

ASSESSMENT OF ENVIRONMENTAL FACTORS IMPACT ON POPULATION HEALTH FORMATION IN IVANO-FRANKIVSK REGION

NATALIIA BIELOVA, TETIANA MYKYTYN, NELIA DOLYNKO

Abstract: The research is dedicated to analyzing environmental factors and their impact on the health status of the population of the Ivano-Frankivsk region. In the context of exacerbated environmental problems and the current period of socio-economic development of society, health is one of the most pressing issues of public concern. Studying the impact of environmental factors and economic development issues, identifying priorities for health-improving actions, is an integral part of the environmental policy of any state. Establishing a connection between influencing factors and the health status of the population enables government authorities to achieve high results in implementing programs and strategies to improve public health and enhance the quality of life. The article provides causal relationships between influencing factors and health status, which allow achieving high indicators of the overall health status of the population, and also evaluates the medical-demographic situation in the Ivano-Frankivsk region. The most significant environmental problem that has a decisive impact on the health of the population of the Ivano-Frankivsk region is air pollution due to industrial emissions, waste, and exhaust gases from automotive transport, causing allergic reactions and viral respiratory diseases. This particularly applies to cities with a large population and industrial production (Ivano-Frankivsk, Kalush, Burshtyn, Nadvirna). Emissions of pollutants into the atmosphere from stationary sources increased by 31.5% in 2022 compared to 2021. This is a very high figure, as emissions decreased by 7.4% in 2020 compared to 2019. Most emissions of these pollutants occur in industrially developed areas. The most common bacterial infection is hepatitis A, known as jaundice. The most common diseases among the population of the Ivano-Frankivsk region during 2017-2022 are diseases of the respiratory tract (52%), circulatory system (6%), skin (5.7%), urogenital system (4.5%), eyes (3.8%), musculoskeletal system (3.5%). Author's research confirms that 55.2% of respondents rated their health as "good," 30.4% as "satisfactory," and 14.4% as "poor." During the year, 89.9% of our compatriots fell ill. Of these, 19.1% believe that infectious diseases have a negative impact over a long period and affect the ability to perform daily activities, 41.2% of individuals indicate on vitality, such as participating in physical activity, attending cultural events, leading an active lifestyle, and so on. Compared to other regions of Ukraine, the Ivano-Frankivsk region is characterized by favorable environmental conditions and a satisfactory medical-demographic situation. Thus, it belongs to the group of regions with a moderate level of morbidity, as evidenced by the statement of the general morbidity of the population of Ukraine.

Keywords: population health, influencing factors, ecology, Ivano-Frankivsk region.

1. INTRODUCTION

The health of individuals is a crucial indicator of quality of life, well-being, and a key metric of socio-economic development. Population health is the determining factor in the importance of preserving and enhancing the human potential of every country; its condition directly influences life expectancy, fertility rates, and workforce productivity.

Amid escalating environmental challenges and the current period of socio-economic development, the health of individuals stands as one of the most pressing concerns for society. Studying the impact of environmental factors and economic development, as well as identifying priorities for health-promoting actions, are integral components of every state's environmental

policy. Establishing the connection between influencing factors and the population's health status enables governmental bodies to achieve significant outcomes in implementing programs and strategies aimed at improving public health and raising living standards.

Consequently, medical-geographical and ecological research play a leading role in examining the current state of health and forecasting future measures. The insufficient study of these issues, both in Ukraine and in the Ivano-Frankivsk region in particular, indicates that these matters have been superficially explored. This underscores the relevance of our research (Voytenko et al., 2004).

2. MATERIALS AND METHODS

The aim of this study is to investigate the peculiarities of the population's health in the Ivano-Frankivsk region and develop recommendations for improving its status, sanitation, and the medical-demographic situation in the researched area.

To accomplish these tasks, modern and traditional research methods have been employed, including historical-geographical analysis, comprehensive analysis, cartographic analysis, comparative geography, geoinformational analysis, and mathematical-statistical analysis.

Information for the study has been sourced from archival materials of the regional environmental and natural resources management authority, the environmental inspection agency, the department of health protection in the Ivano-Frankivsk region, the website of the Ukrainian healthcare system, COVID-19 helplines, data from the regional statistics authority, as well as personal observations and calculations by the authors (State..., 2020; State..., 2020; State..., 2020; Ministry..., 2020).

3. RESULTS AND DISCUSSION

Considering that air pollution is one of the main factors affecting population health, it should be noted that air pollution impacts human health in various ways, from direct effects to slow physical influences. With the increase in transportation, the level of air pollution becomes more adverse. This pattern varies across the Ivano-Frankivsk region and specifically in Ivano-Frankivsk. Particularly, this applies to areas adjacent to roads, where air pollution is significantly higher compared to areas without transportation or greenery (Voytenko et al., 2004).

Emissions of pollutants into the atmosphere from stationary sources increased by 31.5% in 2022 compared to 2021. This is a very high indicator, considering that emissions decreased by 7.4% in 2020 compared to 2019 (State..., 2020). A positive aspect is that emissions of carbon dioxide, which is the main greenhouse gas affecting climate change, decreased by 25.3%. This is due to the fact that in 2022, many commercial and industrial facilities causing air pollution were not operational due to quarantine restrictions and military actions. The main contributors to air pollution are enterprises involved in the production and distribution of electricity, water, and gas, accounting for 92.3% of total emissions. The emissions structure is dominated by sulfur dioxide and other sulfur compounds, nitrogen compounds, carbon monoxide, methane, non-methane volatile organic compounds, and chemical substances in the form of weighted compounds (see table 1).

The majority of emissions of these pollutants occur in industrially developed areas. Specifically, in the Burshtyn and Halych districts, the main polluters are the Burshtyn Thermal Power Plant and the chemical industry in Kalush district. The Bohorodchany, Dolyna, and Nadvirna districts are affected by oil and gas extraction, while the Rozhniativ district is influenced by wood processing industry. The Tysmenytsia district is impacted by the Ivano-Frankivsk Cement Plant. In addition to industry, air pollution also stems from ground and water transport, agriculture, forestry, fishing, and other industrial sectors.

Table 1. Emissions of pollutants into the atmosphere from stationary sources in 2022

№	Districts	The volume of emissions		Emission density per 1 km ² , kg	Volume of emissions per capita, kg
		kT	% by 2021		
1	Bohorodchany	2,3	95,5	2833,0	32,3
2	Verkhovyna	0,0	100,4	5,5	0,2
3	Halych	1,3	117,9	1891,5	30,7
4	Horodenka	0,1	129,2	104,2	1,5
5	Dolyna	3,8	91,1	3070,6	55,0
6	Kalush	0,7	98,7	1045,5	11,4
7	Kolomyia	0,1	82,7	68,8	0,7
8	Kosiv	0,4	106,1	427,1	4,4
9	Nadvirna	2,5	76,1	1950,4	21,9
10	Rohatyn	0,7	127,9	845,5	16,8
11	Rozhniativ	1,2	92,8	920,2	16,5
12	Sniatyn	0,2	70,9	255,9	2,4
13	Tysmenytsia	1,2	107,2	1618,0	14,4
14	Tlumach	0,1	121,0	105,0	1,5
15	Ivano-Frankivsk	0,4	94,3	5328,1	1,8
Ivano-Frankivsk region		196,7	87,8	14121,4	142,4

Contamination of surface waters has a significant impact on human health. Contaminated water poses a serious risk to human health as its consumption can spread infectious diseases such as dysentery, typhoid, cholera, viral hepatitis, and poliomyelitis, among others. The consequences of human consumption of contaminated drinking water are outlined in table 2.

Table 2. The consequences of human consumption of contaminated water

№	Water consumption patterns	Pollutant	Disease
Biological			
1	Drinking and eating	Pathogenic bacteria	Cholera, dysentery, typhoid fever, gastroenteritis, leptospirosis, tularemia
		Viruses	Infectious hepatitis
		Parasites	Amoebic dysentery, helminthiasis, echinococcosis
2	Washing, laundry in water	Parasites	Schistosomiasis, dermatitis, strongyloidiasis
3	Residence or proximity to water	Through insects - vectors	Malaria, yellow fever, sleeping sickness, filariasis
Chemical			

4	Drinking and eating	Nitrates	Methemoglobinemia
		Fluorine compounds	Endemic fluorosis
		Arsenic	Intoxication
		Selenium	Selenosis, intoxication
		Lead	Intoxication
		Polycyclic aromatic hydrocarbons	Cancer
		Excessively soft water	Arteriosclerosis, hypertension
		Chromium	Urov's disease
		Nickel	Skin allergy
		Copper	Damage to the nervous system
		Phenol	Poisoning

The most common bacterial infection is hepatitis A, also known as jaundice. Outbreaks worsen during contact with water, food, and domestic animals (Ministry..., 2020). Overall, hepatitis prevalence is very high in Ukraine, with annual incidence in the Ivano-Frankivsk region ranging from 300 to 500 cases per 100,000 population, including one-third children.

In Table 3, we considered groups of socio-economic factors affecting public health and indicated their positive and negative consequences.

Table 3. Socio-economic factors shaping the health of the population of Ivano-Frankivsk region

№	Factor influencing population health	Factors	
		Improvement of health	Deterioration of health
1	Genetic factors (15-20%)	Healthy heredity. Absence of predisposition to diseases	Inherited diseases and disorders. Genetic predisposition to diseases
2	Environmental conditions (20-25%)	Good living and working conditions, favorable climatic and natural conditions, environmentally friendly living environment	Harmful living and working conditions, unfavorable climatic and natural conditions, environmental pollution
3	Healthcare provision (10-15%)	High level of preventive measures, timely and comprehensive medical care	Lack of regular medical monitoring of health dynamics, low level of primary prevention, poor medical services
4	Lifestyle and behavior (50-55%)	Rational organization of life, sedentary lifestyle, adequate physical activity, social and psychological comfort, balanced and rational nutrition, absence of harmful habits, health education, etc.	Lack of rational lifestyle regime, migration processes, social and psychological discomfort, improper nutrition, harmful habits, insufficient level of health education

An analysis of complaints about the health status of the population of Ivano-Frankivsk region, characterized by low birth rates and high mortality rates, has been conducted. Research has shown that the population of the region most commonly suffers from diseases such as cardiovascular, gastrointestinal, and nervous system disorders, among others. Among the groups of the most common diseases, which are the main cause of mortality in the region, are circulatory system diseases, accidents, neoplasms, respiratory system diseases, and digestive system diseases (see Figure 1).

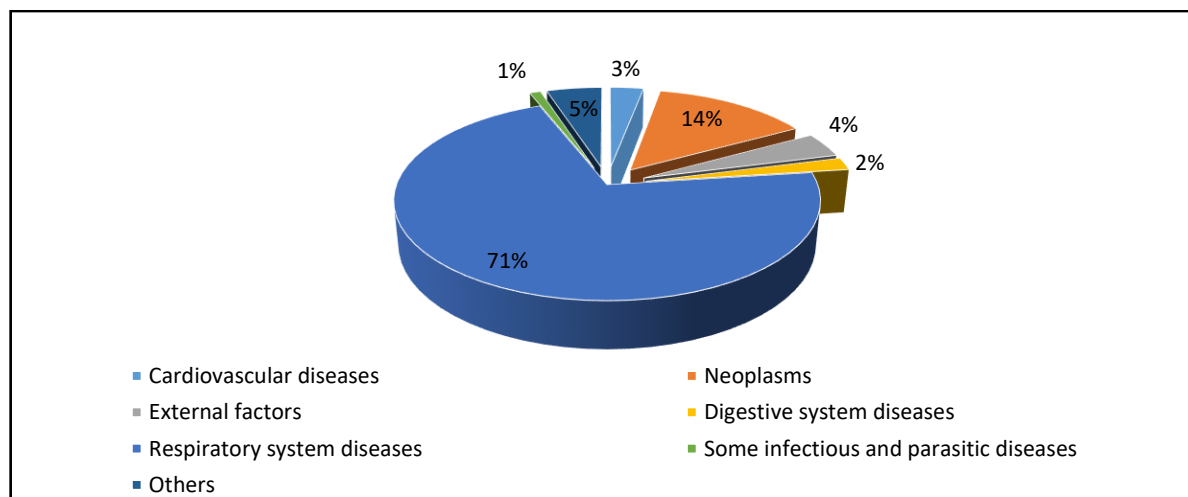


Figure 1. Causes of mortality in the population of Ivano-Frankivsk region in 2022, %

Compared to other regions of Ukraine, Ivano-Frankivsk region is characterized by favorable environmental conditions and satisfactory medical-demographic situation. Thus, it belongs to the group of regions with a moderate level of morbidity, as evidenced by the observation of the general morbidity of the population of Ukraine (Ministry..., 2020). However, considering the medical indicators of the entire Ukraine, the situation is much worse than in Europe.

To learn about the availability of medical services, medications, and medical goods, as well as to obtain information regarding self-assessment of health and well-being in Ivano-Frankivsk region, a survey was conducted among families about their living conditions during 2022. Thus, we obtained additional information about the health status and well-being of the region's residents.

According to the survey data, 55.2% of respondents rated their health as "good", 30.4% as "satisfactory", and 14.4% as "poor". In Ukraine, these percentages are respectively 49.1%, 40.5%, and 10.4%. According to the survey, 89.9% of our fellow citizens fell ill during the year. Among them, 19.1% believe that infectious diseases have a negative impact over a long period and affect their ability to perform daily activities, while 41.2% of individuals indicate life activity, such as engaging in physical activity, attending cultural events, leading an active lifestyle, etc.

The majority of people in the region are accustomed to seeking care at polyclinics (93.1%), with every twentieth patient visiting a family doctor at the polyclinic. The main reason for the latter's visit to the doctor was a disease or health problem, cited by 72.5% of patients, while 26.2% came for preventive visits, and the rest were due to accidents or injuries.

Vaccination of the population of Ivano-Frankivsk region began in February 2021 and continues to this day. In February and March 2021, 10,774 individuals were vaccinated with the AstraZeneca vaccine, and from April of the same year, vaccination with other vaccines such as Sinovac (CoronaVac), Pfizer-BioNTech began, and Moderna was imported to us in July 2021, when vaccination with it also started. The peak of population vaccination occurred in November 2021, as depicted in Figure 2.

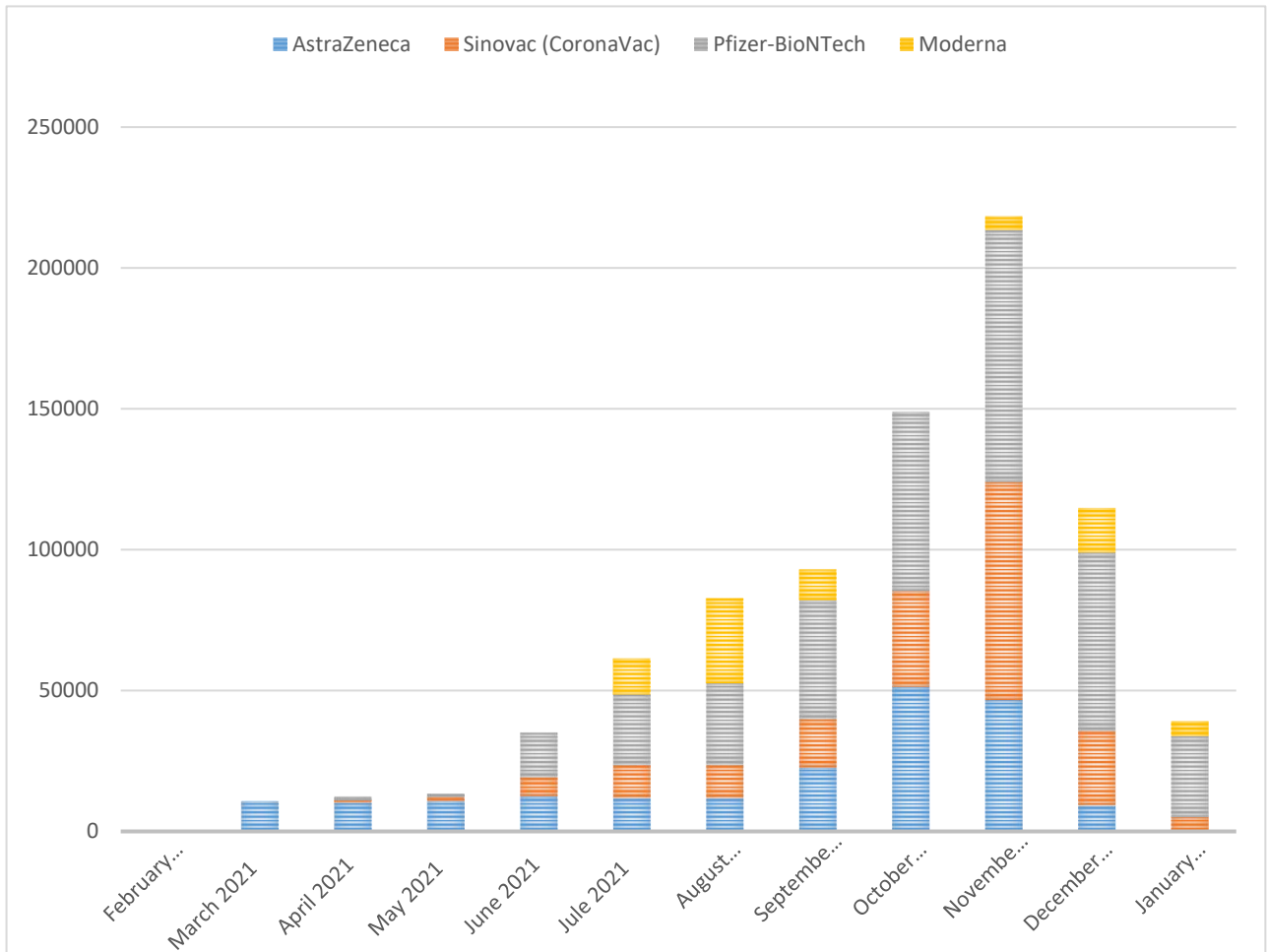


Figure 2. Distribution of vaccinated individuals in Ivano-Frankivsk region for the period from February 24, 2021, to January 23, 2022

As shown in Figure 3, the majority of the population was vaccinated with the Pfizer-BioNTech vaccine.

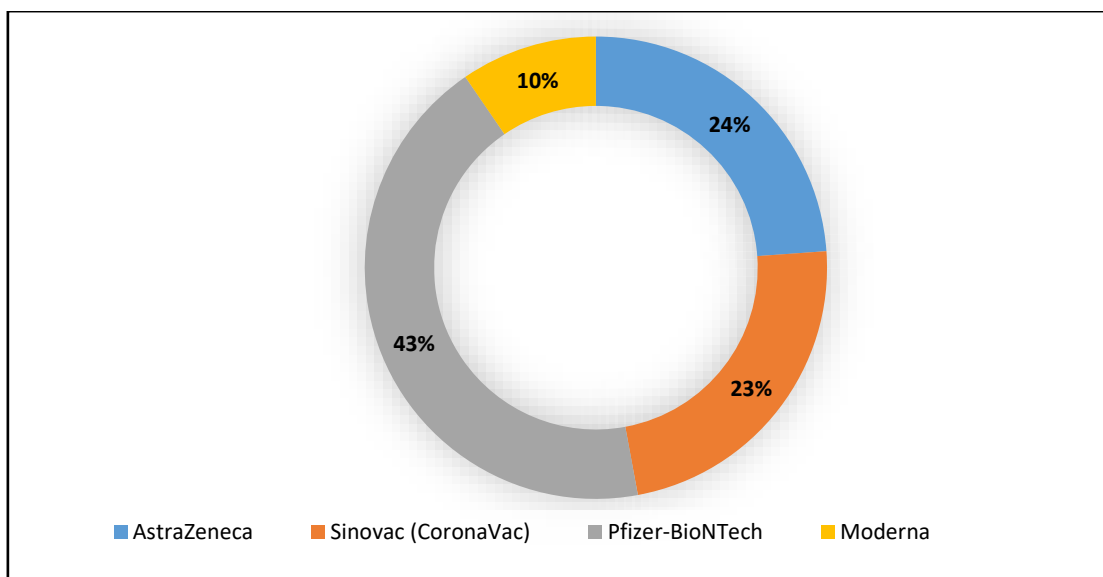


Figure 3. Total number of vaccinated individuals in Ivano-Frankivsk region by vaccine type

For the analysis of the accuracy of calculations, we calculated the mortality rate of the population during the same periods, but without taking into account mortality from COVID-19, as well as deaths from pneumonia and influenza, since these could potentially be undiagnosed cases of COVID-19, to understand whether the increase in the mortality rate is solely due to COVID-19. Reviewing the latest calculations (mortality rate of the population of Ukraine, without taking into account mortality from COVID-19, as well as influenza and pneumonia), we can observe an increase in the mortality rate by 0.00492%.

Despite the increase in the mortality rate of the population of Ukraine, without taking into account mortality from COVID-19, as well as influenza and pneumonia, this rate increases after vaccination, relative to the mortality rate before vaccination. Quantitatively, this can be seen in the data from Figure 4.

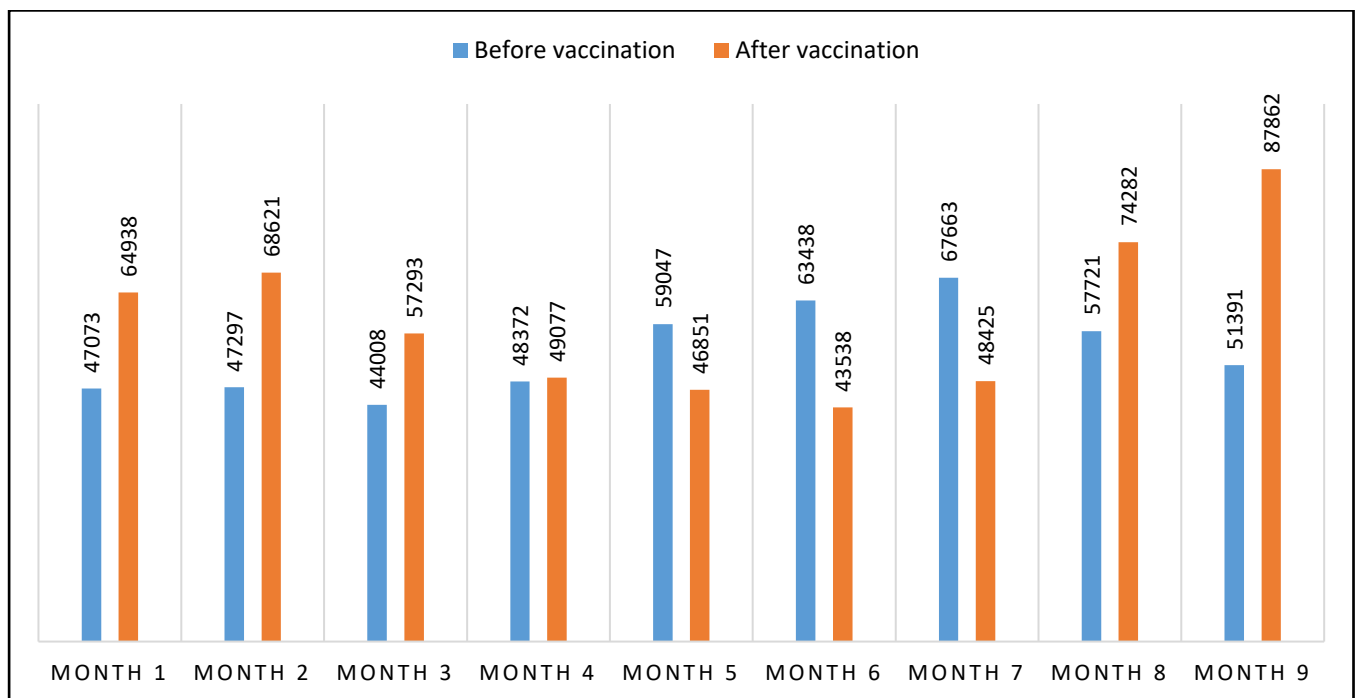


Figure 4. Number of deaths in Ukraine over nine months, I - from June 2020 to February 2021, II - from March 2021 to November 2021

4. CONCLUSIONS

The most significant environmental problem that has a decisive impact on the health of the population of Ivano-Frankivsk region is air pollution due to industrial emissions, waste, and exhaust gases from motor vehicles, leading to allergic reactions and viral respiratory diseases. This is particularly relevant in cities with a large population and industrial production (Ivano-Frankivsk, Kalush, Burshtyn, Nadvirna). The most common diseases among the population of Ivano-Frankivsk region during 2017-2022 were respiratory diseases (52%), circulatory system diseases (6%), skin diseases (5.7%), genitourinary system diseases (4.5%), eye diseases (3.8%), musculoskeletal system diseases (3.5%). Author's research confirms that 55.2% of respondents rated their health as "good", 30.4% as "satisfactory", and 14.4% as "poor".

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Наталія Белова, Тетяна Микитин, Нелія Долинко. Оцінка впливу факторів довкілля на формування здоров'я населення Івано-Франківської області. *Журнал Прикарпатського університету імені Василя Стефаника*, 10 (2023), 87-95.

Дослідження присвячене аналізу екологічних факторів та їх впливу на стан здоров'я населення Івано-Франківської області. У контексті загострених проблем довкілля та поточного періоду соціально-економічного розвитку суспільства, здоров'я є однією з найбільш актуальних проблем громадськості. Вивчення впливу екологічних факторів та питань економічного розвитку, визначення пріоритетів для дій з покращення здоров'я, є необхідною складовою частиною екологічної політики будь-якої держави. Встановлення зв'язку між впливом факторів та станом здоров'я населення дозволяє органам влади досягати високих результатів у реалізації програм і стратегій щодо покращення громадського здоров'я та підвищення якості життя. У статті наведено причинно-наслідкові зв'язки між впливом факторів та станом здоров'я, що дозволяє досягати високих показників загального стану здоров'я населення, а також оцінюється медико-демографічна ситуація в Івано-Франківській області.

Найбільшою екологічною проблемою, що має вирішальний вплив на здоров'я населення Івано-Франківської області, є забруднення атмосферного повітря через промислові викиди, відходи та вихлопні гази автомобільного транспорту, що спричиняють алергічні реакції та вірусні респіраторні захворювання. Це особливо стосується міст з великою кількістю населення та промислового виробництва (Івано-Франківськ, Калуш, Бурштин, Надвірна). Викиди забруднюючих речовин в атмосферне повітря зі стаціонарних джерел зросли на 31,5% у 2022 році порівняно з 2021 роком. Це дуже високий показник, оскільки викиди зменшилися на 7,4% у 2020 році порівняно з 2019 роком. Більшість викидів цих речовин відбувається в промислово розвинених районах. Найпоширенішою бактеріальною інфекцією є гепатит А, відомий як жовтяниця. Найпоширенішими захворюваннями серед населення Івано-Франківської області протягом 2017-2022 років є захворювання дихальних шляхів (52%), системи кровообігу (6%), шкіри (5,7%), сечостатевої системи (4,5%), очей (3,8%), кістково-м'язової системи (3,5%). Дослідження авторів підтверджують, що 55,2% опитаних респондентів оцінили своє здоров'я як "добре", 30,4% – "задовільне", а 14,4% – "погане". Протягом року захворіли 89,9% наших співвітчизників. З них 19,1% вважають, що інфекційні захворювання мають негативний вплив протягом тривалого періоду і впливають на здатність виконувати повсякденні дії, 41,2% осіб вказують на життєву активність, таку як участь у фізичних вправах, відвідування культурних заходів, ведення активного способу життя і так далі. Порівняно з іншими регіонами України, Івано-Франківська область характеризується сприятливими екологічними умовами та задовільною медико-демографічною ситуацією. Таким чином, вона належить до групи областей із помірним рівнем захворюваності, що підтверджується констатацією загальної захворюваності населення України.

Ключові слова: здоров'я населення, фактори впливу, екологія, Івано-Франківська область.