

# YOUNG RESEARCHERS

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## Population health of large cities: trends and risks\*

*The article considers the problem of forming and maintaining the health of the population living in the big city by giving an example of the cities of Vologda and Cherepovets. Based on the correlation analysis the factors having both positive and negative effects on the health of the population of large cities have been identified. With an allowance for intensive development of urban areas at the present stage the author has outlined the main priorities of the activities on maintaining the health of urban populations.*

*Large city, health, quality of life, life expectancy, morbidity, health determinants.*



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Place of residence as a specific environment in which the person is, as a condition of his life activity, is one of the most important factors influencing its social well-being and health. Swift transition from rural to urban lifestyle, which was observed throughout the twentieth century, led to a significant increase in the number of population in the urban areas. According to the UN, 30 years ago there were about 38% of the world's population in the cities, in 2008 this figure was over 50% and made up 3.3 billion people. UN experts believe

that by 2030 almost 5 billion people will be living in the cities<sup>1</sup>. Russia with 73% of urban population belongs to a group of countries with high (70.0 – 75.9%) level of urbanization.

According to one of the classifications of cities by population, large cities are settlements with a number of population from 250 thousand to 1 million people<sup>2</sup>. As of 1 January, 2010 in Russian cities with population over 250 thousand people lived more than half of the urban population (53%) or 38% of the total population.

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<sup>1</sup> The UN report on the prospects of urbanization of the planet [Electronic resource]. – Available at: [www.ruslife.ru/patrol/statistics/2897.smx](http://www.ruslife.ru/patrol/statistics/2897.smx)

<sup>2</sup> [http://www.glossary.ru/cgi-bin/gl\\_sch2.cgi?RDuwukg](http://www.glossary.ru/cgi-bin/gl_sch2.cgi?RDuwukg)

Large cities offer a unique opportunity for their residents to raise their income, provide better access to the educational, health and social services. These positive aspects encourage people to move and to live in the city. However, the concentration of population and their means of livelihood as well as positive traits exacerbate a number of problems, most important of which is reduction of the potential for health.

As far back as the XX century a connection between people's neuro-psychological state and the population density in urban areas was revealed. It was found that in super large cities (more than 1 million inhabitants) this type of disease occurred almost twice as often as in small towns (up to 100 thousand inhabitants). Over the past 18 years (1990 – 2008) the number of patients with mental disorders in the cities of Russia has increased by 20% and amounted 2710 per 100 thousand people. During the same period the prevalence of drug use among the urban population has increased by 13 times<sup>3</sup>.

A feature of big cities is also a large quantity of malignant neoplasm cases. According to the data for 2000 – 2008 the incidence of cancer pathologies of the urban population exceeded the rural incidence by 14% on average. Since 1990s the incidence of malignant neoplasm in the cities has grown by more than 30%<sup>4</sup>.

Among the problems related to public health in the large cities the problem of children and adolescents health is a matter of deep concern. The incidence of child population disease more fully reflects the influence of various factors on health, as the baby is more vulnerable and susceptible to the adverse effects of exogenous factors. During the period from 1999 to 2009 the infant morbidity in the large cities of the Vologda oblast grew by 30%<sup>5</sup>.

According to the World Health Organization, the natural and transformed by man environment affects the health of the city population by

means of quality of housing, water supply and sewerage, air quality, transportation system and infrastructure. Social and economic conditions including income, access to the economy, education, security and law enforcement, social services also have a huge impact on the health of urban residents. An important role in maintaining and improving the health of urban community is played by safety and quality of food products as well as availability of primary medical and sanitary help of good quality. And, finally, the administration of municipal services is inextricably linked to the health and well-being of urban community, and this provides a platform for the development of all spheres of urban population life<sup>6</sup>.

The combination of factors and determinants of health (with a certain degree of conditionality) can be divided into those that are related to lifestyle and those that characterize the quality of life. Foreign studies note that the structural factors (occupation, income, place of living,) influence on the state of health much stronger than the lifestyle (physical exercises, smoking and alcohol consumption).

The quality of life, being a determining factor in the formation and preservation of the public health, characterizes the degree of satisfaction of material and cultural needs of people. It can be regarded as a comprehensive characteristic of economic, political, social and ideological factors that determine a person's position in society<sup>7</sup>.

In our study the analysis of the factors that affect the population health was conducted by the example of cities of the Vologda oblast – Vologda and Cherepovets, which include 70% of urban population of the region.

<sup>3</sup> Public health service in Russia. 2010: stat. bulletin / Rosstat. – M., 2010.

<sup>4</sup> Ibid.

<sup>5</sup> Key performance indicators of health facilities / Medical Information and Analytical Center. – Vologda, 2010.

<sup>6</sup> Hidden cities: unmasking and overcoming health inequities in urban settings // World Health Organization, The WHO Centre for Health Development, Kobe, and United Nations Human Settlements Programme (UN-HABITAT), 2010. – P. 13.

<sup>7</sup> Prokhorov, B.B. Indicators of the quality of public health as indicators of sustainable development / B.B. Prokhorov // Sustainable development: Resources of Russia. – M.: RCTU Publishing Center. – 2004. – Pp. 80-104.

More than 40 factors describing the standard of living, availability of health services, environmental conditions etc. have been studied (for the period from 1997 to 2009)<sup>8</sup>. The choice of these factors is determined by the fact that they can be expressed in numerical form. While there are characteristics that are difficult to be quantified (architectural appearance of the environment, attractiveness and convenience of living, stress, transport fatigue of the population).

In order to identify the power of influence of one or another factor on the population healthy of large cities we used a method of correlation analysis. The task of correlation analysis is quantitative determination of closeness of the relationship between characteristics. As a working tool we used coefficients of linear correlation between the life expectancy (LE) of the population and different indices of socio-economic development. LE is one of the most important characteristics of the standard and quality of life. This indicator integrally reflects a great number of factors from the effectiveness of health service and environmental conditions to behavioural patterns. The correlation coefficient can take the value from 1 to -1. If the absolute value is closer to 1, it indicates a strong connection, and if it is closer to 0 – the connection is weak or absent at all. All factors were divided into several groups, which characterize the standard of living, health service, environmental conditions, etc.

The correlation analysis made it possible to reveal that the maximum positive connection of the index LE becomes apparent with the group of factors characterizing the level of urban population income (*tab. 1*).

<sup>8</sup> Data sources: Income, expenditure and consumption in the households of the Vologda oblast in 2009 (based on a sample survey of household budgets): stat. bull. – Vologda, 2000 – 2010; Districts and cities of the Vologda oblast: stat. bull. – Vologda, 2000 – 2010; Key performance indicators of health facilities / Medical information and analytical center. – Vologda, 1999 – 2010; The state and protection of the environment of the Vologda oblast: stat. bull. – Vologda, 1999 – 2009; Cities of the Vologda oblast in figures. The main socio-economic indicators. 2000 – 2009: stat. bull. – Vologda, 2010.

Of course, higher incomes are not an automatic guarantee of better health, but they allow us to provide a certain set of material values for preservation and promotion of health potential.

The second important group of factors that are beneficial for preservation of urban health is medical service. The level of health system development of large cities is an advantage in the way of maintaining health and increasing the life expectancy. The correlation coefficient between the LE and provision with doctors in the urban areas is 0.877.

In the large cities there is also a close positive relationship between life expectancy and morbidity of the population ( $r = 0.838$ ). In interpreting this relationship, one should bear in mind that the term «morbidity» is not quite accurate, as it increasingly does not reflect the actual incidence but the level of medical aid appealability. Finding of patients, quality of diagnosis of their diseases are largely dependent on the availability of medical facilities, their equipment and proximity to the body of population. By turn, with a high level of disease intelligence and at earlier stages the likelihood of cure increases, which is reflected in the increased life expectancy of urban population.

A significant health influence of pollutant emissions into the atmosphere and wastewater discharges into the water bodies ( $r$  equals -0.638 and -0.629 respectively) is observed in the large cities of the region. According to sociological survey conducted by ISEDТ of RAS in 2010, the population of big cities of the Vologda oblast estimates the environmental conditions at the place of their residence as poor 3 times as often as the rural residents (32 and 12% respectively)<sup>9</sup>.

<sup>9</sup> The survey is conducted in Vologda, Cherepovets and eight districts of the Vologda oblast. The sample size is 1500 respondents. Sampling is focused and quota. Representativeness of the sample is ensured by the following conditions: the proportions between urban and rural populations, the proportions between the inhabitants of different settlements (rural communities, small and medium-sized towns), the proportion of sex and age structure of the adult population. Sampling error does not exceed 3%. Technical information processing was performed in the programs SPSS and Excel.

Table 1. Factors influencing the life expectancy of the population of large cities of the Vologda Oblast (the period for analysis: 1997 – 2009)

Criteria for quality of life		Correlation coefficient (r) with LE
Standard of living	The expenditures for the purchase of products for home food (per a member of household, rubles a month)	0.919
	The expenses for medical services (per a member of household, rubles a month)	0.908
	Gross income (per a member of household, rubles a month)	0.902
	The average monthly nominal wages (thousand rubles per man)	0.767
	The volume of paid services to population (thousands rubles per capita)	0.767
	Sale of non-food products (thousand rubles per capita)	0.733
	The number of private vehicles (cars per 10 thousand people)	0.595
Health service	Provision of population with doctors (per 10 thousand people)	0.877
	Primary morbidity (per 100 thousand people)	0.838
	Total morbidity (per 100 thousand people)	0.831
Environment	The number of trapped and neutralized pollutants (tons per 1000 people)	0.735
	Pollutant emissions from stationary sources to the atmosphere (tons per 1000 people)	-0.638
	Wastewater discharge into water (thousand cubic meters per 1000 people)	-0.629
Housing stock	Commissioning of dwelling houses (sq meters of total area per capita)	0.687
	Commissioning of private dwelling houses (sq meters of total area per capita)	0.632
	Total area of housing stock (sq meters per capita)	0.470
Labour protection	The number of the injured in industrial accidents (per 1000 employees)	-0.606
	The expenses of organizations for the activities on labour protection (thousands of rubles per man)	0.453
Food quality	Consumption of fruit and berries (on average per consumer annually, kg)	0.643
	Consumption of fish and fish products (on average per consumer annually, kg)	0.531
	Consumption of meat and meat products (on average per consumer annually, kg)	0.467
	Consumption of grain products (on average per consumer annually, kg)	-0.353
	Consumption of potatoes (on average per consumer annually, kg)	-0.265
Lifestyle	The number of persons engaged in physical culture and sports (per 10 thousand people)	0.480

Among the most disturbing problems of big cities air pollution and poor quality of drinking water are of the greatest importance. The issue of high noise level and proximity to the highways are urgent for 45 and 41% of urban population respectively (*figure*).

One of the leading causes of environmental degradation of the cities and towns is the rapid growth of motorization. From 1998 to 2009 the number of cars of all types of individual owners in the large cities of region increased almost twice. In 2009 every fourth citizen had a private car, whereas in 2000 – the only one in six<sup>10</sup>.

<sup>10</sup> Districts and towns of the Vologda oblast: Stat. bulletin – Vologda, 2009.

In accord with the growth of road transport in the cities the emissions to the environment increase. It should be noted that the air emissions from motor vehicles increase not only because of the increase in the number of cars, but also because of lower capacity of streets and traffic jams during rush-hours.

The exhaust gases of vehicles create a high concentration of pollutants mainly in the lower atmosphere. Therefore, pollution affects children the most. According to the 2009 data, in the Vologda oblast the children had 10 times higher respiratory disease incidence than the adults.

Environmental problems of the Vologda Oblast in the context of territories (% of total respondents)

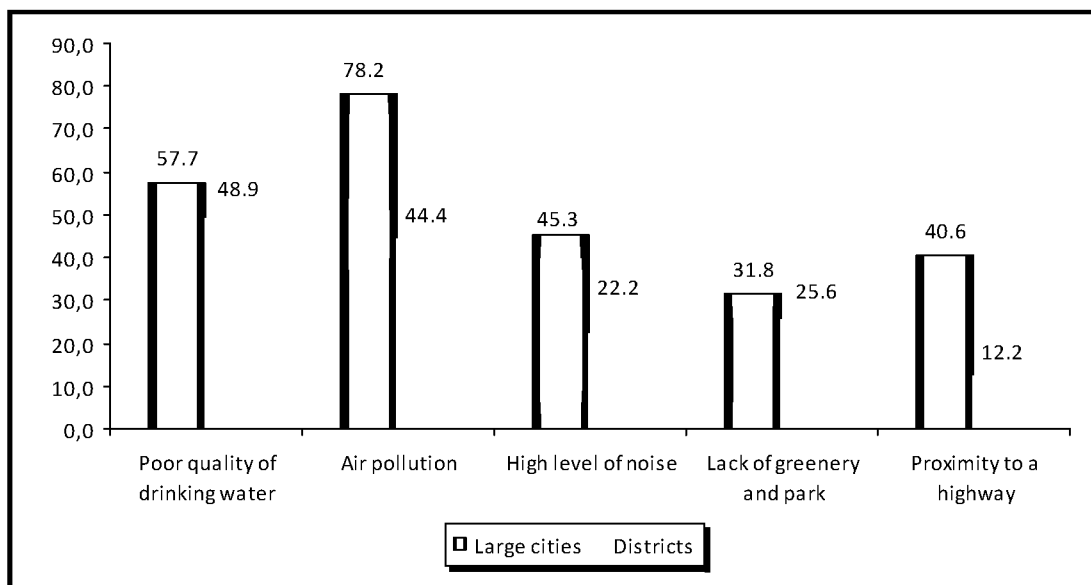


Table 2. The correlation relationship between the disease incidence in the large cities of the Vologda Oblast and the number of private cars

Indicator	Vologda	Cherepovets
The incidence of children at the age of 0-14 (per 1000 people)	0.848	0.932
The incidence of adults (per 1000 people)	0.293	-0.569

The correlation analysis shows that the disease incidence of child population of large cities in the oblast has a close positive relationship ( $r = 0.8-0.9$ ) with the number of private cars (*tab. 2*). At the same time it doesn't have a univocal relationship with the disease incidence of adult population.

On this basis, environmental protection measures in the large cities are of great importance, that is evidenced by the close positive correlation relationship between the LE and the number of trapped and neutralized harmful substances ( $r = 0.735$ ).

However, it should be noted that the number of private cars and the LE of urban population have a positive relationship. This suggests one more time that with increasing the living standards, the characteristics of population's health improve.

The groups of factors, which also revealed their correlation relationship with the LE, but

of less power ( $r$  is no more than 0.6) include: the state of housing stock, labour protection, quality of nutrition and lifestyle.

Today there is a need for new approach to urbanization and new paradigm of public health in the urban areas based on the disease prevention rather than its treatment. We need new management models which are capable to plan the space of city so that the physical, social and natural environment can prevent and reduce new risks to health.

The health care system that provides the advantage of the urban population in the way of health preservation is in need of speedy modernization. Electronic medical records and signing up to the doctor would greatly improve the quality and accessibility of medical care. Preventative health service should become a priority one. Each district should have health centers which permit to make a primary diagnosis more accessible, as well as disease prevention centers.

Modern cities need infrastructure, which would minimize man-caused impact on the environment and contribute to healthy living.

With the number of vehicles going on up, it is necessary to introduce the measures to reduce their negative effects: to increase the capacity of the streets (bringing into duplicate streets, road junctions at different levels, systems of non-stop movement of vehicles), to assign the zones banning the movement, to create additional parking spaces, to develop and strengthen the role of public motor and electric transport of high carrying capacity of intercity transportation. Besides when constructing residential buildings it is necessary to have them away from busy highways, to place them along the greenery and to install sound and vibration protection screens. Children's staying near the intersections and busy streets for a long time must be excluded.

To enhance the attractiveness and comfort of urban areas we should expand woodland park area, pedestrian walkways and introduce recreational complex objects intended for recreation. Due consideration should be given to aesthetic perception of the urban environment: use bright colours for the design of buildings and to avoid dense development.

In order to provide population with housing area it is necessary to develop a system of mortgage lending, as well as to create favorable conditions for private housing construction with the use of technology providing lower cost of housing without reduced quality.

To spread a healthy way of life it is necessary to create conditions so that each urban resident can go in for sports. Each district must have large sports centers, swimming pools, jogging and bike paths, playgrounds in every yard.

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