DOI: 10.15838/esc.2023.2.86.9
UDC 618.2:616-053.3:616-053.4:314.44, LBC 60.524:88.5:51.9

Parent-Related Risk Factors Affecting Child Health (on the Results of a Cohort Monitoring Study for 25 Years)

Yuliya E.
SHMATOVA
Vologda Research Center, Russian Academy of Sciences
Vologda, Russian Federation
e-mail: ueshmatova@mail.ru
ORCID: 0000-0002-1881-0963; ResearcherID: R-1021-2018

Irina N.
RAZVARINA
Vologda Research Center, Russian Academy of Sciences
Vologda, Russian Federation
e-mail: irina.razvarina@mail.ru
ORCID: 0000-0002-9377-1829; ResearcherID: I-8228-2016

Aleksandra N.
GORDIEVSKAYA
Vologda Research Center, Russian Academy of Sciences
Vologda, Russian Federation
e-mail: alessu85@mail.ru
ORCID: 0000-0001-7777-3456; ResearcherID: I-9439-2016

For citation: Shmatova Yu.E., Razvarina I.N., Gordievskaya A.N. (2023). Parent-related risk factors affecting child health (on the results of a cohort monitoring study for 25 years). *Economic and Social Changes: Facts, Trends, Forecast*, 16(2), 166–189. DOI: 10.15838/esc.2023.2.86.9

Abstract. The economic significance of the problem of preserving and strengthening the health of shrinking child population as an important component of reproductive, labor and human potential requires the search for and development of mechanisms to manage risk factors. We present sample results of a multi-year monitoring study of child health in the Vologda Oblast for 25 years of research (1998–2022). The purpose of our research is to evaluate the degree of risk to the health of preschool children caused by certain factors on the part of parents. The research methodology is the intracohort method of data analysis on 1,454 children from five cohorts (1998, 2001, 2004, 2014 and 2020 years of birth) by calculating the relative risk index. The scientific novelty is a comparative analysis of the influence of age, health and hazardous working conditions of future parents on the child health in the pre- and postnatal period. We have found that young maternal age is often a risk factor for child health, while mature maternal age increases the risk of cesarean section and delayed neuropsychological development in children by the age of 7. In contrast, father's young age acts as a protective factor during intrauterine child development, but increases the risk of disease development in the future. Mature father's age creates risks of congenital abnormalities of the cardiovascular system, but its negative effect is mitigated later on. We assume that the reason for this lies in the higher level of material wealth, medical literacy, and responsibility of aging parents. Parents' hazardous working conditions have a deleterious effect on the child health after birth, and on the maternal health in the prenatal period as well. A complicated obstetric history of previous and current pregnancies is the most significant risk factor on the maternal part. Her chronic diseases showed no association with abnormalities in the child health, the exceptions are obesity and thyroid dysfunction. In contrast, father's complicated obstetric history demonstrates a strong association with intrauterine fetal development disorders, the use of surgical childbirth, congenital abnormalities, the low Apgar score for the newborn, and child's disease in the future. Practical significance of the work lies in emphasizing father's role in the formation of child health and preparing recommendations for the prevention of child health disorders taking into account the data on the risk factors of both parents.

Key words: child health, child health risk, maternal age, father's age, hazardous working conditions, diseases of mother and father, obstetric history, chronic diseases, paternal health.

Introduction

Fertility rates have been declining progressively worldwide since the beginning of the 20th century, while life expectancy has been increasing in most countries. Infertility now affects about 15% of couples of reproductive ages. In addition, the proportion of people who postpone parenthood is growing (Eid et al., 2022), childlessness is increasingly common, and the prevalence of one- and two-child models is converging[1] (Churilova, Zakharov, 2019). Moreover, against the background of the COVID-19 pandemic in Russia, the number of people who want to have children (including childless people) has decreased even more (Makarentseva, 2020). These facts lead to an overall decline in fertility.

The UN predicts that by 2050, the share of elderly will exceed that of adolescents and young people combined (15 to 24 years old). The number of children under the age of 5 will be inferior to the number of people over 65[2]. This situation is dangerous for shrinking labor force and aging

[1] Shabunova A.A., Kalachikova O.N., Korolenko A.V. (2021). Demographic situation and socio-demographic policy of the Vologda region in the COVID-19 pandemic: Second regional demographic report. Vologda: VolRC RAS.

[2] United Nations. Demographic changes. Available at: https://www.un.org/ru/un75/shifting-demographics

population, which entails serious socio-economic and political problems[3] (Gurvich, Ivanova, 2018; Wang et al., 2020a).

Among other things, a country's development level should be judged by public health status and equitable distribution of health services (Asif et al., 2022). Children are the future human resource of any country, which means that their health needs reliable protection. Measures are currently being taken in Russia to improve the demographic situation, support maternity and childhood, and protect and promote children's health. However, despite this, the health status of the shrinking child population continues causing concern. The problem is also relevant for most world countries, which are also trying to reduce child morbidity and mortality rates[4]. Understanding the special economic importance of the problem of preserving the health of future generations as an important component of reproductive, labor and human potential in general also provides a rationale to search and develop mechanisms for managing risk factors (Shabunova et al., 2021).

The scientific research results indicate that the child's health of infant and preschool age is mostly influenced by medical and biological factors, occupational hazards, and maternal age. It is known that a woman who is healthy at conception has a better chance of a successful pregnancy and a healthy child. However, the outcome of childbirth (Stephenson et al., 2018) and the further development of the offspring depend on many social, medical and environmental conditions. For example, obstetric or extragenital pathology complicates the course of pregnancy and leads to the formation of various pathologies in the fetus, as well as in the neonatal period and beyond (Dymova, 2020, p. 88).

Most scientific biomedical research focuses on issues of obstetrics and gynecology (Karelskaya, 2016), and the search for risk factors for child health is most often confined to the mother (Nekrasov et al., 2013). It is necessary to have a deeper understanding of the father's contribution to offspring development.

Currently, the concept of "paternity" is insufficiently regulated from the legal, medical, and social points of view (Geras'kina, Syubaev, 2019). For example, Russia, being a social state, ensures the protection, support and welfare of the family, maternity, paternity and childhood according to Article 7 and part 1 of Article 38 of the Constitution of the Russian Federation. The Vologda Oblast also adopted Law 3602-OZ, dated March 16, 2015[5], which regulates relations in this sphere. But, unfortunately, the vast majority of the articles in these laws do not touch upon the father's role, focusing mainly on motherhood, family, and children. According to our hypothesis, paternal factors have no less, and in some cases more negative impact on the formation of children's health. In this connection, we consider it strategically important to study and compare maternal and paternal risk factors for the offspring's health in order to scientifically justify increased attention to the male role.

We should note that we have previously considered some socio-demographic, socio-economic, medico-biological, and environmental predictors on the part of the mother (Shmatova et al., 2022; Shmatova, 2022) and father (Razvarina, Shmatova, 2022; Razvarina et al., 2022a; Razvarina et al., 2022b). In our opinion, we can identify three important risk factors: age, health status, and working conditions before conception (both mother and father).

The purpose of our research is to assess the risk degree and direction of the impact of certain

[3] Denisenko M.B., Mkrtchyan N.V. (2022). Demographic changes and labor supply in Russian regions. *Demoscope Weekly,* 951–952, 21–40.

[4] UNICEF. *Levels and Trends in Child Mortality: Estimates Developed by the UN Inter-Agency Group for Child Mortality Estimation*; UNICEF: New York, NY, USA, 2021.

[5] Electronic Collection of Legal and Regulatory and Technical Documents. Available at: https://docs.cntd.ru/document/424041762

maternal and paternal factors on child health in the pre- and postnatal (during the preschool years) period.

The research tasks are:

1) to analyze studies on age (1), exposure to hazardous working conditions (2), and health status (3) of both parents as risk factors for child health;

2) to assess the relative risk of these factors to the child health on the part of the mother;

3) to assess the relative risk of these factors to the child health on the part of the father;

4) to compare the focus and degree of exposure to maternal and paternal risk factors for their child's health;

5) to offer targeted recommendations to neutralize the negative health risk factors for preschool children identified in the course of the study.

The research object is infants and preschool children of the Vologda Oblast. The subject is the health of children aged 0 to 7.

Research methodology

As an instrument of sociological method, we applied the prospective monitoring of cohorts of families with children, conducted by Vologda Research Center of RAS within the research "Studying the conditions of healthy generation formation"[6]. The methodology involved annual questionnaires filled out by parents and medical workers. The information base consisted of data from five waves of cohort studies. The criteria for inclusion in each cohort were the birth of a child in a certain period of time (May 15 – May 21, 1995; March 1 –March 7, 1998; March 1 – March 25, 2001; March 1 – March 25, 2004; March 1 – March 21, 2014; March 16 – April 10, 2020), the consent of a female parent to complete the questionnaire and participate in further stages of the prospective study, and the availability of medical personnel with the necessary documentation about pregnancy features and the respondent's health status. We selected families with children who participated in at least one of the study stages before the child reached the age of 7 (n = 1,464) for analysis from the total data set (n = 1,037; *Tab. 1*); 1,268 female participants of the cohort study were able to answer questions about a newborn's father.

Table 1. Research sample characteristics

Sample size	Cohort 1998	Cohort 2001	Cohort 2004	Cohort 2014	Cohort 2020	Total	
						abs.	%
Initial number of new mothers	199	250	265	370	380	**1464**	**100.0**
Initial number of married new mothers who answered the question about the child's father	139	208	237	341	343	**1268**	**100.0**
Participated in at least one observational phase (except the neonatal phase) up to and including 7 years of age	166	211	190	243	227	**1037**	**70.8**
in % of initial volume	83.4	84.4	71.7	65.7	59.7		
Database for research:							
Children at the age of: 0 years old	166	211	190	243	227	**1037**	**100.0**
1–2 years old	162	196	176	236	227	**997**	**96.1**
3–4 years old	135	166	160	186	–	**647**	**62.4 (79.9)***
6–7 years old	109	144	140	134	–	**527**	**50.8 (65.0)***

* Analysis for the 3–4 year and 6–7-year periods was conducted using observational data for cohorts born in 1998, 2001, 2004, and 2014; % of the initial sample was calculated without taking into account the 2020 cohort (n = 810).

[6] Each of the stages was held in 5 settlements of the Vologda Oblast – Vologda, Cherepovets, Veliky Ustyug, Kirillov and urban-type settlement Vozhega. We selected the towns at random.

At the first stage, the subsample included 1,464 cases (2,928 questionnaires), each based on questionnaires administered to two informants: the newborn's mother and medical personnel at the maternity hospital. We analyzed retrospective data on the maternal age, health status before and during pregnancy, working conditions in the year before the birth, and similar indicators of the child's father (from the mother's words). An obstetrician-gynecologist provided data on the obstetrician's medical history and a neonatologist presented data on the newborn condition.

Subsequently, we collected information about the children's health status – monitoring participants – through questionnaires from the district pediatrician at the respondent's place of residence (based on medical records). The presence of diseases in a child was determined mainly by open-ended questions (assuming a free-form answer) asked to medical staff. We combined diseases by groups related to one or another body system (cardiovascular, nervous, digestive, etc.). Some of the child's health deviations were calculated based on the answers to one (health group, delay in neuropsychological development, etc.) or several (weight deficit, delayed intrauterine development) questions of the questionnaire.

To assess the influence of the studied risk factors, we chose the relative risk indicator (RR)[7] for several reasons:

– the research information base was the cohort monitoring data;

– the task was to calculate the risk of losing the child's health in the presence or absence of risk factors, rather than the ratio of the odds of encountering the putative factors in patients with and without the outcome (as in case-control studies);

– we had selected monitoring participants over several years, and finished the study at the same time.

The RR is calculated based on a four-field contingency table: risk factor (yes/no) × adverse outcome (yes/no).

$$RR = \frac{A \cdot (C + D)}{C \cdot (A + B)}$$

If the RR > 1, we can conclude that the effect of the factor under study increases the disease development risk, and the higher the RR value, the higher the probability of disease development. If the RR < 1, the factor, on the contrary, reduces the probability of disease development. In each case, the statistical significance of the relative risk is necessarily assessed based on the values of the 95% confidence interval (CI). The value of the confidence interval is inversely proportional to the significance level of the relationship between the factor and the outcome, i.e., the lower the 95% CI, the more significant the relationship identified.

We should note that the RR does not provide information about the magnitude of the absolute risk (incidence), but rather demonstrates the strength of the relationship between exposure and disease. Even with high relative risk values, the absolute risk may be quite small if the disease is rare.

	Outcome (1)	No outcome (0)	Total
There is a risk factor (1)	A	B	A + B
There is no risk factor (0)	C	D	C + D
Total	A + C	B + D	A + B + C + D

[7] Relative risk is defined as the ratio of the probabilities of events in one group to a similar probability in another group. The RR was calculated as the ratio of the risk of health deterioration, disease development in the "exposed" group (affected by a risk factor) to the risk of disease development (or deterioration of the health group, increased incidence rate) in the "unexposed" group (not affected by a risk factor).

In our study, only the RRs greater than 1.10 were considered. In each case, the statistical significance of the relative risk was necessarily assessed based on 95% values.

On the basis of the reviewed literature and the medical-biological and sociological monitoring data available to us, we identified three risk factors, the effects of which could be assessed in both parents: (1) age; (2) health status (presence of chronic diseases of the cardiovascular, respiratory, digestive, nervous, endocrine, urinary systems; in mothers the obstetric history of previous pregnancies and the features of the current pregnancy; complications during childbirth) and (3) hazardous working conditions for mother and father (chemical and toxic substances, dust, gas, vibration, noise, humidity, radiation and microwave effect, high physical load, work on a conveyor belt, work in 2–3 shifts, high and low temperature, biological hazards, mental stress, night work).

We assessed the degree of influence of each factor on the part of both parents with respect to two periods of child development.

I – prenatal (intrauterine) period. We analyzed the impact of the factor on pregnancy (risk of anemia, toxicosis, edema); features and complications of childbirth (use of operative method of birth, asphyxia); changes in child health indicators (evaluation criteria: fetal intrauterine growth retardation (IGR) and deviations in health status, pathological conditions, diseases and congenital defects in a newborn).

II – assessment of the child's health indicators in the postnatal (extrauterine) period. The cut was made at the age of 1–2, 3–4 and 6–7. The choice of age periods was based on the timing of the extended clinical examination of children, accompanied by examinations by many specialists. The criteria were the registration of the child's health group II–IV, frequent morbidity and presence of chronic diseases for which the child was on the dispensary registry. In addition, we calculated the RR of individual diseases of various systems and organs.

Statistical analysis of biomedical and sociological data was performed using the SPSS statistical software package.

The scientific novelty lies in the comparative analysis of the influence of children's health risk factors by both parents in several generations of children from 0 to 7 years. The presented work allows deepening the knowledge about the influence degree of the most significant risk factors for child health (in the dynamics from conception and throughout the preschool age) on the part of both mother and father.

Analysis of studies and publications on the topic

Let us consider the experience of recent scientific research on the impact of the maternal and paternal health risk factors that we are studying.

Age of mother and father. From an obstetric point of view, maternal age (some reports say that it is older than 35 years, others say – older than 40 years) is associated with an increased risk of adverse pregnancy and birth outcomes (Aoyama et al., 2019). With maternal age, the risks of gestational diabetes and preeclampsia, threatened miscarriage, premature birth, fetuses with congenital abnormalities, and low birth weight increase (Carolan, Frankowska, 2011; Schmidt et al., 2012). The risk of macrosomia increases significantly after age 36 (Wang et al., 2020b). We should note that the association between prematurity and advanced maternal age remains controversial because of the possible combined effect of other factors (hypertension, obesity, diabetes, varicose veins, gynecological diseases, obstetrical childbirth, and use of assisted reproductive techniques).

However, from a socio-economic point of view, mother's advanced age is a protective factor. The worldwide trend of delayed childbearing is associated with higher levels of female education and career investments contributing to socio-economic status and material well-being, which in

turn is beneficial for child health (Arkhangelskii, Kalachikova, 2020; Shmatova et al., 2022; Pillas et al., 2014). This statement has been confirmed by a number of population-based studies (Bushnik, Garner, 2008; Sutcliffe et al., 2012; Kato et al., 2017; Falster et al., 2018).

Consequently, socio-economic superiority associated with maternal older age may compensate for biological disadvantage of loss of health potential in some cases. Nevertheless, for example, Down syndrome risk remains significantly higher in children born to women over age 34. It is worth noting that women under age 26 also had a higher risk of the genetic disorder in offspring compared to women at the older age of 27–33 (Song et al., 2022).

The increasing maternal age at first birth is generally recognized, but much less discussed is the fact that the prevalence of mature paternal age (over 40 years old) is also expanding, as are the health effects of this trend. For instance, in this male group there is a decrease in fertility and in the future mother of his child there is an increase in pregnancy complications (gestational diabetes, increased risk of placental detachment (Alio et al., 2012) and premature birth), in offspring there is a delayed intrauterine development, low birth weight, low Apgar score (Sipos et al., 2004; Alio et al., 2012; Khandwala et al., 2018), increased risk of chromosomal and nonchromosomal birth defects (including heart defects, tracheo-esophageal fistula, esophageal atresia, other skeletal/muscular/pelvic anomalies, Down syndrome (Yang et al., 2007; Phillips et al., 2019). Many researchers have linked paternal adulthood to various psychiatric and neurocognitive disorders in children, such as schizophrenia, autism, and obsessive-compulsive disorder (OCD) (Malaspina et al., 2001; Conti, Eisenberg, 2010; Hultman et al., 2011; Wu et al., 2012; Ek et al., 2015; Sharma et al., 2015; de Kluiver et al., 2017; Brandt et al., 2019). Data also show a linear increase in infant health risks each year as the father ages, which may be related to mutations in sperm DNA (Khandwala et al., 2018).

In turn, several in-depth studies have found no increased risk of preeclampsia in male partners over aged 45 when controlling for maternal age and other comorbidities (Hurley, DeFranco, 2017; Khandwala et al., 2018).

Hazardous working conditions of mother and father. Negative environmental conditions affect parents' reproductive health and their offspring health. Environmentally induced epigenetic changes can cause many pathological conditions (from genetic disorders to neurological conditions including schizophrenia and autism) (Xavier et al., 2019).

Russian studies have identified occupations dangerous to reproductive health that increase disorder risks in children's development in the first year of life. They include model makers and controllers in mechanical engineering and crane operators in metallurgical production; chemical analysis laboratory technicians, chemical engineers in the chemical industry (including petrochemical, polymer processing, organic synthesis); surgeons, obstetricians, midwives, surgical nurses working in hospitals (Fesenko et al., 2017).

Unfavorable effects associated with chemical exposure in the expectant mother include spontaneous abortion, premature birth, stillbirth, developmental delays, congenital anomalies (Koch et al., 1990), oncopathology in children (Lassi et al., 2014), and urogenital problems in sons (Rodprasert et al., 2021).

Ionizing radiation is also known to have harmful effects on the reproductive systems of both men and women (Temple et al., 2006). For mothers exposed to radiation in the workplace, the risk of early miscarriage increases 1.3-fold (and 1.5-fold for women monitored for 6 months after conception) and 2.3-fold for stillbirths (Betts, Fox, 1999). The risk of malignant neoplasms in their children also increases (Adab et al., 2004).

Previously, we have identified connection between electromagnetic radiation in the place of family residence and fetal pathology in the

intrauterine period, with effects persisting until the age of 6–7 (pathologies of ENT organs, increased morbidity frequency, rise in body mass index) (Shmatova et al., 2022).

The negative impact of the increased mental stress, namely prenatal stress, is also a significant risk factor for a woman's health and that of her unborn child. Anxiety and depression during pregnancy increase the likelihood of fetal death, miscarriage (Schetter, Tappeg, 2012), preterm birth, and surgical childbirth (Erickson et al., 2017). Maternal anxiety has a significant impact on the formation of the child's psyche (Batuev, 2000; Petrosyan, 2016). Increased maternal anxiety is also associated with a twofold increase in the risk of the infant developing mental disorders (Monk et al., 2019), nervous system abnormalities, and, consequently, cognitive and intellectual problems (Schepanski et al., 2018).

Exposure of men to certain chemicals leads to infertility, altered hormone levels, and risk of cancer in offspring (Rodprasert et al., 2021; Singh et al., 2021). A significant association has been found between paternal exposure to ionizing radiation before conception and Non-Hodgkin's lymphoma in their children (Adab et al., 2004; Barrett, Richens, 2003).

Russian scientists have also proven the relationship between occupational hazards (various types of radiation, temperature changes, chemical action) and some disorders of child health and development (Sofronov, Shakirova, 2010; Baklushina et al., 2014; Ivanov et al., 2018; Podsvirova et al., 2020).

Moreover, negative environmental factors affecting a father's health can indirectly affect not only his children, but also future generations (Day et al., 2016).

Complicated medical history of mother and father. A woman's health before conception is a key factor in determining the success of pregnancy and next generation health. Maternal acute and chronic diseases are well-known perinatal risk factors for child development disorders in preschool age (Bocharova et al., 2002).

Thyroid hormone imbalances (especially hypothyroidism) during pregnancy lead to adverse outcomes for a mother (gestational hypertension and preeclampsia, postpartum bleeding, miscarriage and preterm birth), fetus (congenital anomalies, growth retardation, perinatal disorders, death) and newborn (cognitive impairment) (Casey et al., 2005; Lassi et al., 2014).

Diabetes mellitus is one of the most common chronic diseases among women of childbearing age worldwide, and its rates are increasing. Diabetes during pregnancy is associated with an increased risk of psychiatric disorders in general and schizophrenia, mental retardation, and behavioral disorders in particular (Nogueira Avelar e Silva et al., 2021).

Lifestyle including physical inactivity, poor diet and obesity, stress and urbanization are known to play an important role in the development of diabetes (Kahn et al., 2006; Risérus et al., 2009). For instance, according to the WHO, about 80% of diabetics have an elevated body mass index (BMI). And obese patients are seven times more likely to develop diabetes. Being overweight is associated with an increased risk of most major adverse maternal and perinatal outcomes, from failure to conceive to pregnancy complications (pre-eclampsia, gestational diabetes) and childbirth (macrosomia), congenital anomalies, stillbirth and low birth weight, failure of breastfeeding and even maternal mortality (Gesink Law et al, 2007; Marchi et al., 2015; Turcksin et al., 2014; Poston et al., 2016). We should note that numerous studies have proven the cumulative effect of both maternal and paternal obesity on the risk of obesity in future generations (Godfrey et al., 2017).

Higher levels of maternal physical activity before conception in turn reduce the risk of gestational diabetes by 45% (Tobias et al., 2011) and preeclampsia by 65% (Aune et al., 2014). Walking

at a brisk pace for four or more hours a week before pregnancy also contributes to a lower risk of gestational diabetes (Zhang et al., 2006).

Pregnancy complicated by chronic hypertension and heart disease is associated with an increased risk of hypertension, other organ dysfunction, preterm childbirth, intrauterine growth retardation (IGR), fetal death, hypospadias and placental detachment. We should say that a systolic blood pressure above 130 mmHg increases the risk of preeclampsia by more than 7-fold (Caton et al., 2008).

Studies conducted at the turn of the 20th and 21st centuries have shown that women diagnosed with asthma before pregnancy are extremely likely to have exacerbations during pregnancy. This reinforces the importance of adequate disease control before conception, as asthma can cause serious complications in a mother (toxicosis, hypertension, preeclampsia, preterm birth) (Demissie et al., 1998) and a fetus (intrauterine delay, neonatal hypoxia, stillbirth, and infant mortality) (Liu et al., 2001). In turn, use of oral corticosteroids in the first trimester is associated with an increased risk of preeclampsia, a decrease in birth weight, and an increased risk of cleft mouth (Schatz, 2001). The analysis results show that preconception asthma medication use doubles the risk of gastroschisis in the fetus (Jones, Hayslett, 1996). Nevertheless, the risk of uncontrolled asthma is greater than that of essential anti-asthma medications.

Adverse pregnancy outcomes due to maternal renal disease include preeclampsia, chronic hypertension, cesarean section, preterm delivery, fetal growth retardation, increased risk of fetal death and stillbirth. Renal hypertension is associated with a 10-fold increased risk of fetal death compared to women with normal blood pressure (Jungers et al., 1997).

A research by Krapels and colleagues found an association of any maternal illness and cold in the periconceptional period (3 months before and after conception) with orofacial defects. The risk of malformations of the maxilla-facial area increases by a factor of 1.5 to 1.7 (Krapels et al., 2006).

A number of studies have shown the impact of the future father's chronic diseases as perinatal risk factors (Podsvirova et al., 2020). Overall, the risk of disease among children of fathers with poor health outcomes increased more than threefold (Azuine, Singh, 2019). The results underscore the important role of fathers not only in the physical well-being but also children's mental well-being of (Azuine, Singh, 2019). Mental health disorders in an expectant father during the waiting period (perinatal stress) increase the likelihood of emotional and behavioral problems in a child by 2.6 times (Day et al., 2016; Wong et al., 2016; Glasser, Lerner-Geva, 2019; Sokół-Szawłowska, 2020).

The effects of diabetes in men include reproductive disorders, which can be inherited through the male line and passed on to more than one generation, thereby increasing the risk of diabetes in offspring (Ding et al., 2015).

Fathers' significant contribution to the development of metabolic disorders in children has been proven. Moreover, transmission has also been observed in subsequent generations (Christoforou, Sferruzzi-Perry, 2020). Male obesity is associated not only with impaired own fertility (Kort et al., 2006), but also with an increased risk of chronic diseases in offspring (Kaati et al., 2002), such as diabetes, obesity (Andreeva et al., 2019), brain oncopathology (Day et al., 2016). A father's childhood eating habits may increase or decrease the risk of fatal cardiovascular disease in his children and grandchildren (Krempley et al., 2016).

Thus, the scientific research data confirm the relevance of the health risk factors we selected for the analysis of children's health in preschool age by both parents. Let us consider the results of our assessment of the relative risk for each criterion.

Main results

Maternal factors

Maternal age. According to our data, the expectant mother's young age (< 20 and < 30 years) is a risk factor for anemia during pregnancy (increasing its risk 1.5–fold) and edema (2.2–1.7-fold, respectively; *Tab. 2*). Mothers under 20 years old are twice as likely to have fetal malformations and 1.7 times as likely to have birth defects in their newborns. Older age correlates only with the risk of operative caesarean section in labor, and the older the age, the higher the risk.

Analysis of the influence of maternal age on developing diseases in children at preschool age showed[8] that young age increases the probability of developing diseases of the digestive system (by 2 times) and ENT organs (by 50%) in infancy, neurological (by 60%) and allergic manifestations (by 70%), and tooth decay at the age of 3–4 (by 3.6 times). Children born to mothers aged over 40 have a 77% increased likelihood of developing ENT diseases at the age of 3–4 *(Tab. 3)*.

Maternal age over 40 years is associated with the following risks: a child is registered as early as

Table 2. Maternal age as a risk factor for pregnancy complications and newborn health problems (RR, 95% CI)

Maternal age, years	Pregnancy complications			Child health disorder	
	Anemia	Edema	Cesarean section	Intrauterine growth retardation	Newborn health problems
Under 20	1.48 (1.29–1.69)*	2.21 (1.49–3.30)		2.22 (1.23–3.98)	1.69 (1.24–2.28)
Under 30	1.54 (1.33–1.77)	1.73 (1.18–2.54)			
Over 30			1.69 (1.31–2.20)		
Over 35			1.88 (1.40–2.52)		

* Hereinafter, we show the relative risk ratio (RR), with the 95% confidence interval (CI) in parentheses.
Note. We determined the presence of anemia and edema during pregnancy, childbirth by cesarean section, intrauterine growth retardation, and the presence of neonatal disorders based on the answers to the questionnaire designed for completion by medical personnel (obstetrician-gynecologist and neonatologist).

Table 3. Maternal age as a risk factor for child health in preschool age (RR, 95% CI)

Maternal age, years	Child's age									
	1–2 years					3–4 years				6–7 years
	Health disorders; illnesses									
	Dispensary registration	Weight deficit	Anemia	ENT organs	GT	Cardiology	Neurology	ENT organs	Caries	Lagging behind the NPD
Under 20				1.49 (1.07–2.08)	2.02 (1.19–3.42)		1.59 (1.12–2.47)		3.61 (1.14–11.41)	
Under 30				1.50 (1.15–1.96)	2.55 (1.50–4.32)	1.81 (1.22–2.70)				
40 and older	2.14 (1.47–3.11)	4.23 (1.10–16.23)	2.43 (1.17–4.29)					1.77 (1.13–2.76)		7.24 (2.58–20.30)

[8] Hereinafter, we determined the considered abnormalities in the child's health based on the answers of local pediatricians; the child's presence in the dispensary registry, weight deficit, anemia, ENT organ diseases and gastrointestinal diseases based on the pediatrician's answers about the child's health at age 2, in the absence of data – at the age of 1. Similarly, we determined adverse outcomes at the age of 3–4 and 6–7. Cardiology, neurological problems, ENT organ diseases, presence of caries and some others – by open questions for pediatricians. The lag in neuro-psychological development was calculated by the question "Does the child's neuro-psychological development correspond to the norm?" (a variant of the pediatrician's answer "lag behind").

infancy, weight deficiency and anemia at 1–2 years; ENT diseases at 3–4 years and delayed neuropsychic development (NPD) by 6–7 years. It can be caused by a decrease in the mother's health potential at the time of conception and carrying a child.

Thus, we can conclude that mother's young age is more often a risk factor for the child's health in the prenatal period and throughout preschool age. For older mothers (over 40 years old) conscious motherhood and high medical activity are more common, which has a favorable effect on the pregnancy course, but at the same time increases the likelihood of the development of pathologies in the child in 1 year with their subsequent removal at an older age. Nevertheless, there is a significant increase in the risk of delayed NPD to school age.

Mother's hazardous working conditions[9]. Exposure to radiation and microwave frequencies in a mother's workplace one year before childbirth increases her risk of developing anemia (by 46%) and edema (by 80%) during pregnancy *(Tab. 4)*. Contact with toxic and chemical preparations correlates with the risk of cesarean section, increasing it 1.7-fold, and with infected people, animals, plants, and microorganisms 1.9-fold. If maternal working conditions were associated with dustiness, the risk of birth of a child with birth defects increased by 60%.

Unfavorable working conditions of the expectant mother correlate with some pathologies in the child during their growing up. For example, gas pollution, work on an assembly line, and exposure to high temperatures contribute to the development of various ENT diseases *(Tab. 5)*. Mother's exposure before and during pregnancy to low temperatures in the workplace increases the risk of developing lacrimal duct stenosis in the unborn child by 5.5-fold.

Table 4. Maternal hazardous working conditions in the year before birth as a risk factor for pregnancy complications and newborn health disorders (RR, 95% CI)

Risk factor, condition	Pregnancy complications			Newborn health problems
	Anemia	Edema	Cesarean section	
Chemical and toxic effects			1.74 (1.22–2.46)	
Dustiness				1.59 (1.17–2.16)
Radiation and microwave effect	1.46 (1.15–1.85)	1.80 (1.27–2.56)		
Biological hazard			1.89 (1.35–2.64)	

Table 5. Maternal hazardous working conditions in the year before birth as a risk factor for child health in preschool age (RR, 95% CI)

Maternal hazardous working conditions	Child's age			
	1 year old		3–4 years old	6–7 years old
	Diseases			
	Neurology	Lacrimal dust stenosis	ENT organs	ENT organs
Gassing			1.71 (1.33–2.21)	
Working on conveyor belt	2.22 (1.10–4.48)		1.61 (1.11–2.34)	2.57 (1.26–5.25)
High temperature			1.47 (1.15–1.87)	
Low temperature		5.52 (1.30–23.46)		

[9] We determined occupational risk factors based on the answers chosen by the laboring mother to the question "Working conditions at the enterprise where you worked a year before the birth of your child". The list included the following hazardous factors: chemical and toxic substances; dustiness; gas pollution; vibration; noise; humidity; radiation and microwave frequency; heavy physical workload; work on a conveyor belt; high temperature; low temperature; biological hazards (microorganisms, sick people, animals, plants); mental stress; work in 2–3 shifts; work at night; work on the computer more than 4 hours a day.

Mother's complicated medical history. Mother's chronic diseases, according to our calculations, showed no association with the development of certain diseases in the child at preschool age. The exception was maternal history of complicated thyroid hyper- or hypothyroidism, in which the relative risk of endocrine disease in a child by the age of 6 or 7 was 8.18 (95% CI 2.04–32.88). We also found that a diagnosis of maternal obesity doubles the risk of delayed neuropsychic development of a child by the age of 3–4 (RR = 2.04; 95% CI 1.07–3.86).

At the same time, according to our calculations, mother's obstetric history has a serious influence on the development of certain diseases in the future child (according to the obstetrician-gynecologist's answers based on the data from the maternal medical record). For example, stillbirth as an outcome of previous pregnancies 5.5-fold increases the risk of digestive disorders in the infant and 16-fold of bronchial asthma by the time of school enrollment *(Tab. 6)*. Children whose mother had a history of ectopic pregnancies were 8 times more likely to develop an umbilical hernia in the first year of life, 12 times more likely to have bronchial asthma, and 7 times more likely to be obese at the age of 6–7.

In turn, anemia and edema during the current pregnancy correlate positively with the risk of ENT diseases at 1 year and cardiovascular disorders at 3–4 years *(Tab. 7)*.

Table 6. Complications of mother's previous pregnancies as a risk factor for some diagnoses in the preschool child (RR, 95% CI)

Complications	Child's age			
	1 year old		6–7 years old	
	Child's diseases			
	GI	Umbilical hernia	Bronchial asthma	Elevated BMI
Stillbirth	5.54 (1.36–22.47)		15.88 (2.89–87.25)	
Ectopic pregnancy		7.91 (1.40–44.80)	11.89 (1.97–71.57)	6.88 (1.19–39.75)

Table 7. Complications of mother's current pregnancy as a risk factor for some diagnoses in the preschool child (RR, 95% CI)

Complications during pregnancy	Child's age				
	1 year old	3–4 years old			6–7 years old
	Child's diseases				
	ENT organs	Cardiology	Neurology	ENT organs	Neurology
Toxicosis				1.33 (1.13–1.57)	1.52 (1.12–2.07)
Anemia	1.61 (1.25–2.06)	1.62 (1.17–2.23)			
Edema	1.61 (1.21–2.15)	1.61 (1.15–2.27)	1.89 (1.30–2.75)		
Protein in urine tests	1.90 (1.48–2.44)			1.37 (1.15–1.63)	
Eclampsia seizures				1.65 (1.24–2.18)	

Note. These maternal risk factors were calculated based on the answers to the questions about the pregnancy features ("Will you indicate what diseases the respondent had during the pregnancy. Particular attention should be paid to cases of nephropathy, pre-eclampsia, eclampsia"; "Was the respondent hospitalized or outpatient care during pregnancy (specify gestational age and diagnosis)?"; "Was there any protein in urine tests?"; "Did she have any eclampsia attacks?"; "Did she have any edema during pregnancy?").

Paternal factors

Paternal age. According to our calculations, a young age (less than 30 years) of the man is a protective factor for the development of anemia (RR = 0.70; 95% CI 0.61–0.79) and edema (RR = 0.55; 95% CI 0.38–0.79) in the mother of the unborn child during pregnancy, as well as for health problems, abnormal conditions, diseases, and congenital malformations in the newborn (RR = 0.71; 95% CI 0.56–0.91). If a man is over 40 years old, his child is three times more likely to develop congenital cardiovascular abnormalities, including heart defects (RR = 3.05; 95% CI 1.18–7.87).

We obtained the following results with regard to the influence of the father's age in the postnatal period of child development. Children whose fathers are mature men (over 40 years old) have a slightly (12%) higher probability of lowering the health group below II in infancy *(Tab. 8)*. The offspring of young men (up to 20 years old) have a threefold increased risk of developing GI diseases by the age of 2 and an 18–20% reduction in health group at the age of 3–4 and preschool age. In children whose fathers are up to 30 years old, the risk of delayed physical and neuropsychic development increases by 40% already in infancy, doubles the risk of digestive system disorders by the age of 2, and 80% of cardiac diseases by the age of 3–4.

Thus, father's young age has a favorable effect on the pregnancy course and intrauterine development of the fetus, but can lead to some health problems of a child in the early preschool age. Parenthood at a more mature age may have a negative effect in the prenatal period and the first year of life, but the further influence of this risk factor is neutralized. This may be due to higher levels of medical literacy and responsibility, financial security and readiness to promote a child's health among older fathers. Despite this, the age of the future father over 30 years old increases the probability of delay in the NPD by the age of 3–4.

Father's hazardous working conditions[10]. We have found that father's harmful working conditions a year before the birth of the child act as a risk factor for the child health. For example, working in a gassy environment tripled the risk of asphyxia in childbirth (RR = 2.99; 95% CI 1.35–6.63), and biohazard conditions (microorganisms, sick people, animals, plants) contributed to an 18% increase in the risk of a lower child health group by the age of 3–4 (RR = 1.18; 95% CI 1.14–1.22).

Table 8. Father's age as a risk factor for child health in preschool age (RR, 95% CI)

Father's age, years	Child's age					
	1–2 years old		3–4 years old			6–7 years old
	Child health disorders					
	Mismatch between physical and NPD	GI diseases	Health groups II–IV	Lagging behind the NPD	Cardiological diseases	Health groups II–IV
Under 20		3.09 (1.50–6.40)	1.20 (1.15–1.24)			1.18 (1.14–1.23)
Under 30	1.40 (1.13–1.74)	2.00 (1.35–2.97)			1.81 (1.23–2.69)	
30 and older				1.82 (1.22–2.70)		

[10] We determined occupational risk factors on the part of the father based on the mother's answers to the question "Working conditions at the enterprise where your husband worked a year before the birth of the child". The list of harmful conditions is the same as for the mother (see "Mother's hazardous working conditions").

In addition, we analyzed the risk of developing certain diseases in the child depending on hazardous working conditions of his father before conception. We found that the greatest harm to the child's health is caused by a man's work in close contact with chemical and toxic substances. Children of such fathers are 75% more likely to have neurological diseases already in the first year of life, two or more times more likely to have allergic manifestations and disorders of the digestive system from the age of three *(Tab. 9)*.

We note that the risk of developing an umbilical hernia in infancy was 4.6 times higher in infants whose fathers worked in conveyor belt. Gastrointestinal diseases are more susceptible to children whose fathers worked in an environment with increased gas pollution. If a man worked in a humid environment, his child is 5.5 times more likely to develop bronchial asthma by preschool age. Obesity at the age of 6–7 years is 5.7 times more likely in children whose fathers worked in a biologically hazardous environment a year before their birth.

Complicated paternal medical history. Our study has revealed that a complicated paternal history may adversely affect the child's health from the prenatal period. For example, male diabetes mellitus on average 8-fold raises the risk of intrauterine growth and development retardation and asphyxia during birth *(Tab. 10)*, and metabolic disorders and tuberculosis 3.3 and 5.5-fold,

Table 9. Father's hazardous working conditions as a risk factor for developing certain diseases in a preschool-age child (RR, 95% CI)

Father's hazardous working conditions	Child's age						
	1 year old		3–4 years old		6–7 years old		
	Child's diseases						
	Neurological diseases	Umbilical hernia	GI diseases	Allergic manifestations	GI diseases	Bronchial asthma	Obesity
Chemical and toxic effects	1.74 (1.30–2.33)		2.16 (1.26–3.70)	2.41 (1.53–3.79)			
Dustiness					2.07 (1.16–3.70)		
Working on conveyor belt		4.63 (1.22–17.57)					
Humidity						5.52 (1.58–19.34)	
Biological hazard							5.74 (1.53–21.51)

Table 10. Complicated paternal medical history as a risk factor for childbirth and newborn health (RR, 95% CI)

Father's diseases*	Disorders of childbirth and child health			
	IGR	Cesarean section	Asphyxiation	Apgar score less than 7
Diabetes mellitus	8.13 (1.98–33.36)		16.78 (4.00–70.45)	
Endocrine diseases		3.35 (1.62–6.95)		
Venereal diseases				2.83 (2.59–3.10)
Tuberculosis		5.54 (4.83–6.37)		2.83 (2.59–3.09)
Diseases of urogenital diseases				2.08 (1.43–3.02)

* The presence of the indicated father's diseases was determined by asking the child's mother, "Does your spouse have any diseases (including chronic ones)?" Groups of diseases according to ICD-10 class (with the most common examples), individual diseases (venereal diseases, tuberculosis) were indicated, and there was also an opportunity to write about the existing disease in a free form in case of difficulty in answering the question.

respectively, increase the risk of caesarean section during childbirth. The risk of giving birth to a baby with a low Apgar score is more than doubled in men who had venereal and genitourinary diseases, as well as tuberculosis.

We also note the impact of the father's complicated medical history as a risk factor for some health disorders of his children at birth. For example, skin and subcutaneous tissue diseases in a man increase the risk of jaundice in his newborn son or daughter by 4-fold and of musculoskeletal abnormalities (hip dysplasia, valgus foot, clubfoot) by 11-fold. The risk of giving birth to a child with a congenital heart defect is 3.8 times higher in a father with digestive system diseases. Urological problems in newborn boys (hypospadias, cryptorchidism, testicular prolapse) correlate positively with paternal genitourinary problems *(Tab. 11)*.

Chronic diseases in a male medical history continue affecting the offspring's health in the future worsening such general indicators as health group, frequency of diseases and dispensary registration. For example, a father's history of diabetes mellitus, tuberculosis, or venereal diseases increases the incidence of his children's illnesses in infancy, dispensary registration, and deterioration of health group II or lower by 15% (RR = 1.16; 95% CI 1.13–1.19), by the age of 3–4 the risks grow to 19% (RR = 1.19; 95% CI 1.15–1.24) and by the age of 6–7 – a quarter (RR = 1.25; 95% CI 1.19–1.31). Paternal congenital malformations raised the incidence of child morbidity by a third by the age of 1–2 (RR = 1.33; 95% CI 1.23–1.44) and decreased health group by 22% (RR = 1.22; 95% CI 1.15–1.30). If a father had diseases of the urogenital, endocrine, nervous, respiratory, and kidney systems, his offspring had an average risk of an 18–20% reduction in health group by the age of 3–4 and 6–7. In addition, paternal metabolic and genitourinary system disorders increased the incidence of disease in the child by a quarter by preschool age (RR = 1.25; 95% CI 1.19–1.31).

We also have found that certain chronic diseases in a male medical history increase the chance of developing certain diagnoses in his offspring during the preschool period. For example, father's nervous system and sensory organ disorders increase the risk of developing gastrointestinal diseases in his future children by 5 times by the age of 3–4, and by 6–7 – by 6.5 times *(Tab. 12)*. In turn, the presence of gastrointestinal problems in a father is not associated with similar diseases in children at preschool age, but doubles the risk of lagging behind the child's NPD by the age of 3–4. A father's medical history complicated by kidney disease is three times more likely to provoke the development of neurological diseases in his son or daughter by the age of 3–4. Earlier male venereal disease raises by 4.8 times the likelihood of gastrointestinal disease in his offspring by the preschool age. Skin and subcutaneous tissue

Table 11. Father's complicated medical history as a risk factor for the development of diseases in the newborn child (RR, 95% CI)

Father's chronic illnesses	Disorders of childbirth and child health			
	Newborn jaundice	Musculoskeletal abnormalities	Cardiovascular abnormalities	Urological problems in boys
Skin and subcutaneous tissue	4.09 (1.15–14.61)	11.25 (1.55–81.75)		
Digestive organs			3.75 (1.34–10.45)	
Urogenital system				12.49 (1.67–93.47)
Note. We determined diseases of a newborn child based on the medical staff's answers to the open-ended question "What pathological conditions and/or diseases did the child have in the first 7 days of life?"				

Table 12. Father's complicated medical history as a risk factor for child health in preschool age (RR, 95% CI)

Father's diseases	Child's age					
	1–2 years old	3–4 years old				6–7 years old
	Child's diseases					
	Cardiology	Lagging behind the NPD	Cardiology	Neurology	GI	GI
Nervous systems and sensory organs					5.24 (1.90–14.42)	6.45 (2.77–15.02)
Digestive organs		2.11 (1.10–4.06)				
Kidney				3.17 (1.54–6.50)		
Venereal diseases						4.75 (1.16–19.49)
Skin and subcutaneous tissue	2.83 (1.11–7.27)		2.68 (1.18–6.09)			

diseases more than 2.5 times increase the risk of developing cardiac diseases in his children starting at age 1.

Thus, we can conclude that the most significant risk factor for the offspring's health on maternal part is not so much her chronic diseases, but rather the complications of previous and current pregnancies. Father's complicated medical history, on the contrary, correlates with the development of a number of diagnoses in his children.

Conclusion

Parents' age, health status and effects of hazardous working conditions in the period before conception are significant risk factors for child health and not only have an impact in the prenatal and early postnatal period, but also continue worsening health throughout the preschool years.

Analyzing our results, we can make the following conclusions about risk factors.

On a mother's side, they are:

1. Mother's young age (up to 20 years old) is more often a risk factor for the health of the child during the prenatal period, as well as during the preschool period.

2. As a woman ages, her level of education and medical literacy, social status and financial status, and responsible attitude toward childbearing most often increase. The impact of these factors, according to our research results (Shmatova et al., 2022), to some extent levels out the negative impact of accumulated medical and biological predictors associated with loss of health potential. The mature age of the expectant mother is not associated with pregnancy threat, but it increases the risk of caesarean section at birth, the probability of developing some pathologies in infant (with subsequent healing as they grow up) and the lag of the NPD by school age (by 7 times).

3. Mother's hazardous working conditions have a significant detrimental effect on the course of pregnancy and childbirth, the newborn health and throughout preschool age, most often provoking diseases of ENT organs.

4. A medical history of stillbirths and ectopic pregnancies is extremely detrimental to a child's health from birth and throughout preschool age.

5. Mother's obesity and thyroid dysfunction are associated with a child's health risks.

On a father's side, they are:

1. Father's young age acts as a protective factor during pregnancy and intrauterine development, but is a risk factor for a number of diseases in the future (GI, cardiology, lagging of the NPD).

2. More mature age increases the risk of congenital abnormalities of the cardiovascular system and delay of NDP by the age of 3–4, but later its negative influence is leveled. Perhaps it is also due to greater medical literacy and responsibility, financial security and more opportunities to improve child's health.

3. Male hazardous working conditions have slightly less impact on the unborn child in the prenatal period than the mothers' ones, but also correlate with a number of diagnoses in the preschool period.

4. Unlike a mother, future father's medical history complicated by chronic diseases demonstrates a connection with intrauterine development of the fetus, surgical method of birth, development of congenital pathologies and low Apgar scores for a newborn. We also note its negative impact on child's health in the future.

Thus, we have confirmed the hypothesis of a significant impact on child health of not only mother's but also father's risk factors. The vast majority of them are manageable and can be neutralized by measures of state educational, medical and socio-economic support of men and women of childbearing age (starting with adolescents), improvement of gynecological, andrological and obstetric care, development of perinatal centers and male health clinics. Based on in-depth comprehensive analysis of Russian and international studies, as well as the results of our own long-term cohort monitoring, let us note some measures for preventing and treating childhood diseases.

Most studies on the reproductive process is conducted on women due to their obvious role in childbearing. In addition, women have a better knowledge of their reproductive function due to annual visits to a gynecologist, social pressure and communication with friends and family. Men only consult an andrologist or urologist about their reproductive health when they have medical or fertility problems. Therefore, it is important to activate a new research program stimulating a rethinking of male role in reproduction and health of future generations (Almeling, Waggoner, 2013).

Given the negative impact of environmental factors on both parents, it is necessary to create conditions for providing young families with children with housing in areas that exclude the impact of electromagnetic radiation. It is worth envisaging the provision of sanatorium treatment for children from families living in environmentally unfriendly areas, as well as parents working in industries with hazardous working conditions. We consider it essential to improve the regulatory and legal framework related to health protection of men and women working in hazardous conditions.

Medical services should focus on the emotional well-being of fathers during the perinatal period, which is important not only for men's health, but also for their wives and future children (Davenport et al., 2022). It is important to include questions about the condition of the father of the child during pregnancy during the screening of the psycho-emotional state of the expectant mother; if distress is detected, appropriate help should be provided (Glasser, Lerner-Geva, 2019); investigate paternal perinatal depression.

More attention needs to be paid to intervening with prospective parents before conception to improve maternal and child health and reduce the growing burden of noncommunicable diseases. It is important that health care providers be aware of ways to identify women and men who are planning to become pregnant (Stephenson et al., 2018).

Health care providers should be aware of the potential men's health risks for future generations and counsel not only future mothers, but also fathers accordingly.

Prevention of childhood overweight should also be done before conception (Guo et al., 2014) by both parents (Philips et al., 2020). The research results proves that fathers play a key role in children's eating behavior (Litchford et al., 2020; Davison et al., 2020). In order to have a significant impact on preconception health, a dual population strategy is required, improving nutritional status and increasing motor activity throughout life and especially during the reproductive years. The focus should be on all men and women who are thinking about conception (Stephenson et al., 2018).

Children's health can also be improved through policies and programs that support low-income young fathers and mothers, i.e., improve their financial status, education, and health literacy.

Reproductive planning and contraception for women of reproductive age with chronic diseases should be discussed immediately after diagnosis (Lassi et al., 2014).

Our monitoring results demonstrate the need for increased awareness of risk factors and motivation for health and lifestyle changes before conception among expectant parents. Interventions to improve health before conception should focus on communication between health professionals, schools, family members, and media (Daly et al., 2022).

We consider it advisable to use the elements of the proven mechanism of child health preservation by a mother as a basis for building medical and social support for future fathers, supplemented by adaptive measures that take into account the specific physiology and development of male organism. Qualitative characterization of risk factors on the part of both parents will allow correcting the existing system of prevention of child morbidity and strengthen their health potential.

Study limitations are the following: 1) the sample consisted of initially medically and socially advantaged women with children who wished to participate in monitoring, rather than all who gave birth during the cohort recruitment period; 2) there is a serious problem with maintaining cohort participation over the long research period; the sample decreases each year; 3) residual and unmeasurable confounding and combination of all internal and external factors requires further study; 4) in the current work we have not taken into account the interaction of mothers' and fathers' factors. The combined effects of both parents may have varying.

Further, we are planning to study maternal and paternal risk factors not only in preschool, but also at the child's older age including the use of other methods of analysis. Additional data may clarify the complex interaction of both maternal and paternal components. We recognize the need for scientific justification and the development of targeted recommendations for improving child and parental health policies to increase the health potential of future generations.

References

Adab N., Kini U., Vinten J. et al. (2004). The longer-term outcome of children born to mothers with epilepsy. *Journal of Neurology, Neurosurgery & Psychiatr,* 75(11), 1575–1583. DOI: 10.1136/jnnp.2003.029132

Alio A.P., Salihu H.M, Mcintosh C. et al. (2012). The effect of paternal age on fetal birth outcomes. *Am. J. Mens Health*, 6(5), 427–435. DOI: 10.1177/1557988312440718

Almeling R., Waggoner M.R. (2013). More and less than equal: How men factor in the reproductive equation. *Gend. Soc.*, 27(6), 821–842. Available at: https://doi.org/10.1177/0891243213484510

Andreeva V.O., Khoshabi K.E., Andreeva S.S. et al. (2019). Risk factors of ovarian dysfunction in adolescents with obesity. *Reproduktivnoe zdorov'e detei i podrostkov=Pediatric and Adolescent Reproductive Health*, 15(3), 22–32. DOI: 10.24411/1816-2134-2019-13003 (in Russian).

Aoyama K., Pinto R., Ray J.G. et al. (2019). Association of maternal age with severe maternal morbidity and mortality in Canada. *JAMA Netw Open*, 2(8), e199875. DOI: 10.1001/jamanetworkopen.2019.9875

Arkhangel'skii V.N., Kalachikova O.N. (2021). Women and men: Differences in fertility and reproductive behavior indicators. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 14(5), 165–185. DOI: 10.15838/esc.2021.5.77.10 (in Russian).

Asif M.F., Meherali S., Abid G. et al. (2022). Predictors of child's health in Pakistan and the moderating role of birth spacing. *Int J Environ Res Public Health*, 19(3), 1759. DOI: 10.3390/ijerph19031759

Aune D., Saugstad O.D., Henriksen T., Tonstad S. (2014). Physical activity and the risk of preeclampsia: A systematic review and meta-analysis. *Epidemiology,* 25(3), 331–343. DOI: 10.1097/EDE.0000000000000036

Azuine R.E., Singh G.K. (2019). Father's health status and inequalities in physical and mental health of U.S. children: A population-based study. *Health Equity,* 3(1), 495–503. DOI: 10.1089/heq.2019.0051

Baklushina E.K., Boboshko I.E., Balakireva A.V. (2014). The influence of perinatal risk factors on fetus development and newborns' health. *Vestnik Ivanovskoi meditsinskoi akademii=Bulletin of the Ivanovo Medical Academy*, 19(1), 48–51 (in Russian).

Barrett C., Richens A. (2003). Epilepsy and pregnancy: Report of an Epilepsy Research Foundation Workshop. *Epilepsy Research,* 52(3), 147–187.

Batuev A.S. (2000). The emergence of the psyche in the prenatal period: Brief overview of modern research. *Psikhologicheskii zhurnal*, 21(6), 51–56 (in Russian).

Betts T, Fox C. (1999). Proactive pre-conception counselling for women with epilepsy – is it effective? *Seizure,* 8(6), 322–327.

Bocharova E.A., Sidorov P.I., Soloviev A.G. (2002). Influence of perinatal risk factors and somatic conditions on psychic health of preschool children. *Vestnik RUDN. Seriya Meditsina=RUDN Journal of Medicine*, 4, 16–20 (in Russian).

Brandt J.S., Cruz Ithier M.A., Rosen T., Ashkinadze E. (2019). Advanced paternal age, infertility, and reproductive risks: A review of the literature. *Prenat. Diagn*, 39(2), 81–87. DOI: 10.1002/pd.5402

Bushnik T., Garner R. (2008). The children of older first-time mothers in Canada: Their health and development. *Genus*, 64(3), 63–81.

Carolan M., Frankowska D. (2011). Advanced maternal age and adverse perinatal outcome: A review of the evidence. *Midwifery,* 27(6), 793–801. DOI: 10.1016/j.midw.2010.07.006

Casey B.M., Dashe J.S., Wells C.E. et al. (2005). Subclinical hypothyroidism and pregnancy outcomes. *Obstetrics & Gynecology,* 105(2), 239–245.

Caton A.R., Bell E.M., Druschel C.M. et al. (2008). Maternal hypertension, antihypertensive medication use, and the risk of severe hypospadias. *Birth Defects Research Part A: Clinical and Molecular Teratology,* 82(1), 34–40.

Christoforou E.R., Sferruzzi-Perri A.N. (2020). Molecular mechanisms governing offspring metabolic programming in rodent models of in utero stress. *Cell Mol Life Sci*, 77(23), 4861–4898. DOI: 10.1007/s00018-020-03566-z

Churilova E., Zakharov S. (2019). Reproductive attitudes of the Russian population: Is there any reason for optimism? *Vestnik obshchestvennogo mneniya*, 2(129), 69–89 (in Russian).

Conti S.L., Eisenberg M.L. (2010). Paternal aging and increased risk of congenital disease, psychiatric disorders, and cancer. *Asian Journal of Andrology*, 8(3), 93–102. DOI: 10.1017/9781139169349.011

Daly M.P., White J., Sanders J., Kipping R.R. (2022). Women's knowledge, attitudes and views of preconception health and intervention delivery methods: A cross-sectional survey. *BMC Pregnancy Childbirth,* 22(1), 729. DOI: 10.1186/s12884-022-05058-3

Davenport C., Lambie J., Owen C., Swami V. (2022). Fathers' experience of depression during the perinatal period: A qualitative systematic review. *JBI Evid Synth,* 20(9), 2244–2302. DOI: 10.11124/JBIES-21-00365

Davison K.K., Haines J., Garcia E.A. et al. (2020). Fathers food parenting: A scoping review of the literature from 1990 to 2019. *Pediatr Obes,* 15(10), e12654. DOI: 10.1111/ijpo.12654

Day J., Savani S., Krempley B.D. et al. (2016). Influence of paternal preconception exposures on their offspring: Through epigenetics to phenotype. *Am J Stem Cells*, 5(1), 11–8.

de Kluiver H., Buizer-Voskamp J.E., Dolan C.V., Boomsma D.I. (2017). Paternal age and psychiatric disorders: A review. *Am J Med Genet B Neuropsychiatr Genet.,* 174(3), 202–213. DOI: 10.1002/ajmg.b.32508

Demissie K., Breckenridge M.B., Rhoads G.G. (1998). Infant and maternal outcomes in the pregnancies of asthmatic women. *American Journal of Respiratory and Critical Care Medicine,* 158(4), 1091.

Ding G.L., Liu Y., Liu M.E. et al. (2015). The effects of diabetes on male fertility and epigenetic regulation during spermatogenesis. *Asian J Androl,* 17(6), 948–953. DOI: 10.4103/1008-682X.150844

Dymova I.A. (2020). Factors, forming health status of children of first year of life (literature review). *Permskii meditsinskii zhurnal=Perm Medical Journal*, 37(1), 85–92. DOI: 10.17816/pmj37185%92 (in Russian).

Eid N., Morgan H.L., Watkins A.J. (2022). Paternal periconception metabolic health and offspring programming. *Proc Nutr Soc,* 81(2), 119–125. DOI: 10.1017/S0029665121003736

Ek M., Wicks S., Svensson A.C. et al. (2015). Advancing paternal age and schizophrenia: The impact of delayed fatherhood. *Schizophr Bull*, 41(3), 708–714. DOI: 10.1093/schbul/sbu154

Erickson N.L., Gartstein M.A., Dotson J.A.W. (2017). Review of prenatal maternal mental health and the development of infant temperament. *J Obstet Gynecol Neonatal Nurs,* 46, 588–600.

Falster K., Hanly M., Banks E. et al. (2018). Maternal age and offspring developmental vulnerability at age five: A population-based cohort study of Australian children. *PLoS Med*, 15(4), e1002558. DOI: 10.1371/journal.pmed.1002558

Fesenko M.A., Sivochalova O.V., Fedorova E.V. (2017). Occupational reproductive system diseases in female workers employed at workplaces with harmful working conditions. *Analiz riska zdorov'yu=Health Risk Analysis*, 3, 92–100. DOI: 10.21668/health.risk/2017.3.11 (in Russian).

Geras'kina A.A. Syubaev R.R. (2019). The institute of fatherhood in modern Russia. *Akademicheskaya publitsistika*, 5, 342–345 (in Russian).

Gesink Law D.C., Maclehose R.F., Longnecker M. (2007). Obesity and time to pregnancy. *Hum Reprod,* 22(2), 414–420.

Glasser S., Lerner-Geva L. (2019). Focus on fathers: Paternal depression in the perinatal period. *Perspect Public Health,* 139(4), 195–198. DOI: 10.1177/1757913918790597

Godfrey K.M., Reynolds R.M., Prescott S.L. et al. (2017). Influence of maternal obesity on the long-term health of offspring. *Lancet Diabetes Endocrinol,* 5(1), 53–64. DOI: 10.1016/S2213-8587(16)30107-3

Guo B., Mei H., Yang S., Zhang J. (2014). Prenatal factors associated with high BMI status of infants and toddlers. *Zhonghua Er Ke Za Zhi,* 52(6), 464–467.

Gurvich E.T., Ivanova M.A. (2018). Economic effect of population ageing and pension reforms. *Finansovyi zhurnal=Financial Journal*, 5(45), 9–22. DOI: 10.31107/2075-1990-2018-5-9-22 (in Russian).

Hultman C.M., Sandin S., Levine S.Z. et al. (2011). Advancing paternal age and risk of autism: New evidence from a population-based study and a meta-analysis of epidemiological studies. *Mol. Psychiatry*, 6(12), 1203–1212. DOI: 10.1038/mp.2010.121

Hurley E.G., DeFranco E.A. (2017). Influence of paternal age on perinatal outcomes. *Am J Obstet Gynecol*, 217(5), 566.e1–566.e6. DOI: 10.1016/j.ajog.2017.07.034. Available at: https://pubmed.ncbi.nlm.nih.gov/28784418/

Ivanov D.O., Radzinskii V.E., Petrenko Yu.V., Fedorova L.A. (2018). An interdisciplinary review of the problem of perinatal mortality in premature infants. *StatusPraesens*, 4, 22–28 (in Russian).

Jones D.C., Hayslett J.P. (1996). Outcome of pregnancy in women with moderate or severe renal insufficiency. *The New England Journal of Medicine,* 335(4), 226–232.

Jungers P., Chauveau D., Choukroun G. et al. (1997). Pregnancy in women with impaired renal function. *Clinical Nephrology,* 47(5), 281–288.

Kaati G., Bygren L.O., Edvinsson S. (2002). Cardiovascular and diabetes mortality determined by nutrition during parents and grandparents slow growth period. *Eur J Hum Genet,* 10(11), 682–688.

Kahn S.E., Hull R.L., Utzschneider K.M. (2006). Mechanisms linking obesity to insulin resistance and type 2 diabetes. *Nature,* 444, 840–846.

Karel'skaya L.P. (2016). Male reproductive health as a medical and social problem. In: *Mediko-sotsial'nye i psikhologicheskie aspekty bezopasnosti promyshlennykh aglomeratsii: materialy Mezhdunarodnoi nauchno-prakticheskoi konferentsii (Ekaterinburg, 16–17 fevralya 2016 g.)* [Medico-Social and Psychological Aspects of the Safety of Industrial Agglomerations: Proceedings of the International Scientific-Practical Conference (Yekaterinburg, February 16–17, 2016)]. Yekaterinburg: UrFU (in Russian).

Kato T., Yorifuji T., Yamakawa M. et al. (2017). Association of maternal age with child health: A Japanese longitudinal study. *PLoS One,* 12(2), e0172544. DOI: 10.1371/journal.pone.0172544

Khandwala Y.S., Baker V.L., Shaw G.M. et al. (2018). Association of paternal age with perinatal outcomes between 2007 and 2016 in the United States: Population based cohort study. *BMJ*, 363, k4372. DOI: 10.1136/bmj.k4372

Koch R., Hanley W., Levy H. et al. (1990). A preliminary report of the collaborative study of maternal phenylketonuria in the United States and Canada. *Journal of Inherited Metabolic Disease,* 13(4), 641–650.

Kort H.I., Massey J.B., Elsner C.W. et al. (2006). Impact of body mass index values on sperm quantity and quality. *J Androl*, 27(3), 450–452. DOI: 10.2164/jandrol.05124

Krapels I.P.C., Zielhuis G.A., Vroom F. et al. (2006). Periconceptional health and lifestyle factors of both parents affect the risk of live born children with orofacial clefts. *Birth Defects Research. Part A: Clinical and Molecular Teratology,* 76(8), 613–620.

Krempley B.D., Nguyen M., Kitlinska J.B. (2016). Influence of paternal preconception exposures on their offspring: Through epigenetics to phenotype. *Am J Stem Cells,* 5(1), 11–18.

Lassi Z.S., Imam A.M., Dean S.V., Bhutta Z.A. (2014). Preconception care: Caffeine, smoking, alcohol, drugs and other environmental chemical/radiation exposure. *Reprod Health,* 11, 3(S6). DOI: 10.1186/1742-4755-11-S3-S6. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4196566/

Litchford A., Savoie Roskos M.R., Wengreen H. (2020). Influence of fathers on the feeding practices and behaviors of children: A systematic review. *Appetite,* 147, 104558. DOI: 10.1016/j.appet.2019.104558

Liu S.L., Wen S.W., Demissie K. et al. (2001). Maternal asthma and pregnancy outcomes: A retrospective cohort study. *Diabetes,* 24(2), 411–412.

Makarentseva A.O. (2020). Impact of the epidemiological situation on the reproductive intentions of the population. *Monitoring ekonomicheskoi situatsii v Rossii. Tendentsii i vyzovy sotsial'no-ekonomicheskogo razvitiya*, 17(119), 25–30 (in Russian).

Malaspina D., Harlap S., Fennig S. et al. (2001). Advancing paternal age and the risk of schizophrenia. *Arch. Gen. Psychiatry*, 58(4), 361–367. DOI: 10.1001/archpsyc.58.4.361

Marchi J., Berg M., Dencker A. et al. (2015). Risks associated with obesity in pregnancy, for the mother and baby: A systematic review of reviews. *Obes Rev*, 16(8), 621–638. DOI: 10.1111/obr.12288

Monk C., Lugo-Candelas C., Trumpff C. (2019). Prenatal developmental origins of future psychopathology: Mechanisms and pathways. *Annu Rev Clin Psychol,* 15, 317–344.

Nekrasov S.D., Ryabikina Z.I., Tivodar A.R. (2013). To the definition of the concept of "Fartherhood". *Nauchnyi zhurnal KubGAU=Scientific Journalof KubSAU*, 86. Available at: https://cyberleninka.ru/article/n/opredelimsya-s-ponyatiem-ottsovstvo (accessed: November 15, 2022; in Russian).

Nogueira Avelar e Silva R., Yongfu Yu., Liew Z. et al. (2021). Associations of maternal diabetes during pregnancy with psychiatric disorders in offspring during the first 4 decades of life in a population-based Danish birth cohort. *JAMA Netw Open*, 4(10), e2128005. DOI:10.1001/jamanetworkopen.2021.28005

Petrosyan S.N. (2016). Prenatal and perinatal periods of child development as a crisis stage of personality formation. *Vestnik AGU=The Bulletin of Adyghe State University*, 3(183), 114–122 (in Russian).

Philips E.M., Santos S., Trasande L. et al. (2020). Changes in parental smoking during pregnancy and risks of adverse birth outcomes and childhood overweight in Europe and North America: An individual participant data meta-analysis of 229,000 singleton births. *PLoS Med,* 17(8), e1003182. DOI: 10.1371/journal.pmed.1003182

Phillips N., Taylor L., Bachmann G. (2019). Maternal, infant and childhood risks associated with advanced paternal age: The need for comprehensive counseling for men. *Maturitas,* 125, 81–84. DOI: 10.1016/j.maturitas.2019.03.020

Pillas D., Marmot M., Naicker K. et al. (2014). Social inequalities in early childhood health and development: A European-wide systematic review. *Pediatr Res*, 76(5), 418–424. DOI: 10.1038/pr.2014.122

Podsvirova E.V., Gurova M.M., Kotsareva S.V. et al. (2020). Influence of social and medico-biological factors on the health of newborn infants. *Voprosy detskoi dietologii=Pediatric Nutrition*, 18(2), 46–52. DOI: 10.20953/1727-5784-2020-2-46-52 (in Russian).

Poston L., Caleyachetty R., Cnattingius S. et al. (2016). Preconceptional and maternal obesity: Epidemiology and health consequences. *Lancet Diabetes Endocrinol,* 4(12), 1025–1036.

Razvarina I.N. Shmatova Yu.E. Gordievskaya A.N. (2022b). On the role of fathers in shaping the health of preschool children. In: *Sem'ya i preemstvennost' pokolenii: mat-ly mezhdunar. simpoziuma, g. Ivanovo-Ples, 30 sentyabrya – 10 oktyabrya 2022 goda* [Family and Continuity of Generations: Proceedings of the International Symposium, Ivanovo-Plyos, September 30–October 10, 2022]. Ivanovo: Ivanovskii gosudarstvennyi universitet (in Russian).

Razvarina I.N. Shmatova Yu.E. Gordievskaya A.N. (2022a). Healthy father – healthy children (results of long-term cohort monitoring in the Vologda Oblast). *Sotsial'noe prostranstvo=Social Area,* 8(4). DOI: 10.15838/sa.2022.4.36.6 (in Russian).

Razvarina I.N., Shmatova Yu.E. (2022). Prevalence of risk factors for the child's health from the father's side. Monitoring results. *Zdorov'e cheloveka, teoriya i metodika fizicheskoi kul'tury i sporta=Health, Physical Culture and Sport,* 27(3), 65–75. Available at: http://journal.asu.ru/index. php/zosh. DOI: 10.14258/zosh(2022)3.05 (accessed: November 15, 2022; in Russian).

Risérus U., Willett W.C., Hu F.B. (2009). Dietary fats and prevention of type 2 diabetes. *Prog Lipid Res,* 48, 44–51.

Rodprasert W., Toppari J., Virtanen H.E. (2021). Endocrine disrupting chemicals and reproductive health in boys and men. *Front Endocrinol (Lausanne),* 12, 706532. DOI: 10.3389/fendo.2021.706532

Schatz M. (2001). The efficacy and safety of asthma medications during pregnancy. *Semin Perinatol*, 25(3), 145–152. DOI: 10.1053/sper.2001.24569

Schepanski S., Buss C., Hanganu-Opatz I.L., Arck P.C. (2018). Prenatal immune and endocrine modulators of offspring's brain development and cognitive functions later in life. *Front Immunol,* 9, 2186. DOI: 10.3389/fimmu.2018.02186. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6168638/

Schetter Ch.D., Tanner L. (2012). Anxiety, depression and stress in pregnancy: Implications for mothers, children, research, and practice. *Curr Opin Psychiatry*, 25(2), 141–148. DOI: 10.1097/YCO.0b013e3283503680

Schmidt L., Sobotka T., Bentzen J.G., Nyboe Andersen A. (2012). Demographic and medical consequences of the postponement of parenthood. *Hum Reprod Update,* 18(1), 29–43. DOI: 10.1093/humupd/dmr040

Shabunova A.A., Korolenko A.V., Natsun L.N., Razvarina I.N. (2021). Presrving children's health: Search for the ways of solving relevant issues. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 14(2), 125–144 (in Russian).

Sharma R., Agarwal A., Rohra V.K. et al. (2015). Effects of increased paternal age on sperm quality, reproductive outcome and associated epigenetic risks to offspring. *Reprod Biol Endocrinol,* 13(35). DOI: 10.1186/s12958-015-0028-x. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4455614/pdf/12958_2015_Article_28.pdf

Shmatova Yu.E. (2022). A healthy mother – healthy children. Russia: Trends and prospects for development. In: *Mat-ly XXI Natsional'noi nauchnoi konferentsii s mezhdunarodnym uchastiem "Modernizatsiya Rossii: prioritety, problemy, resheniya". Ezhegodnik. Vyp. 17* [Proceedings of the 21st National Scientific Conference with International Participation "Modernization of Russia: Priorities, Problems, Solutions". Yearbook. Vol. 17]. RAN. INION (in Russian).

Shmatova Yu.E., Razvarina I.N., Gordievskaya A.N. (2022). Maternal risk factors for a child's health prior to and during pregnancy (results of long-term cohort monitoring in Vologda region). *Analiz riska zdorov'yu=Health Risk Analysis*, 3, 143–159. DOI: 10.21668/health.risk/2022.3.14 (in Russian).

Singh R.D., Koshta K., Tiwari R. et al. (2021). Developmental exposure to endocrine disrupting chemicals and its impact on cardio-metabolic-renal health. *Front Toxicol,* 3, 663372. DOI: 10.3389/ftox.2021.663372

Sipos A., Rasmussen F., Harrison G. et al. (2004). Paternal age and schizophrenia: A population-based cohort study. *Br Med J*, 329(7474), 1070. DOI: 10.1136/bmj.38243.672396.55. Available at: https://www.bmj.com/content/329/7474/1070.long

Sofronov V.V., Shakirova E.M. (2010). Role of social and biological factors in formation healthy neonates of different gestational age. *Prakticheskaya meditsina=Practical Medicine*, 6(45), 113–117 (in Russian).

Sokół-Szawłowska M. (2020). Paternal perinatal depression: Cases. *Psychiatr Pol*, 54(6), 1123–1135. DOI: 10.12740/PP/110610

Song Y., Jieping S., Tianshu Z. et al. (2022). Incidence of Down Syndrome by maternal age in Chinese population. *Front Genet,* 13, 980627. DOI: 10.3389/fgene.2022.980627

Stephenson J., Heslehurst N., Hall J. et al. (2018). Before the beginning: Nutrition and lifestyle in the preconception period and its importance for future health. *Lancet,* 391, 1830–1841.

Sutcliffe A.G., Barnes J., Belsky J. et al. (2012). The health and development of children born to older mothers in the United Kingdom: Observational study using longitudinal cohort data. *BMJ,* 345, e5116. DOI: 10.1136/bmj.e5116

Temple R.C., Aldridge V., Stanley K., Murphy H.R. (2006). Glycaemic control throughout pregnancy and risk of pre-eclampsia in women with type I diabetes. *BJOG,* 113(11), 1329–1332.

Tobias D.K., Zhang C., van Dam R.M. et al. (2011). Physical activity before and during pregnancy and risk of gestational diabetes mellitus: A meta-analysis. *Diabetes Care,* 34(1), 223–229.

Turcksin R., Bel S., Galjaard S., Devlieger R. (2014). Maternal obesity and breastfeeding intention, initiation, intensity and duration: A systematic review. *Matern Child Nutr,* 10(2), 166–183.

Wang H., Abbas K.M., Abbasifard M. et al. (2020a). Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950–2019: A comprehensive demographic analysis for the Global Burden of Disease Study 2019. *The Lancet,* 396(10258), 1160–1203.

Wang S., Yang L., Shang L. et al. (2020b). Changing trends of birth weight with maternal age: A cross-sectional study in Xi'an city of Northwestern China. *BMC Pregnancy Childbirth*, 20(1), 744–751. DOI: 10.1186/s12884-020-03445-2

Wong O., Nguyen T., Thomas N. et al. (2016). Perinatal mental health: Fathers – the (mostly) forgotten parent. *Asia Pac Psychiatry,* 8(4), 247–255. DOI: 10.1111/appy.12204

Wu Y., Liu X., Luo H. et al. (2012). Advanced paternal age increases the risk of schizophrenia and obsessive-compulsive disorder in a Chinese Han population. *Psychiatry Res*, 198(3), 353–359. DOI: 10.1016/j.psychres.2012.01.020

Xavier M.J., Roman S.D., Aitken R.J., Nixon B. (2019). Transgenerational inheritance: How impacts to the epigenetic and genetic information of parents affect offspring health. *Hum Reprod Update*, 25(5), 518–540. DOI: 10.1093/humupd/dmz017

Yang Q., Wen S.W., Leader A. et al. (2007). Paternal age and birth defects: How strong is the association. *Hum Reprod,* 22, 696–701.

Zhang C., Solomon C.G., Manson J.E., Hu F.B. (2006). A prospective study of pregravid physical activity and sedentary behaviors in relation to the risk for gestational diabetes mellitus. *Arch Intern Med,* 166(5), 543–548. DOI: 10.1001/archinte.166.5.543

Information about the Authors

Yuliya E. Shmatova – Candidate of Sciences (Economics), Researcher, Vologda Research Center, Russian Academy of Sciences (56A, Gorky Street, Vologda, 160014, Russian Federation; e-mail: ueshmatova @mail.ru)

Irina N. Razvarina – Researcher, Vologda Research Center, Russian Academy of Sciences (56A, Gorky Street, Vologda, 160014, Russian Federation; e-mail: irina.razvarina@mail.ru)

Aleksandra N. Gordievskaya – Junior Researcher, Vologda Research Center, Russian Academy of Sciences (56A, Gorky Street, Vologda, 160014, Russian Federation; e-mail: alessu85@mail.ru)

Received January 24, 2023.