

*Ecological situation, population problem and the health of people
in Belarus and neighboring countries including EU Member States.
International Scientific Research Centre „Ecology and Health”*

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Radio-ecological problem.

The ecological environment, influencing health of people, regulates developments of a human society. Not looking on considerable progress in business of protection of environment and therefore health of people, there are countries in which there are serious environmental problems. First of all, there are the countries of the former Soviet Union. The aspiration to catch up and overtake in the military and economic development of the country of the West forced a management of the former Soviet Union to introduce the industrial technologies, making fatal impact on environment and therefore on health of people. First of all it is necessary to consider the tests of the nuclear weapon spent by the USSR.

Pollution by radioactive elements of huge territories of Belarus, Lithuania, Latvia, Estonia, Ukraine, Russia, since 60th years of 20th century is a consequence of such activity. The population of these countries had no information on the existing radiating factor, and it could not is natural to protect itself from its influence in no way.

Starting with the sixties there has been a great number of ^{137}Cs radionuclides contents in foodstuffs consumed by the inhabitants of mentioned states within many years. (Marey A.N. and co-authors, 1974. Rusyayev A.P. and co-authors, 1974. Ternov V.I., Gurskaya N.V., 1974). – Fig. 1.

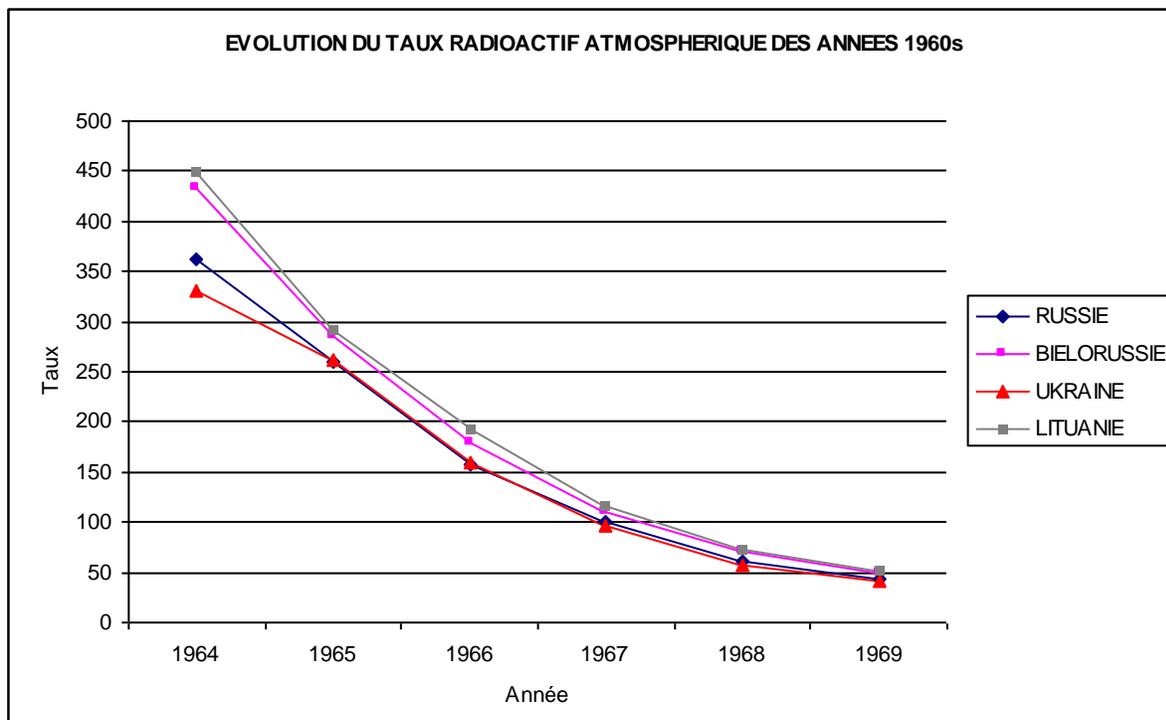


Fig. 1. ^{137}Cs contents in villagers' daily food allowance in **IIKu** (Marey A.N. and co-authors, 1974).

Cow's milk is one of the basic products forming rather high levels of ^{137}Cs radionuclides contents in inhabitants of Belarus and Baltic lands. “Milk-Caesium Map” was created – the largest ^{137}Cs radionuclides contents were observed from 1967 to 1970 in Gomel region of the Republic of Belarus (Fig.2).



Fig. 2. ^{137}Cs contents in cow's milk from different districts of Belarus in the sixties of the 20th century (Marey A.N. and co-authors, 1974).

The Chernobyl accident of 1986 intensified a lot the already existing radiation effects on the population of some European countries and the Republic of Belarus, first of all.

The map of ^{137}Cs radionuclides deposition in the territory of Belarus after the Chernobyl accident in 1992 (Fig. 3) almost corresponds to the map of such radionuclides deposition in the territory of Belarus in the sixties published in 1974 (Marey A.N. and co-authors, 1974.).



Fig.3. Map of ^{137}Cs deposition in the territory of Belarus in 1992.

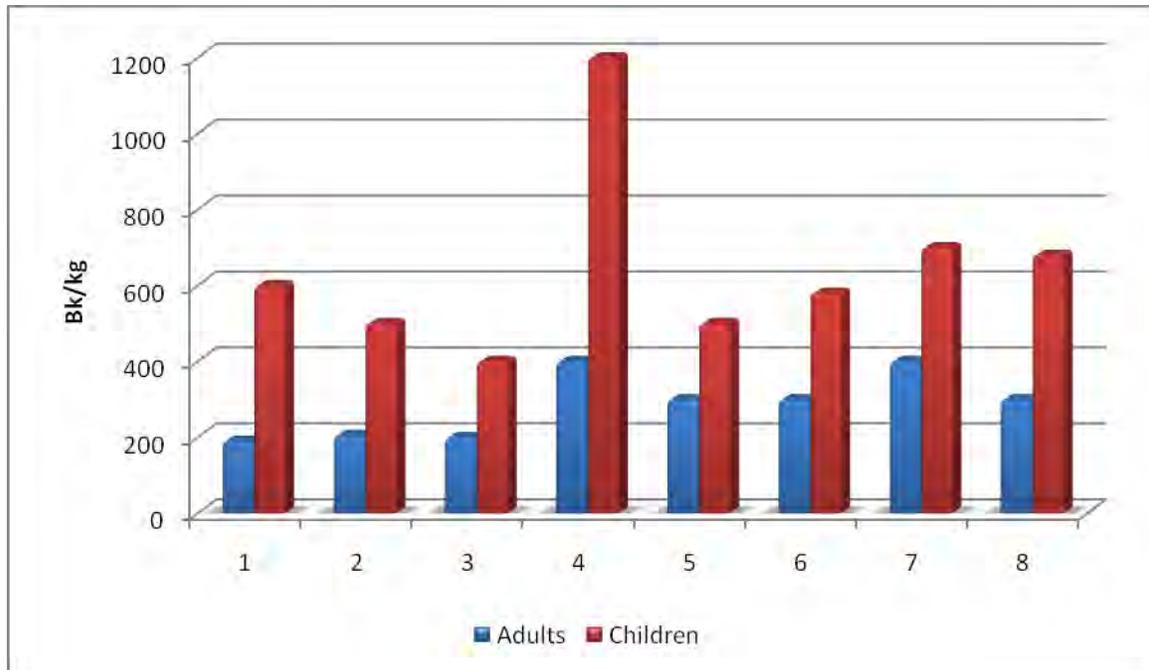
Just after the Chernobyl accident of 1986 due to the actions performed by the western public organizations it became to be possible to speak about the influence of radiation agents on the health of people in Belarus and another countries.

According to the scale and consequences the Chernobyl accident dated to April 26, 1986 is considered to be the largest man-caused catastrophe in the human history. Its social, medical and ecological consequences require the detailed study. From all the European countries Belarus was affected to a greater extent. About 70% of radioactive substances released to the atmosphere as a result of the accident at the 4th block of the Chernobyl NPP contaminated 23% of the territory of the republic. At present in the zone there live about 1.4 million inhabitants including 260 thousand children. The radiation situation in several affected regions is still difficult.

The greatest danger is represented by the consumption of the foodstuffs containing radioactive elements Cs-137 and Sr-90.

The contribution of the mentioned radionuclides to the internal dose reaches to 70 to 80% (National report. 20 years after the Chernobyl accident).

Cs-137 radionuclides under conditions of permanent chronic intake by people with food are accumulated in vitally important organs: thyroid gland, heart, kidneys, spleen, cerebrum (Fig.4).



1 – myocardium, 2 – brain, 3 – liver, 4 – thyroid gland, 5 – kidneys, 6 – spleen, 7 – skeletal muscles, 8 – small intestine.

Fig.4. ¹³⁷Caesium contents in adults' and children's viscera according to the data of radiometric measurements of the autopsies of inhabitants of Gomel region in 1997 and 1998 (Yu. I. Bandazhevsky, 1999, 2003).

There were determined negative effects of ¹³⁷Cs radionuclides incorporated into the human organism on the state of vitally important systems, first of all, on cardiovascular, endocrine, reproductive, digestive, urinary and immune systems (Bandazhevsky Yu.I. and co-authors, 1993-2003).

Population problem and the health of people.

Starting with the sixties of the 20th century in the Republic of Belarus there has been increasing a death-rate and there has been decreasing a birth-rate (Fig. 5).

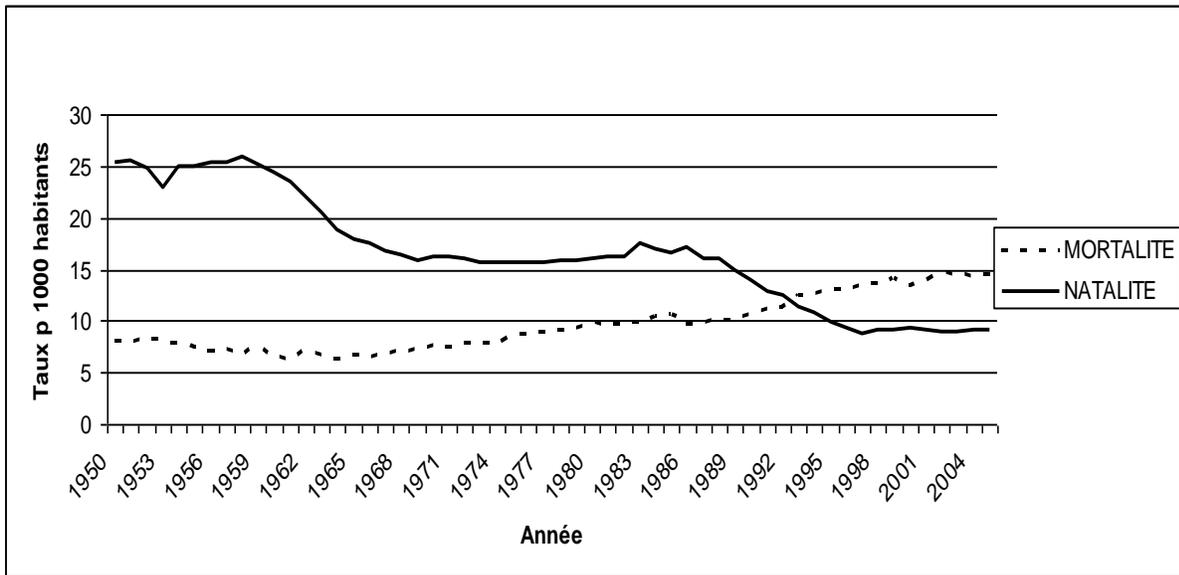


Fig. 5. Indices of the death-rate and the birth-rate (per 1000 inhabitants) in the Republic of Belarus.

At present a demographic index (a difference between the indices of the death-rate and the birth-rate) has negative values making, for example, -5,5‰ in 2003 and -5.2‰ in 2005 (Fig.6).

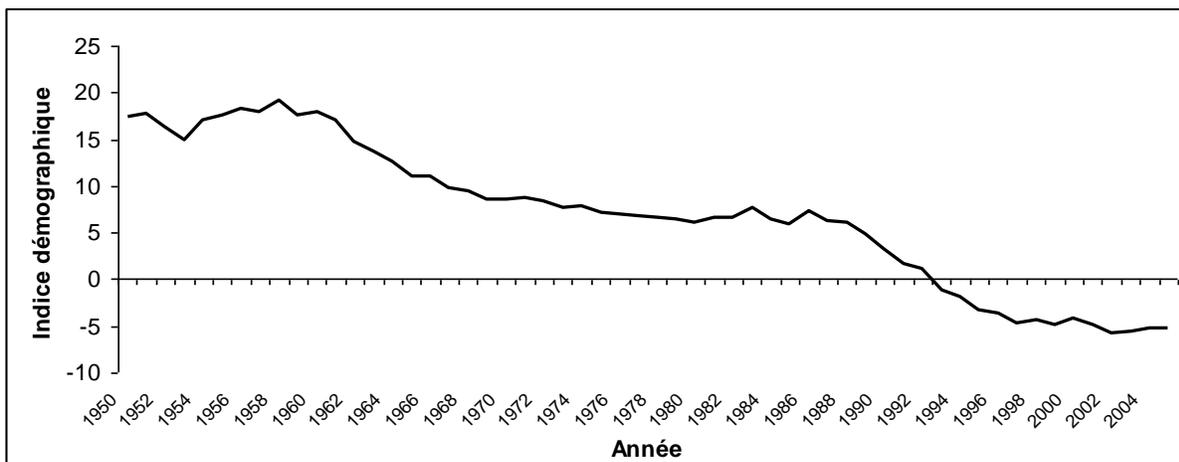


Fig. 6. Demographic index in the Republic of Belarus.

The contact with radiation agents led for the death-rate of the population in the Republic of Belarus to be increased in 2 times within the last 20 years. The process of the death of people in the district with a high level of contamination of the territory by ^{137}Cs и ^{90}Sr radionuclides is especially expressed (Fig.7).

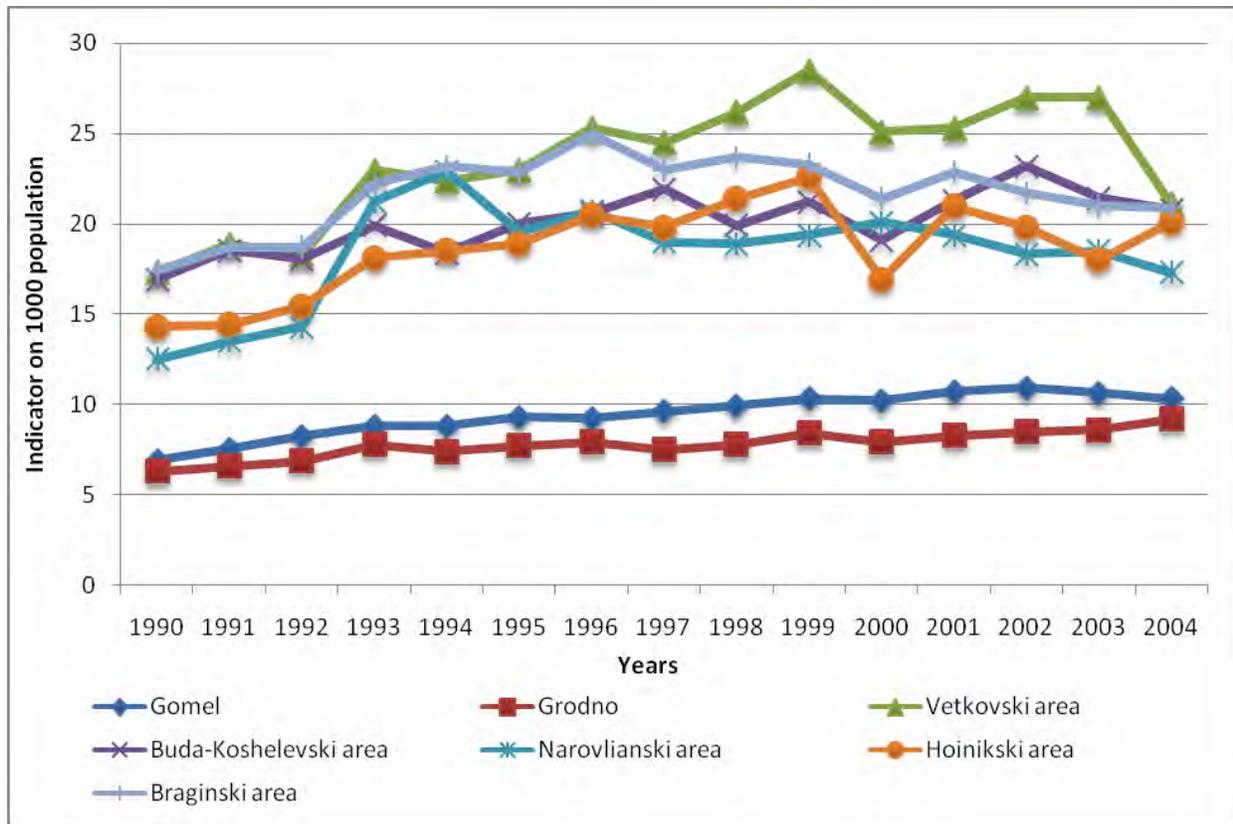


Fig.7. The dynamics of the death-rate of the population in different districts of Belarus.

The duration of life of both men and women has decreased in comparison with Western countries, such as France, for example (Fig. 8 and 9).

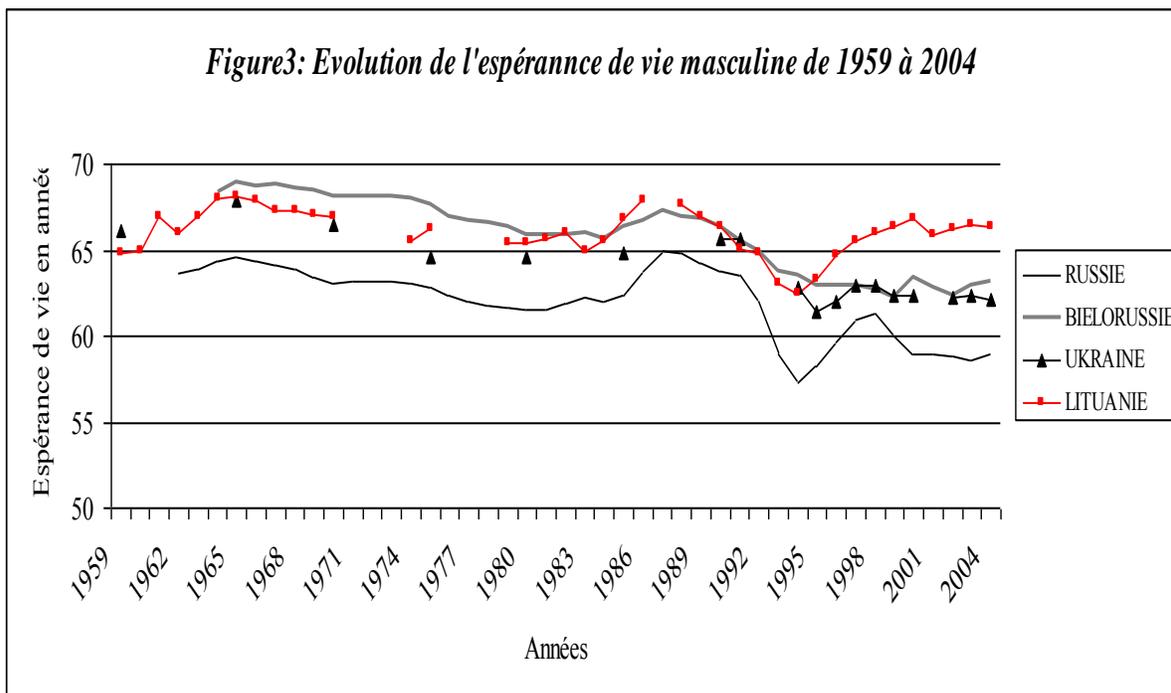


Fig. 8. The duration of life of men in the countries of Eastern Europe.

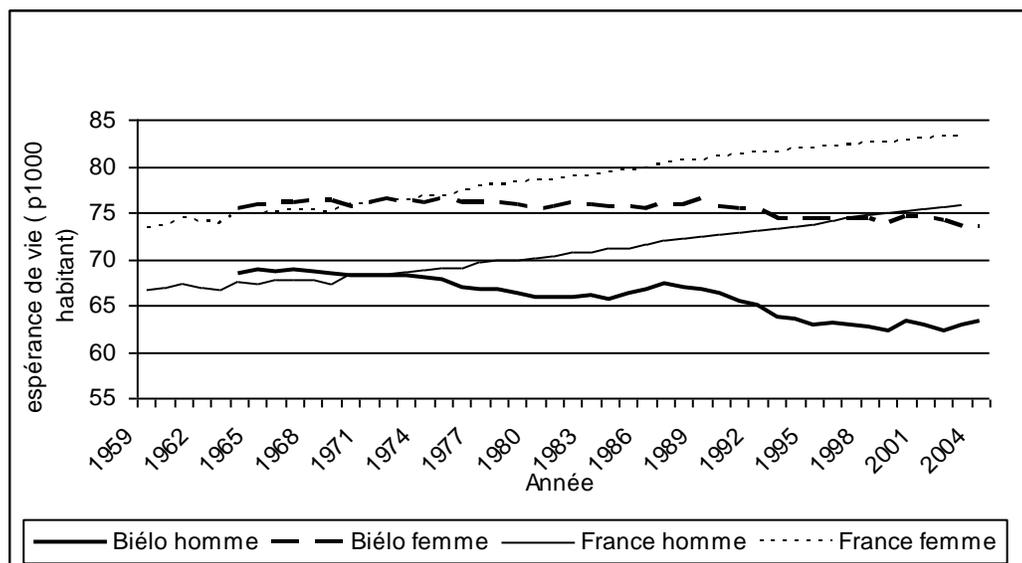


Fig. 9. The duration of men's and women's life in Belarus and in France.

Among the causes of death of the inhabitants of Belarus cardiovascular and oncologic diseases take dominant place (Fig 10).

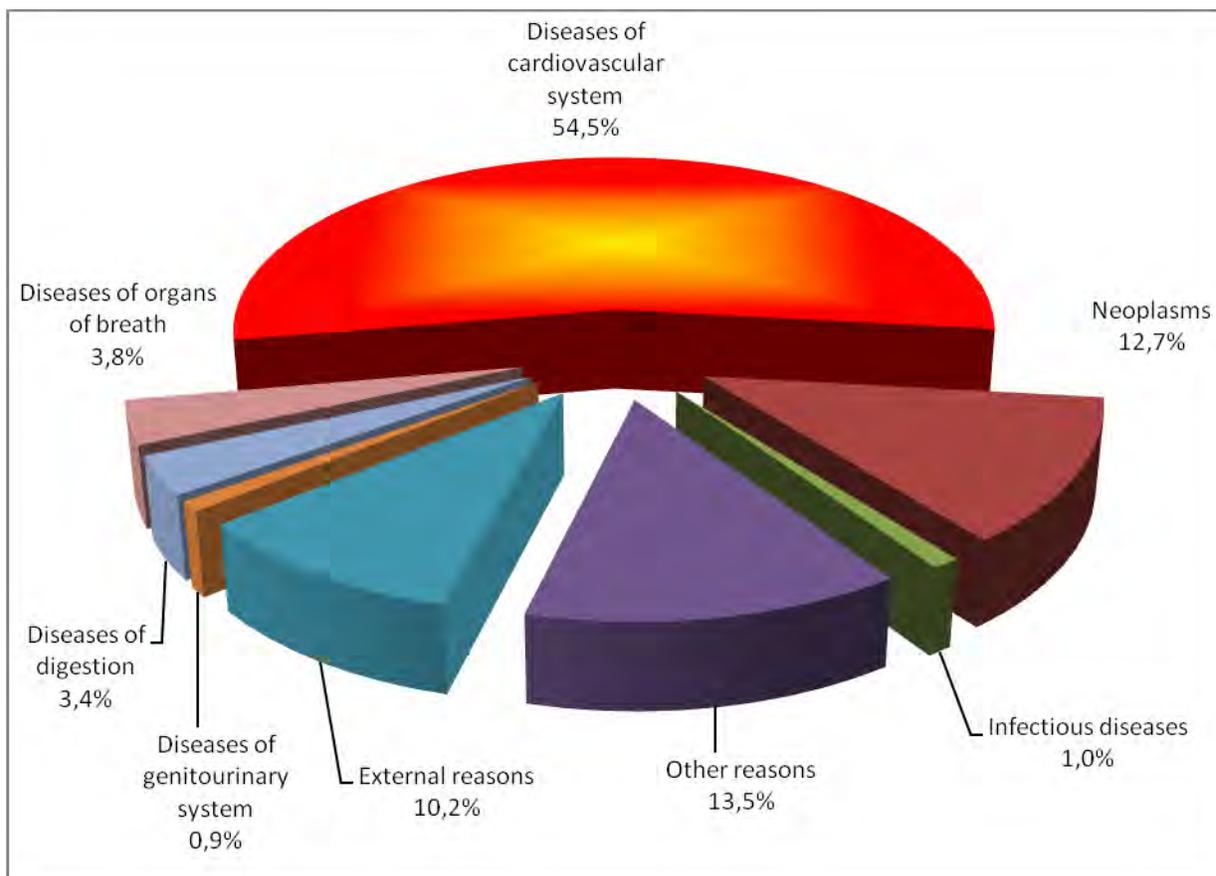


Fig.10. Structure of the causes of death in 2007.

There causes anxiety the scientifically significant increase of the primary incidence with the diseases of blood circulation system (Fig. 11) especially among the participants of the liquidation of consequences of the accident at the Chernobyl nuclear power plant.

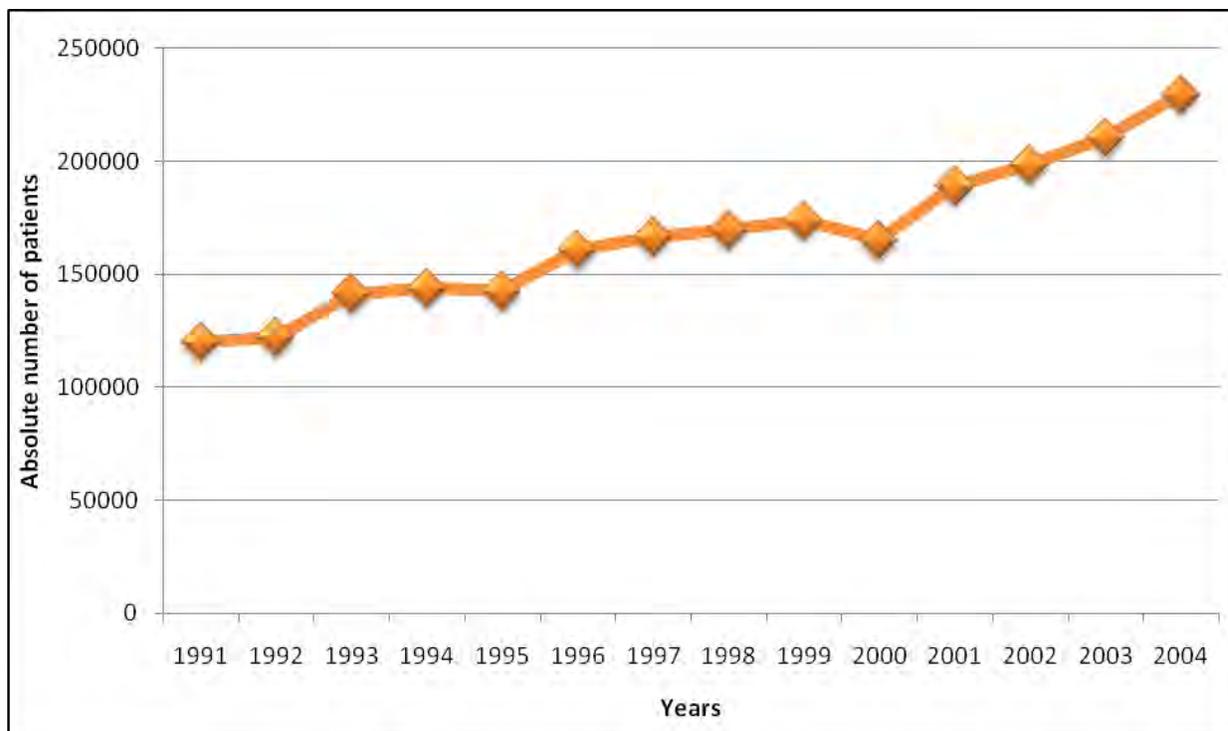


Fig.11. The dynamics of cardiovascular diseases in the Republic of Belarus.

There should be emphasized the scientifically significant increase of the incidence level with the diseases defined by increased blood pressure, myocardial ischemia, including acute myocardial infarction, and by cerebrovascular diseases among the male liquidators in comparison with the same figures among the man of another categories of the affected population (Fig. 12).

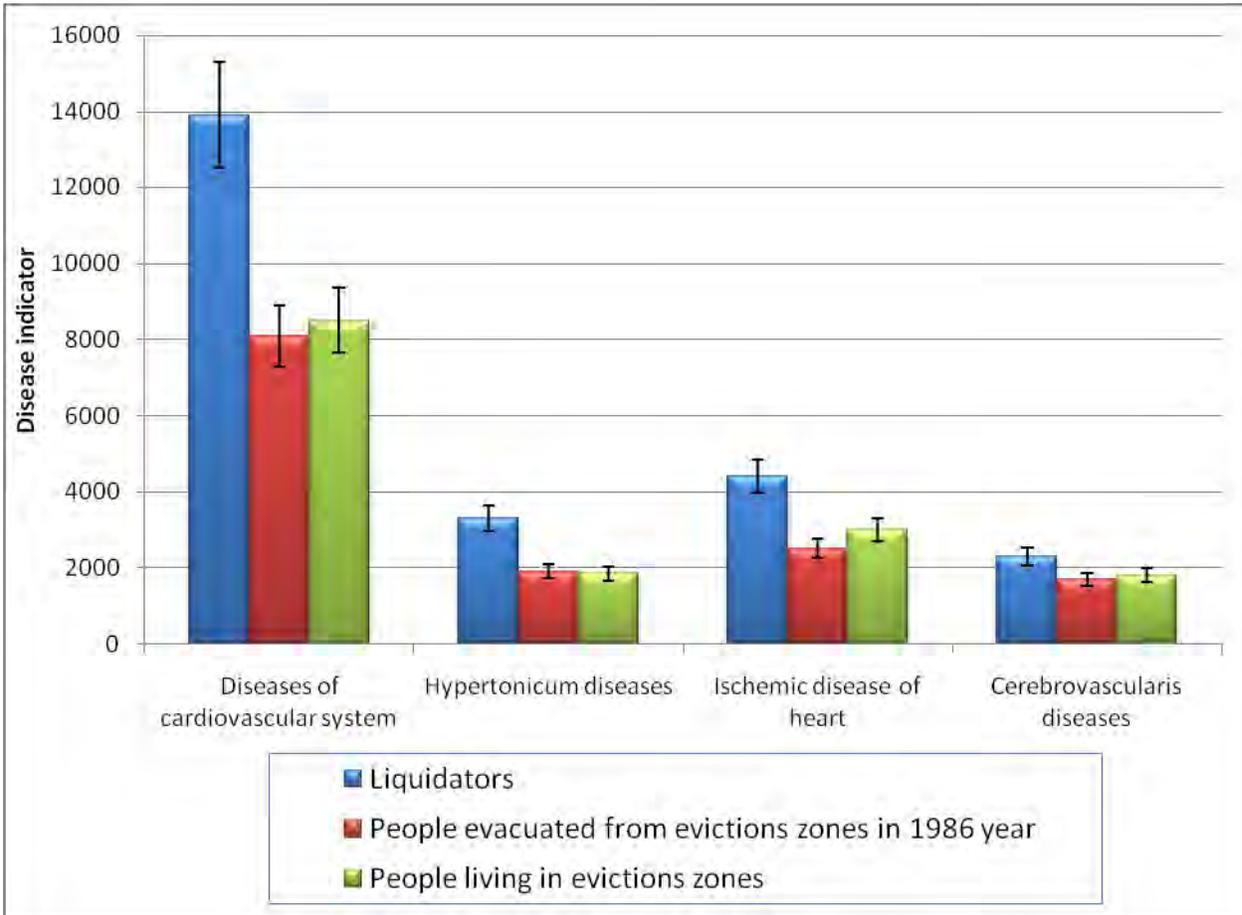


Fig. 12. Standardized figures of the incidence of the men of the Republic of Belarus affected by the accident at the Chernobyl NPP with the diseases of blood circulation system.

^{137}Cs radionuclides incorporation in schoolchildren causes the disorder of electrophysiological processes in cardiac muscle shown by the disorder of cardiac beat rate. There was a defined dependence between the radionuclide contents in the organism and the arrhythmia rate (Fig. 13).

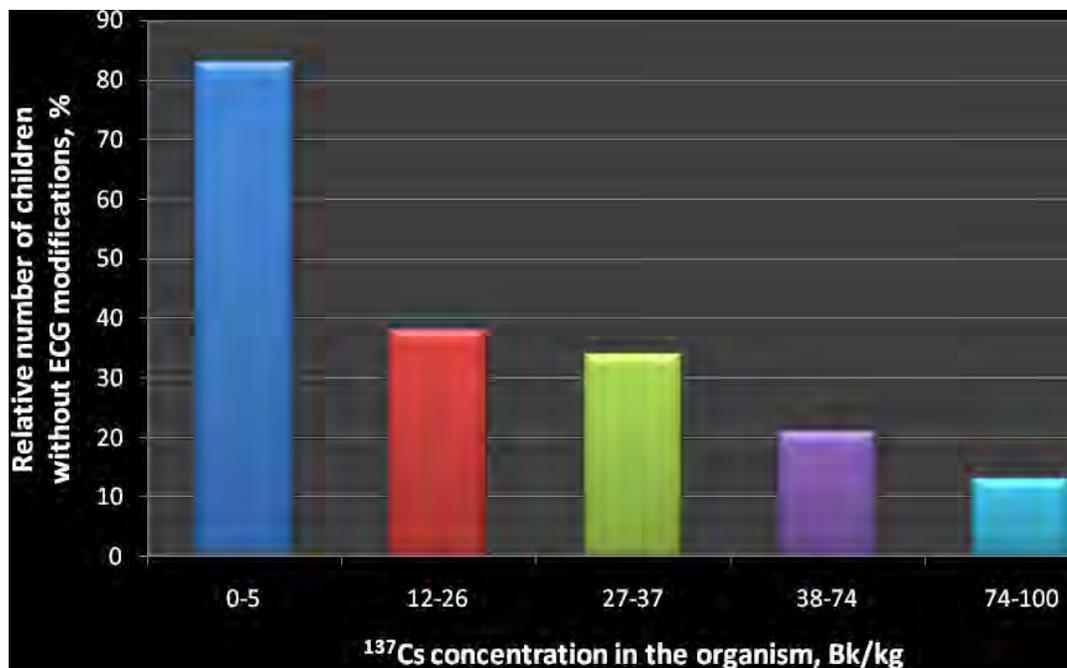


Fig. 13. Number of children without ECG modifications as a function of ^{137}Cs concentration in the organism.

The indices of morbidity in the countries of the former USSR differ sharply for the worse from same in the western countries (Fig. 14, 15).

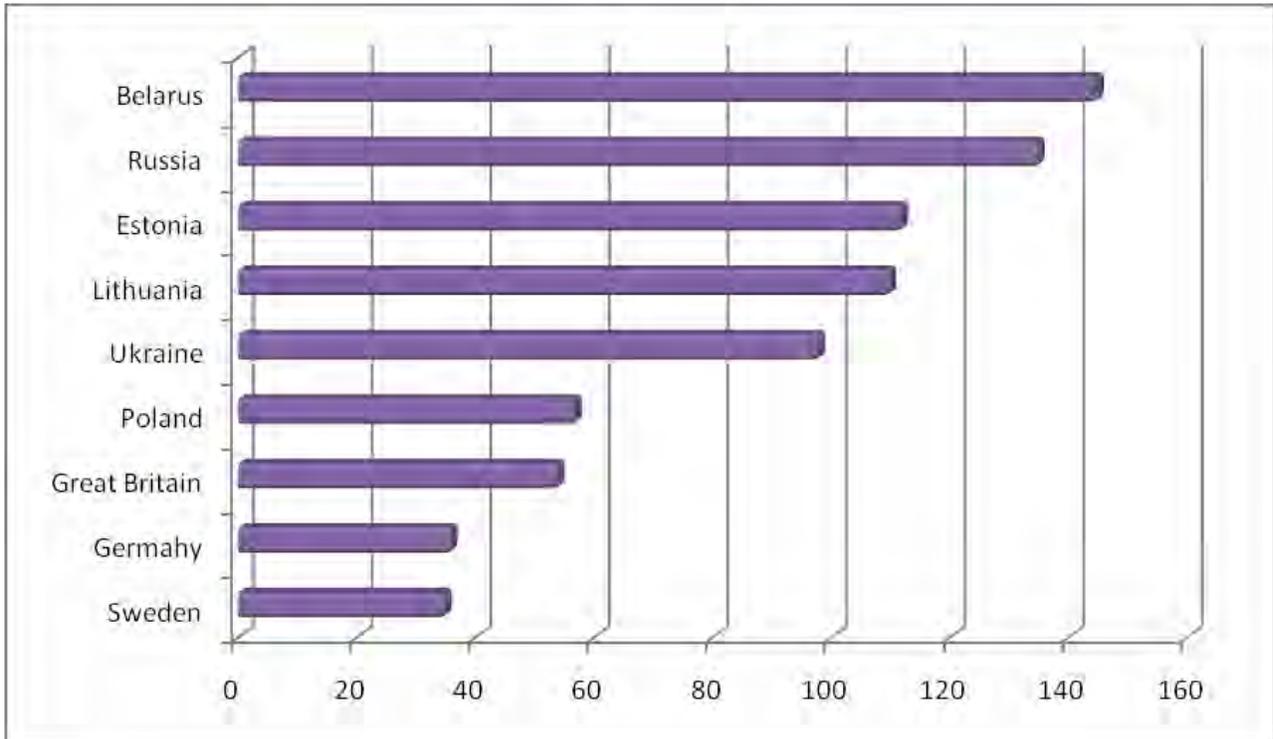


Fig. 14. Ischemic heart disease rate in Europa for 100 thousand inhabitants in 1993-1994.

«The population health in Europe. Report on monitoring measures to obtain health for everyone in 1993-1994. Regional VOZ publications, European edition, № 56, Copenhagen, 1995».

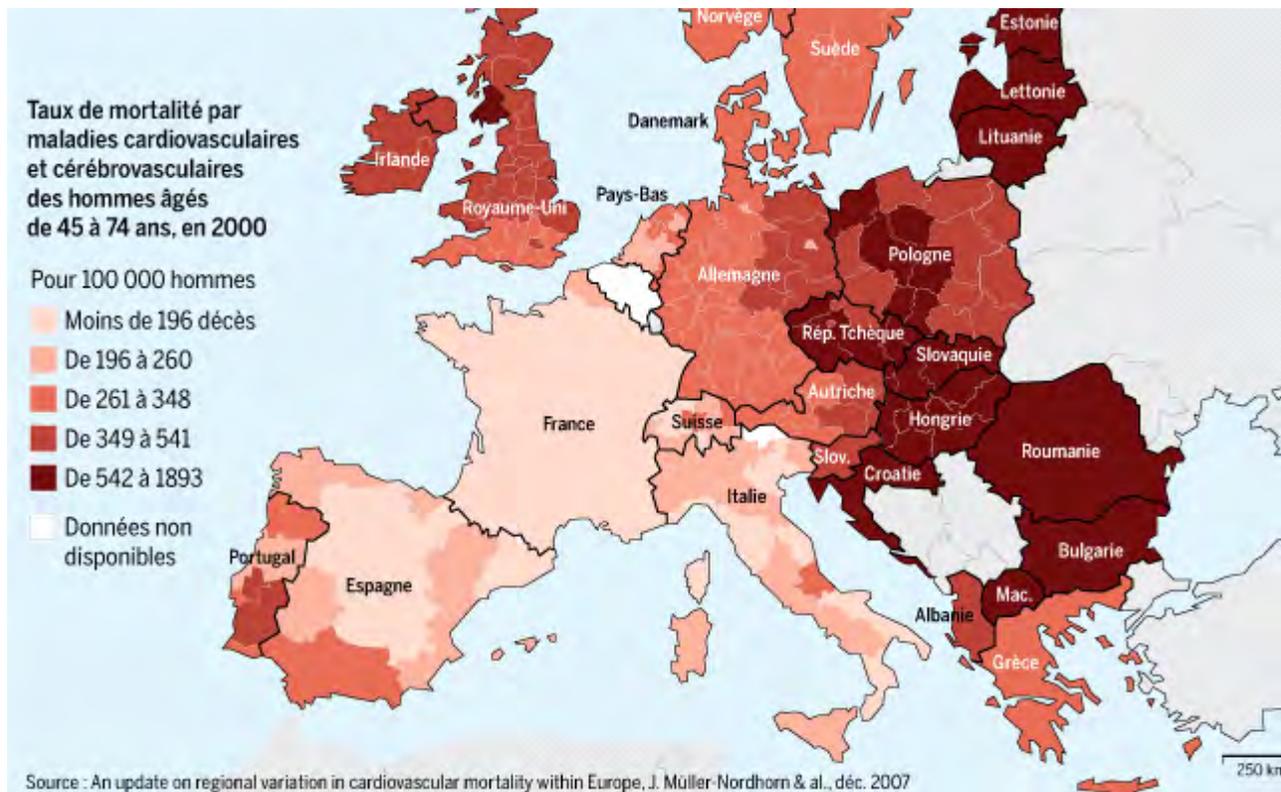


Fig. 15. Death-rate among males caused by cardiovascular diseases in the countries of the European Union (Le Monde .FR 03.03.08 – Les maladies Cardio-vasculaires en Europe).

During 20 years after Chernobyl the incidence with malignant neoplasms increased in several times in the Republic of Belarus (Fig. 16).

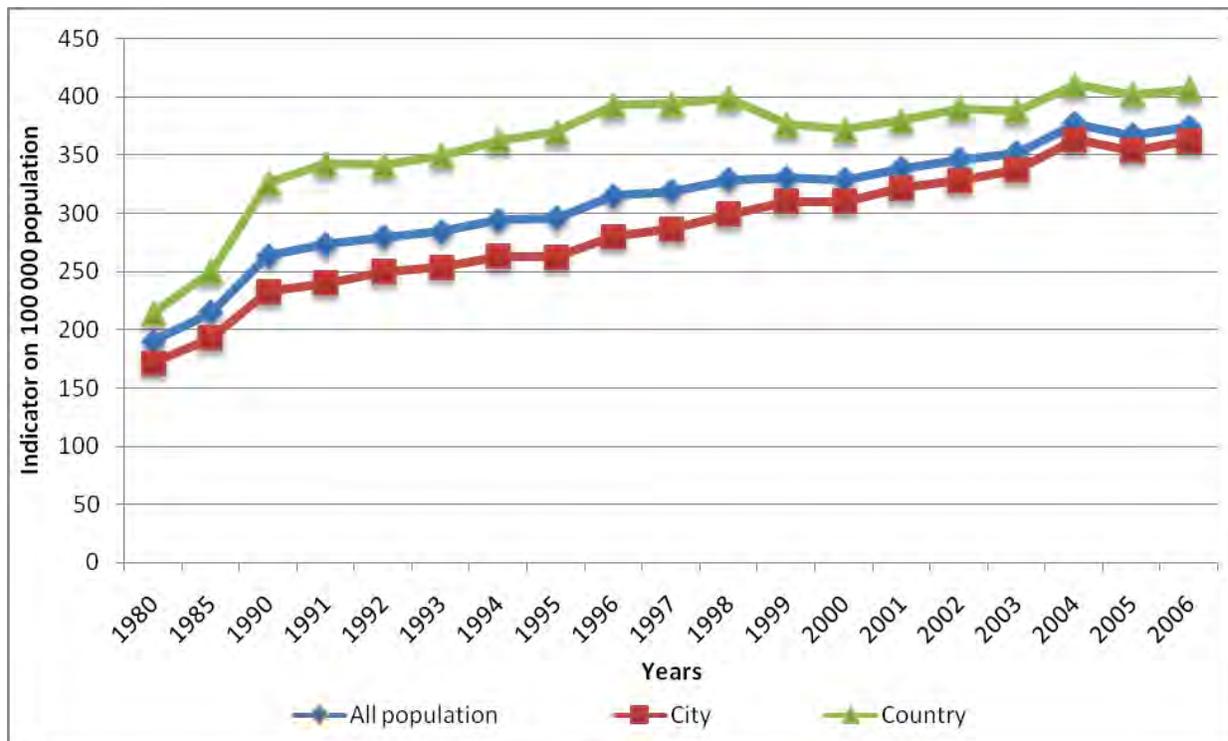


Fig.16. Incidence of the population of the Republic of Belarus with malignant neoplasms (per 100000 inhabitants).

From 1986 to 2004 after the accident at the Chernobyl NPP 2500 children fell ill with thyroid cancer with its peak in 1995 and 1996. Their sickness rate increased in 39 times in comparison with the year 1986 (Fig. 17, 18).

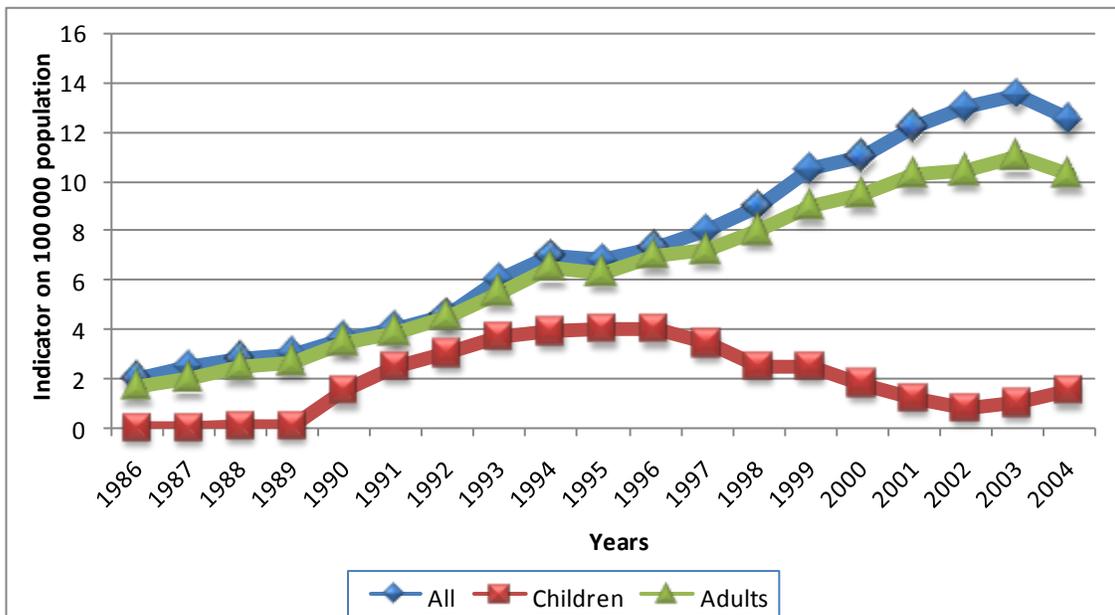


Fig.17. The dynamics of the incidence of the Belarusian population with thyroid cancer.

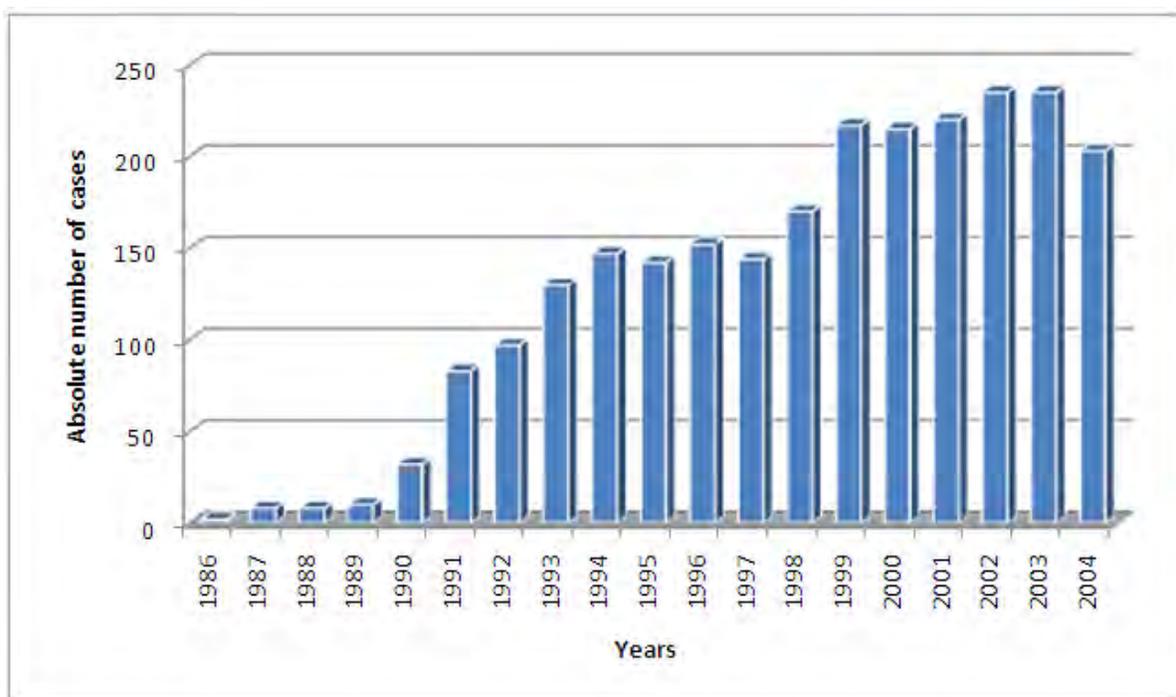


Fig. 18. The dynamics of the absolute number of the cases of thyroid cancer detected for the first time.

There should be mentioned the more difficult situation with the liquidators of the accident at the Chernobyl NPP received huge external doses during the liquidation of consequences of the accident at the Chernobyl nuclear power plant and having been exposed to the permanent internal radioactive irradiation during many next years.

The relative risk of the incidence with malignant neoplasms of all sites among the liquidators had begun to increase since 1997 and exceeded the value of 1.0 from 1999 to 2003 authentically (Fig. 19).

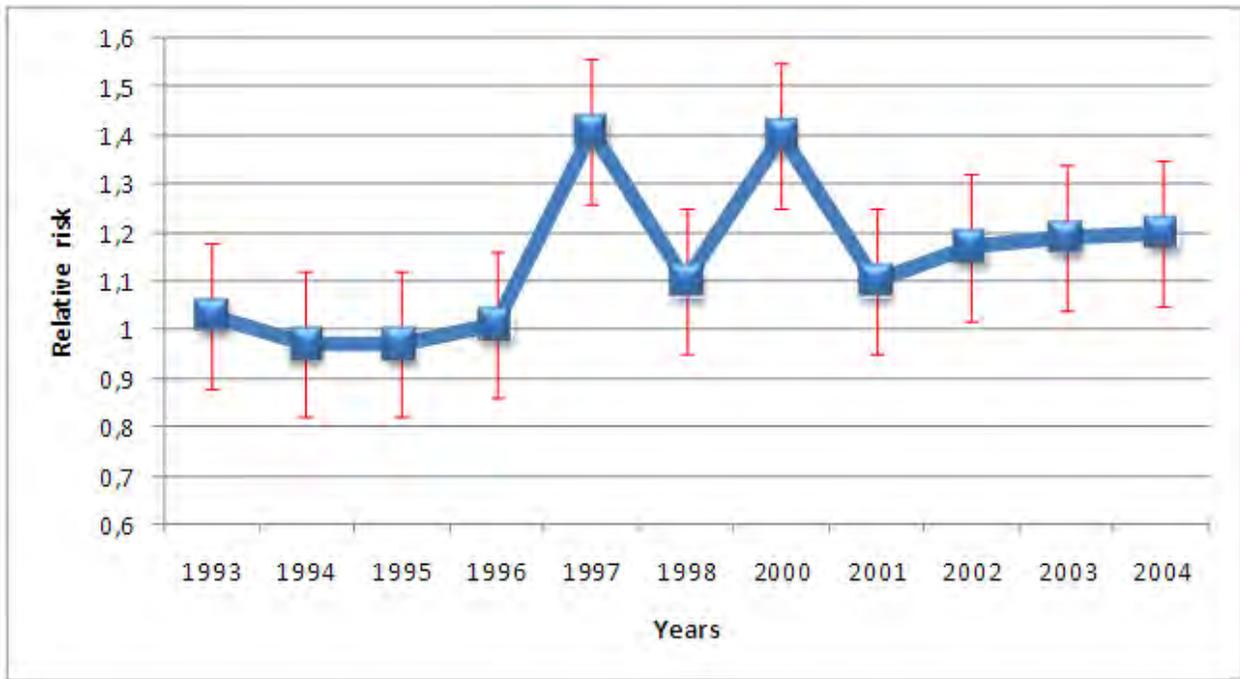


Fig. 19. The dynamics of the relative risk of the incidence with malignant neoplasms of all sites among the liquidators

The rate of the increase of the incidence with malignant neoplasms (including malignant neoplasms of lungs, stomach, kidneys and urinary bladder) of all sites among the liquidators is authentically higher than the same figure among another groups of Belarusian inhabitants (Fig. 20, 21).

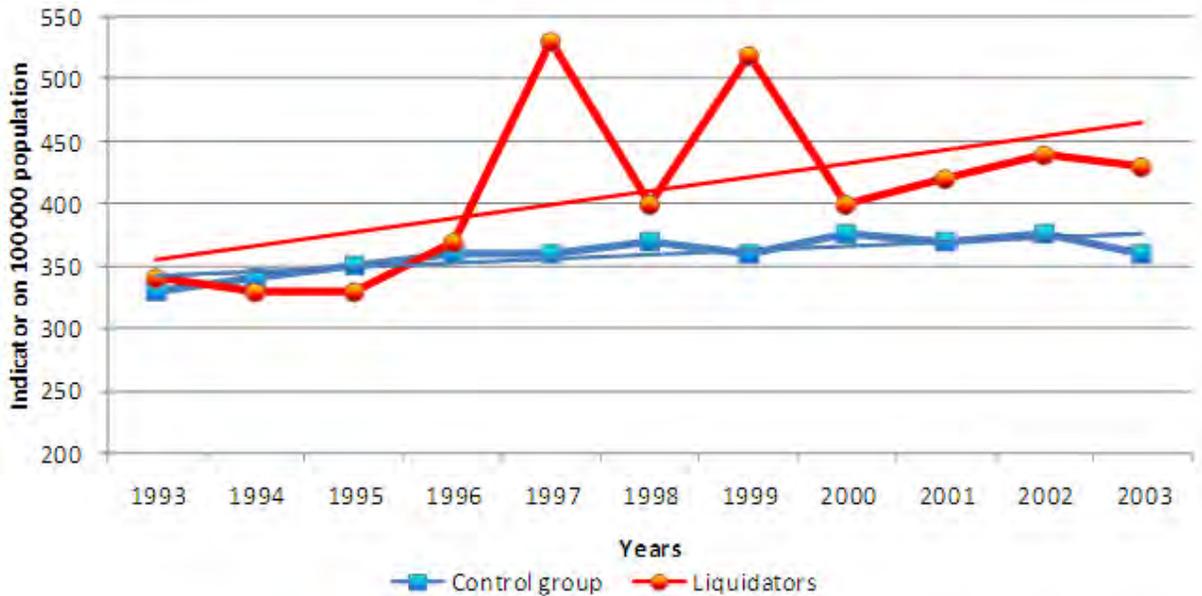


Fig. 20. The dynamics of standardized figures of the incidence with malignant neoplasms of all sites among the liquidators and the population of the control group

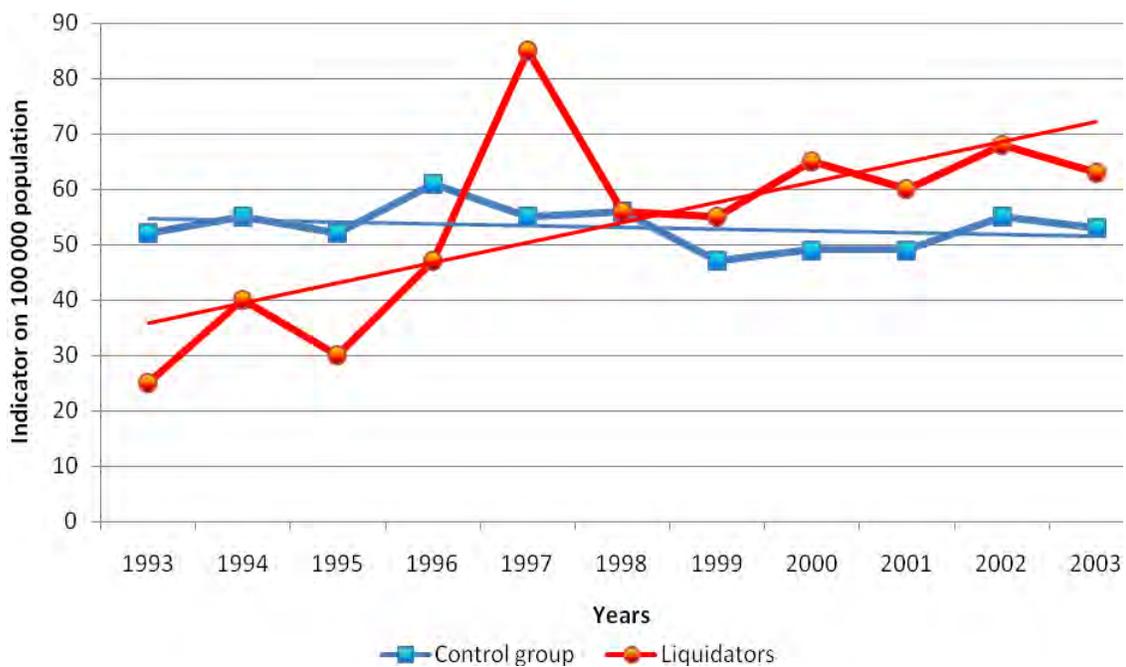


Fig. 21. The dynamics of standardized figures of the incidence with malignant neoplasms of lungs among the liquidators and the control group.

In the territory with the density of contamination of more than 555 kBq/m² the average increase of the incidence with breast cancer makes 32.7% and the same time the annual average increase of the incidence with breast cancer in the women from the control group and the women living in the territories with the density of ¹³⁷Cs contamination of 37-185kBq/m² increased on 1.2% and 5.7% (Fig. 22).

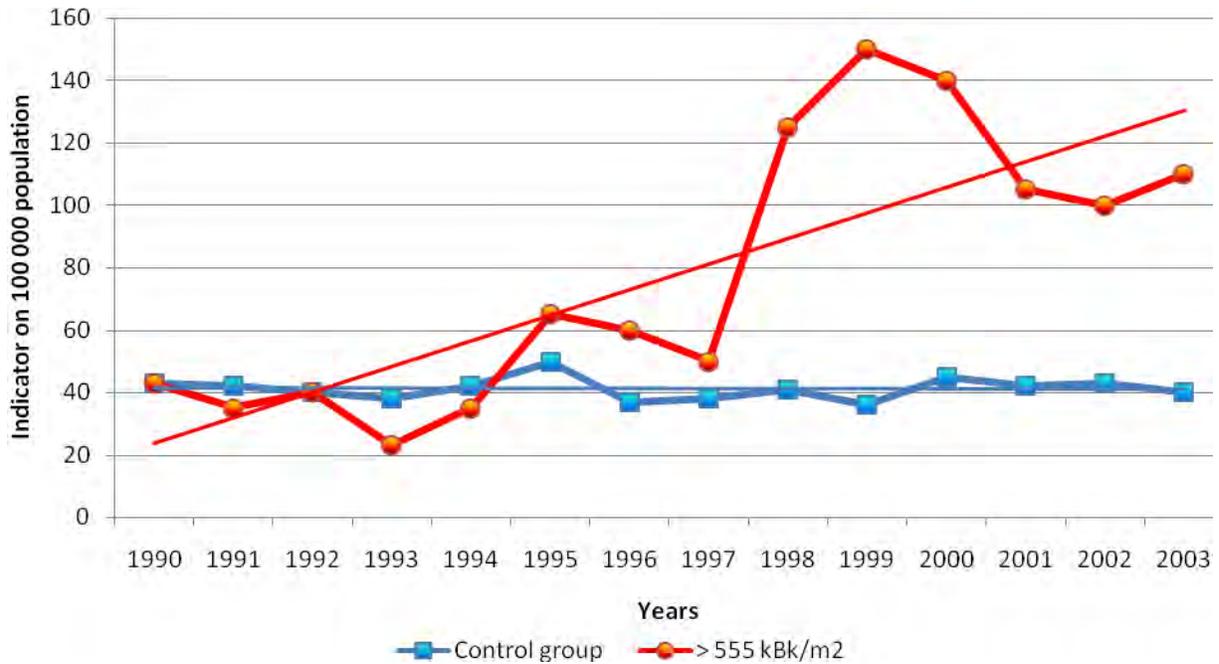


Fig. 22. The dynamics of the incidence with breast cancer living in Gomel region in the territories with the density of contamination of more than 555 kBq/m² and in the control group (Vitebsk region).

From 1993 to 2003 the annual increase of the incidence with cataract (6% in the mean) was detected in the male liquidators of the accident at the Chernobyl nuclear power plant. It is authentically higher in comparison with the same figures among the men of other categories of the affected population (Fig.23).

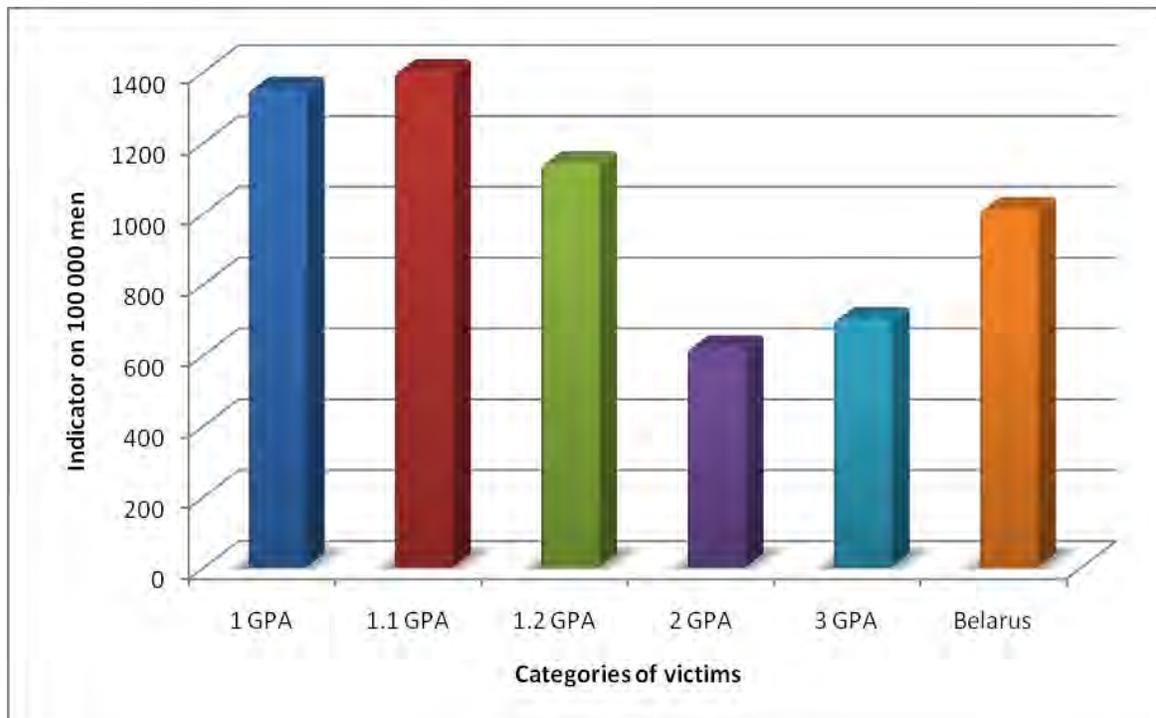


Fig. 23. Incidence with cataract among the men affected by accident at the Chernobyl nuclear power plant from 1993 to 2003 (per 100000 men)

There should be mentioned the increase of the cases of cataract in schoolchildren living in the radiocontaminated territory. At that the frequency of detecting this pathology of eyesight organs is in direct relation to the quantity of ^{137}Cs radionuclides in the organism (Fig. 24).

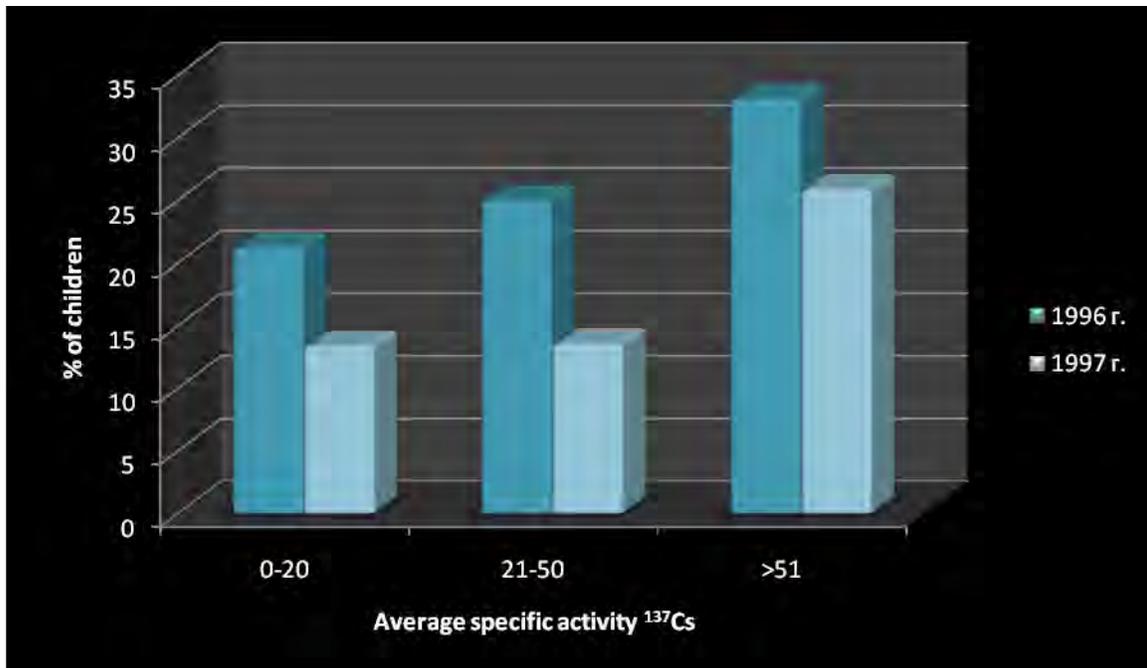


Fig. 24. The dynamics of the increase of the cases of cataract in the children of Vetka district of Gomel region depending on the level of the average specific activity of ^{137}Cs (Bq/kg) in the organism (Yu.I. Bandazhevsky and co-authors, 1997, 1999).

CONCLUSION

1. After 22 years after the accident at the Chernobyl nuclear power plant the inhabitants of the Republic of Belarus, living in the territory contaminated by radioactive elements and consuming these radionuclides for a long time, run the risk of the incidence by cardiovascular diseases and malignant neoplasms.

2. The steady rise of this pathology within 22 years after the accident at the Chernobyl nuclear power plant leads to the situation that is close to the demographic catastrophe when a death-rate of the population has begun to exceed a birth-rate in two times.

3. The more difficult situation takes place with the state of health of the liquidators of the accident at the Chernobyl nuclear power plant that can not but cause anxiety among the international community for the life of this category of Belarusian citizens.

4. The current situation requires the immediate decisions at state and international levels directed to the solution of the arisen problem – protection of the state of health of the citizens living in the territories affected by the accident at the Chernobyl NPP.

Creation of the research centre «Ecology and health» can be one of such decisions.

Results of the centre activities will be specific suggestions for the planning of the development of several spheres of the national economy, where the greatest attention will be paid to the solution of demographic problem, health protection.

In order to change the current situation it is necessary to conduct explicit scientific research estimating all parts of people life. The involvement of specialists from different scientific fields for the evaluation of the current situation will allow not only diagnosing effects of the emerged catastrophic situation to the generation of human resources but also foreseeing possible solutions of the problem. It is planed to involve in this work doctors, ecologists, economists, businessmen, lawyers from different countries of the world and first of all from the European Union.

It is foreseen to establish the scientific research centre at Mykolas Romeris University in Vilnius (Lithuania).

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