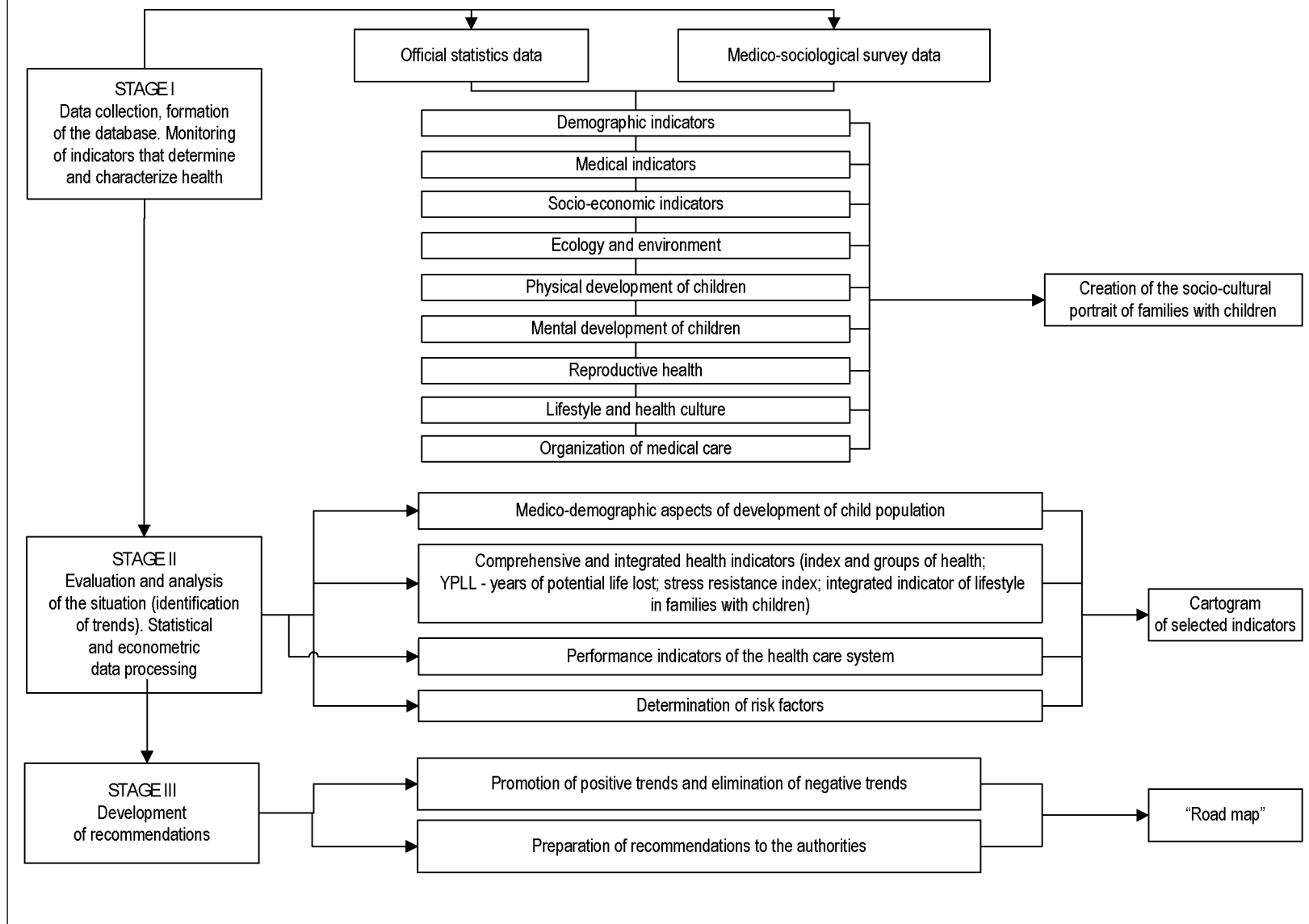
Econometric methods (correlation, regression, factor and cluster analysis) were applied along with the above methods in order to analyze the generated database more profoundly, and to identify statistically significant relationships and dependencies of the examined parameters³.

In the first year of the child's life the information is taken four times (at birth, when the children reach the age of one month, six months and twelve months, after that – annually [13]).

It is very important for studying the health and development of children to have information about their own attitude to their health, and their view of life values. Therefore, the children themselves participate in the survey in the framework of this project beginning from 2005. The children from the cohort born in 1998 take part in the survey

³ The database of the monitoring "The research into the conditions for the formation of a healthy generation" has the certificate of state registration No. 2012620788 of August 13, 2012 in the Federal Service for Intellectual Property, Patents and Trademarks.

Figure 4. Stages of the monitoring "Study of the conditions for the formation of the healthy generation"



since 2008; the children from the cohort born in 2001 – since 2011; and the children from the cohort born in 2014 – since 2014. The research program provides for the adjustment of the questionnaires taking into account the age of the children and socio-economic transformations that take place in the society.

The entire monitoring study can be divided into three stages (*fig. 4*). At the first stage necessary information is collected and a database is formed. The main sources of information are official statistical data and the results of the medico-sociological study.

On the second stage the situation is analyzed on the basis of the database formed, and trends are identified. The findings of this stage can be reflected in the cartograms for individual indicators.

The third stage is the development of medico-social and organizational guidelines, as well as the necessary measures aimed to improve the key indicators of health and development of children and to improve social policy in the sphere of family, motherhood and childhood.

Research findings and their discussion. According to the statistics, in 1990–2005 there was a significant increase in the incidence rate in newborn children (from 17.8 to 38.6% of live births) in the Vologda Oblast [16]. Some positive changes in the health status of this population group started in 2006 due to implementation of the oblast target program “Healthy child” and the priority national project “Health”. These programs provide for the screening of pregnant women and newborn screening (screening of infants for genetic diseases),

the purchase of special mixtures for pregnant women and nursing mothers, the purchase of artificial lung ventilation apparatuses for newborns [17, p. 24]. Although in recent years the situation was characterized by certain stability, in 2012, approximately 29% of children (34% – nationwide) were born ill or fell ill soon after birth, which is almost twice as much as in 1990.

Trends in the health of newborns are confirmed not only by the official statistics, but also by the results of the longitudinal study. The monitoring made it possible to see the trends in the changes of health of newborns in 1995–2014 (*fig. 5*). For instance, the proportion of infants with the first group of health has reduced by seven percentage points over these years. At the same time the share of infants with chronic diseases (the third and fourth groups) was the greatest among the children born in 1998. This is because the period of child-bearing and birth coincided with economic decline, with the crisis in the economy and social sphere, including health care, which had an impact on the children’s health.

A new phase of research in 2014 showed that almost 15% of newborns had good health (classified as the first group of health); it is by 6–13 p.p. higher than in the previous years of the study. At the same time, the proportion of children with functional and some morphological abnormalities (group 2B) reduced by six p.p. compared with the level of 2004. These processes are connected, on the one hand, with the improvement of socio-economic status of the population, and on the other hand, with demographic policy in the country and the region.

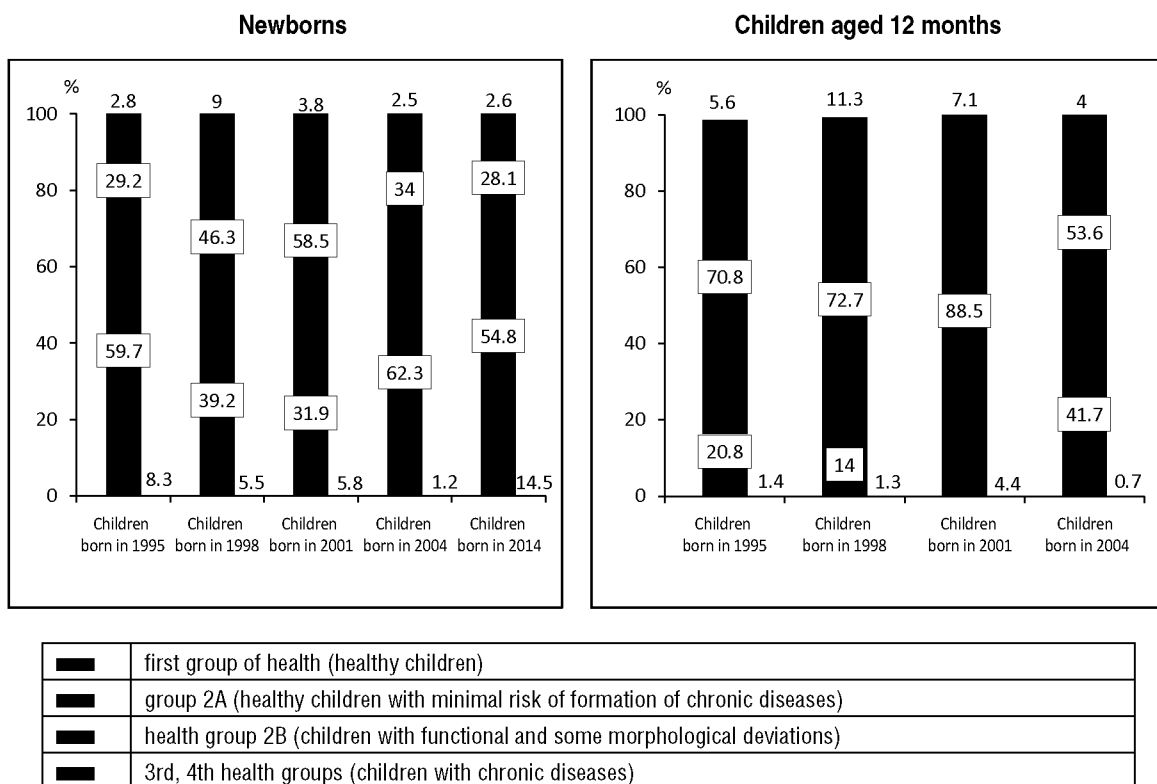
But we should not forget that the first year of life is very important in the development of the child and to this time there is a significant deterioration of the capacity of children's health at birth.

For example, according to the study, the proportion of healthy children (first group of health) in the cohorts born in 1995, 1998, 2001, 2004 has decreased before they reached twelve months of age, but still greater decline occurred in the group 2A (*fig. 5*).

Thus, one or another disease was identified in the first year of life in most of the examined children who had the risk of disease due to unfavorable medical history. The proportion of children with chronic diseases over this period in each cohort has increased in 1.3–2 times.

We consider it very important that within the framework of the monitoring in 2014 the new fifth cohort of children (born in 2014) was selected, and this allowed us to track changes in the lives of families with children,

Figure 5. Health of newborn and children aged 12 months



Source: the monitoring "The research into the conditions for the formation of a healthy generation". ISED T RAS, 1995, 1996, 1998, 1999, 2001, 2002, 2004, 2005, 2014.

and to see what effects the changes in the economy and social sphere (particularly in health care) had on the health of the new generations⁴.

The data on the new cohort illustrate the age-specific shift in the birth rate (the increase in the average age of expectant mothers). For example, in 2014 the average age of mothers was 29 years, i.e. four years more than in 1995.

For 1995–2014, the number of births in two-parent families increased from 72 to 93%, which is certainly beneficial for raising children and shaping their health (*tab. 2*). The number of families living separately from their relatives increased (from 50 to 74%). The highest value of the indicator of the number of large families is observed in 2014. In rural

areas the figure is higher (15%) than in cities (in Vologda – 11%; in Cherepovets – 12%).

Next, let us consider the basic living conditions of families, in which new generations are born, and their changes during almost 20 years.

Housing conditions of families into which children were born in 2014 are diverse. For example, 72% of the respondents have their own apartment or house, 11% of the respondents live in rental housing, 3% live in communal apartments, 1% live in rooms in families' hostels. Based on this we can conclude that most families are provided with housing.

If we look at the data for 1995, we see that almost 30% of the families changed their housing conditions after the birth of a child.

Table 2. Social portrait of the families by cohorts (as a percentage of the number of respondents)

| Indicator | Cohort of those born in 1995 | Cohort of those born in 1998 | Cohort of those born in 2001 | Cohort of those born in 2004 | Cohort of those born in 2014 |
|--------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Age of mother, years | 25 | 24 | 25 | 22 | 28.5 |
| Age of father, years | 23 | 23 | 24 | 25 | 33.5 |
| Type of family, %: | | | | | |
| - two-parent | 72.3 | 85 | 86.4 | 87 | 93.2 |
| - single-parent | 27.7 | 15 | 14.6 | 13 | 6.8 |
| - nuclear | 50 | 38 | 30 | 35 | 74 |
| - complex | 34 | 47 | 56 | 53 | 19.5 |
| Presence of other children, % | 49 | 40.1 | 43.1 | 41.7 | 51 |
| Families with many children, % | 10.2 | 4 | 2 | 0.4 | 12 |

Source: hereinafter – the monitoring “The research into the conditions for the formation of a healthy generation”. ISED T RAS, 1995, 1998, 2001, 2004, 2014.

⁴ The survey comprised the families with babies born in March 1–21 in the regional center – Vologda, economic center – Cherepovets, district centers – Kirillov and Veliky Ustyug, and the urban settlement of Vozhega. The survey was carried out by collecting the empirical data produced by the method of the panel survey of mothers in maternity hospitals. The questionnaire consisted of two parts: part one described the characteristics of families and households of the newborn, and the health of its parents and other relatives (filled in by the mother); part two described in detail the health of the mother during pregnancy, the specifics of the delivery, the main parameters of the health of the newborn or the cause of its death (based on the medical documentation; filled in by gynecologists). In 2014, the sample included 370 families with newborns (373 children).

One quarter of them privatized state apartments, in which they lived. 18% of the families were able to improve their housing conditions, changing a hostel room to a separate apartment; and the housing conditions in 22% of the families changed for the worse (the families moved in communal apartments from separate state apartments). This explains to some degree the situation, when in 2014 60% of mothers assessed their housing conditions as “good”, which is 30 percentage points higher than in 1995 (*tab. 3*).

Satisfaction with the environmental conditions in the neighborhood has remained unchanged for the years under consideration. According to the survey, 52% of the families assess them as “satisfactory”; 31% – as “good” and 10% – as “poor” (*tab. 4*).

Cherepovets has maintained a higher level of negative assessments for many years; it is almost three times higher than in the regional center, and six times higher than in the oblast

districts. There are several large industrial enterprises in Cherepovets (OAO Severstal, OJSC PhosAgro-Cherepovets) that largely determine its environmental situation.

The major adverse environmental factors in Cherepovets are as follows: polluted air (93%), poor water quality (56%), excessive level of noise (34%; *tab. 5*). As for Vologda, according to the survey of female respondents, excessive level of noise is on the first place (73%), poor water quality – on the second (64%), lack of greenspaces – on the third (55%).

Rational nutrition affects the health of both mother and unborn child. Nutrition depends directly on the level of family income. If it is low, the quality of food is limited and most of the income has to be spent on food to the disadvantage of other basic needs (medicine, recreation, etc.). The study shows that families with newborn children spend much less money on food – the figure decreased from 66% in 1995 to 44% in 2014.

Table 3. Satisfaction with housing conditions in families with newborn children (as a percentage of the number of respondents)

| Housing conditions | Cohort of those born in 1995 | Cohort of those born in 1998 | Cohort of those born in 2001 | Cohort of those born in 2004 | Cohort of those born in 2014 |
|--------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Good | 29 | 31.2 | 29.9 | 38.1 | 60 |
| Satisfactory | 62 | 54.3 | 57.8 | 51.3 | 32 |
| Poor | 7 | 13.1 | 8.8 | 8.3 | 3 |
| Very poor | 2 | 1.5 | 2.8 | 1.5 | 0.5 |

Table 4. Satisfaction with environmental conditions in families with newborn children (as a percentage of the number of respondents)

| Environmental conditions | Cohort of those born in 1995 | Cohort of those born in 1998 | Cohort of those born in 2001 | Cohort of those born in 2004 | Cohort of those born in 2014 |
|--------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Good | 30.7 | 15.6 | 18.3 | 20.4 | 31.4 |
| Satisfactory | 53.5 | 56.3 | 48.6 | 54.0 | 51.6 |
| Poor | 14.9 | 17.6 | 15.5 | 10.6 | 10.0 |
| Very poor | 1.0 | 2.0 | 2.0 | 4.9 | 0.5 |

Table 5. Assessment of environmental conditions in the area where families with newborn children live (in % of the number of those who assessed the environmental conditions as unfavorable)

| Environmental factors | Vologda | | | | | Cherepovets | | | | |
|--------------------------|---------|------|------|------|------|-------------|------|------|------|------|
| | 1995 | 1998 | 2001 | 2004 | 2014 | 1995 | 1998 | 2001 | 2004 | 2014 |
| Polluted air | 33.3 | 14.3 | 83.3 | 81.8 | 45.5 | 0.0 | 62.5 | 93.1 | 40.7 | 92.6 |
| Poor water quality | 50.0 | 92.9 | 77.8 | 81.8 | 63.6 | 75.0 | 91.7 | 41.4 | 81.5 | 55.6 |
| Excessive level of noise | 33.3 | 14.3 | 61.1 | 36.4 | 72.7 | 25.0 | 25.0 | 48.3 | 44.4 | 33.3 |
| Lack of green spaces | 66.7 | 78.6 | 61.1 | 72.7 | 54.5 | 100.0 | 45.8 | 10.3 | 40.7 | 11.1 |
| Contaminated soil | 16.7 | 28.6 | 55.6 | 0.0 | 9.1 | 50.0 | 41.7 | 10.3 | 22.2 | 14.8 |

Table 6. Evaluation by the mother of her own health (as a percentage of the number of respondents)

| Answer | Cohort of those born in 1995 | Cohort of those born in 1998 | Cohort of those born in 2001 | Cohort of those born in 2004 | Cohort of those born in 2014 |
|--------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Excellent | 4.0 | 5.5 | 4.4 | 11.7 | 9.7 |
| Good | 66.3 | 68.8 | 61.0 | 65.7 | 73.5 |
| Satisfactory | 28.7 | 24.6 | 30.7 | 21.9 | 12.2 |
| Poor | 0.0 | 0.5 | 1.2 | 0.0 | 0.5 |

This indicates the increase in the standard of living and expands opportunities for families to satisfy other basic needs.

The health of expectant mothers, the increase in the number of cases of pregnancy and childbirth complications largely determine the health condition of children. New mothers were more satisfied with their health in 2014 (83%) than in 1995 (70%; *tab. 6*).

The effectiveness and performance efficiency of health facilities, the improvement of quality indicators of maternal and child health are largely determined by the *organization and quality of medical care provided* during pregnancy and preparation for childbirth.

For 1995–2014 the assessments of the availability of services related to the organization of medical observation during pregnancy and preparation for childbirth have become more positive. We should also point out the increase in the number of

high estimates regarding the availability of information about the medical, psychological and other preparation to birth (7.6), and also about the nursing of a newborn child (8 points; *tab. 7*).

In 2014 the majority of expectant mothers (59%) evaluated the quality of prenatal medical supervision as good (*tab. 8*). In comparison with assessments for previous years of the study there is an increase by 4–15 p.p.

At the same time, one third of women respondents assessed this type of assistance as satisfactory. Their main suggestions for improvement of medical care are as follows: raising the level of professionalism of doctors; observance of medical ethics; repair of maternity homes, renovation of equipment and facilities at medical institutions, provision of laboratory and diagnostic rooms with modern medical equipment; expansion of the range of services and streamlining the time of examination of pregnant women in polyclinics

Table 7. Availability of services related to the organization of medical observation during pregnancy and preparation for childbirth (average score)

| Indicator | Cohort of those born in 1998 | Cohort of those born in 2001 | Cohort of those born in 2004 | Cohort of those born in 2014 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|
| Availability of timely laboratory and diagnostic examination | 7.7 | 7.5 | 7.3 | 8 |
| Availability of timely skilled obstetric (medical) assistance | 8.3 | 8 | 7.7 | 8.5 |
| Availability of timely skilled therapeutic (medical) assistance | 7.9 | 7.4 | 7.3 | 7.9 |
| Availability of advisory medical care in various specialties (neurologist, ophthalmologist, others) | 6.8 | 6.1 | 5.6 | 7 |
| Timely hospitalization if necessary | 8.5 | 8.4 | 8.2 | 8.7 |
| Provision with essential medicines (including those containing iron, vitamins) and medical products | 7 | 7.6 | 7.2 | 7.3 |
| Information about medical, psychological and other preparation for childbirth | 6.1 | 5.6 | 6.6 | 7.6 |
| Information about nursing a newborn | 5.6 | 5.8 | 6.6 | 8 |

Note. This question was not asked in 1995.

Table 8. Distribution of answers to the question: "Please indicate how you rate the quality of prenatal medical surveillance in general" (as a percentage of the number of respondents)

| Answer | Cohort of those born in 1998 | Cohort of those born in 2001 | Cohort of those born in 2004 | Cohort of those born in 2014 |
|--------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Good | 54.8 | 39.4 | 37.4 | 58.6 |
| Satisfactory | 33.2 | 43.4 | 43.4 | 31.9 |
| Poor | 3.0 | 2.8 | 5.7 | 1.4 |
| Very poor | 1.5 | 0.4 | 0.8 | 0.5 |

Note. This question was not asked in 1995.

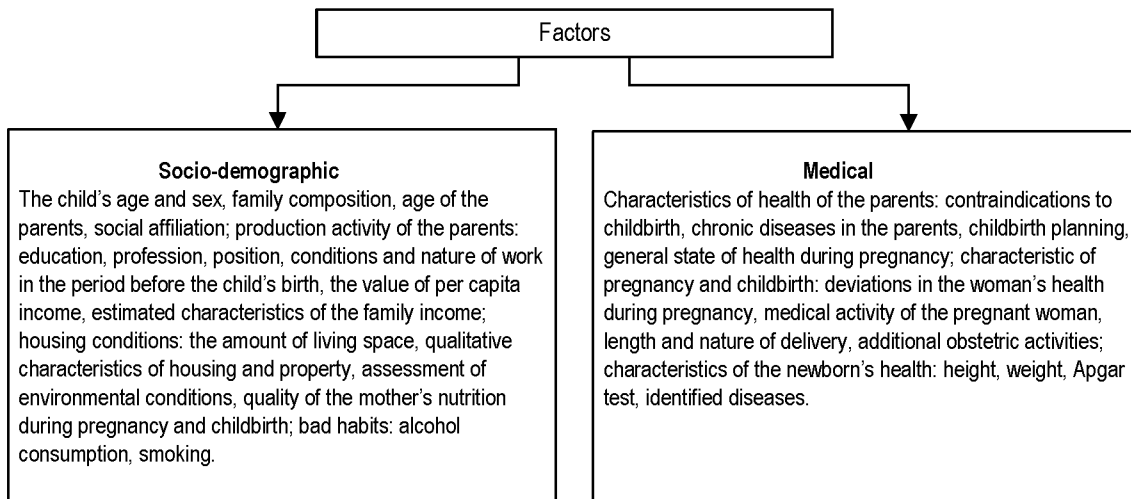
and maternity welfare centers; free supply of vitamins in the period of childbearing; psychological assistance at childbirth and during the postpartum period; the use of individual approach; expansion of the list of information on legal issues, nutrition, adherence to the day regimen; organization of schools for expectant mothers.

Thus, the first results of the study conducted in 2014 indicate the positive dynamics in satisfaction of families with children with housing conditions, some stability in the assessment of the environmental situation in the area of their residence. As for health, expectant mothers' assessments of their own

health have improved for 1995–2014, as well as their assessments of the availability of services related to the organization of medical supervision during pregnancy and preparation for childbirth.

The monitoring data allow us to assess the impact of various factors on the health and development of children on the basis of information received in real time. The questions in the questionnaire that aim to identify risk factors for the health of the child are compiled by experts based on the experience of domestic and foreign research. The study considered *socio-demographic and medical factors* (fig. 6).

Figure 6. Factors affecting children's health



The analysis made it possible to highlight the most significant factors determining the health of children in different periods of life.

During infancy and early childhood (up to 3 years) the most significant impact on the health of the child is caused by the following factors:

- low hemoglobin in women in late pregnancy ($R_s=0.712$ at the time of birth; $R_s=0.830$ by the time the child is 12 months old);
- health of the parents ($R_s=0.645$ at the time of birth; $R_s=0.832$ by the time the child is 12 months old; $R_s=0.532$ by the time the child is two years old);
- nature of the course of delivery ($R_s=0.513$ at the time of birth; $R_s=0.147$ by the time the child is 12 months old);
- unfavorable working conditions of the mother during her pregnancy: air pollution in the workplace ($R_s=0.939$ at the time of birth); effects of radiation and ultra-high frequency ($R_s=0.839$ at the time of birth); work with toxic chemicals ($R_s=0.6$ at the

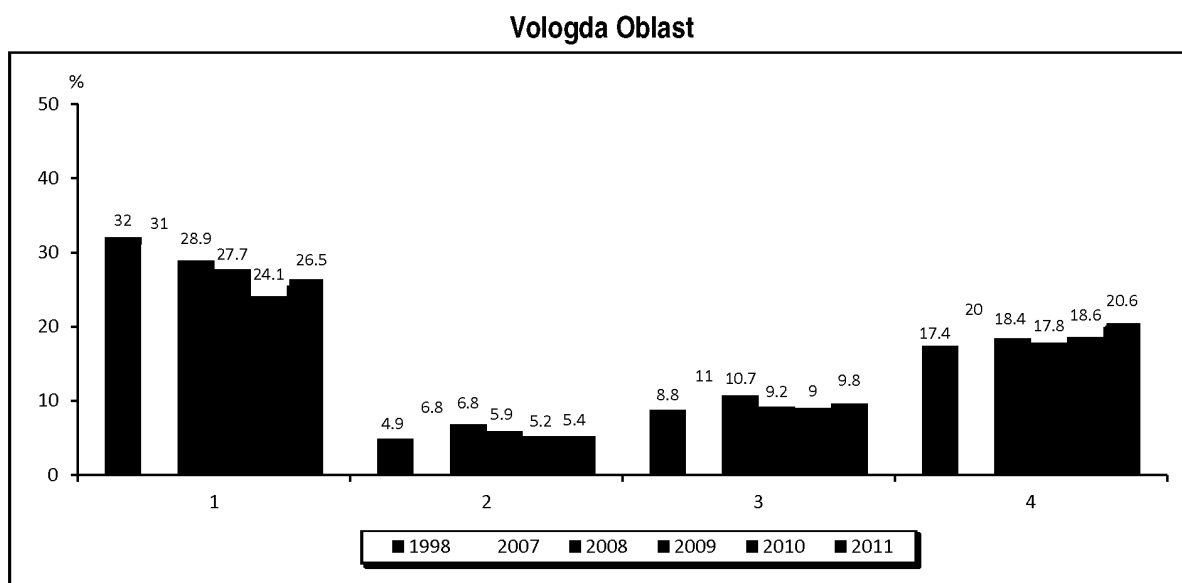
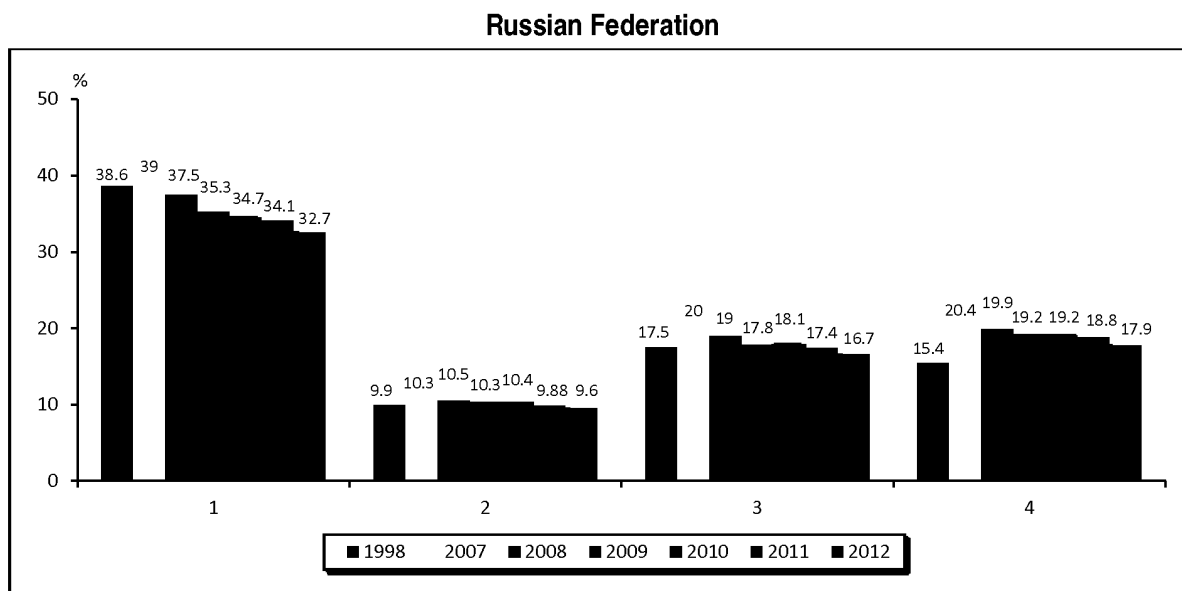
time of birth); work in 2–3 shifts ($R_s=0.510$ at the time of birth);

- smoking of the mother during pregnancy ($R_s=0.898$ at the time of birth, $R_s=0.661$ by the time the child is 12 months old);
- specifics of the child's feeding ($R_s=0.85$ with breastfeeding up to six months).

Let us focus only on some of the factors that, in our opinion, require more careful attention.

The first factor concerns deviations in the health of women during pregnancy. Such diseases of the mother, as anemia, vegetative-vascular dystonia and hypotension entail a lack of nutrients and oxygen delivery to the fetus. Various infections of the mother cause the weakening of the child's immune system resulting in increased morbidity and deteriorating health. Cold-related diseases, hypertension, digestive diseases, diseases of the genitourinary system and related dysfunction in the woman's organism during pregnancy also adversely affect the health of the child.

Figure 7. Diseases in women who have completed their pregnancy
(as a percentage of the number of those who completed their pregnancy)



Among the women who completed pregnancy, there were cases of:
 1 - anemia
 2 - diseases of the circulatory system
 3 - edema, proteinuria and hypertensive disorders
 4 - diseases of the genitourinary system

Source: *Osnovnye pokazateli zdorov'ya materi i rebenka, deyatel'nost' sluzhby okhrany detstva i rodovspomozheniya v Rossiiskoi Federatsii* [Main Indicators of Maternal and Child Health, the Activities of the Service for Protection of Children and Obstetrics in the Russian Federation]. Moscow, 2012. 193 p.

In 1998–2007 morbidity rate in pregnant women increased both nationwide and in the Vologda Oblast (fig. 7). But since 2008 there has been a tendency of reducing the incidence in pregnant women. The most common is anemia; diseases of the genitourinary system rank second; edema, proteinuria and hypertensive disorders rank third; diseases of the circulatory system occupy the fourth place.

The results of the monitoring show that in women who suffered from anemia during

pregnancy (in the cohort born in 2004) only 3% of children were born healthy; by the time they reached three years of age, almost all of the children (91%) had some health deviations (tab. 9). At that, the children’s health, already weakened at birth, is deteriorating throughout the entire period of early childhood.

The second factor is maternal smoking. According to the monitoring data, in 1995–2014 the number of women who smoked during pregnancy in the surveyed cohort increased from 3 to 10%, respectively, (tab. 10).

Table 9. Impact of diseased conditions of pregnant women on child's health (as a percentage of the number of respondents)

| Diseased conditions of expectant mothers | Children's health by age | | | | | | | |
|--|--------------------------|------|-----------|------|---------|------|---------|------|
| | Newborns | | 12 months | | 2 years | | 3 years | |
| | R 1 | R 2 | R 1 | R 2 | R 1 | R 2 | R 1 | R 2 |
| | Cohort of 1995 | | | | | | | |
| Anemia | 58.3 | 41.7 | 25.0 | 75.0 | 66.7 | 33.3 | 0.0 | 100 |
| Infections of genitourinary system | 66.7 | 33.3 | 0.0 | 100 | 0.0 | 100 | 0.0 | 100 |
| Gynecological disorders | 80.0 | 20.0 | 0.0 | 100 | 0.0 | 100 | 0.0 | 100 |
| | Cohort of 2004 | | | | | | | |
| Anemia | 2.7 | 97.3 | 55.7 | 44.3 | 6.8 | 93.2 | 9.3 | 90.7 |
| Infections of genitourinary system | 5.0 | 95.0 | 65.0 | 35.0 | 4.3 | 95.7 | 0.0 | 100 |
| Gynecological disorders | 2.2 | 97.8 | 57.1 | 42.9 | 6.1 | 93.9 | 4.0 | 96.0 |
| Vegetative-vascular dystonia | 9.1 | 90.9 | 33.3 | 66.7 | 0.0 | 100 | 0.0 | 100 |
| Hypertension | 0.0 | 100 | 0.0 | 100 | 0.0 | 100 | 0.0 | 100 |

R 1 is the group with the lowest risk of health deterioration (includes children with the health group 1 and 2A).
 R 2 is a group of children with different deviations in health status, chronic diseases (includes children with the health group 2B, 3 and 4) [14, p. 51].
 Source: the monitoring "The research into the conditions for the formation of a healthy generation". ISEDT RAS, 1995-1998, 2004-2007.

Table 10. Maternal smoking before and during pregnancy (as a percentage of the number of respondents)

| Answer | Before pregnancy | | | | | During pregnancy | | | | |
|-----------------|------------------|------|------|------|------|------------------|------|------|------|------|
| | 1995 | 1998 | 2001 | 2004 | 2014 | 1995 | 1998 | 2001 | 2004 | 2014 |
| I smoked | 2.2 | 28.1 | 29.6 | 27.9 | 26.5 | 2.8 | 12.6 | 14.2 | 13.1 | 10.3 |
| I did not smoke | 77.8 | 68.3 | 69.2 | 70.2 | 73.5 | 97.2 | 83.9 | 84.2 | 86.9 | 89.2 |
| No answer | 20 | 3.5 | 1.2 | 1.9 | 0 | 0 | 3.5 | 1.6 | 0 | 0.5 |

Source: the monitoring "The research into the conditions for the formation of a healthy generation". ISEDT RAS, 1995, 1998, 2001, 2004, 2014.

Maternal smoking leads to the development of functional disorders in their children. Smoking during pregnancy is especially unfavorable. The non-smoking mothers gave birth to 34–37% of healthy children; those who smoked before pregnancy – only 25–34%. Those who smoked during pregnancy undermined the health of their newborns to a great extent: on average only 20% of children were born without health deviations.

Maternal smoking affects the weight of the unborn child; smoking mothers more often gave birth to low birth-weight babies (14% on average). The proportion of children with birth weight less than 2500 grams is 20% in the women who continued to smoke during pregnancy.

The obtained data also is also confirmed by other studies. In particular, the UK scientists, having examined 17 thousand newborns in 1958, marked the slowdown in physical and mental development in the children whose mothers had smoked during pregnancy. If mothers smoked 10 cigarettes or more per day, their children were on average by one cm shorter in height, and they studied worse at school compared with their peers whose mothers had not smoked during pregnancy [21].

During the formation of health in the pre-school and school age, several other factors, different from those in infancy, become more important. The most common of these factors are as follows:

1. Poor health of the children in early childhood. For example, frequent and prolonged illness at the age of 1–2 years increase the risk of developing chronic diseases at older ages.

2. Unsatisfactory housing conditions. The children living in good conditions have better health compared to those living in unsatisfactory housing conditions, such as cold, humidity, overcrowding or cramped quarters. Such characteristics have a particularly noticeable effect on the children's health.

3. Adverse environmental conditions in the area of residence. The children who live in ecologically polluted neighborhoods fall ill more frequently.

4. Low medical activity of the family. About 70% of parents in surveyed families always go to the doctor in case of acute diseases or exacerbation of chronic diseases in the child, and they follow the recommendations of the doctors. About a quarter of parents say that they do not always follow the pediatrician's recommendations. This trend is observed especially often in single-parent families. In other families parents resort to self-treatment, remedies of folk medicine, or they go to the doctor only when the child's condition becomes critical.

5. Low welfare of the family. High incomes do not guarantee better health, but they provide for a certain set of benefits, contributing to the development of the child.

These factors in children's health determine the main issues that should be addressed, in our opinion:

- improvement of medico-social measures aimed to improve the reproductive health of the population;
- health promotion in the children that have already been born; creation of conditions favorable for their development;
- improvement of medical and sanitary-hygienic literacy of the population.

* * *

The child population in any country is the most important resource, the future basis for economic growth, scientific and technological development and defense. From this viewpoint, socio-economic aspects of the health of the younger generation require extensive research to determine the correct vector of the government policy. It is therefore quite natural that the results of the monitoring under consideration constitute the evidence base for legislative decisions in the sphere of motherhood and childhood.

The representatives of the regional authorities showed interest in the research findings throughout the whole study period. Using the monitoring data, the Vologda Oblast Department of Health Care is undertaking efforts to provide support to families and children.

The concept “Vologda Oblast: Health-21”, the research and development work “Study of the reproductive potential of the region’s population”, the Russian-American project “Mother and child”, the Program for demographic development of the region, the target programs “Healthy generation” and “Healthy child” – this is an incomplete list of studies and documents, which used the results of the monitoring of the conditions of formation of a healthy generation.

Returning to the British research of 1958, we note that it originates from the studies of the reasons for high perinatal mortality in children (in that period it was 33 deaths per 1000 live births) and the studies of preservation of children’s health, and successful management of pregnancy and childbirth. The research findings served as the basis for the formation of national policy in the sphere of public health since birth [21].

The Russian scientific medical community has been discussing the issue concerning the establishment of the law on the protection of children’s and adolescents’ health [1, pp. 5-9; 8, pp. 9-11], which would imply the recognition of the child not just as the owner of rights and freedoms, but as the object of special protection. When adopting the regional legislative and normative-legal acts it is necessary to take into account local socio-economic and demographic characteristics of the territory (region, republic). *Therefore, the ongoing monitoring of children’s health should become the main instrument for assessing the situation.*

The example of the British study (NCDS) that lasted more than a half-century, and the experience of one of Russia’s regions (Vologda Oblast) confirm that the results of such research have a great impact on the formation of the main directions of the state policy – from the living conditions and health to education and employment.

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