

Public Health Service

# Analysis of the Dynamics of Cardiovascular Health in the Population of Ivano-Frankivsk Region over the Past Seventeen Years

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## Abstract

The key to increase the level of life expectancy is good health. To study the indicators of cardiovascular health in the population of the Carpathian region, the analysis of the indicators of cardiovascular disease prevalence over the period 1998-2014 was made. The analysis was conducted based on statistical data of the Regional Information-Analytical Center of Medical Statistics and medical records of the Ivano-Frankivsk Regional Clinical Cardiology Dispensary over the period 1998-2014.

To identify the population structure in Ivano-Frankivsk region, the analysis of the main demographic indices over the period 1998-2014 was made. The analysis revealed that in 2007, the total population of the Carpathian region was 1,386,000 people while in 2014, it was 1,379,400 people that was 1.05% and 5.76% lower compared to the total population in 1998 (1,463,600 people). Similar tendency was observed across the whole country. During the studied period, the indicators of the overall prevalence of hypertension (all forms) increased by 2.89 times while the indicators of primary disease incidence increased by 1.89 times. The indicator of the overall prevalence of ischemic heart disease among the adult population of Ivano-Frankivsk region during the studied period increased by 2.11 times ranging from 9780.3 to 20629.1 cases per 100,000 population. It should be noted that since 2012 a reduction in the prevalence of angina pectoris from 6545.7 to 6126.2 cases per 100,000 population (by 1.07 times) was observed. The increase in the incidence of acute myocardial infarction from 81 to 108.2 cases per 100,000 population (by 1.34 times) was detected as well. Cardiovascular diseases are known to be the most urgent problem of modern health care system having no geographical, socioeconomic and sexual preferences. They remain to be the major cause of mortality accounting for about 17,300,000 cases per year.

**Conclusions.** Thus, important factors affecting life expectancy of Ivano-Frankivsk region residents include morbidity and mortality due to cardiovascular diseases which have increased recently.

## Keywords

population health; cardiovascular diseases; hypertension; angina pectoris; acute myocardial infarction; ischemic heart disease

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## Problem statement and analysis of the recent research

Over the past decades, there has been a tendency toward increasing life expectancy in the developed world which leads to an increase in the number of older people who are eager to prolong the period of normal physical, social and psychological activity. Therefore, the promising direction in medicine is the development of a program which should be based on a thorough knowledge of the mechanisms of life expectancy and longevity. According to modern concepts, ageing is process of slowing down, inhibition and loss of physiological functions of the body accompanied by an increased incidence of the diseases [1]. The key to increase the level of life expectancy is good health.

Due to the depopulation increasing since 1991, the total population of Ukraine reduced by more than 6 million people. The demographic situation in Ukraine is critical as

evidenced by low birth rates and too high mortality rates, an unprecedented decline in life expectancy, especially among men, an extensive illegal labor migration of economically active citizens abroad and, as a result, a continuous ageing of the population [2]. The excess of male mortality (compared to the countries of the European Union) by 4.9 times as well the excess of female mortality by 3.2 times (the age group of 30-44 years) is a threat to both the labor and reproductive potential [6]. Over the past 20 years, the total population of Ukraine has reduced by almost 7 million people and according to the World Bank's forecast, by 2025, it will have reduced by another 24%. The leading causes of death in 2012 (as during the previous years) were circulatory system diseases – 65.8% of all cases [6].

The Ukrainian system of health care is aimed at treatment rather than the prevention and promotion of healthy lifestyle. Due to this fact, over the past five years, there has been ob-

served an increase in mortality and morbidity rates [3]. The health status of the population in Ukraine is characterized by a significant prevalence of chronic diseases and socially dangerous diseases. The rates of disability and mortality in case of short life expectancy remain to be high.

The objective of the research was to analyze the indicators of cardiovascular health in the population of the Carpathian region over the period 1998-2014.

## **1. Materials and methods**

The analysis was made based on statistical data of the Regional Information-Analytical Center of Medical Statistics and medical records of the Ivano-Frankivsk Regional Clinical Cardiology Dispensary over the period 1998-2014. Both parametric and non-parametric methods were used to process the data statistically, namely the arithmetic mean ( $M$ ), the mean-square deviation ( $\sigma$ ), the standard error ( $\tau$ ) as well as statistical significance of differences in the research results ( $p$ ) were calculated. Statistical analysis was conducted using standard software package Statistica 12.0 (StatSoft, USA).

## **2. Results and Discussion**

To identify the population structure in Ivano-Frankivsk region, the analysis of the main demographic indices over the period 1998-2014 was made. The analysis revealed that in 2007, the total population of the Carpathian region was 1,386,000 people while in 2014, it was 1,379,400 people that was 1.05% and 5.76% lower compared to the total population in 1998 (1,463,600 people). Similar tendency was observed across the whole country. The distribution of the population according to age in 2007 and 2014 was as follows: 240,600 and 247,400 people were younger than those of working age; there were 824,400 and 822,600 people of working age as well as 398,600 and 309,300 people of retirement age. During the studied period, there was observed a positive correlation between the reduction in the total population of the region as well as in the reduction in the number of people of working and retirement age. Therefore, a logical continuation of the work was the study of the health status of the population.

The mortality rate is one of the negative indicators of population health. This indicator increased by 21.38% during the studied period. Circulatory system diseases were the leading causes of death accounting for 58.2% of cases in 1998 and 60.9% of cases in 2007. Among people of working age, this indicator ranged from 29.9 to 23.3% while among people of retirement age, it ranged from 66.8 to 72.4%. More detailed analysis revealed that ischemic heart disease (IHD) was the major cause of death due to separate nosological forms. The indicator was the lowest among the population of Ivano-Frankivsk and Kalush district. The highest indicators were recorded in Bolekhiv, Rohatyn district, Halych district, Tlumach district and Horodenka district depending on the studied periods.

The morbidity rate was the next analyzed parameter. During the studied period, the lowest incidence rates were observed in Nadvirna region and Bolekhiv while the highest incidence rates were observed in Ivano-Frankivsk. Among the diseases affecting the population of Ivano-Frankivsk region, circulatory system diseases predominate. It should be noted that since 1998 to 2014 this indicator increased by 2.33 times (from 22704.9 to 52941.3 cases per 100,000 population).

The next stage of our research consisted in a detailed analysis of the indicators of the overall prevalence and primary incidence of hypertension (HT) and IHD including angina pectoris and acute myocardial infarction among the adult population. During the studied period, the indicators of the overall HT prevalence (all forms) increased by 2.89 times while the indicators of primary incidence of HT increased by 1.89 times (Fig. 1). The comparison of the obtained results with similar results obtained when analyzing the whole country revealed a slight excess of the studied indicator in 2006 and 2009-2013. The determination of the overall HT prevalence across the Ivano-Frankivsk region revealed that in 1998 it was the highest in Bolekhiv and Kosiv region constituting 14655.0 and 13096.5 cases per 100,000 adult population, respectively. However, in 2007, among all the districts of Ivano-Frankivsk region, the number of patients with HT was the lowest in Bolekhiv. Over the past 7 seven years, the highest rates of the overall HT prevalence were observed in Rohatyn district as well as Tlumach district. It should be noted that over the past 17 years, HT incidence in all the districts increased from 1.86 to 4.69 times. The analysis of primary incidence of HT across the districts did not reveal a clear negative or positive dynamics: this indicator ranged depending on the studied period. However, in Halych district (2005, 2006, 2008), Kosiv district (2000, 2001, 2002, 2003, 2009, 2010), Nadvirna district (2008-2014) and Sniatyn district (2011-2014), the number of incident cases of HT was higher compared to other districts of Ivano-Frankivsk region.

The indicator of the overall IHD prevalence among the adult population of Ivano-Frankivsk region during the studied period increased by 2.11 times ranging from 9780.3 to 20629.1 cases per 100,000 population (Fig.2). The highest incidence rates of IHD were observed in Horodenka district (2008-2012), Tlumach district (2009, 2010) and Bohorodchany district (2011, 2013, 2014). At the same time, the highest number of incident cases was observed in Dolyna district (2010-2014), Sniatyn district (2011-2013) and Nadvirna district (2008, 2009).

The dynamic increase in the indicators of both the overall prevalence and primary incidence of IHD chronic forms, angina pectoris in particular (Fig.3) was observed – from 2975 to 6126.2 cases per 100,000 population (by 2.06 times) and from 333 to 432.3 cases per 100,000 population (by 1.29 times).

It should be noted that since 2012 a reduction in the prevalence of angina pectoris from 6545.7 to 6126.2 cases per 100,000 population (by 1.07 times) was observed. The highest

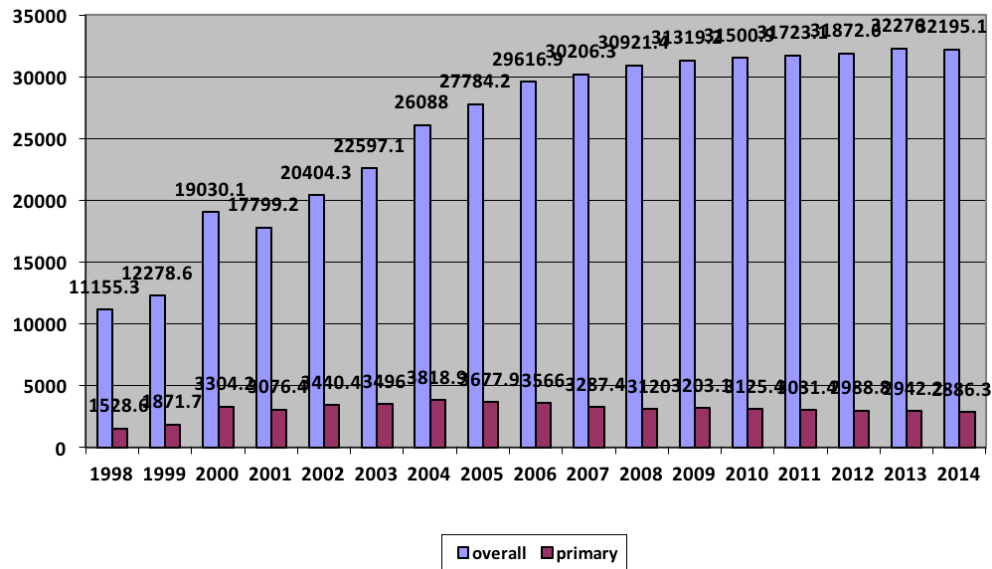


Figure 1. HT incidence per 100,000 adult population of Ivano-Frankivsk region.

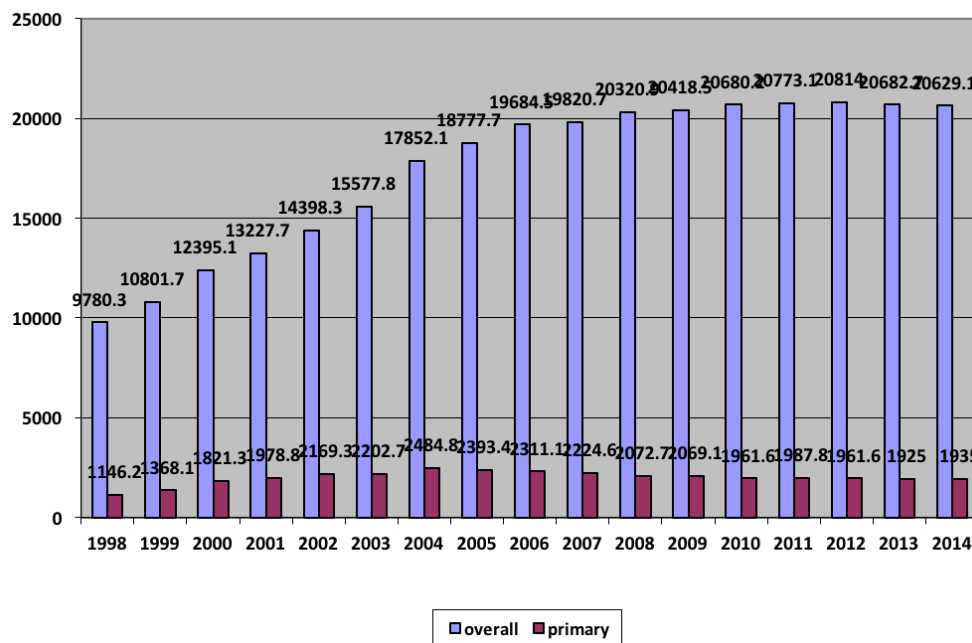


Figure 2. IHD incidence per 100,000 adult population of Ivano-Frankivsk region.

incidence rates of angina pectoris were observed in Bolekhiv (2008-2013), Horodenka district (2008-2010) and Tlumach district (2011, 2012, 2014). At the same time, the highest number of incident cases was observed in Horodenka district (2008-2011, 2013, 2014) and Rohatyn district (2009-2010).

During the studied period, the increase in the incidence of acute myocardial infarction from 81 to 108.2 cases per 100,000 population (by 1.34 times) was detected as well (Fig. 4). It should be noted that over the past 5 years, the incidence of acute myocardial infarction reduced by 7.7%

(from 117.2 to 108.2 cases per 100,000 population). The highest incidence rates were observed in Ivano-Frankivsk (2008, 2010-2013), Dolyna district (2005, 2007) and Rohatyn district (2000, 2004, 2005, 2006, 2009, 2011-2014). Cardiovascular diseases (CVD) are known to be the most urgent problem of modern health care system having no geographical, socio-economic and sexual preferences [4]. They remain to be the major cause of mortality accounting for about 17,300,000 cases per year [5]. According to experts, by 2030, the proportion of cardiovascular death will have exceeded this indicator

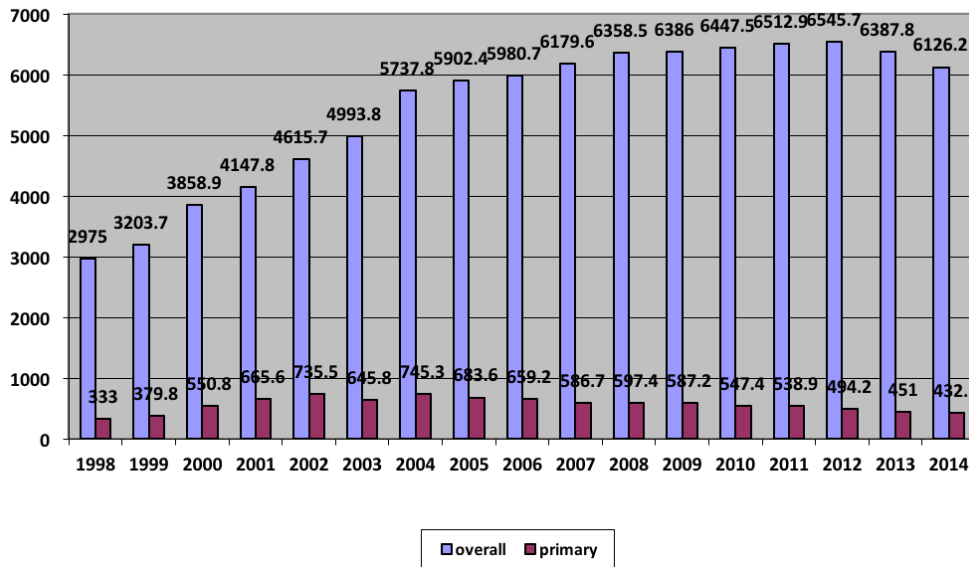


Figure 3. Angina pectoris incidence per 100,000 adult population of Ivano-Frankivsk region.

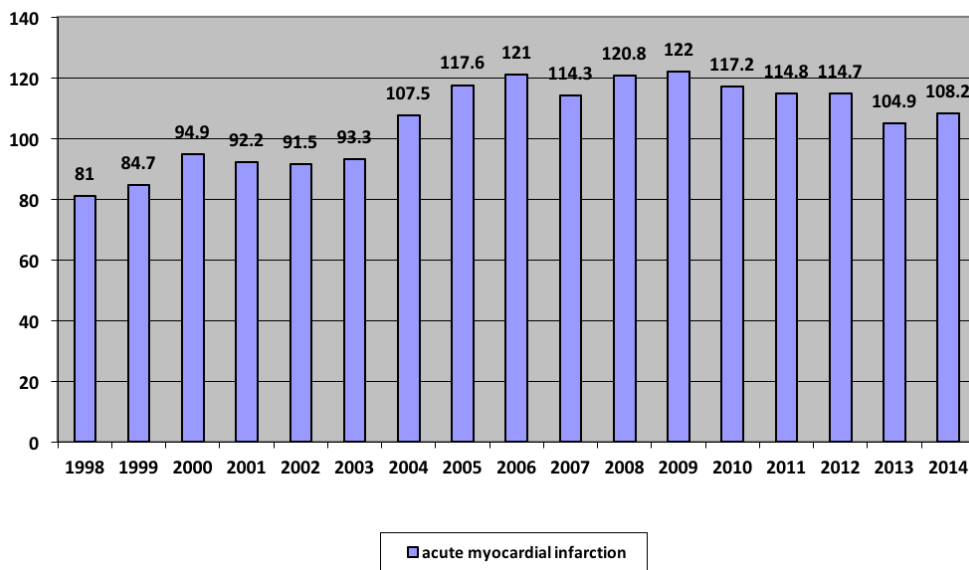


Figure 4. Myocardial infarction incidence per 100,000 adult population of Ivano-Frankivsk region.

by 23.6 million [8]. There is a tendency toward increasing mortality from CCD in low-income as well as middle-income countries where nearly 80% of deaths occur among young people of working age [5]. This situation is closely related to changes occurring worldwide, namely population ageing and growth, globalization, rapid urbanization, changes in social structure and economic development. Statistical predictions indicate that by 2025, 43.5% of the population in developing countries will have lived in towns and cities (in 1994, their proportion was 21.9% only) [4]. The “globalization” of dietary habits (high intake of carbohydrates and saturated fats), reduced physical activity and an increase in stressors are the

global burden of CVD.

The WHO experts predict economic losses due to CVD equivalent to 3.7 trillion US dollars by 2025. At the same time, the reduction in cardiovascular mortality by 10% allow low-income as well as middle-income countries to save 377 billion US dollars [7].

Since the 30-ies of the last century, the incidence of CVD has increased in developed countries. Since the mid-1970s, CVD mortality rate has stabilized in some high-income countries due to the reduction in risk factors as well as the improvement of treatment. At the same time, this indicator increased in low-income as well as middle-income countries [9].

According to the Prospective Urban Rural Epidemiological (PURE) study – a cohort study which included 150,000 adults from 17 countries at different stages of economic development – cardiovascular disease mortality rate was the lowest in low-income countries: 9.23 cases per 1,000 people (5.59 cases per 1,000 people in middle-income countries and 2.43 cases per 1,000 people in high-income countries). The highest incidence rate of major cardiovascular events was observed in rural areas (6.25 vs 4.83 cases per 1,000 people a year,  $p < 0.001$ ). The similar trend was observed in case of fatal cardiovascular events: 3.09 vs 1.71 cases per 1,000 people a year as well as total mortality: 8.01 vs 4.48 deaths per 1,000 people a year [10].

Secondary prevention of CVD is a significant factor in longevity as well. It includes the intake of certain medications as well as maintaining a healthy lifestyle. However, according to the data of the cross-sectional study EUROASPIRE IV, which included Ukraine as well, only less than half of patients with past acute coronary syndrome or revascularization due to IHD participate in rehabilitation programs. Moreover, most of them did not adhere to the standards of secondary prevention: there was a large proportion of overweight and obese people, smokers, people with hypodynamia and those having unhealthy eating habits [11].

### 3. Conclusions

Thus, during the studied period, circulatory system diseases were the leading causes of death among the population of the Carpathian region accounting for 58.2% of cases in 1998 and 60.9% of cases in 2007. The increase in the indicators of the overall HT prevalence (all forms) by 2.89 times, primary incidence of HT by 1.89 times, the incidence of IHD by 2.11 times and the incidence of acute myocardial infarction by 1.07 times turned out to be important factors affecting life expectancy of Ivano-Frankivsk region residents. Such tendency toward changes in the indicators was more pronounced in the areas with higher development pressure.

### 4. Prospects for further research

Prospects for further research include the study of the distribution of cardiovascular risk factors among people of different age groups living in the Carpathian region.

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