

THE LEGACY OF CHORNOBYL 1986 TO 1996 AND BEYOND

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BEFORE THE

COMMISSION ON SECURITY AND COOPERATION IN EUROPE

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THE LEGACY OF CHORNOBYL—1986 TO 1996 AND BEYOND

Tuesday, April 23, 1996

COMMISSION ON SECURITY AND COOPERATION IN EUROPE
Washington, DC.

The Commission convened in room 2154, Rayburn House Office Building, at 10:00 a.m., Chairman Christopher H. Smith, presiding.

Commissioners present: the Honorable Christopher H. Smith and the Honorable Frank R. Wolf.

Witnesses present: His Excellency Serguei N. Martynov, Ambassador of the Republic of Belarus; His Excellency Yuri Shcherbak, Ambassador of Ukraine; Dr. Murray Feshbach, Professor, Georgetown University; and Alexander Kuzma, Director of Development, Children of Chornobyl Relief Fund.

Mr. SMITH. The Commission will come to order. Good morning. Today's hearing focuses on the medical, environmental, social, political, and economic aftermath of the Chornobyl nuclear disaster, the world's worst nuclear accident. This Friday, April 26, marks the tenth anniversary of one of the most bitter legacies of the Soviet system. Chornobyl is a legacy that has had tremendous human costs and will continue to be felt for decades to come, especially in Ukraine and in Belarus, which bore the brunt of Chornobyl's radioactive fallout. The explosion of the reactor at Chornobyl released 200 times more radioactivity than was released by the atomic bombs at Hiroshima and Nagasaki combined. The physical and psychological health and welfare of hundreds of millions of people in the region, in Ukraine, Belarus and Russia, including nuclear clean-up workers, have been harmed by Chornobyl.

To cite just one example, thyroid cancer in children in Belarus is more than 200 times higher than normal. Several hundred thousand still live in the surrounding contaminated areas.

The scope of the destruction, and its long-term effects, cannot be overstated. Chornobyl's deadly fall-out continues. Inadequate decontamination efforts have failed to eliminate the radiation. The hurriedly erected concrete covering, the so-called "sarcophagus," over the obliterated fourth reactor has developed serious cracks. Unless concerted efforts are taken to repair it, experts fear that it will corrode, releasing tons of radioactive dust into the environment. In addition, there are continuing concerns about radio-nuclide pollution in the Dnipro River, Ukraine's main river, and the source of Kyiv's drinking water. Because of the latency period for various radiation-related diseases, the most significant health impact, regrettably, may be yet to come.

Ukraine and Belarus, which are undergoing an extremely difficult period of transition from the devastating effects of 70 years of communism, are simply not in a position to deal, by themselves, with what is, ultimately, an international problem. The international community is beginning to respond, as witnessed by the December 1995 Memorandum of Understanding between Ukraine and the G-7. This international cooperation is vital. Hopefully, such cooperation will help prevent future Chornobyls.

For today's hearing, I am very pleased to have this panel of very distinguished witnesses, including the Ambassadors of the two countries most affected.

Our first witness is Ambassador Serguei Martynov, Ambassador of Belarus to the United States, since 1993. In 1991, Ambassador Martynov served as Deputy Permanent Representative of the Republic of Belarus to the United Nations and subsequently became Belarus' first charge, opening the Belarus Embassy to Washington. A career diplomat with Belarus' Ministry of Foreign Affairs, the Ambassador has 12 years' experience in multilateral disarmament efforts, especially at the United Nations. The Ambassador will discuss the impact of Chornobyl on Belarus, the country that received 70 percent of the radiation fall-out.

Our second witness, Ambassador Yuri Shcherbak, in addition to being Ukraine's Ambassador to the United States since 1994, has a very direct, personal connection to Chornobyl. A physician, epidemiologist, and writer by profession, Dr. Shcherbak was an eye-witness to the Chornobyl disaster and exposed official malfeasance before and after the accident in his documentary novel *Chornobyl*. In 1988 he founded and led the Ukrainian Green movement. He entered politics in 1989 and was elected to the USSR Supreme Soviet. Having never been a member of the Communist Party, he worked closely with Andrei Sakharov. As Chairman of the Supreme Soviet Subcommittee on Energy and Nuclear Safety, he initiated the first parliamentary investigation of Chornobyl. In 1991 and 1992, the Ambassador served as Ukraine's Minister of Environmental Protection and, from 1992 to 1994, as Ukraine's first Ambassador to Israel.

Dr. Murray Feshbach has been a research professor at Georgetown University since 1981. Prior to Georgetown, he served as Chief of the USSR Population Branch of the Foreign Demographic Analysis Division of the U.S. Census Bureau. Dr. Feshbach is the co-author of "Ecocide in the USSR: Health and Nature Under Siege," published in 1992, and has more recently authored a new book, "Ecological Disaster: Cleaning Up the Hidden Legacy of the Soviet Regime," and edited an environmental and health atlas of Russia. Dr. Feshbach will address Chornobyl's public health and environmental legacy.

Finally, Alexander Kuzma is an attorney by training and has been with the New Jersey-based Children of Chornobyl Relief Fund since 1991. He manages the development of new programs, including hospital development in Ukraine, and a women's and children's health care initiative begun in Ukraine recently. Mr. Kuzma served

The Helsinki Commission is very pleased and grateful that all four of you are here to present your testimony, and Ambassador, I would ask you to begin, at this point.

Amb. MARTYNOV. Thank you very much, Mr. Chairman. Honorable Chairman Smith, Honorable Members of the Commission, ladies and gentlemen. I am profoundly grateful to you, Mr. Chairman, for the invitation and for the honor to take the floor before such a distinguished audience, and I am equally indebted to you for the initiative of holding these important hearings.

For almost 10 years since the explosion of the Chornobyl power plant, on April 26, 1986, the Republic of Belarus has been exposed to radioactive contamination. That date split our history, the history of Belarus, into two epochs, before and after Chornobyl. According to its scale, the Chornobyl disaster is the biggest technogenic catastrophe that has ever occurred on this planet. The United Nations General Assembly resolution estimated the Chornobyl tragedy as the global radioeconomic catastrophe—radioecological, sorry, catastrophe.

You have rightly indicated, sir, that the effect of the explosion of Chornobyl is equal to 200 nuclear bombs. The worst results of the catastrophe are, unfortunately, to be found in my country, Belarus, as you said, received 70 percent of the total radioactive fall-out. It is not the first time that great ordeals have fallen on my country. As you may know, we lost every third citizen in the course of the Second World War. Now, 50 years later, Chornobyl has placed my nation, again, on the brink of either extinction or survival. We have to fight again for the health and for the survival of the nation.

Only 1 percent of the territory of Belarus is standard clean. The rest is contaminated, to different degrees, from very contaminated to relatively acceptable, if the word acceptable can be used under the circumstances. Almost overnight, hundreds of thousands of people were forced to say good-bye to their native lands, to leave behind the graves of their ancestors, and to start building their lives in quite new and unfamiliar areas. The government spends a lot of resources and effort to try to remedy the consequences of Chornobyl. In particular, the government has evacuated and resettled 131,000 people from the area worst affected by Chornobyl. We had to build housing, social infrastructure, provide people jobs, often in an open country. That has been created specifically for these people who are, in themselves, a new category of people. They're ecological refugees.

In spite of this effort of the government, almost two million people continue to live in the areas which are contaminated in Belarus. Among these two million people, there are almost 500,000 children under the age of 17, which is most striking and worrisome. Health problems, indeed, are awesome. Above all, as I said, the children are the most heavily affected. You have indicated, sir, that thyroid cancer has risen dramatically. According to different estimates, from 200 times to 300 times over the normal rate in Belarus. Apart from the thyroid cancer problem, there are other health problems with kids. They have a lot of respiratory diseases. They have general immune system deficiencies. They are prone to fall sick much more often than they used to be. About 40 percent

tional breaches of the cardiovascular system. The general morbidity in Belarus is increasing. We estimate that malignant neoplasm rose, on average, by 60 percent in the years after Chornobyl.

One particular grim aspect of the consequences is that the birth rate in Belarus has been dropping very steadily after Chornobyl. Abortions, for fear of bearing a deformed or otherwise handicapped child, are very much on the rise. Coupled with the economic hardships of the transition period, we are facing what experts call now negative growth of the population. But simply put, in plain language, with each passing year, there are less and less Belarusians on the earth, on the face of this earth.

There is no proven scientific knowledge of what is going to happen in the coming years, to masses of people who are subjected to extremely long-term—and I would say life-term—irradiation. The majority of experts expect a further substantial increase of malignant tumors, as well as other diseases.

Another frightening realization and truth for us is that we are going to live with Chornobyl forever. The radioactive situation now is primarily determined by the presence of the following radio-nuclides: cesium-137, with a half-life of 30 years; strontium-90, 29 years; plutonium-239, 25,000 years; plutonium-240, over 6,000 years. To dissipate, an element needs ten half-life periods. So a simple multiplication act gives a creeping feeling of an adverse eternity before you, and before the country.

Health problems, Mr. Chairman, are not long. Economic losses needed for new expenditures and related problems are mind-boggling. Hundreds and hundreds of enterprises, both industrial and agricultural, had to be closed down in the contaminated areas, along with hospitals, schools, infrastructure. Twenty percent of arable land is taken out of economic use in my country, as a consequence of Chornobyl. According to the most modest estimate, the economic damage incurred by Belarus as an immediate result of the Chornobyl accident is equal to 32 annual budgets of my state. That is about US\$235 billion. Now, 10 years later, the government is compelled to spend, year in and year out, up to 25 percent of its annual budget to try to ameliorate the consequences of Chornobyl.

You were right to indicate, sir, that this is an additional and huge burden on reform in my country, and the pace of that reform. I hope members of this Congress would agree that we cannot abandon hundreds of thousands of helpless people out there in the radioactive cold to face the beast of Chornobyl all alone. The government has to help them.

After the disintegration of the Soviet Union, we were left alone with this disaster. The nuclear power plant in Chornobyl was not built by us. It was not serviced by us. We did not have any influence on the processes taking place. The state that did it is gone by now.

The consequences of the catastrophe coincided with economic crisis and with the destruction of the very fabric of former life. This is why, apart from purely health and economic problems, we have to resolve a multitude of social and economic problems. We have to construct a new Belarusian state, while doing everything, at the same time, in order to minimize, to the extent possible, the consequences of Chornobyl. It is extremely difficult for not only

Belarus but any single country to cope with it, taking into account the global character of the disaster.

The grim Chornobyl picture makes us recall the chilling prophecy to be found in the Revelations. I will quote. "And a gray star fell from the sky, on a third of the rivers. The name of the star is Wormwood. A third of the waters turned bitter, and many people died from the waters that had become bitter." Wormwood translates, in Belarusian and in Ukrainian languages, as Chornobyl. A Revelation prophecy come true is now a frightful reality for the peoples of Belarus, Russia, Ukraine, and for people of the whole world.

So this is a tragic lesson, which, as never before, brought us, citizens of our planet, closer to each other, and makes us think over shall we survive another unforeseeable mistake in a nuclear plant design, or an operator's mistake at such a plant? Can we, as a world community, afford ignoring the worst case scenarios? Do we have enough knowledge to prevent future catastrophes? Do we have enough statesmanship to rise above other considerations and face the challenges of the after-Chornobyl epoch?

Belarus, as I indicated, does all it can, and more than that, to mitigate the consequences of Chornobyl. We try also to provide the international community with a sizable scientific contribution for that purpose. But, again, the scale of the catastrophe and the consequences defies capabilities of any single country.

In our view, the 10 years since the explosion at the Chornobyl power station showed that the international community is not quite up to the Chornobyl test. New and vigorous international cooperation is badly needed in the following three areas.

First, we have to recognize that the plight of Chornobyl victims in Belarus, Ukraine, and Russia still demands meaningful assistance to relieve their suffering. What is needed here is humanitarian help, medical help, in terms of high quality equipment, especially in early diagnosis of treatment, and modern and effective medicine.

Second, we need to increase scientific knowledge of the disaster and its consequences. We need to precisely identify scientific guidelines to try to cope with that. The area of scientific cooperation is, in our view, an extremely important area where we should pool together our efforts, including on multilateral and bilateral levels. Belarus here proceeds from the principle of free and guaranteed access to the information on the consequences of the catastrophe. We are investing a very important part of our research potential in studying the effects of Chornobyl. We have a lot to share with the world, and we are ready to do that, but we need help also.

Under the same second heading, so to say, of cooperation, we need also cooperation to create technologies for rehabilitation of contaminated lands, as well as technologies allowing for producing safe foods in a contaminated environment. This is especially important for us, because that would allow us to gradually return the affected territories, which are large, to full and viable life. If we let the time pass, if we fail to create acceptable conditions for life in these areas, then a whole zone in the geographic center of Europe, the size of several small European countries put together, will be doomed to social, demographic, and economic degradation.

Third, we need to identify the most rational applications of international intellectual efforts and material means. For that purpose, Belarus has recently submitted to an international conference in Vienna several proposals. I will just briefly enumerate them:

To set up a joint scientific, interstate center, to coordinate efforts of the scientists, to make them more efficient.

To arrange finances for Chornobyl projects on some basis, and to study for that purpose a proposal to set up a fund of the planet protection, which could accumulate part of the profits of nuclear machine-building, and power engineering industries.

Third, we need to create a viable and enforceable international legal framework of the responsibility of states for causing nuclear damage to other countries, which would specify proper guarantees and compensations.

Belarus also considers that the disproportionate share of Chornobyl's sacrifice and damage which we had to sustain, warrants international contribution to sustainable social, economic and environmental, and development of the Republic of Belarus and reform in Belarus.

In conclusion, Mr. Chairman, I will say that, for us, this tragedy 10 years ago has a clear beginning. But, unfortunately, we don't see any foreseeable end. Thank you.

Mr. SMITH. Thank you very much, Mr. Ambassador, and I appreciate your very sobering and wise counsel to the Commission. Considering the fact that you have attempted to take these efforts to every responsible body, including our friends in Europe, your recommendations will not fall on deaf ears.

Mr. Wolf, a commissioner who's a member of the Appropriations Committee and very active on human rights and child humanitarian causes, myself, and others will do what we can to take your recommendations and give them additional push and boost from the Congress.

I do thank you for that very fine statement. Let me also point out that, when you quote Scripture and the Book of Revelation, it reminds me of something that Joseph Terelia has said. I've read his book, and I've met him in the past. As a matter of fact, Terelia appeared before this Commission, back in the 1980s, and talked about Chornobyl and, quoting from the Book of Revelation, used the Wormwood explanation just as you did. Yours is a very sobering assessment.

Mr. Wolf, Commissioner Wolf, do you have any opening statement?

(No audible response.)

OK. Mr. Ambassador?

Amb. SHCHERBAK. Thank you very much, Mr. Chairman. Distinguished Chairman, Congressman Smith, ladies and gentlemen. First of all, let me thank you for the great honor to be here this morning at a congressional hearing on the Chornobyl disaster.

In the first days of 1986, I voluntarily went to the Chornobyl area as a doctor of medicine and writer, and began to collect testimonies of people involved in the Chornobyl case. Thus, I am testifying before you today not only as an official representative of the Ukrainian Government, but also as an eyewitness who realized

Over 10 years after the events, I continued to study the Chornobyl catastrophe, its causes, and effects. By the totality of its consequences, the accident at the Chornobyl nuclear power plant in 1986 is the largest modern disaster, a national calamity which radically changed the destinies of millions of people living on vast territories. This catastrophe has brought the former Soviet Union and the world community at large to recognize the necessity of solving new and extremely complex, comprehensive, and unprecedented problems, dealing practically with all spheres of life—political and social systems, economy, industrial development, and the state of science and technology, legal norms and laws, culture, and morals.

Chornobyl was not simply another disaster of the sort mankind has experienced throughout history, like fire or an earthquake or a flood. It is a global environmental event of a new kind which is characterized by the presence of dozens of thousands of environmental refugees, long-term contamination of land, water and air, and possibly irreparable damage to ecosystems. The regions affected include not only Ukraine itself, but also Belarus, Russia, Georgia, Poland, Sweden, Latvia, Lithuania, Germany, Great Britain, France, Switzerland, and others. By mid-August of 1996 in Ukraine, there were over 90,000 people from 81 settlements evacuated. From 1990 to 1995, due to the dangerous radiation conditions, 52,000 citizens of Ukraine were resettled. According to the latest data, as a result of the accident, there were contaminated 50.5 thousand square kilometers of the territory of Ukraine, with the population of 2.6 million in 2,218 settlements.

Needless to say, Chornobyl also brought considerable social, economic, psychological, medical, and other consequences. The long-term consequences are grave and cause great tension in the work of state agencies and medical services of Ukraine. For example, 5,000 people have lost the ability to work. The sickness of 30,000 liquidators is officially attributed to the aftermath of the catastrophe. According to different sources, including the Ministry of Health and NGOs, 20,000 to 30,000 people died as a result of the accident. The population mortality in the most affected region increased by 15.7 percent, compared to the pre-accident period.

The unprecedented measures taken in 1986–1987 for overcoming Chornobyl's effects required, even according to very unreliable, low figures, the sum of over \$10 billion, and indirect costs were \$25 billion. Over recent years, the new, independent Ukrainian state had to spend over three billion more to solve post-Chornobyl problems. This sum considerably, by five times, exceeds the budget expenses for health care, culture, and public education. Every year, Ukraine spends 12 percent of its state budget on Chornobyl problems. More detailed statistical data on Chornobyl's effects can be found in my written testimony.

Mr. Chairman, as you know, on Saturday, April 20, 1996, the G-7 Summit took place in Moscow, with the participation of Russian President Boris Yeltsin and Ukrainian President Leonid Kuchma. Here, I would like to express my gratitude for the U.S. support of the idea to invite the President of Ukraine to participate in this meeting.

President Kuchma has confirmed the political decision of Ukraine to shut down the Chornobyl NPP by the year 2000 under the condition of adequate and timely financial and technical assistance by G-7 countries. The President has drawn the attention of the G-7 leaders to the necessity of combined efforts to upgrade the shelter, "sarcophagus," safety, and rehabilitation of contaminated territories. He highly appreciated the Memorandum of Understanding, signed last December, between Ukraine, G-7, and the European Commission, stressing at the same time that the MOU does not envisage clear financial obligations of the Western side.

Up to this time, Ukraine has been promised, not in the form of legal documents yet, \$2.6 billion in credit lines and \$512 million in grants. In this connection, President Kuchma proposed to G-7 leaders to conclude a legally binding agreement which will clearly define the conditions, sources, and time-frame for the fund's provisions. Without that, he stressed, Ukraine cannot take the obligation and the responsibility for the plant decommissioning, while having to keep proper nuclear safety standards.

It must be stressed, once again, that the issue of decommissioning the Chornobyl NPP is directly related to the national security of Ukraine and its independence. As you know, Ukraine is experiencing a severe energy crisis. At this time, it is capable of covering only 10 percent to 15 percent of its needs by its own production of oil and gas. Various nuclear power plants produce up to 40 percent of energy, with the Chornobyl NPP accounting for 7 percent of all electricity generated in the country. Therefore, the problem of the plant's shutdown is directly connected with the restructuring of Ukraine's energy sector and introducing new facilities, which could compensate for energy losses.

The U.S. role in G-7 decisions is highly appreciated by us. Furthermore, on a bilateral basis, out of \$225 million allocated by the U.S. Congress to the USAID, for the fiscal year 1996, \$50 million to \$70 million is to be used for energy sector and nuclear safety problems, including \$3 million allocated for the establishment of the International Safety and Environmental Research and Development Center, and \$2.5 million for fire safety measures at the plant's unit No. 3. The U.S. Government also provided \$10 million to the G-7 nuclear safety accounts for the projects in support of the Chornobyl closure agreement.

Still, I want to say, frankly, that we consider such assistance for Chornobyl-related problems insufficient.

First and foremost, we need help in making up a plan for Ukraine's energy independence, energy saving, and efficiency, creating our own nuclear fuel cycle with the participation of Westinghouse Company, enhanced cooperation in the sphere of radiation safety, personnel training, and so on.

We are ready to continue work with our U.S. colleagues for implementation of these plans. Dear friends, Chornobyl is not only the case for Ukraine. It is a warning to mankind at large. Chornobyl must teach the nations of the world the dreadful lesson of preparedness, if we are to rely on super-powerful and hyperdangerous nuclear technology. Ten years ago, we entered a new Chornobyl era, and we have yet to comprehend all its consequences. Thank you for your attention.

Mr. SMITH. Thank you very much, Mr. Ambassador. Dr. Feshbach?

Dr. FESHBACH. Yes. I would like to thank the Chairman and, of course, the members of the Commission for inviting me to speak on this very important topic. I do not intend to read, but to highlight some of the points from the written testimony, which I've given you already.

One of the major questions about the Chornobyl accident is how much radioactivity was there, and how widespread was the impact on the Chornobyl area.

To take the latter issue first, we were first told, after a few days of delay, that there were two oblasts—roughly equivalent to our states—impacted by radioactivity in Russia, two in Ukraine, and one in Belarus. We now know that the number of oblasts affected is 18 in Russia, 11 in Ukraine, and six in Belarus.

So there was a much greater spread than previously announced, though the key question is how much more than one curie per square kilometer was there? Where is it 40 curies per square kilometer? That is, of course, a much more serious level.

In northern Ukraine, southern Belarus, and parts of Bryansk Oblast in Russia, the figure is 40 curies per square kilometer. The total amount of curies released, the radioactivity, for a long time was 50 million curies. Then, it became perhaps 80 million. Then, occasionally, from officially released data it became 90 million. Now, the current best estimates are around 150 to 200 million, or possibly more. If this last figure is the actual amount, the long-term impact or health consequences of the Chornobyl event may be much greater.

Just to place it in context, Three Mile Island released a grand total of 15 curies from beyond the containment structure itself.

It could have been much worse had there been no containment structure, which the RBMK type reactors in the former Soviet Union do not have to this day.

This brings me to another major concern: how many people were involved in containment and clean-up efforts. Again, the official figure, in the early phase, was around 300,000 so-called liquidators, or clean-up personnel. It was never clear exactly who was included in that figure. It later became 660,000. Now, the actual number appears to be about 800,000 involved in the clean-up efforts. Although, how 800,000 could have been there without getting in each other's way, even though some actually participated only for a few seconds—is a puzzle to me!

Regardless of the actual number, many of the clean-up personnel did not have protective clothing, and then many of them had to pick up hot particles, using just their bare hands. Now, we're beginning to see some of the consequences.

To jump ahead a little bit, on a recent trip to Moscow, one of the leading pulmonologists of the former Soviet Union, and also now, especially in Russia, one who publishes internationally, has told me that they are beginning to see a major increase among clean-up personnel of lung cancer, probably due to plutonium aerosols in their lungs that were breathed in 10 years ago during this clean-up effort.

Now, if you apply the 30 percent to the 300,000, to 600,000, or to 800,000 liquidators, you get very different results.

Now, of course, with lung cancer, one always has the problem of the issue of smoking as a co-factor. But everybody smokes there, so the question is the incremental addition to that, because there's a law of equal smoking, which is the way I think of it. So you look just for the differentials. In this case, we may begin to see many more cases, and, apparently, there is some evidence that the cases are increasing.

In addition to lung cancer, there is the issue of thyroid cancer. Now thyroid cancer, particularly among children, who being younger have a smaller thyroid, compared to adults, will be susceptible to even a non-lethal amount of dose of radiation, in this case, of iodine-131, which was the initial nuclide released from the accident site.

If the normal rate per million children, 0.14, is just one case, we're now seeing evidence of it being 80 to 100 cases per million in both Belarus and Ukraine. To make one comparison. In France, for the last 42 years—40 years, there were 72 cases recorded. In Belarus, during the last 2 years there were 74 cases. So, there is a 20 times higher rate in Belarus adjusting for the same number of years/cases, so that the impact is just devastating. That's only what we have seen so far.

The Minister of Health of Belarus invited an independent team from the World Health Organization. What was important about this was that it was not the initial evaluation that much of the health consequences were overstated or exaggerated by the people of this region, which was, of course, quite understandable. But, when the International Atomic Energy Agency went in, in 1989, they only had 2 years of data, and then they didn't have all of the data. This being the case, many thought that the consequences were exaggerated by the local medical personnel, local institutions, and local physicians.

It now turns out that only new thyroid cancer is beginning to show up, as we expected it might, compared to the events in Hiroshima and Nagasaki, of 7 to 10 years later. This is why we're now seeing these events.

The initial evaluation of this illness was not made at the right time to make the evaluation, no matter how very capable the radiation medicine people, the health physicists, and epidemiologists who came in from outside.

We also have to take into account the possibility of bad diagnostics, as well as the lack of iodine salts in the region, leading to endemic goiter as a pre-cancerous condition.

That may have been reasonable, if the increase was about ten times. But the increase is about 30 or more times. It's way beyond normal—normal being improvement of the diagnostics about the correct treatment, et cetera, among the young children. It is now pretty well confirmed that there's a real, major increase in the health problem. But another jump is expected again, around the year 2005 to 2010. Currently we have, in Belarus, about 400 cases among children 0 to 14. In Ukraine, there are about 200 cases, and, in Russia, about 80 cases. Of course there are cases of thyroid cancer among adults, which one has to take into account as well.

If you look at standardized rates by age group, for all ages, in Gomel Oblasts, in Belarus, thyroid cancer rates are about four times the rate they were in the 7 years prior to and after the event.

I have tried to standardize by age group, to keep it an equal comparison. Thus, there has been a real increase.

In terms of leukemia, there has been very little, according to published accounts. In part, that's because the USSR Ministry of Health ordered physicians not to record it as chronic radiation sickness, or acute radiation, in the immediate period. Therefore, much of the leukemia was classified as something else, because physicians were not allowed to diagnose it as radiation sickness.

However, we're now going to begin to see, I believe, a large increase. We're seeing it, for example, from the Center of Radiation Medicine in Kyiv, which has reported a large increase in cases of leukemia among those aged 65 years of age and older. Thus, it is not just among the younger people, unless they're just among the so-called liquidators, or among the children.

There was some exaggeration, however, when it was claimed by one physician that one out of every three persons in the republic—whether it be Belarus, Ukraine, it makes no difference—had leukemia. Well, that's clearly just too much. But there is, undoubtedly, many more cases of leukemia than we're aware of, because I think they're hiding it under another coding of the classification of diseases. It really has no meaning. But, within that, clearly is leukemia. So we have to do more research.

Now, with lung cancer, as I indicated, we should see a major increase, over and above the "normal" rate of lung cancer, some of which is probably associated with cigarette smoking. But another cause is pollution within the republics or countries, as the case may be.

In addition, a friend of mine brought to me evidence from Philadelphia, literally Philadelphia, where a lot of former Ukrainian Jewish emigres have settled, some of whom have black teeth. The teeth look black, not from lack of cleaning, but undoubtedly from the enamel being affected by radiation. This is just a classic case, which is not normally seen, certainly, in the country, but you have to look for evidence like this to determine that there was something special about what happened.

The Israelis probably have a lot more information about which one should inquire. But one source tells me that 40 percent or more of recent emigres had enlarged nodules on their thyroid glands. Among the children who came to the country as part of the immigration from this region were low vitamin levels and high numbers of endocrine diseases. This, of course, was differentiated between those that came from contaminated and non-contaminated areas.

Now, to cut it a little bit shorter, one has to deal also with the official statements versus all the other evidence. For example, there is a Dr. Ilyin, who is a gentleman who represents the classified section of the prior medical establishment. He says that the Chernobyl sarcophagus is totally secure—no cracks, or no holes in it, or anything like that, totally contradictory to all other evidence. He wrote in a brand-new article. Well, it just is mind-boggling in many ways.

In another case, however, now he's also saying there's been some increase in infant mortality in the area. This is a major concession from him, without giving specific data, but just making that statement. So maybe the evidence is building up, even for people like Ilyin and others, that they will have to recognize that there have been excessive consequences from the Chornobyl event.

One last thing that they indicated needs to be monitored is the long-term, low-doses of radiation. We really don't know in this country, that country, or any other country, what the health consequences will be of that, so it needs to be examined for the future. Thank you very much.

Mr. SMITH. Dr. Feshbach, thank you very much for your testimony. Mr. Kuzma?

Mr. KUZMA. Thank you. Mr. Chairman and distinguished members of the Commission, on behalf of the coalition, Chornobyl Challenge '96 and the Children of Chornobyl Relief Fund, I'd like to thank you for the opportunity to address this Commission on the aftermath of Chornobyl.

Since 1990, our foundation has been heavily involved in providing direct relief to the affected region. We've now completed 16 airlifts, and numerous smaller shipments, providing about US\$38 million worth of humanitarian assistance.

We're also heavily involved in long-term hospital partnerships, designed to upgrade the quality of care at pediatric centers which specialize in the treatment of children with cancer and other radiation-induced illnesses.

In the course of our relief missions, we've become quite familiar with a wide range of health problems, which have been on the rise since 1986; and we have been concerned about the lack of attention that some of these problems have received.

The sharp increase in thyroid cancer has been well-documented and discussed by the prior speakers. But these statistics of 288 cases in Ukraine, close to 400 cases in Belarus, really need to be considered as just the tip of the iceberg. The highest incidence of cancer usually occurs, as Professor Feshbach says, between 10 to 20 years after exposure, and there are thousands of children who are suffering from enlarged thyroids and other conditions which indicate that they are at risk for cancer in the future.

The members of the Commission might remember that, in last week's Washington Post, there was a case cited of the village of Narodichi, in the Zhytomyr district, where actually a quarter of the children, about 466 out of 2100 children, are suffering from various thyroid disorders that are a very alarming sign of problems to come.

Even more troubling are the overall demographic trends, in both Belarus and Ukraine. According to the U.N. Office of Population, the two nations which suffered the greatest amount of fallout from Chornobyl are also the two nations which are suffering the biggest decline in population over the last few years.

We simply find it difficult to believe that this is a matter of coincidence. Traditionally, Ukrainians have prided themselves on large families and healthy children. Yet, in 1992, there were 40,000 more deaths than live births throughout Ukraine. This ratio has declined steadily so that in 1995 there were 174,000 more deaths than live

births. We find it difficult to believe that economic hardships alone can account for this dramatic decline.

The Boston Globe reported, in January of this year, that infertility among Ukrainian males is now the highest in the world. The New York Times reports that life expectancy among Russian men has dropped by 10 years since Chornobyl. Today, infant mortality in Ukraine stands at twice the European average, 14.3 deaths per thousand live births.

Recent studies by the Ukrainian Ministry of Health, its Office of Children's and Maternal Health, have shown that pre-natal and post-partum complications have increased much more sharply in regions which were contaminated by fallout from Chornobyl, as opposed to areas that were non-contaminated.

Two weeks ago, at a conference at Yale University, physicians from Ukraine and Belarus, Dr. Anna Petrova and Dr. Olesya Hulchy, presented startlingly similar results from epidemiological studies on women's reproductive health.

Several patterns emerged. First, anemia among pregnant women has risen to alarming levels, over 60 percent in regions affected by radiation, roughly in the one to five curies per square kilometer range. Anemia is only one of the factors which greatly reduces the ability of mothers to deliver healthy babies. Hypoxia and increases in other normally rare conditions have also had a severe effect on survival rates of newborns and young mothers.

A study is currently underway, under the supervision of the University of Illinois School of Public Health, conducted by Dr. Daniel Hryhorczuk, which is tracking more than 15,000 mothers and children in six provinces in Ukraine, to determine the effect of economic and environmental factors on maternal and children's health.

This study has received really modest funding from the Soros Foundation and the World Health Organization, yet has made much more substantial progress than many studies which have received far greater financial support from Western agencies.

For some time now, we've been receiving persistent reports from our Ukrainian partners and colleagues that the rate in birth defects has doubled in areas closest to the evacuated regions. This has been the case both in Belarus and Ukraine.

These reports have been routinely dismissed by Western health officials, and yet a team of Japanese experts, from the University of Hiroshima, in 1994, studied more than 30,000 autopsies, fetuses, and newborns in contaminated areas of Belarus.

Their findings were reported by UPI and the Kyodo News Service, but received scant attention in Western news publications. The Japanese team did observe nearly twice as many birth defects as would normally be expected, and these were a wide range of problems: severe cleft palates, missing digits, extra digits, malformations of critical organs. These have all been reported with greater frequency since Chornobyl.

In other areas, where the levels of contamination are higher, between five to ten curies per square kilometer, the rate of birth defects has actually risen eight-fold.

I personally have had an opportunity to see some of the children and the newborns in the neonatal wards in Kyiv and Luhansk, and

we've been struck by the strangeness of many of the defects that we've witnessed there. These are defects that we've never encountered in American neonatal wards, even in some of our urban areas and industrial areas, where one might expect to find some of these kinds of severe defects.

Dr. Valery Kuznetsov, the Director of the Neonatal Division at the Institute of Pediatrics in Kyiv, has noted that, since Chornobyl, the number of birth defects has increased, but, also, that the number of children with multiple defects has also increased noticeably. Arguably, these are anecdotal reports, but they deserve much broader follow-up.

Many Western scientists, particularly those involved with the International Atomic Energy Agency, have been eager to dismiss widespread reports of these problems by ascribing them to radiophobia, a supposedly unfounded fear of radiation and psychological stress. Without even looking at the population in question, some researchers have adopted the posture of the Soviet government in the early days following the accident, accusing the Western media of exaggerating the problems.

We, and a lot of our colleagues in Ukraine, really find this stereotype of hypochondria quite offensive. That is largely because, as the Ambassador of Belarus mentioned, these are both countries that have undergone a really staggering history of oppression and suffering, and, if anything, have shown a great deal of resilience and political maturity in the process of achieving their independence.

The kind of bias which had been expressed by many of the health researchers from the West really is antithetical to the principles of scientific inquiry. The experience with thyroid cancer, in which many of these early reports were just dismissed out of hand, really needs to be examined. Now that the link between Chornobyl's fallout and thyroid cancer has been conclusively established, we believe that the scientific community needs to assume a more open-ended, open-minded posture toward other health concerns expressed by Ukrainian and Belarusian physicians.

In 1992, when the president of our foundation and other health experts testified on the Chornobyl aftermath before the Senate Subcommittee on Nuclear Safety, there were grave concerns expressed about the lack of research focusing on the highest-risk population, that is, the clean-up workers and the families which were evacuated from some of the most highly contaminated zones. Regrettably, there still has been very little progress in studies of these critical populations. We still do not really know the number of casualties among the clean-up workers, most of them men in their twenties and thirties, at the time of the accident. We still do not know the leukemia cancer rates among, for instance, the 11,000 Ukrainian children who were brought to Cuba in the days of the former Soviet Union for treatment.

We believe that there are several large clusters of Chornobyl evacuees living in the cities of Kharkiv and Kyiv, and other settlements around Kyiv and Minsk, who would be easily accessible and of prime interest for long-term health studies. We're mystified as to why more effort has not gone into studying their condition.

Regardless of the continuing debate over Chornobyl's ultimate health impact, the Children of Chornobyl Relief Fund and our col-

leagues have made a long-term commitment to upgrade the quality of care in these pediatric institutions. We're proud of CCRF's role as a leading PVO. At the same time, we recognize that there are many other groups which are also making vital contributions to this international relief effort.

Among these, we're proud to be associated with groups such as the Catholic Medical Mission Board, the Cherkassy Diabetes Project, the Kharkiv-Cincinnati Sister Cities Program, the Ukrainian National Women's League of America, Thoughts of Faith, Share the Dream, and many others.

In Belarus, we've long admired the success of some of our counterparts. In particular, the CitiHope organization and the Ramapo High School organization. Despite the progress we've made, our board and our volunteers are painfully aware of the grim realities that Ukraine and Belarus face. We're humbled by the enormity of the task that lies ahead.

Hospital development is one of our key priorities, and we feel that, as Western companies expand their investment in the former Soviet Union, they need to be encouraged to apply the principles of community involvement and good corporate citizenship, which have become standard in the United States.

Community health programs can build trust and solidarity between American businesses and government agencies and East European partners. A wonderful example of some of this type of activity has been a women and children's health initiative initiated by the Monsanto Company, which has launched programs in three rural provinces in Ukraine.

The program offers pre-natal screening, nutrition, and immunization programs to help reduce infant mortality in regions which have been heavily affected by environmental degradation and infectious disease.

The Chornobyl disaster remains one of the most profound and pivotal events in East European history. We should not and cannot afford to minimize its impact, or to turn our backs on the victims. We believe, based on our experience, that the people of the United States can build very powerful relationships with the people of Ukraine, Belarus, and western Russia, by addressing the issue of Chornobyl head on.

We think that our government can enhance its stature as a compassionate world leader by providing continued funding for health programs in the CIS. Given the likelihood that health effects in Chornobyl will intensify over the next 10 years, USAID and other agencies should continue to provide funding for health programs in Ukraine and Belarus beyond the current 1998 cutoff date.

Chornobyl is a unique disaster, and it requires unique approaches. But, as a nation, we believe that the United States has a great deal of expertise, and technology, and compassion to offer. We should not be afraid to tap our generosity of spirit. The children of Chornobyl share a legacy with all the children of the nuclear age, and their future should be of concern to every society in every corner of the world. Thank you.

Mr. SMITH. Mr. Kuzma, thank you very much for your work, and for your very fine words at this hearing. We appreciate it, and we

I believe that the problem is more complex than only shutting down the Ukrainian Chornobyl plant. It has to be solved as a comprehensive problem, for all non-reliable units in the territory of the former Soviet Union.

Mr. SMITH. Is there more that the United States could be doing to help Ukraine with regards to those risky reactors?

Amb. SHCHERBAK. Risky? Yes, sir. Absolutely. We got aid, technical aid, from the United States for new types of reactors, VVER, for training personnel. Now, also, we had talks with the American Commission for Nuclear Safety for more efforts in this direction. Also, we want to create or have special fuel cycles for our nuclear plants, with participation of American companies.

Mr. SMITH. If you could be so kind to provide the Commission with a list of humanitarian issues that need to be addressed.

Amb. SHCHERBAK. Yes, sir.

Mr. SMITH. Especially specific things that the Congress could do. You know, the executive branch obviously takes the lead in foreign policy, but we are the purse-strings. Just by way of background, I also serve as Chairman of the International Operations and Human Rights Subcommittee.

Amb. SHCHERBAK. Yes.

Mr. SMITH. And, very often, we will work very cooperatively and sometimes over and above what the Administration will want to do in a given situation. So, if we have a clear assessment of what needs to be done, I will give you my word that I will try to energize this Congress to be much more proactive with regards to Chornobyl, and not just leave it to the executive branch to take the initiative. So, if you could provide that for us, I think it would be very helpful.

Amb. SHCHERBAK. We can give you a list of our needs. Let me say that we really appreciate humanitarian aid by the American side, especially by the Children of Chornobyl Relief Fund, represented by Mr. Kuzma. Their aid for Ukraine is estimated at \$35 million-\$37 million. Yes, right? Compared to official aid of maybe \$10 million. You can see that this is a very big difference. We really appreciate the humanitarian aid.

Mr. SMITH. Thank you, Mr. Ambassador. Ambassador Martynov, I would like to ask you that same request. That whatever you could provide us, relative to the humanitarian concerns for the people of Belarus, that would be helpful, as we go through our fiscal year 1997 appropriations bill for foreign assistance. Could you tell us what is the Belarusian Government's position with respect to closure of the Chornobyl nuclear power plant. Is the G-7 agreement of the year 2000 acceptable? Would you like it closed immediately?

Amb. MARTYNOV. Thank you, Mr. Chairman. First, we would oblige with your request and submit to you information related to the needed areas of assistance.

Secondly, on the closure of Chornobyl: we, in Belarus, do not have any reactors or nuclear power stations which are active in our territory, and, under the circumstances, we feel that we are hostages to a number of old-type nuclear power stations along our perimeter.

One is obviously Chornobyl. Second is Ignalina in Lithuania, and third is Smolensk in Russia. These are the closest to us. St. Peters-

burg is not too far. Geographically, Rovno is not too far, though it is a different type of reactor, as far as I understand.

So our position is that, yes, the international community has to take efforts to increase the safety of these stations and to close those which are most dangerous. We do understand that our neighboring countries have their problems in closing them altogether and immediately, for obvious economic reasons and social reasons.

So, as I said, the international community has to display much more statesmanship and understanding and come to help these countries close these stations. They should no longer keep us hostages. Thank you.

Mr. SMITH. Mr. Ambassador, how would you assess the international assistance that has been provided? Has there been enough so far?

Amb. MARTYNOV. Well, I am sorry to say, but I will say frankly that we do not perceive the international assistance as adequate, and that we are not just greedy in this respect.

We first went to the United Nations, to the international community, immediately after the catastrophe. But, unfortunately, the multilateral effort did not yield too much of tangible, practical results, though there are some.

In terms of bilateral assistance between the United States and Belarus, we are very appreciative of the humanitarian assistance we are getting from the U.S. people. But this assistance primarily comes through private philanthropic organizations, non-governmental organizations of the United States. I could name CitiHope and Ramapo School, which were already quoted here, The Global Environment and Technology Foundation, Pittsburgh Children's Hospital, and other foundations.

The U.S. Government provides some assistance in transportation of these PVO-acquired medicines to Belarus. We also have an agreement between the Department of Energy and the Ministry of Health of Belarus for studying thyroid cancer. But this is about it.

There are also ad hoc deliveries. Say, for the tenth anniversary of Chornobyl, which would come through or with the help of the U.S. Government. But that's about it, again.

We need much more assistance, as I indicated, in such areas as early diagnostics, because we are afraid a new wave of cancers is coming up, as was confirmed here by experts also. We need early diagnostics, we need means for treatment of the things which are to come. The second aspect is, as I said, scientific cooperation to understand it better. The third is that we need to reclaim, to get back the vast areas of arable lands we have lost to radiation.

So we have to cooperate with the United States and other communities in looking for technologies which would allow us to reuse these lands, to get them back into the productive cycle.

So these would be the main areas where the assistance is extremely needed. We were particularly heartened to learn from the Administration of the new ecological emphasis in the foreign policy of the United States. So what we would like to make sure, and to ask you to try to make sure, is that the Chornobyl problem is included on these ecological agenda priority items. It is to be included not only in the aspect of the closure of Chornobyl station, but also

in the aspect of mitigating the consequences of Chornobyl. Thank you.

Mr. SMITH. Let me ask you, regarding the issue of resettlement and the individuals who return to areas that are ill-affected. As far as we know, what are the risks to them in going back prematurely?

From an agricultural point of view, and raising livestock, how do both of your governments fence off certain areas so that people do not return, begin growing certain crops, and then begin exporting them or consuming them themselves?

Amb. MARTYNOV. Well, there is what is called an exclusion zone, which is fenced off, and is off-limits to anyone.

The Belarus Government has already resettled 130,000 people, and I understand this is the biggest resettlement pool, so to say, in the area of Chornobyl. But we have found serious problems in resettlement programs. First, the resources which are needed are very large. Secondly, the people who were resettled continue to be unhappy, because they were uprooted, they were brought to a different environment, they have lost their old ties. They don't feel comfortable in this situation, and the social problems which we are facing in the new settlements are very high.

So some people choose to go back to their old places, where they used to live; and the government does not have an enforcement mechanism for stopping them from going to places, other than exclusion zones. The government tries to dissuade them from doing that, but we cannot force them to leave these areas. Basically, the resettlement programs were for volunteers.

We find, now, ourselves in a situation where more and more people would like to stay where they are, to live with their roots. That increases the necessity to have technologies and possibilities to provide them with safe foods, to provide them with means to grow safe foods in a contaminated environment. So this is another aspect which is very important, because what people do now, in these areas, they consume the foods they grow.

This is the most dangerous aspect of the whole situation, when radionuclides are getting inside through the stomach. So these are the whole sets of problems which we have to face.

Mr. SMITH. Are you beginning to see some cancers attributable to that, or?

Amb. MARTYNOV. Excuse me?

Mr. SMITH. Are people getting sick as a result of eating foods that have been grown?

Amb. MARTYNOV. Absolutely. Yes.

Mr. SMITH. Mr. Ambassador, on the resettlement issue, are people moving back to contaminated areas, and how do you—

Amb. SHCHERBAK. I met those people, you know, in special contaminated zones. It's not a large number, but maybe 100, 200 people now live in this very contaminated zone. Practically, they're very old people, and they don't want to resettle to another region of Ukraine.

But let me give you some numbers. That, for the population evacuated from the zone, about 21,000 houses were built, and 15,000 new apartments provided, Mr. Chairman, without any foreign aid, absolutely only at Ukrainian, you know, for Ukrainian cost.

Mr. SMITH. Dr. Feshbach, can you provide us with an overview of the environmental damage resulting from Chornobyl?

Dr. FESHBACH. Well, one is the actual damage, and there's also some potential environmental damage. This is quite a concern, because of the possible contamination of the Dnipro River, which would get into the reservoir for Kyiv, thereby affecting the quality of the water supply.

This is, in part, a question of the sarcophagus. It's a question of, if you build another sarcophagus on top of it, whether the sub-soil and sub-strata are strong enough to support it and not shift. But the roof itself might even fall down, because the metal rods, which are being exposed to radioactivity, may disintegrate on their own.

In addition, there was a lot of radioactive dust which got onto the nearby forest. In the recent fire, a lot of it was spread. People ate mushrooms, a major part of their diet, from the area. In fact, many of them got sick, and some even died.

So, the issue here is the current situation, as well as the potential future. The land is very badly damaged, and will take a long time to recover. Still, it may be possible to clean up some of it. But a lot of people are moving back because they don't care, and they're going to die anyway, is what they say. They die a little earlier; drink a little more, you know, and it just eases your way to death. But it really is a very major social problem.

But the environmental issue is—how shall I put it? It's hard to comprehend. It's so big that the question becomes one of setting priorities. You really can't deal with all of the problems at once, and you have to understand that their choice has to be made within a constrained budget. It's a question not only of what AID does, or the declining proportion of money going to them and others that's happening, but how, within the constraints that we have, can we get other international agencies to get involved, maybe to pick up some of the slack, and what priorities do we set for ourselves.

Thus I think what the two Ambassadors have said is very reasonable. But, again, one issue is the environment and the other is environmental health impact; and I find it hard to separate them.

I can give you plenty more data. But the issues and key events, as directly related to the Chornobyl event, I think are basically what I've described.

Mr. SMITH. Is there ongoing water testing occurring?

Dr. FESHBACH. Is there ongoing water?

Mr. SMITH. Water testing, to determine whether or not it has become contaminated?

Dr. FESHBACH. Yes, of course, there is. But, again, it's a question of what kind of decimeters they're using, what kind of testing they're doing. The tests need to be, shall we say, made comparable; we need to have a standardized way of measuring, so that we know exactly that it's this definition, as opposed to that definition, and not some local definitions.

This is always a problem. Then the question is who do you bring in to do it. I think the OECD would be a very good candidate organization. It has a good reputation and does a lot of this water testing. So we should try to encourage this kind of organization to do it. It doesn't necessarily have to be an American organization. But

we're a part of that organization, and let others also contribute to that.

I don't think the United States has to do everything, but I think we have to do a lot. Don't misunderstand me. But we have to choose what to do and choose the priorities very carefully.

Mr. SMITH. What about testing of the aquifer?

Dr. FESHBACH. Well, the testing of the aquifer is going on now. So far, it hasn't been determined to be dangerous. We have an embassy there, we have a lot of people there from various organizations.

A lot of commercial organizations are there, and they'll stay there in the immediate future. But, if there's a further accident, then it may become very different.

Mr. SMITH. In talking about lung cancers, as mentioned in your testimony, has there been an increase in bronchiolar, alveolar carcinoma, which is the—

Dr. FESHBACH. I don't have such precise data from there. I wish I did, so that I would know precisely what kinds of cancer that they have. Somebody literally asked me that question two days ago, over the weekend. A cancer specialist was in town for a big meeting, and I told him I don't have those data.

Now, maybe they're available, maybe they're not available. But I hope, if I could go to Kyiv, or to Minsk, whatever, as the case may be, to do some work, I would ask those kinds of questions. But now I don't know the answer.

Mr. SMITH. OK. Could you provide information, because, obviously, that's a plutonium-based cancer.

Dr. FESHBACH. Yes. I would want to know it, too.

Mr. SMITH. Yes.

Dr. FESHBACH. And I'd certainly be happy to.

Mr. SMITH. Could you tell us, doctor, why the mortality rate estimates vary so widely?

Dr. FESHBACH. Oh, sure. But one must separate what is a direct consequence of the Chernobyl event from natural causes of death. For the former, the number of liquidators or clean-up personnel that, as I tried to describe, is now almost a three times differential, from 300,000 to 800,000. Not, obviously, exactly three times, but a little less.

But it's also the question of whether, as many allege, including myself, that this is specifically due to Chernobyl, or not due to the Chernobyl event.

How many people would have died otherwise? It's very hard to determine it. But, when you see differential rates of this level, of 30 times versus, let's say, 10 times, you always have to be sure that it's not a statistical anomaly—that it's not because there are better diagnostics and not because we're paying more attention to this issue. Rather, there's something that we missed before, that they're now getting currently. It happens in the United States, too.

I mean, something may happen so you go out and look for salmonella. So, you go out and look for this problem, or that problem, and you may find that the increase is there, but it's because the prior figure was not as accurate as it should have been. Certainly, this seems to be the case much more than before, and we need to know. It's part of the secrecy of the system.

One of the problems with the International Atomic Energy 1989 Agency survey of the event of 1986 was they didn't know there was a third administration in the Ministry of Health in the USSR. This was the secret component. It now has a slightly different name. But they didn't know it existed, because they didn't know the Soviet system. They didn't know to ask where the nuclear, biological, chemical warfare accident data are collected, hidden, not published, etcetera.

The root cause is you have rules that change diagnostics. You know, you don't say that somebody has a plague, you call it hepatitis; or, in this case, acute radiation sickness might be called appendicitis, or something like that. This was a practice there. There was a State Secrets Act that was in place at the time.

This occurs, as we saw from the work of Alla Yaroshinska, who collected some of the protocols of the working group of the Politburo, which told her to lie, period.

So we have to be very careful that what we're seeing now is not a major increase compared to what was there before, but you have to make the balance in both cases. That's part of the problem of trying to tell what is the excess deaths. Now, I was asked to do this, at one time, by Radio Liberty, as it happened, and I looked at normal mortality tables. How many people survive of this age group? Now, the trouble is, I didn't have a precise definition of who the age group of the liquidators were, the clean-up personnel. But you can make some assumptions.

It seemed to me, at that time when I did it, 3 or 4 years ago, there was four to five thousand excess deaths among this group. Now, they're talking about six to eight thousand. That's in Ukraine alone. Some people are talking about 20,000 or 30,000. That's in addition to the thyroid cancer deaths. It's in addition to the infant mortality deaths. But we don't know precisely.

Somebody from the Ministry of Chernobyl, at this conference that Mr. Kuzma talked about, at Yale, where I also gave a talk, used another figure that was, I think, just much too high. Now, he may be correct, and I may be quite wrong. But that it's all really part of this difficulty of calculation is really what I'm trying to say.

Mr. SMITH. How many people, in your estimation, are still living in contaminated areas? And what is the threat of people being resettled in those contaminated areas?

Dr. FESHBACH. I really don't know any precise number. I would guess it's probably several thousand within the 30-kilometer zone. Nevertheless, even if it's 1,000, or 500, the danger is, of course, much higher. But, you know, there also are half-lives of these radionuclides. Iodine-131's is only 8 days, although others may last longer. Cesium-137 may last 30 years, as well as strontium 90.

But these are elderly people, and you don't know whether it's going to be the last key to push them over at the last mortality stage, or it's just overall difficulty of living conditions. But I don't know the exact number. You get estimates all the time, and I don't know how good they are. They vary. You might quote something in January, and somebody in March will say something quite different.

It's just not determinate yet, really. But it's not a large number. It's not 30,000 to 50,000, something like that. That I'm quite sure of.

Mr. SMITH. To what extent do you think post-traumatic stress has had an impact in terms of increasing people's propensity to get sick?

Dr. FESHBACH. Well, let me tell you my personal experience. I lived in Brussels at the time. I was the Sovietologist in residence at the office of the Secretary General of NATO, Lord Carrington. I was stressed out, too, let me tell you, because the plume also reached to the whole compass, and reached to us in Brussels as well. I mean, I wasn't happy with it, but I hopefully got over it. I don't know how well I'm responding to your question.

But of course, the people who lived there were undoubtedly very stressed. But to say and blame everything, as the International Atomic Energy first report did, or as Dr. Ilyin and many others still do, to blame everything on this radiophobia. That's a bit much.

Now, I think there are exaggerations on the other side, just as much as there are exaggerations on this side. This is not trying to be eclectic. It's trying to be reasonable, and to get a precise medical definition.

But there is no doubt that there is a post-traumatic stress syndrome, which has probably weakened the immune system, which has probably then made many people more susceptible to other illnesses. So, you could say it's linked back to Chernobyl.

But, to say everything is due to post-traumatic stress, I don't believe that either. Nonetheless, I believe many do have this PTS syndrome.

Mr. SMITH. One final question, if I could. In the Bryansk Oblast, in western Russia.

Dr. FESHBACH. Yes.

Mr. SMITH. What has been the impact of Chernobyl on that region?

Dr. FESHBACH. Well, we've had about 60 cases of thyroid cancer among children. Sixty-four is the number, the latest number that I've seen, which is much higher than they ever had before. No question about it. But it also is one of the ones which was very heavily impacted. I could show you a map of that in my atlas on environmental health.

But it's also a question of proper diagnostics. I just don't know whether they're as precise as some other groups are. Whether they have these papillary carcinoma slides. They haven't shown them to the WHO, as far as I know. Only the Belarusians, as far as I know, invited the WHO. The Ukrainians are quite capable of doing it also. But I just don't know precisely how they have diagnosed it.

But I assume it's now done correctly, because they have learned from the others. But I assume we'll see more. Regrettably, but we'll see more.

Mr. SMITH. Thank you very much, Dr. Feshbach.

Dr. FESHBACH. Thank you.

Mr. SMITH. Mr. Kuzma, just a few questions.

Mr. KUZMA. Sure.

Mr. SMITH. Besides yourself, how many other NGOs are active in Ukraine?

Mr. KUZMA. There's quite a large number of NGOs that are active. I'm more familiar just with the medical relief groups, and even those, it's difficult to keep track of, because there are some wonderful projects that may be operating on a small scale, in particular cities.

When my wife and I were in Luhansk, on the eastern perimeter of Ukraine, we met with a Baptist church, for instance, from Texas that was very active in providing containers out there.

I'm not even sure that a lot of these groups show up in the overall assessment of the organizations involved. So there, again, I think it's difficult to gauge how many groups. But I know of about 15 different organizations that have developed sustained, long-term efforts, at a fairly high level of activity, ranging from \$5 million and above in the value of their medical relief.

Mr. SMITH. Has the intensity of their activities increased or waned over the last 10 years?

Mr. KUZMA. In some cases, it has waned. There are some smaller groups that have. I mean, it just takes an awful lot of effort to sustain this kind of an effort over time. Others seem to have gotten over that survival threshold, and are doing quite well, and progressing. I know that we've kept in touch with a number of groups, such as Brother's Brother Foundation. The American Hospital Alliance, that's been very active in Kyiv, and a number of other cities, that have had very successful hospital partnerships with American hospitals. The Ukrainian Fraternal Association, the Ukrainian Orthodox League, has been quite active. They sort of went through an ebb, and now have intensified some of their activities more recently.

So, it seems to me that a lot of groups really are beginning to intensify their efforts, understanding that the peak of the crisis is actually ahead of us. What we've noticed, in the last 2 years, has been a bit of a revival in interest, both financially and in terms of activity.

Mr. SMITH. Does the Catholic Hospital Association lend a hand in this?

Mr. KUZMA. Yes. The Catholic Medical Mission Board, under the leadership of Father McMahon and Father Yannarell, has been very active, and we've worked closely with them. I know they've been active not just in Ukraine and Belarus, but also in Lithuania, and really have produced a very large volume of aid going in there.

Mr. SMITH. How about UNICEF?

Mr. KUZMA. I have to admit I'm not that familiar with UNICEF's programs and how in-depth their activity's been.

Mr. SMITH. We'll check it out, because I think that's very important there.

Mr. KUZMA. Certainly.

Mr. SMITH. Looking at the overall international response, governments providing moneys—which obviously are best administered in most cases through NGOs—has the U.S. Government been as generous as it should be and ought to be?

Mr. KUZMA. I hate to cast aspersions on the U.S. Government in this sense. I think, certainly, in the last few years, we've seen an improvement both in the level of interest in the Chernobyl zone and the Chernobyl aftermath. Also, the level of activity, I think,

President Kuchma has confirmed the political decision of Ukraine to shut down the Chornobyl NPP by the year 2000 under the condition of adequate and timely financial and technical assistance by G-7 countries. The President has drawn the attention of the G-7 leaders to the necessity of combined efforts to upgrade the shelter, "sarcophagus," safety, and rehabilitation of contaminated territories. He highly appreciated the Memorandum of Understanding, signed last December, between Ukraine, G-7, and the European Commission, stressing at the same time that the MOU does not envisage clear financial obligations of the Western side.

Up to this time, Ukraine has been promised, not in the form of legal documents yet, \$2.6 billion in credit lines and \$512 million in grants. In this connection, President Kuchma proposed to G-7 leaders to conclude a legally binding agreement which will clearly define the conditions, sources, and time-frame for the fund's provisions. Without that, he stressed, Ukraine cannot take the obligation and the responsibility for the plant decommissioning, while having to keep proper nuclear safety standards.

It must be stressed, once again, that the issue of decommissioning the Chornobyl NPP is directly related to the national security of Ukraine and its independence. As you know, Ukraine is experiencing a severe energy crisis. At this time, it is capable of covering only 10 percent to 15 percent of its needs by its own production of oil and gas. Various nuclear power plants produce up to 40 percent of energy, with the Chornobyl NPP accounting for 7 percent of all electricity generated in the country. Therefore, the problem of the plant's shutdown is directly connected with the restructuring of Ukraine's energy sector and introducing new facilities, which could compensate for energy losses.

The U.S. role in G-7 decisions is highly appreciated by us. Furthermore, on a bilateral basis, out of \$225 million allocated by the U.S. Congress to the USAID, for the fiscal year 1996, \$50 million to \$70 million is to be used for energy sector and nuclear safety problems, including \$3 million allocated for the establishment of the International Safety and Environmental Research and Development Center, and \$2.5 million for fire safety measures at the plant's unit No. 3. The U.S. Government also provided \$10 million to the G-7 nuclear safety accounts for the projects in support of the Chornobyl closure agreement.

Still, I want to say, frankly, that we consider such assistance for Chornobyl-related problems insufficient.

First and foremost, we need help in making up a plan for Ukraine's energy independence, energy saving, and efficiency, creating our own nuclear fuel cycle with the participation of Westinghouse Company, enhanced cooperation in the sphere of radiation safety, personnel training, and so on.

We are ready to continue work with our U.S. colleagues for implementation of these plans. Dear friends, Chornobyl is not only the case for Ukraine. It is a warning to mankind at large. Chornobyl must teach the nations of the world the dreadful lesson of preparedness, if we are to rely on super-powerful and hyperdangerous nuclear technology. Ten years ago, we entered a new Chornobyl era, and we have yet to comprehend all its consequences. Thank you for your attention.

Mr. SMITH. Thank you very much, Mr. Ambassador. Dr. Feshbach?

Dr. FESHBACH. Yes. I would like to thank the Chairman and, of course, the members of the Commission for inviting me to speak on this very important topic. I do not intend to read, but to highlight some of the points from the written testimony, which I've given you already.

One of the major questions about the Chornobyl accident is how much radioactivity was there, and how widespread was the impact on the Chornobyl area.

To take the latter issue first, we were first told, after a few days of delay, that there were two oblasts—roughly equivalent to our states—impacted by radioactivity in Russia, two in Ukraine, and one in Belarus. We now know that the number of oblasts affected is 18 in Russia, 11 in Ukraine, and six in Belarus.

So there was a much greater spread than previously announced, though the key question is how much more than one curie per square kilometer was there? Where is it 40 curies per square kilometer? That is, of course, a much more serious level.

In northern Ukraine, southern Belarus, and parts of Bryansk Oblast in Russia, the figure is 40 curies per square kilometer. The total amount of curies released, the radioactivity, for a long time was 50 million curies. Then, it became perhaps 80 million. Then, occasionally, from officially released data it became 90 million. Now, the current best estimates are around 150 to 200 million, or possibly more. If this last figure is the actual amount, the long-term impact or health consequences of the Chornobyl event may be much greater.

Just to place it in context, Three Mile Island released a grand total of 15 curies from beyond the containment structure itself.

It could have been much worse had there been no containment structure, which the RBMK type reactors in the former Soviet Union do not have to this day.

This brings me to another major concern: how many people were involved in containment and clean-up efforts. Again, the official figure, in the early phase, was around 300,000 so-called liquidators, or clean-up personnel. It was never clear exactly who was included in that figure. It later became 660,000. Now, the actual number appears to be about 800,000 involved in the clean-up efforts. Although, how 800,000 could have been there without getting in each other's way, even though some actually participated only for a few seconds—is a puzzle to me!

Regardless of the actual number, many of the clean-up personnel did not have protective clothing, and then many of them had to pick up hot particles, using just their bare hands. Now, we're beginning to see some of the consequences.

To jump ahead a little bit, on a recent trip to Moscow, one of the leading pulmonologists of the former Soviet Union, and also now, especially in Russia, one who publishes internationally, has told me that they are beginning to see a major increase among clean-up personnel of lung cancer, probably due to plutonium aerosols in their lungs that were breathed in 10 years ago during this clean-up effort.

Now, if you apply the 30 percent to the 300,000, to 600,000, or to 800,000 liquidators, you get very different results.

Now, of course, with lung cancer, one always has the problem of the issue of smoking as a co-factor. But everybody smokes there, so the question is the incremental addition to that, because there's a law of equal smoking, which is the way I think of it. So you look just for the differentials. In this case, we may begin to see many more cases, and, apparently, there is some evidence that the cases are increasing.

In addition to lung cancer, there is the issue of thyroid cancer. Now thyroid cancer, particularly among children, who being younger have a smaller thyroid, compared to adults, will be susceptible to even a non-lethal amount of dose of radiation, in this case, of iodine-131, which was the initial nuclide released from the accident site.

If the normal rate per million children, 0.14, is just one case, we're now seeing evidence of it being 80 to 100 cases per million in both Belarus and Ukraine. To make one comparison. In France, for the last 42 years—40 years, there were 72 cases recorded. In Belarus, during the last 2 years there were 74 cases. So, there is a 20 times higher rate in Belarus adjusting for the same number of years/cases, so that the impact is just devastating. That's only what we have seen so far.

The Minister of Health of Belarus invited an independent team from the World Health Organization. What was important about this was that it was not the initial evaluation that much of the health consequences were overstated or exaggerated by the people of this region, which was, of course, quite understandable. But, when the International Atomic Energy Agency went in, in 1989, they only had 2 years of data, and then they didn't have all of the data. This being the case, many thought that the consequences were exaggerated by the local medical personnel, local institutions, and local physicians.

It now turns out that only new thyroid cancer is beginning to show up, as we expected it might, compared to the events in Hiroshima and Nagasaki, of 7 to 10 years later. This is why we're now seeing these events.

The initial evaluation of this illness was not made at the right time to make the evaluation, no matter how very capable the radiation medicine people, the health physicists, and epidemiologists who came in from outside.

We also have to take into account the possibility of bad diagnostics, as well as the lack of iodine salts in the region, leading to endemic goiter as a pre-cancerous condition.

That may have been reasonable, if the increase was about ten times. But the increase is about 30 or more times. It's way beyond normal—normal being improvement of the diagnostics about the correct treatment, et cetera, among the young children. It is now pretty well confirmed that there's a real, major increase in the health problem. But another jump is expected again, around the year 2005 to 2010. Currently we have, in Belarus, about 400 cases among children 0 to 14. In Ukraine, there are about 200 cases, and, in Russia, about 80 cases. Of course there are cases of thyroid cancer among adults, which one has to take into account as well.

If you look at standardized rates by age group, for all ages, in Gomel Oblasts, in Belarus, thyroid cancer rates are about four times the rate they were in the 7 years prior to and after the event.

I have tried to standardize by age group, to keep it an equal comparison. Thus, there has been a real increase.

In terms of leukemia, there has been very little, according to published accounts. In part, that's because the USSR Ministry of Health ordered physicians not to record it as chronic radiation sickness, or acute radiation, in the immediate period. Therefore, much of the leukemia was classified as something else, because physicians were not allowed to diagnose it as radiation sickness.

However, we're now going to begin to see, I believe, a large increase. We're seeing it, for example, from the Center of Radiation Medicine in Kyiv, which has reported a large increase in cases of leukemia among those aged 65 years of age and older. Thus, it is not just among the younger people, unless they're just among the so-called liquidators, or among the children.

There was some exaggeration, however, when it was claimed by one physician that one out of every three persons in the republic—whether it be Belarus, Ukraine, it makes no difference—had leukemia. Well, that's clearly just too much. But there is, undoubtedly, many more cases of leukemia than we're aware of, because I think they're hiding it under another coding of the classification of diseases. It really has no meaning. But, within that, clearly is leukemia. So we have to do more research.

Now, with lung cancer, as I indicated, we should see a major increase, over and above the "normal" rate of lung cancer, some of which is probably associated with cigarette smoking. But another cause is pollution within the republics or countries, as the case may be.

In addition, a friend of mine brought to me evidence from Philadelphia, literally Philadelphia, where a lot of former Ukrainian Jewish emigres have settled, some of whom have black teeth. The teeth look black, not from lack of cleaning, but undoubtedly from the enamel being affected by radiation. This is just a classic case, which is not normally seen, certainly, in the country, but you have to look for evidence like this to determine that there was something special about what happened.

The Israelis probably have a lot more information about which one should inquire. But one source tells me that 40 percent or more of recent emigres had enlarged nodules on their thyroid glands. Among the children who came to the country as part of the immigration from this region were low vitamin levels and high numbers of endocrine diseases. This, of course, was differentiated between those that came from contaminated and non-contaminated areas.

Now, to cut it a little bit shorter, one has to deal also with the official statements versus all the other evidence. For example, there is a Dr. Ilyin, who is a gentleman who represents the classified section of the prior medical establishment. He says that the Chernobyl sarcophagus is totally secure—no cracks, or no holes in it, or anything like that, totally contradictory to all other evidence. He wrote in a brand-new article. Well, it just is mind-boggling in many ways.

In another case, however, now he's also saying there's been some increase in infant mortality in the area. This is a major concession from him, without giving specific data, but just making that statement. So maybe the evidence is building up, even for people like Ilyin and others, that they will have to recognize that there have been excessive consequences from the Chornobyl event.

One last thing that they indicated needs to be monitored is the long-term, low-doses of radiation. We really don't know in this country, that country, or any other country, what the health consequences will be of that, so it needs to be examined for the future. Thank you very much.

Mr. SMITH. Dr. Feshbach, thank you very much for your testimony. Mr. Kuzma?

Mr. KUZMA. Thank you. Mr. Chairman and distinguished members of the Commission, on behalf of the coalition, Chornobyl Challenge '96 and the Children of Chornobyl Relief Fund, I'd like to thank you for the opportunity to address this Commission on the aftermath of Chornobyl.

Since 1990, our foundation has been heavily involved in providing direct relief to the affected region. We've now completed 16 airlifts, and numerous smaller shipments, providing about US\$38 million worth of humanitarian assistance.

We're also heavily involved in long-term hospital partnerships, designed to upgrade the quality of care at pediatric centers which specialize in the treatment of children with cancer and other radiation-induced illnesses.

In the course of our relief missions, we've become quite familiar with a wide range of health problems, which have been on the rise since 1986; and we have been concerned about the lack of attention that some of these problems have received.

The sharp increase in thyroid cancer has been well-documented and discussed by the prior speakers. But these statistics of 288 cases in Ukraine, close to 400 cases in Belarus, really need to be considered as just the tip of the iceberg. The highest incidence of cancer usually occurs, as Professor Feshbach says, between 10 to 20 years after exposure, and there are thousands of children who are suffering from enlarged thyroids and other conditions which indicate that they are at risk for cancer in the future.

The members of the Commission might remember that, in last week's Washington Post, there was a case cited of the village of Narodichi, in the Zhytomyr district, where actually a quarter of the children, about 466 out of 2100 children, are suffering from various thyroid disorders that are a very alarming sign of problems to come.

Even more troubling are the overall demographic trends, in both Belarus and Ukraine. According to the U.N. Office of Population, the two nations which suffered the greatest amount of fallout from Chornobyl are also the two nations which are suffering the biggest decline in population over the last few years.

We simply find it difficult to believe that this is a matter of coincidence. Traditionally, Ukrainians have prided themselves on large families and healthy children. Yet, in 1992, there were 40,000 more deaths than live births throughout Ukraine. This ratio has declined steadily so that in 1995 there were 174,000 more deaths than live

births. We find it difficult to believe that economic hardships alone can account for this dramatic decline.

The Boston Globe reported, in January of this year, that infertility among Ukrainian males is now the highest in the world. The New York Times reports that life expectancy among Russian men has dropped by 10 years since Chornobyl. Today, infant mortality in Ukraine stands at twice the European average, 14.3 deaths per thousand live births.

Recent studies by the Ukrainian Ministry of Health, its Office of Children's and Maternal Health, have shown that pre-natal and post-partum complications have increased much more sharply in regions which were contaminated by fallout from Chornobyl, as opposed to areas that were non-contaminated.

Two weeks ago, at a conference at Yale University, physicians from Ukraine and Belarus, Dr. Anna Petrova and Dr. Olesya Hulchy, presented startlingly similar results from epidemiological studies on women's reproductive health.

Several patterns emerged. First, anemia among pregnant women has risen to alarming levels, over 60 percent in regions affected by radiation, roughly in the one to five curies per square kilometer range. Anemia is only one of the factors which greatly reduces the ability of mothers to deliver healthy babies. Hypoxia and increases in other normally rare conditions have also had a severe effect on survival rates of newborns and young mothers.

A study is currently underway, under the supervision of the University of Illinois School of Public Health, conducted by Dr. Daniel Hryhorczuk, which is tracking more than 15,000 mothers and children in six provinces in Ukraine, to determine the effect of economic and environmental factors on maternal and children's health.

This study has received really modest funding from the Soros Foundation and the World Health Organization, yet has made much more substantial progress than many studies which have received far greater financial support from Western agencies.

For some time now, we've been receiving persistent reports from our Ukrainian partners and colleagues that the rate in birth defects has doubled in areas closest to the evacuated regions. This has been the case both in Belarus and Ukraine.

These reports have been routinely dismissed by Western health officials, and yet a team of Japanese experts, from the University of Hiroshima, in 1994, studied more than 30,000 autopsies, fetuses, and newborns in contaminated areas of Belarus.

Their findings were reported by UPI and the Kyodo News Service, but received scant attention in Western news publications. The Japanese team did observe nearly twice as many birth defects as would normally be expected, and these were a wide range of problems: severe cleft palates, missing digits, extra digits, malformations of critical organs. These have all been reported with greater frequency since Chornobyl.

In other areas, where the levels of contamination are higher, between five to ten curies per square kilometer, the rate of birth defects has actually risen eight-fold.

I personally have had an opportunity to see some of the children and the newborns in the neonatal wards in Kyiv and Luhansk, and

we've been struck by the strangeness of many of the defects that we've witnessed there. These are defects that we've never encountered in American neonatal wards, even in some of our urban areas and industrial areas, where one might expect to find some of these kinds of severe defects.

Dr. Valery Kuznetsov, the Director of the Neonatal Division at the Institute of Pediatrics in Kyiv, has noted that, since Chornobyl, the number of birth defects has increased, but, also, that the number of children with multiple defects has also increased noticeably. Arguably, these are anecdotal reports, but they deserve much broader follow-up.

Many Western scientists, particularly those involved with the International Atomic Energy Agency, have been eager to dismiss widespread reports of these problems by ascribing them to radiophobia, a supposedly unfounded fear of radiation and psychological stress. Without even looking at the population in question, some researchers have adopted the posture of the Soviet government in the early days following the accident, accusing the Western media of exaggerating the problems.

We, and a lot of our colleagues in Ukraine, really find this stereotype of hypochondria quite offensive. That is largely because, as the Ambassador of Belarus mentioned, these are both countries that have undergone a really staggering history of oppression and suffering, and, if anything, have shown a great deal of resilience and political maturity in the process of achieving their independence.

The kind of bias which had been expressed by many of the health researchers from the West really is antithetical to the principles of scientific inquiry. The experience with thyroid cancer, in which many of these early reports were just dismissed out of hand, really needs to be examined. Now that the link between Chornobyl's fallout and thyroid cancer has been conclusively established, we believe that the scientific community needs to assume a more open-ended, open-minded posture toward other health concerns expressed by Ukrainian and Belarusian physicians.

In 1992, when the president of our foundation and other health experts testified on the Chornobyl aftermath before the Senate Subcommittee on Nuclear Safety, there were grave concerns expressed about the lack of research focusing on the highest-risk population, that is, the clean-up workers and the families which were evacuated from some of the most highly contaminated zones. Regrettably, there still has been very little progress in studies of these critical populations. We still do not really know the number of casualties among the clean-up workers, most of them men in their twenties and thirties, at the time of the accident. We still do not know the leukemia cancer rates among, for instance, the 11,000 Ukrainian children who were brought to Cuba in the days of the former Soviet Union for treatment.

We believe that there are several large clusters of Chornobyl evacuees living in the cities of Kharkiv and Kyiv, and other settlements around Kyiv and Minsk, who would be easily accessible and of prime interest for long-term health studies. We're mystified as to why more effort has not gone into studying their condition.

Regardless of the continuing debate over Chornobyl's ultimate health impact, the Children of Chornobyl Relief Fund and our col-

leagues have made a long-term commitment to upgrade the quality of care in these pediatric institutions. We're proud of CCRF's role as a leading PVO. At the same time, we recognize that there are many other groups which are also making vital contributions to this international relief effort.

Among these, we're proud to be associated with groups such as the Catholic Medical Mission Board, the Cherkassy Diabetes Project, the Kharkiv-Cincinnati Sister Cities Program, the Ukrainian National Women's League of America, Thoughts of Faith, Share the Dream, and many others.

In Belarus, we've long admired the success of some of our counterparts. In particular, the Citihope organization and the Ramapo High School organization. Despite the progress we've made, our board and our volunteers are painfully aware of the grim realities that Ukraine and Belarus face. We're humbled by the enormity of the task that lies ahead.

Hospital development is one of our key priorities, and we feel that, as Western companies expand their investment in the former Soviet Union, they need to be encouraged to apply the principles of community involvement and good corporate citizenship, which have become standard in the United States.

Community health programs can build trust and solidarity between American businesses and government agencies and East European partners. A wonderful example of some of this type of activity has been a women and children's health initiative initiated by the Monsanto Company, which has launched programs in three rural provinces in Ukraine.

The program offers pre-natal screening, nutrition, and immunization programs to help reduce infant mortality in regions which have been heavily affected by environmental degradation and infectious disease.

The Chornobyl disaster remains one of the most profound and pivotal events in East European history. We should not and cannot afford to minimize its impact, or to turn our backs on the victims. We believe, based on our experience, that the people of the United States can build very powerful relationships with the people of Ukraine, Belarus, and western Russia, by addressing the issue of Chornobyl head on.

We think that our government can enhance its stature as a compassionate world leader by providing continued funding for health programs in the CIS. Given the likelihood that health effects in Chornobyl will intensify over the next 10 years, USAID and other agencies should continue to provide funding for health programs in Ukraine and Belarus beyond the current 1998 cutoff date.

Chornobyl is a unique disaster, and it requires unique approaches. But, as a nation, we believe that the United States has a great deal of expertise, and technology, and compassion to offer. We should not be afraid to tap our generosity of spirit. The children of Chornobyl share a legacy with all the children of the nuclear age, and their future should be of concern to every society in every corner of the world. Thank you.

Mr. SMITH. Mr. Kuzma, thank you very much for your work, and for your very fine words at this hearing. We appreciate it, and we

I believe that the problem is more complex than only shutting down the Ukrainian Chornobyl plant. It has to be solved as a comprehensive problem, for all non-reliable units in the territory of the former Soviet Union.

Mr. SMITH. Is there more that the United States could be doing to help Ukraine with regards to those risky reactors?

Amb. SHCHERBAK. Risky? Yes, sir. Absolutely. We got aid, technical aid, from the United States for new types of reactors, VVER, for training personnel. Now, also, we had talks with the American Commission for Nuclear Safety for more efforts in this direction. Also, we want to create or have special fuel cycles for our nuclear plants, with participation of American companies.

Mr. SMITH. If you could be so kind to provide the Commission with a list of humanitarian issues that need to be addressed.

Amb. SHCHERBAK. Yes, sir.

Mr. SMITH. Especially specific things that the Congress could do. You know, the executive branch obviously takes the lead in foreign policy, but we are the purse-strings. Just by way of background, I also serve as Chairman of the International Operations and Human Rights Subcommittee.

Amb. SHCHERBAK. Yes.

Mr. SMITH. And, very often, we will work very cooperatively and sometimes over and above what the Administration will want to do in a given situation. So, if we have a clear assessment of what needs to be done, I will give you my word that I will try to energize this Congress to be much more proactive with regards to Chornobyl, and not just leave it to the executive branch to take the initiative. So, if you could provide that for us, I think it would be very helpful.

Amb. SHCHERBAK. We can give you a list of our needs. Let me say that we really appreciate humanitarian aid by the American side, especially by the Children of Chornobyl Relief Fund, represented by Mr. Kuzma. Their aid for Ukraine is estimated at \$35 million-\$37 million. Yes, right? Compared to official aid of maybe \$10 million. You can see that this is a very big difference. We really appreciate the humanitarian aid.

Mr. SMITH. Thank you, Mr. Ambassador. Ambassador Martynov, I would like to ask you that same request. That whatever you could provide us, relative to the humanitarian concerns for the people of Belarus, that would be helpful, as we go through our fiscal year 1997 appropriations bill for foreign assistance. Could you tell us what is the Belarusian Government's position with respect to closure of the Chornobyl nuclear power plant. Is the G-7 agreement of the year 2000 acceptable? Would you like it closed immediately?

Amb. MARTYNOV. Thank you, Mr. Chairman. First, we would oblige with your request and submit to you information related to the needed areas of assistance.

Secondly, on the closure of Chornobyl: we, in Belarus, do not have any reactors or nuclear power stations which are active in our territory, and, under the circumstances, we feel that we are hostages to a number of old-type nuclear power stations along our perimeter.

One is obviously Chornobyl. Second is Ignalina in Lithuania, and third is Smolensk in Russia. These are the closest to us. St. Peters-

burg is not too far. Geographically, Rovno is not too far, though it is a different type of reactor, as far as I understand.

So our position is that, yes, the international community has to take efforts to increase the safety of these stations and to close those which are most dangerous. We do understand that our neighboring countries have their problems in closing them altogether and immediately, for obvious economic reasons and social reasons.

So, as I said, the international community has to display much more statesmanship and understanding and come to help these countries close these stations. They should no longer keep us hostages. Thank you.

Mr. SMITH. Mr. Ambassador, how would you assess the international assistance that has been provided? Has there been enough so far?

Amb. MARTYNOV. Well, I am sorry to say, but I will say frankly that we do not perceive the international assistance as adequate, and that we are not just greedy in this respect.

We first went to the United Nations, to the international community, immediately after the catastrophe. But, unfortunately, the multilateral effort did not yield too much of tangible, practical results, though there are some.

In terms of bilateral assistance between the United States and Belarus, we are very appreciative of the humanitarian assistance we are getting from the U.S. people. But this assistance primarily comes through private philanthropic organizations, non-governmental organizations of the United States. I could name CitiHope and Ramapo School, which were already quoted here, The Global Environment and Technology Foundation, Pittsburgh Children's Hospital, and other foundations.

The U.S. Government provides some assistance in transportation of these PVO-acquired medicines to Belarus. We also have an agreement between the Department of Energy and the Ministry of Health of Belarus for studying thyroid cancer. But this is about it.

There are also ad hoc deliveries. Say, for the tenth anniversary of Chornobyl, which would come through or with the help of the U.S. Government. But that's about it, again.

We need much more assistance, as I indicated, in such areas as early diagnostics, because we are afraid a new wave of cancers is coming up, as was confirmed here by experts also. We need early diagnostics, we need means for treatment of the things which are to come. The second aspect is, as I said, scientific cooperation to understand it better. The third is that we need to reclaim, to get back the vast areas of arable lands we have lost to radiation.

So we have to cooperate with the United States and other communities in looking for technologies which would allow us to reuse these lands, to get them back into the productive cycle.

So these would be the main areas where the assistance is extremely needed. We were particularly heartened to learn from the Administration of the new ecological emphasis in the foreign policy of the United States. So what we would like to make sure, and to ask you to try to make sure, is that the Chornobyl problem is included on these ecological agenda priority items. It is to be included not only in the aspect of the closure of Chornobyl station, but also

in the aspect of mitigating the consequences of Chornobyl. Thank you.

Mr. SMITH. Let me ask you, regarding the issue of resettlement and the individuals who return to areas that are ill-affected. As far as we know, what are the risks to them in going back prematurely?

From an agricultural point of view, and raising livestock, how do both of your governments fence off certain areas so that people do not return, begin growing certain crops, and then begin exporting them or consuming them themselves?

Amb. MARTYNOV. Well, there is what is called an exclusion zone, which is fenced off, and is off-limits to anyone.

The Belarus Government has already resettled 130,000 people, and I understand this is the biggest resettlement pool, so to say, in the area of Chornobyl. But we have found serious problems in resettlement programs. First, the resources which are needed are very large. Secondly, the people who were resettled continue to be unhappy, because they were uprooted, they were brought to a different environment, they have lost their old ties. They don't feel comfortable in this situation, and the social problems which we are facing in the new settlements are very high.

So some people choose to go back to their old places, where they used to live; and the government does not have an enforcement mechanism for stopping them from going to places, other than exclusion zones. The government tries to dissuade them from doing that, but we cannot force them to leave these areas. Basically, the resettlement programs were for volunteers.

We find, now, ourselves in a situation where more and more people would like to stay where they are, to live with their roots. That increases the necessity to have technologies and possibilities to provide them with safe foods, to provide them with means to grow safe foods in a contaminated environment. So this is another aspect which is very important, because what people do now, in these areas, they consume the foods they grow.

This is the most dangerous aspect of the whole situation, when radionuclides are getting inside through the stomach. So these are the whole sets of problems which we have to face.

Mr. SMITH. Are you beginning to see some cancers attributable to that, or?

Amb. MARTYNOV. Excuse me?

Mr. SMITH. Are people getting sick as a result of eating foods that have been grown?

Amb. MARTYNOV. Absolutely. Yes.

Mr. SMITH. Mr. Ambassador, on the resettlement issue, are people moving back to contaminated areas, and how do you—

Amb. SHCHERBAK. I met those people, you know, in special contaminated zones. It's not a large number, but maybe 100, 200 people now live in this very contaminated zone. Practically, they're very old people, and they don't want to resettle to another region of Ukraine.

But let me give you some numbers. That, for the population evacuated from the zone, about 21,000 houses were built, and 15,000 new apartments provided, Mr. Chairman, without any foreign aid, absolutely only at Ukrainian, you know, for Ukrainian cost.

Mr. SMITH. Dr. Feshbach, can you provide us with an overview of the environmental damage resulting from Chornobyl?

Dr. FESHBACH. Well, one is the actual damage, and there's also some potential environmental damage. This is quite a concern, because of the possible contamination of the Dnipro River, which would get into the reservoir for Kyiv, thereby affecting the quality of the water supply.

This is, in part, a question of the sarcophagus. It's a question of, if you build another sarcophagus on top of it, whether the sub-soil and sub-strata are strong enough to support it and not shift. But the roof itself might even fall down, because the metal rods, which are being exposed to radioactivity, may disintegrate on their own.

In addition, there was a lot of radioactive dust which got onto the nearby forest. In the recent fire, a lot of it was spread. People ate mushrooms, a major part of their diet, from the area. In fact, many of them got sick, and some even died.

So, the issue here is the current situation, as well as the potential future. The land is very badly damaged, and will take a long time to recover. Still, it may be possible to clean up some of it. But a lot of people are moving back because they don't care, and they're going to die anyway, is what they say. They die a little earlier; drink a little more, you know, and it just eases your way to death. But it really is a very major social problem.

But the environmental issue is—how shall I put it? It's hard to comprehend. It's so big that the question becomes one of setting priorities. You really can't deal with all of the problems at once, and you have to understand that their choice has to be made within a constrained budget. It's a question not only of what AID does, or the declining proportion of money going to them and others that's happening, but how, within the constraints that we have, can we get other international agencies to get involved, maybe to pick up some of the slack, and what priorities do we set for ourselves.

Thus I think what the two Ambassadors have said is very reasonable. But, again, one issue is the environment and the other is environmental health impact; and I find it hard to separate them.

I can give you plenty more data. But the issues and key events, as directly related to the Chornobyl event, I think are basically what I've described.

Mr. SMITH. Is there ongoing water testing occurring?

Dr. FESHBACH. Is there ongoing water?

Mr. SMITH. Water testing, to determine whether or not it has become contaminated?

Dr. FESHBACH. Yes, of course, there is. But, again, it's a question of what kind of decimeters they're using, what kind of testing they're doing. The tests need to be, shall we say, made comparable; we need to have a standardized way of measuring, so that we know exactly that it's this definition, as opposed to that definition, and not some local definitions.

This is always a problem. Then the question is who do you bring in to do it. I think the OECD would be a very good candidate organization. It has a good reputation and does a lot of this water testing. So we should try to encourage this kind of organization to do it. It doesn't necessarily have to be an American organization. But

we're a part of that organization, and let others also contribute to that.

I don't think the United States has to do everything, but I think we have to do a lot. Don't misunderstand me. But we have to choose what to do and choose the priorities very carefully.

Mr. SMITH. What about testing of the aquifer?

Dr. FESHBACH. Well, the testing of the aquifer is going on now. So far, it hasn't been determined to be dangerous. We have an embassy there, we have a lot of people there from various organizations.

A lot of commercial organizations are there, and they'll stay there in the immediate future. But, if there's a further accident, then it may become very different.

Mr. SMITH. In talking about lung cancers, as mentioned in your testimony, has there been an increase in bronchiolar, alveolar carcinoma, which is the—

Dr. FESHBACH. I don't have such precise data from there. I wish I did, so that I would know precisely what kinds of cancer that they have. Somebody literally asked me that question two days ago, over the weekend. A cancer specialist was in town for a big meeting, and I told him I don't have those data.

Now, maybe they're available, maybe they're not available. But I hope, if I could go to Kyiv, or to Minsk, whatever, as the case may be, to do some work, I would ask those kinds of questions. But now I don't know the answer.

Mr. SMITH. OK. Could you provide information, because, obviously, that's a plutonium-based cancer.

Dr. FESHBACH. Yes. I would want to know it, too.

Mr. SMITH. Yes.

Dr. FESHBACH. And I'd certainly be happy to.

Mr. SMITH. Could you tell us, doctor, why the mortality rate estimates vary so widely?

Dr. FESHBACH. Oh, sure. But one must separate what is a direct consequence of the Chernobyl event from natural causes of death. For the former, the number of liquidators or clean-up personnel that, as I tried to describe, is now almost a three times differential, from 300,000 to 800,000. Not, obviously, exactly three times, but a little less.

But it's also the question of whether, as many allege, including myself, that this is specifically due to Chernobyl, or not due to the Chernobyl event.

How many people would have died otherwise? It's very hard to determine it. But, when you see differential rates of this level, of 30 times versus, let's say, 10 times, you always have to be sure that it's not a statistical anomaly—that it's not because there are better diagnostics and not because we're paying more attention to this issue. Rather, there's something that we missed before, that they're now getting currently. It happens in the United States, too.

I mean, something may happen so you go out and look for salmonella. So, you go out and look for this problem, or that problem, and you may find that the increase is there, but it's because the prior figure was not as accurate as it should have been. Certainly, this seems to be the case much more than before, and we need to know. It's part of the secrecy of the system.

One of the problems with the International Atomic Energy 1989 Agency survey of the event of 1986 was they didn't know there was a third administration in the Ministry of Health in the USSR. This was the secret component. It now has a slightly different name. But they didn't know it existed, because they didn't know the Soviet system. They didn't know to ask where the nuclear, biological, chemical warfare accident data are collected, hidden, not published, etcetera.

The root cause is you have rules that change diagnostics. You know, you don't say that somebody has a plague, you call it hepatitis; or, in this case, acute radiation sickness might be called appendicitis, or something like that. This was a practice there. There was a State Secrets Act that was in place at the time.

This occurs, as we saw from the work of Alla Yaroshinska, who collected some of the protocols of the working group of the Politburo, which told her to lie, period.

So we have to be very careful that what we're seeing now is not a major increase compared to what was there before, but you have to make the balance in both cases. That's part of the problem of trying to tell what is the excess deaths. Now, I was asked to do this, at one time, by Radio Liberty, as it happened, and I looked at normal mortality tables. How many people survive of this age group? Now, the trouble is, I didn't have a precise definition of who the age group of the liquidators were, the clean-up personnel. But you can make some assumptions.

It seemed to me, at that time when I did it, 3 or 4 years ago, there was four to five thousand excess deaths among this group. Now, they're talking about six to eight thousand. That's in Ukraine alone. Some people are talking about 20,000 or 30,000. That's in addition to the thyroid cancer deaths. It's in addition to the infant mortality deaths. But we don't know precisely.

Somebody from the Ministry of Chernobyl, at this conference that Mr. Kuzma talked about, at Yale, where I also gave a talk, used another figure that was, I think, just much too high. Now, he may be correct, and I may be quite wrong. But that it's all really part of this difficulty of calculation is really what I'm trying to say.

Mr. SMITH. How many people, in your estimation, are still living in contaminated areas? And what is the threat of people being resettled in those contaminated areas?

Dr. FESHBACH. I really don't know any precise number. I would guess it's probably several thousand within the 30-kilometer zone. Nevertheless, even if it's 1,000, or 500, the danger is, of course, much higher. But, you know, there also are half-lives of these radionuclides. Iodine-131's is only 8 days, although others may last longer. Cesium-137 may last 30 years, as well as strontium 90.

But these are elderly people, and you don't know whether it's going to be the last key to push them over at the last mortality stage, or it's just overall difficulty of living conditions. But I don't know the exact number. You get estimates all the time, and I don't know how good they are. They vary. You might quote something in January, and somebody in March will say something quite different.

It's just not determinate yet, really. But it's not a large number. It's not 30,000 to 50,000, something like that. That I'm quite sure of.

Mr. SMITH. To what extent do you think post-traumatic stress has had an impact in terms of increasing people's propensity to get sick?

Dr. FESHBACH. Well, let me tell you my personal experience. I lived in Brussels at the time. I was the Sovietologist in residence at the office of the Secretary General of NATO, Lord Carrington. I was stressed out, too, let me tell you, because the plume also reached to the whole compass, and reached to us in Brussels as well. I mean, I wasn't happy with it, but I hopefully got over it. I don't know how well I'm responding to your question.

But of course, the people who lived there were undoubtedly very stressed. But to say and blame everything, as the International Atomic Energy first report did, or as Dr. Ilyin and many others still do, to blame everything on this radiophobia. That's a bit much.

Now, I think there are exaggerations on the other side, just as much as there are exaggerations on this side. This is not trying to be eclectic. It's trying to be reasonable, and to get a precise medical definition.

But there is no doubt that there is a post-traumatic stress syndrome, which has probably weakened the immune system, which has probably then made many people more susceptible to other illnesses. So, you could say it's linked back to Chernobyl.

But, to say everything is due to post-traumatic stress, I don't believe that either. Nonetheless, I believe many do have this PTS syndrome.

Mr. SMITH. One final question, if I could. In the Bryansk Oblast, in western Russia.

Dr. FESHBACH. Yes.

Mr. SMITH. What has been the impact of Chernobyl on that region?

Dr. FESHBACH. Well, we've had about 60 cases of thyroid cancer among children. Sixty-four is the number, the latest number that I've seen, which is much higher than they ever had before. No question about it. But it also is one of the ones which was very heavily impacted. I could show you a map of that in my atlas on environmental health.

But it's also a question of proper diagnostics. I just don't know whether they're as precise as some other groups are. Whether they have these papillary carcinoma slides. They haven't shown them to the WHO, as far as I know. Only the Belarusians, as far as I know, invited the WHO. The Ukrainians are quite capable of doing it also. But I just don't know precisely how they have diagnosed it.

But I assume it's now done correctly, because they have learned from the others. But I assume we'll see more. Regrettably, but we'll see more.

Mr. SMITH. Thank you very much, Dr. Feshbach.

Dr. FESHBACH. Thank you.

Mr. SMITH. Mr. Kuzma, just a few questions.

Mr. KUZMA. Sure.

Mr. SMITH. Besides yourself, how many other NGOs are active in Ukraine?

Mr. KUZMA. There's quite a large number of NGOs that are active. I'm more familiar just with the medical relief groups, and even those, it's difficult to keep track of, because there are some wonderful projects that may be operating on a small scale, in particular cities.

When my wife and I were in Luhansk, on the eastern perimeter of Ukraine, we met with a Baptist church, for instance, from Texas that was very active in providing containers out there.

I'm not even sure that a lot of these groups show up in the overall assessment of the organizations involved. So there, again, I think it's difficult to gauge how many groups. But I know of about 15 different organizations that have developed sustained, long-term efforts, at a fairly high level of activity, ranging from \$5 million and above in the value of their medical relief.

Mr. SMITH. Has the intensity of their activities increased or waned over the last 10 years?

Mr. KUZMA. In some cases, it has waned. There are some smaller groups that have. I mean, it just takes an awful lot of effort to sustain this kind of an effort over time. Others seem to have gotten over that survival threshold, and are doing quite well, and progressing. I know that we've kept in touch with a number of groups, such as Brother's Brother Foundation. The American Hospital Alliance, that's been very active in Kyiv, and a number of other cities, that have had very successful hospital partnerships with American hospitals. The Ukrainian Fraternal Association, the Ukrainian Orthodox League, has been quite active. They sort of went through an ebb, and now have intensified some of their activities more recently.

So, it seems to me that a lot of groups really are beginning to intensify their efforts, understanding that the peak of the crisis is actually ahead of us. What we've noticed, in the last 2 years, has been a bit of a revival in interest, both financially and in terms of activity.

Mr. SMITH. Does the Catholic Hospital Association lend a hand in this?

Mr. KUZMA. Yes. The Catholic Medical Mission Board, under the leadership of Father McMahon and Father Yannarell, has been very active, and we've worked closely with them. I know they've been active not just in Ukraine and Belarus, but also in Lithuania, and really have produced a very large volume of aid going in there.

Mr. SMITH. How about UNICEF?

Mr. KUZMA. I have to admit I'm not that familiar with UNICEF's programs and how in-depth their activity's been.

Mr. SMITH. We'll check it out, because I think that's very important there.

Mr. KUZMA. Certainly.

Mr. SMITH. Looking at the overall international response, governments providing moneys—which obviously are best administered in most cases through NGOs—has the U.S. Government been as generous as it should be and ought to be?

Mr. KUZMA. I hate to cast aspersions on the U.S. Government in this sense. I think, certainly, in the last few years, we've seen an improvement both in the level of interest in the Chernobyl zone and the Chernobyl aftermath. Also, the level of activity, I think,

since about 1991, when President Bush began the initiative of fuel assistance, there's been a fairly steady acceleration. I think President Clinton and his administration have been quite supportive, as witnessed in their activity at the G-7 and so forth.

However, in all of our discussions with our counterparts in Ukraine we understand that, per capita, and even in absolute terms, relatively small European countries like Holland, and then large countries like Germany, have actually been more forthcoming with assistance. I think that's one aspect of the problem that, in absolute terms of government activity, that I think there can be an acceleration at the U.S. Government level. We've been quite disturbed by reports that we've heard from some of our colleagues at USAID that there may actually be a trimming back of humanitarian assistance in particular, in the years to come.

Not just in terms of the overall cutbacks in USAID, but percentage-wise, that the amount of aid that would go toward medical programs may be cut back. We think that's a mistake, partly because I think a lot of the programs that have been operating in the medical arena have been extremely cost-efficient. I think that there's been a tremendous amount of creativity in leveraging a great deal of aid from the corporate sector and at the grass roots level.

If we want to get literally more bang for the buck, and, to put it more in humane terms, to save more lives per dollar invested, I think there's a tremendous amount that the U.S. Government can contribute.

The other problem is really in the area of disguised aid. As Ambassador Shcherbak noted, a lot of activity that is happening at the government level actually is overlaid over private, voluntary activity that would already be taking place. I think that it's important for our government—and that's something that the recipients are aware of. I think it's very important for the government itself to take a primal role, and not to run the risk of piggy-backing onto just private, voluntary efforts. So that I think there is more that we can do generally.

Mr. SMITH. Have you or your organization been concerned about people resettling in the region and being back in harm's way perhaps infecting, or putting at risk, more children?

Mr. KUZMA. Yes. We're very worried, not just about the resettlement back into the Chornobyl zone, but that wide swath of communities that live just on the periphery of the dead zone, and in fairly highly contaminated regions.

In economically strapped times, these folks are definitely going to have an incentive to bring their produce, from their villages, into major urban centers, whether it be Kyiv, or Chernihiv, or Lviv, or wherever.

Again, anecdotally, we've received a lot of reports from our colleagues at the Institute of Pediatrics, and several of the key hospitals in Kyiv and Chernihiv, that there has been a high incidence of gastrointestinal disorders, including stomach cancers, intestinal cancers.

There is growing fear among many of our colleagues that have gone into this region, and have done outreach—and now, we're doing much more of that work in rural areas in northern Ukraine. There's a tremendous fear of the constant

bombardment of low-level radiation into human tissue, just by consuming the standard foods—beets, and potatoes, and cabbage, and so forth—that in the near future could result in an explosion of gastrointestinal cancers similar to what we've seen with thyroid disorders and cancers. I would echo what Ambassador Martynov said, regarding the importance of diagnostic equipment. It's really got to come in.

This is a unique disaster, where we can anticipate the worst that is yet to come, unlike the disasters of famine in Somalia, or wherever, where the international community really was caught offguard. Here, we know it's coming, and so it's very important for us to provide gastroscopes, ultrasounds, basic diagnostic equipment. We've put a lot of energy into that, in terms of blood diagnostics.

So that, if there is an explosion in leukemia, or Hodgkins disease—and we have seen it, in several areas, we need to be ready. But, again, we're not an epidemiological team. We can't make those assessments, as Dr. Feshbach can.

We think, regardless of whether or not these are radiation-caused problems, the United States can provide an extremely valuable service in just upgrading the quality of the medical infrastructure in that country. God willing, maybe we'll be proven wrong. Maybe, down the road, the impact of Chornobyl won't be as great as we suspect it is or will be. Yet, we will still have delivered a precious resource to these people, by helping them rebuild their medical infrastructure. That is worth everything, from our perspective.

Mr. SMITH. To the best of your knowledge, is the circle around Chornobyl drawn too tightly, or should it be expanded?

Mr. KUZMA. Well, it should be expanded, and, in the best of worlds, I'm sure that the Ukrainian Government and the Belarusian Government would make those efforts. But, again, in these brutal economic times, in these two republics, I don't know that it's possible for them to expand that.

So that the best fall-back option is really to provide better monitoring, and better food monitoring and then diagnostic work, and very intensive screening.

I think, frankly, Mr. Chairman, that it's going to be very important for the public research community to begin to take a very hard look at the highest risk populations.

Our suspicion has been—and I think it was borne out somewhat by the aftermath, with thyroid cancer—that the research communities were not looking hard enough, and not looking in the right places. I think the thyroid cancer explosion could have been identified by IAEA quickly, because a lot of those cases were being funneled into the key endocrinological institutes in Kyiv and Minsk. Had they wanted to find the problems, I think they would have found them.

As a matter of correlation, I think if there's an intensive effort launched in some of the regional hospitals in the Chornobyl region over the next 3 to 5 years, to look at cancer rates in those areas—I hope we're wrong. But I think we will find those cases. That can help us to shape the quality of the medical relief that we bring into the affected region.

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Mr. SMITH. Let me just ask one final question. What do your volunteers, or your personnel eat?

Mr. KUZMA. What do we eat?

Mr. SMITH. When they're in country—in the affected zone, and I'm not trying to be frivolous here.

Mr. KUZMA. No, not at all.

Mr. SMITH. If these things show up, years down the line, the donor community and the international relief workers could be seriously affected.

Mr. KUZMA. You know, it's a very fair question. We—most of our volunteers go in for relatively short periods of time, to monitor the shipments, to maintain the chain of custody to the hospitals and so forth, and to do spot checks.

However, that's changed over the last 2 years, where we now have permanent staff on the ground. We try to mitigate some of the potential exposure by bringing, you know, stockpiles of our own food into that area.

Another way to monitor that is to have relatively inexpensive hand-held counters, these rad alerts that you can buy for 75 dollars. We've recommended that to our staff and have procured a couple of these for our staff. But I have to admit that most of our staff and volunteers, after awhile, get to be fairly cavalier about the exposures that they might be facing.

We make a point of not sending our staff into the actual Chernobyl zone, but try to work more in the hospitals that are beyond the zone and aid the people that were resettled there.

Mr. SMITH. But they do buy food on the market and eat—

Mr. KUZMA. They do, and I have, and others.

Mr. SMITH [continuing]. So they potentially develop these types of problems?

Mr. KUZMA. Yes. So that it is an ongoing risk, and the only way to check that is to have a rad alert and to be fairly systematic in just, at least, scanning it over your foodstuffs before you sit down at dinner. On the other hand, Ukrainian and I'm sure Belarus hospitality is such that it would probably be pretty offensive to do that when you're asked out to private homes, and so forth.

So I think there's just no way of avoiding some elevated risk. That's been a personal issue, because I've had family members that have gone there for extended periods of time, with small children, and asked me "what is the risk?" I had to tell them I think that the risk is elevated, and you're definitely running the possibility of doubling, tripling the possibility of a cancer somewhere down the road, because there are these hot particles.

There are these small clusters, even in the vicinity of Kyiv and it is a risk that, you know, I personally wouldn't run that risk with young children, with my own family. But these are decisions that each individual makes for themselves.

Mr. SMITH. Ambassador Shcherbak, is there thought being given to extending the area ineligible for growing crops or raising livestock in order to try to mitigate the danger of contaminating the food chain?

Amb. SHCHERBAK. No, I don't think so. I believe the territory of the zone is sufficient. But maybe we must establish more restrictions in the zone, because a lot of people live in the zone. There

are proposals that Kyiv be proclaimed a disaster zone. Practically, we cannot ever create the zone including Kyiv, and I don't believe that it would be the right decision.

The only problem is clean water, clean food. It's a big problem for us, because, in very contaminated areas, it's the main problem for people who live in those areas.

Mr. SMITH. Mention was made earlier about a forest fire which spread further the contamination. How far did it spread?

What other naturally occurring phenomena could cause a spreading east, west, south, or north? And what can be done to mitigate those dangers? Dr. Feshbach, perhaps.

Dr. FESHBACH. Well, the key phrase, as I understood it, was "naturally occurring." There's none that I can think of, unless, you know, it's among animals, or something like that. But none really. I mean, the forests are the biggest issue, I think, right now. There's water, in terms of its movements, but that's about it.

Mr. SMITH. Yes?

Amb. MARTYNOV. With your permission, Chairman Smith. I just returned yesterday from a visit to Tulane University in Louisiana, and they are heading a joint project with a Belarusian research institution on migration of radiation.

Apart from the forest fires, another important danger is floods, because radioactive isotopes are also found in sediments in rivers. They are relatively quiet, until a flood comes. This is especially dangerous when there is a kind of sequence of floods. When the first flood would kind of bring it up, and the next flood will carry it much, much beyond the area.

Also, there is kind of a natural as well as human-induced migration of other types, like on the wheels of the trucks going from this zone to that zone, and things like that. So what we find in Belarus, and I'm sure the Ukrainian scholars find, is that the contamination area grows slowly, but it grows. So that also affects the problem of evacuation or non-evacuation because, apart from the tight exclusion zone around the Chernobyl station itself, we have other stains of radioactivity on the territory of Belarus to relatively high degrees.

But you cannot just evacuate people from there firstly, because it's very expensive. Second, because you have to provide these people with something else, and new places. And, third, because it all changes. You cannot move people, shift people all the time, all around. Thank you.

Mr. SMITH. Thank you. One final question for all of you, or anyone who would like to answer. Is there a mechanism in place which would continuously monitor this possible migration? Some device at the parameters of the effective zone which, if it is migrating outward, for instance, at a rate of 50 feet a year, or 100 feet, the radioactivity will be detected? It's certainly not contracting; instead, I would think, it is expanding.

Amb. MARTYNOV. Well, Mr. Chairman, we have at least two aspects of effort here, of which I am aware. First, we have a monitoring network in our territory, which observes the status of radioactivity at each given moment. So, we would be in a position to detect

Secondly, we work on mathematical models which would allow us to basically make a prognosis of how these radioactive elements can migrate in the future. The project I related to you a little bit earlier, in Tulane, does exactly that. So we are in a position now to measure the situation as it is on the ground and make projections into the future, if we are in a position to continue with this research.

Mr. SMITH. OK.

Amb. SHCHERBAK. Mr. Chairman, we have, in Ukraine, in the closed Chornobyl zone, a very strong scientific center for studying these problems.

Maybe you saw the TV program on CNN about this center last week. It's a very interesting study about the consequences for nature, for the ecosystems, genetic materials.

Also, we in Ukraine have a network of laboratories, especially for food, for milk, for water, and a very well-equipped medical center in Kyiv for Chornobyl diseases.

Yesterday I called the Minister of Environmental Protection for Ukraine and discussed with him the problem of American aid to Ukraine. He says that we need very high-level equipment and a very high-level technology laboratory for water because it's a big problem.

Let me draw your attention that there are very highly contaminated areas surrounding the Chornobyl plant—not large areas, but areas very highly contaminated by plutonium and strontium. We are afraid that floods can be very dangerous for water, not only for underground water resources, reservoirs, but also for rivers, for the Dniro. It's a very dangerous period right now.

We believe that we will get such a laboratory from EPA to support our efforts to liquidate the consequences of the Chornobyl catastrophe.

Dr. FESHBACH. Both countries have a Ministry of Chornobyl which also has responsibilities for monitoring. Both countries now have spin-offs from what was then a Soviet hydrometeorological service agency, which included monitoring also. But the responsibilities were more for air and water, in general, than radioactivity. But they also monitored radioactivity, though they didn't publish the data.

There is certainly these networks and other activities, but there has to be a lot more. Part of the problem, if I may digress a little bit, is that, until recently, most of the effort of AID, under orders of the Congress, as well as of others, was to deal with issues of democratization and privatization. I'm all for those, but it was to the detriment of environment and health.

As a major priority, it's only coming up now, but now AID's money, which also supports some of the EPA activities, is going down. So you have this confluence of more need for this at the same time the moneys are going down.

It's really a very difficult, shall we say, juncture, if you want to get something done before this runs out.

As to the models, there are all kinds of models, and one has to be very careful, because I just got a proposal in the mail the other day, and somebody wants \$1.3 million to do models as well as

good people there, everywhere, and bad people everywhere, and you have to make sure it's a good model.

Mr. KUZMA. Yes. The only laboratory that I've been familiar with over the last few years is one under the administration of Dr. Volodya Tykhy, whose father, actually, was an heroic political prisoner in the past who died as a result of the abuse he sustained in a Soviet prison camp.

Dr. Tykhy has been one of the real leaders in helping to monitor this. He's received support from the American Greenpeace organization. Apparently, they've been running quite effectively, in recent years, in tracking contamination of the Dniro and other watersheds.

Just in conclusion, one other type of contamination, although it might not seem totally relevant to this, we've been actually very concerned about the need for additional medical care and additional surgeries in the coming years. The fact that just the rate of thyroid cancers is rising indicates that there probably will be surgeries for other types of cancers.

A critical need for Ukraine, and I'm sure for Belarus, is also to provide adequate AIDS testing, to prevent contamination of blood through transfusions. This is a problem that the United States, having a tragic lead on this issue, can really offer a lot to the people of Eastern Europe to help prevent the spread of HIV infections.

We've already met with a number of people that have been tracking this problem. There was an explosion of AIDS in Dnipropetrovsk this year. There were five pediatric cases in Donetsk. One of our hospitals also now has the capability to test for AIDS. That's an area in which we can make a huge contribution to save tens of thousands of lives in the years to come. It's another gigantic challenge that we're facing as we try to improve the quality of medical care in that area.

Mr. SMITH. The Commission is most appreciative for your testimony. I've been in Congress 16 years, and you are perhaps the most informative panel I have ever heard. I can assure you, we will provide copies of this record to many Members of Congress, especially those who are in strategic positions to do something, on my subcommittee, as well as on the full Committee on International Relations.

Especially with this tragic milestone approaching on the 26th, we should look at that as a launching pad to pursue what we haven't done, and try to backfill, and make sure we are covering all the bases, especially with the peak period still on the horizon. There's so much and questions of resettlement are important, so that we ensure more people won't be contaminated, which would be a terrible tragedy.

Thank you for your very fine testimony. Each and every one of you have been an excellent panel. The Commission is adjourned. Thank you.

The hearing was concluded at 12:04 p.m.

[Written inserts follow.]

**Commission on Security and Cooperation in Europe
Hearing on "The Legacy of Chernobyl - 1986 to 1996 and Beyond"**

Statement of

H.E. Mr. Serguei N. Martynov Ambassador of the Republic of Belarus

April 23, 1996

Honorable Chairman Smith !
Honorable Co-Chairman D'Amato !
Honorable Members of Commission !
Ladies and gentlemen !

I am profoundly grateful to you, Mr. Chairman, for the invitation and for the opportunity to take the floor before such a distinguished audience.

For almost ten years since the explosion of the Chernobyl power plant reactor on April 26, 1986 the Republic of Belarus has been exposed to radioactive contamination. *That day split Belarusian history into two epochs - before and after Chernobyl.*

According to its scale the Chernobyl accident is the biggest technogenic catastrophe that has ever occurred on this planet. The United Nations General Assembly sized up the Chernobyl tragedy as a global radio-ecological catastrophe.

Such words as curie, becquerel, radionuclides, radioactive contamination of soil, radioisotope content in food and human organism, radiocaesium and radiostrontium, plutonium and many others which had previously been used only by a narrow circle of specialists became part of the ordinary people's vernacular.

Scientists are still arguing as to the amount of radionuclides released into the environment by the explosion. But the margin of the argument itself is shocking. Estimates suggest it is equal to the effect of the explosion of twenty to two hundred nuclear bombs. The worst results of the catastrophe are to be found in Belarus. According to international estimates, my country *Belarus received 70 percent of the radioactive fallout from the explosion*, and is by far the most affected victim of the disaster.

It is not the first time that great ordeals have fallen to the lot of the Belarusian people. Many of you are aware that every third citizen of Belarus perished during World War II. *Now Chernobyl tragedy has raised the question of the very survival for the Belarusian nation.*

Only one percent of the territory of my country is standard clean from radioactive contamination. A large number of Belarusian villages have become empty. More than 400 settlements have become uninhabited and more than 600 schools and kindergartens have been closed. Almost overnight people were forced to say good-bye to their native land, leave behind the graves of their ancestors and start building their lives in new unfamiliar areas.

Following the disaster, the Government evacuated 131 thousand people from the areas worst affected by Chernobyl. Housing, social infrastructure and jobs often in an open country, have been created for these people.

Although 10 years passed after the accident the most polluted areas are still functioning in the emergency regime conditions.

Almost 2 million people, including 484 thousand children and teenagers 17 years and younger, continue to live in over 3 thousand settlements located on the territories seriously affected by radiation. People are living under a constant stress, are prone to greater risk of diseases and are facing greater social, psychological and economic problems. But in these places the people came to link their destinies with their native towns and villages and most of them are not going to leave for elsewhere.

Health consequences

Health problems are most striking and, indeed, are awesome. Above all, the children are the most heavily affected. *Thyroid cancer among children increased 285 times.* Belarusian children affected by the Chernobyl catastrophe are vulnerable to thyroid cancer to a greater degree than Japanese children who went through the atomic bombing. This conclusion was made by a group of scientists from Nagasaki on the basis of a 5-year (May 1991 - June 1995) study in the city of Gomel, Republic of Belarus.

Also, the analysis of health state of children from the contaminated territories revealed the rise of otolaryngological diseases, biliary system diseases, chloranemias, chronic gastritis and other digestion diseases by 40-80% in comparison with the clean (control) areas. In 40% of schoolchildren affected by the radiation, functional breaches of cardiovascular system were exposed.

Monitoring the health of people living in contaminated territories shows that in Belarus general morbidity is increasing. Malignant neoplasms rose at average by 60%. The most frightening example is the growing number of thyroid pathologies, including thyroid gland cancer to which I have already referred.

Of urgent and special concern is also the health of the people who worked in 1986-1987 close to the reactor that exploded trying to eliminate direct consequences of the disaster. We now have more than 110 thousand of these people.

Birth rate in Belarus has been dropping steadily and sharply after the Chernobyl disaster. Abortions for fear of bearing a deformed or otherwise handicapped child are on the rise. Coupled with economic hardships of the transition period we are facing now what experts call "negative growth" of the population. *Simply put, with each passing year there is less and less Belarusians of this Earth.*

There is no proved scientific knowledge of what is going to happen in the coming years to masses of people subjected to extremely long-term - I'd say life-term - irradiation. The majority of experts expect a further substantial increase of malignant tumors, as well as other diseases.

Another frightening truth is that *we are going to live with Chernobyl forever*. The radioactive situation now is primarily determined by the presence of the following radionuclides - caesium-137 (half-life of 30 years), strontium-90 (29 years), plutonium-239 (24390 years), plutonium-240 (6537 years). To dissipate, an element needs 10 half-life periods. Simple multiplication gives you a creeping feeling of an adverse eternity.

Economic consequences

Health problems were not alone. Economic losses, need for new expenditures and related problems are mind-boggling.

Hundreds and hundreds of enterprises, both industrial and agricultural, had to be closed down in the contaminated areas - along with hospitals, schools, infrastructure. Twenty percent of arable land were taken out of economic use as a result of the catastrophe.

According to the most modest estimates, the economic damage incurred by Belarus as *an immediate result of the Chernobyl accident is equal to 32 annual budgets of the Republic, i.e. 235 billion US dollars.*

Now ten years later, *the Government is compelled to spend, year in and year out, up to 25% of its budget to try to cope with the aftermath of Chernobyl.* This is an additional and huge burden on the reform pace in Belarus. We cannot abandon, and members of the US Congress, I hope, will agree with it, hundreds of thousands of helpless people out there in the radioactive cold to face the beast of Chernobyl on their own.

After the disintegration of the Soviet Union we were left alone with this disaster. This nuclear power station was not built by us, it was not serviced by us and we did not have any influence on the processes taking place in it. The state which did it is gone. The consequences of the catastrophe coincided with the economic crisis, with the destruction of the very fabric of former life. That is why we have to resolve a multitude of socio-economic problems, to construct a new Belarusian state while doing everything at the same time in order to minimize to

an extent possible the consequences of the Chernobyl catastrophe. And it is extremely difficult for a single country to cope with it, taking into account the global character of the disaster.

The grim Chernobyl picture makes us recall the chilling prophecy.

The Book of books - the Bible - reads: " **And a great star... fell from the sky on a third of the rivers... The name of the star is Wormwood. A third of the waters turned bitter, and many people died from the waters that had become bitter.**" (Revelation; 8:10-11)

A bitter *wormwood* herb translates in Belarusian and Ukrainian languages as "chernobyl". A Revelation prophecy come true is now a frightful reality for the peoples of Belarus, Russia, Ukraine and for the peoples of the whole world.

International cooperation

This is a tragic lesson which, as never before, has brought us - the citizens of our planet - closer to each other and made us think over: Shall we survive another unforeseeable mistake in a nuclear plant design or an operator's mistake at such a plant? Can we as a world community afford ignoring the worst case scenario? Do we have enough knowledge to prevent future catastrophes of this kind and to cope with the consequences of Chernobyl? Do we have enough statesmanship to rise above other considerations and face the challenges of the after-Chernobyl epoch?

Obviously, Chernobyl catastrophe put to a very serious test the vitality not only of Belarusian people but the vitality of the international community bonds and the preparedness of states to cooperate meaningfully in the face of an unseen ecological danger.

Belarus does all it can, and more than that, to mitigate the consequences of Chernobyl and provides the international community with a sizable scientific contribution for that purpose. *The scale of the catastrophe and its consequences, however, defies capabilities of any single country.* The 10-years since the explosion at the Chernobyl power station showed, however, that the international community is not quite up to the Chernobyl test. *New and vigorous international cooperation is badly needed in the following three areas.*

1. *The world community ought to understand in full measure the current plight of Chernobyl victims in Belarus, Ukraine and Russia and to provide meaningful assistance to relieve their suffering.* Wanted here remain adequate and targeted humanitarian help and medical help, both in terms of high-quality equipment (early diagnostics and treatment) and modern and effective medicines.

2. *We need to understand how to cope with the disaster - the one which happened and, God forbids, possible new disasters.*

a) Undoubtedly, we will hardly be able to manage without *precisely identified scientific guidelines*, without the participation and help of the world's best scientific experts.

Belarusian scientists and experts have by now a 10-years experience in intense study of the situation in the polluted areas. This is our continued contribution to the international scientific cooperation. A considerable part of the intellectual resources of Belarus is devoted to this purpose. A network of specialized research institutes has been formed, qualified national scientific personnel has been trained in new areas. Large-scale research is being conducted in the field of radiation medicine, genetics, radiobiology, agricultural radiology, manufacturing of special preparations and food additives. There is an active research into the problems of socio-psychological and economic rehabilitation.

In Belarus in the post-Chernobyl decade we had accumulated a unique experience on the results of the radiation effects on human beings and the environment. We have fundamental scientific material on the reduction of negative effects of radiation.

Here I would like to stress an important point: **Belarus proceeds from the principle of free and guaranteed access to the information on the consequences of the catastrophe.** We cooperate fully with the World Health Organization, International Atomic Energy Agency, European Commission and other international agencies. We are providing necessary conditions for the implementation of international research projects in our territory. Experts from many countries, international scientific community at large and international agencies displayed serious interest in our scientific findings. We in Belarus are convinced that the comprehensive results of this research should be applied for the purpose of overcoming the consequences of disasters.

b) We need to gain knowledge and create *technologies for rehabilitation of contaminated lands as well as technologies allowing for producing safe foods* in a contaminated environment. This kind of cooperation will allow us to gradually return the affected territories to full and viable life. If we let the time pass, if we fail to create acceptable conditions for life in these areas - then a whole zone in the geographic center of Europe the size of several small European countries put together will be doomed to social, demographic and economic degradation.

3. We need to identify the most rational applications of international intellectual efforts and material means. For that purpose Belarus has recently submitted to the International Conference "One Decade after Chernobyl: Summing

up of the Consequences of the Accident" held in Vienna recently, on April 09, the following proposals:

a) to set up a **Joint Scientific Interstate Center** on the problems of Chernobyl to coordinate efforts of scientists, which would allow for increased efficiency of their work and cooperation;

b) to arrange financing of the Chernobyl projects on equal and mutually acceptable terms and for that purpose to set up the **Fund of the Planet Protection** which could accumulate a part of profits of the nuclear machine-building and power engineering industries in order to use these funds for the mitigation of the consequences of nuclear catastrophes and prevention of further disasters;

c) to create a viable and enforceable international legal framework of the **responsibility of states** for causing nuclear damage to other countries which would specify appropriate guarantees and compensations. The IAEA is already undertaking practical steps in this direction. We welcome this and call for the speediest elaboration of such international instruments.

Belarus also considers that the disproportionate share of Chernobyl sacrifice and damage which Belarus has to sustain warrants international contribution to sustainable socio-economic and environmental development of the Republic of Belarus.

During 10 years already the international community have been realizing step by step the bitter lessons of one of the most tragic events of the 20th century when a creation of human mind built for the benefit of people went out of control and scorched our earth with a radioactive tornado never seen before. And these lessons should be learnt from for many more years to come.

For those who did not face directly the radiation disaster it may seem that the problem of Chernobyl has lost its intensity and topicality. But not for the people of Belarus, Russia, the Ukraine.

We will never agree with deliberately understated estimates of the disaster consequences, which are presented from time to time by certain representatives of international organizations.

For us this tragedy has a clearly expressed *beginning*, but unfortunately has no foreseeable end.

Written Testimony

of His Excellency Yuri Shcherbak, Ambassador of Ukraine
at a hearing to assess the social, political, health, economic and
environmental legacy of the Chornobyl disaster
before the Commission on Security and Cooperation in Europe
(April 23, 1996)

Dear Mr. Chairman,

Distinguished members of the United States Congress,

Ladies and Gentlemen!

First of all, let me express my gratitude for the great honor to be here this morning at a congressional hearing on the Chornobyl disaster as an eyewitness of its aftermath. On the first days of May, 1986 I voluntarily went to the Chornobyl area as a doctor of medicine and author and begun to collect testimonies of people involved in Chornobyl case. On the basis of such testimonies I wrote a documentary story about Chornobyl. Being a member of the Soviet parliament in 1989-1991, as a Chairman of the Subcommittee on Nuclear Energy and Environment, I organized the first in history of the Soviet Parliament public hearing on the consequences of the Chornobyl catastrophe. Due to this activity many secret data about the disaster were made public.

As a leader of the Green Movement of Ukraine, I organized the first "public trial" in 1991 for investigation of reasons and consequences of Chornobyl. The trial found the Communist regime guilty. There is no doubt that Chornobyl disaster to a great extent contributed to the demise of the Communist regime, because the

Ukrainian people realized that the Communist Party and its leader Mikhail Gorbachev, hiding the truth from society, exposed to danger lives and health of millions of people, especially children, forcing them to take part in May First manifestations under the conditions of high radiation levels.

By the totality of its consequences, the accident at Chornobyl nuclear power plant in 1986 is the largest modern disaster, a national calamity which touched upon the destinies of millions of people living on vast territories. This catastrophe has brought the Soviet Union and the world community at large to the necessity of solving new and extremely complex and comprehensive problems dealing practically with all spheres of life - political and social system, economy, industrial development and the state of science and technology, legal norms and laws, culture and morals.

The following testimony is based upon the data contained in the 1996 National Report of Ukraine "Ten Years After Chornobyl Accident", 1996 report of the Ukrainian Ministry of Chornobyl Affairs and the article "Ten Years of the Chornobyl Era" published in April 1996 issue of "Scientific American" magazine.

WHAT HAPPENED IN CHORNOBYL?

April 26, 1986 will go into history books as the date when reactor number four of the Chornobyl Nuclear Power Plant in Ukraine exploded causing death and radioactive contamination of a wide area

around it. The Chornobyl Plant is situated 110 kilometers (about 70 miles) from Kyiv, capital of Ukraine, and not far from the very heart of Europe either. That industrial disaster was later qualified as the world's major engineering and ecological catastrophe.

The events that led up to the explosion are well known. Reactor number four, a 1,000-megawatt RBMK-1000 design, produced steam that drove generators to make electricity. On the night of the accident, operators were conducting a test to see how long the generators would run without power. For this purpose, they greatly reduced the power being produced in the reactor and blocked the flow of steam to the generators.

Unfortunately, the RBMK-1000 has a design flaw that makes its operation at low power unstable. In this mode of operation, any spurious increase in the production of steam can boost the rate of energy production in the reactor. If that extra energy generates still more steam, the result can be a runaway power surge. In addition, the operators had disabled safety systems that could have averted the reactor's destruction, because the systems might have interfered with the results of the test.

At 1:23 and 40 seconds on the morning of April 26, realizing belatedly that the situation had become hazardous, an operator pressed a button to activate the automatic protection system. The action was intended to shut the reactor down, but by this time it was too late. What actually happened could be likened to a driver who

presses the brake pedal to slow down a car but finds instead that it accelerates tremendously.

Within three seconds, power production in the reactor's core surged to 100 times the normal maximum level, and there was a drastic increase in temperature. The result was two explosions that blew off the 2,000-metric-ton metal plate that sealed the top of the reactor, destroying the building housing it.

There had been over 230 metric tons of fuel in unit number four, including 192 tons of fuel in the core of the reactor. As a result of the explosion and fire of the reactor, the environment was polluted by a part of released nuclear fuel amounting to as minimum 90 million curie of radioactivity including radioactive iodine, cesium, plutonium, strontium and several other isotopes. The rest of fuel was dispersed within the damaged reactor and around it. Intensity of radioactivity could be compared to that which would result from the simultaneous explosion of 500 A-bombs similar to the one that was dropped on Hiroshima in August 1945. The hot gases from the burning reactor were being thrown into the atmosphere for at least ten days after the accident and rose to the altitude of about three thousand feet, only gradually sinking to lower altitudes. The radioactive cloud that was hanging above the nuclear-power plant was carried by winds towards the Ukrainian land of Polissya and some areas of Belarus and Russia. A little later higher levels of radioactivity were registered in parts of Sweden, Finland, Poland, Germany, Romania, Turkey, Georgia,

Switzerland, France and Great Britain. The atmosphere of the whole northern hemisphere was affected.

COMBATING THE CATASTROPHE

Military units of the Soviet Armed Forces and specialized units of some ministries and departments were engaged in clearing up the rubble, providing access to the ruined reactor, removing radioactive substances thrown out of the reactor during the explosion. The work on cleaning up the contaminated territories with the use of chemical and other means began in just a few days after the explosion. A great number of reservists were mobilized to help overcome the consequences of the disaster.

All in all, more than 600,000 civilians and military took part in the work of overcoming the consequences of the disaster in 1986 and 1987 (every second of them was military). About 40 ministries and departments of Ukraine, Russian Federation and other constituent republics of the former Soviet Union took part in this work of enormous complexity and scope.

By incredible efforts of so-called "liquidators", i.e. cleanup workers, a special Shelter later called "Sarcophagus" was built over the damaged reactor. It was built in less than half a year owing to self-sacrifice of the people as well as to high professionalism of experts and technical level of national design and construction organizations.

The "Sarcophagus" facility was the most complicated technical construction at that time. It reduced radioactive releases from the reactor to the minimum; improved, in principle, the radiation situation at the industrial site of the nuclear power plant, lessened psychological tension of the population.

At the construction of the Shelter 10,000 workers were employed. 360 thousand tons of concrete were used, about 500,000 metal constructions were erected. For the population evacuated from the zone about 21,000 houses were built and 15,000 new apartments provided. In 1989 the construction of a new city for Chornobyl NPP personnel was initiated, and the city's population now is 26,000 people.

In order to provide efficient help to the victims, almost 2,500 doctors, 5,000 medical workers and 1,200 students of Ukrainian colleges and universities were engaged in the works at the end of April - beginning of May 1986. All of them were united into 230 urgently organized dosimetry laboratories and over 400 special medical teams. Soon there was established a sanitary epidemic service which was reinforced with expert teams from other Ukrainian regions.

Network of radiation control system includes almost 2,200 laboratories, points and posts equipped with corresponding facilities and instruments, first of all spectrometers, radiometers, dosimeters etc. Almost 3,300,000 samples of soil, atmospheric aerosols and releases, water, foodstuffs, grass and forestry products are analyzed annually.

Over 100 human irradiation meters, 20 of which are mobile, have been installed in 12 regions.

At the same time, over 90% of technical devices used for radiation control in the contaminated areas are outdated and need to be replaced with modern highly sensitive efficient mobile equipment.

Beginning from 1986, decontamination works have been carried out both at the plant and in 1,840 human settlements. The Program of Elimination of Chornobyl NPP Accident Consequences for 1995-2000 contains a provision for implementation of such works in additional 40 settlements of 7 regions of Ukraine. Unfortunately, the efficiency of decontamination efforts on the soils is decreasing yearly, as radionuclides get washed out with precipitation and penetrate into the soil where a considerable part of them remains. The concentration of radionuclides in the soil, however, contributes to lower dose rates generated by external radiation.

RADIOACTIVE CONTAMINATION OF ENVIRONMENT

Vast stretches of land in Ukraine and elsewhere were contaminated by radioactivity. Later surveys revealed that in Ukraine alone plutonium-239 had contaminated over 700 square kilometers, or about 270 square miles (0.1 curie and higher per 1 sq. km.), strontium-90 (3 curie and higher per 1 sq. km) and cesium-137 (5 curie and higher per 1 sq. km) had contaminated over 3,420 sq. km (about 1,320 sq. miles).

Rivers and lakes in the vicinity of Chornobyl were badly contaminated as well, the Kyiv water reservoir in particular. Higher levels of radioactivity were registered in all water reservoirs along the Dnieper River, and it should be noted that these reservoirs supply more than 30 million people of Ukraine with water. There is a constant danger that the radionuclides can seep through the soil and penetrate into the underground water sources.

According to the latest data, more than 50,000 sq. kilometers (about 19,300 sq. miles) in 74 districts of 12 regions of Ukraine were contaminated to lesser or greater extent (these regions are: Kyiv, Zhytomyr, Chernihiv, Rivne, Vinnytsya, Cherkasy, Khmelnytsky, Ivano-Frankivsk, Volyn, Chernivtsi, Sumy, Ternopil); 2,218 towns and villages were located within the boundaries of the contaminated territory, and the number of people who have been affected by the disaster is in excess of 2.6 million people, including 700,000 children. Ukraine was proclaimed "the area of ecological disaster".

As a consequence of the Chornobyl disaster, 4.6 million hectares of agricultural lands (3.1 million hectares of arable lands included) and 4.4 million hectares of forests were contaminated with products of radioactive decay. The authorities had to exclude 180 thousand hectares of agricultural lands (52 thousand hectares in the exclusion zone) and 157 thousand hectares of forests (among them 40 thousand hectares in the exclusion zone).

The distribution of the fallout was extremely patchy. Today, three zones are distinguished on the contaminated territory: the exclusion, obligatory relocation, and guaranteed voluntary relocation zones and strict radiation control. The most affected area has been the exclusion zone (so-called 30-km zone surrounding Chornobyl NPP), i.e. the territory of Ukraine which was contaminated by radionuclides resulting from the Chornobyl accident. Those lands have been excluded from agricultural activity, with a special form of government control being performed by the administration of the zone. In compliance with the law "On the legal status of the territory contaminated by the Chornobyl accident", the zone has been determined as the territory from which the population has been evacuated in 1986. The total area of the exclusion zone equals 2,044 sq. km. Located within the zone are the towns of Prypyat and Chornobyl as well as 74 more villages.

Radioactive contamination of the exclusion zone is determined first of all by the radionuclides of Cs-137, Sr-90 as well as transuranic elements. As of January 1, 1994, about 95% of radioactive contamination remained in the upper 5-cm deep layer of soil. The surface radioactive contamination of the zone amounts to about 110 thousand Ci of Cs-138, 127 thousand Ci of Sr-90 and 800 Ci of Pu-230 and Pu-240. The area with contamination level higher than 15 Ci/sq. km. of radioactive cesium and 3 Ci/sq. km. of radioactive strontium and 0.1 Ci/sq. km. of plutonium covers 1856 sq. km.

According to maximum estimations, the Shelter incorporates more than 200 tons of nuclear fuel with activity higher than 20 million Ci. Apart from the fuel containing masses (FCM), there is a great deal of radioactive waste: core remains, reactor graphite, contaminated structural elements. In different premises of the facility there are 3000 cu. m. of water. Its activity amounts to 0.001 to 0.00001 Ci/l (these are primarily Cs-137, Cs-134 and Sr-90). It also contains uranium in the form of dissolved salts - about 1 mg/l. There are more than 2 metric tons of uranium and 700 kg of plutonium inside the Shelter.

About 14 thousand of spent cassettes are stored at the spent nuclear fuel storage site. The volume of waste accumulated at ChNPP is more than 40,000 cu. m. of solid waste, about 25,000 cu. m. of liquid waste. Annually, as a result of ChNPP operation, 2,000 cu. m. of solid and 870 cu. m. of liquid wastes are released.

Radioactive materials with total activity of about 380 thousand Ci and the bulk volume of about 1 million cu. m. are disposed in three burial sites and temporary disposal sites. Burial and temporary disposal sites. Burial and temporary disposal sites were simple to build, their number exceeds 800. They were made at the critical phase of the catastrophe without proper project preparation. All of these places are recorded and marked at the maps and there have been organized engineering research and project works, in which a number of European firms participate. Transformation of temporary storages

into the system of long-term radioactive storage is a rather difficult technical and economic task requiring our joint efforts.

The ChNPP cooling pond covers the area of 22.9 sq. km. and contains 160 million cu. m. of water. In 1989 - 1993, the annual average water contamination in the cooling pond was as much as 140 to 330 picoCi/l of Cs-137, 120 to 230 picoCi/l of Sr-90. The total activity of bottom sediments is up to 3.5 thousand of Cs-137, nearly 800 Ci of Sr-90 and about 3 Ci of Pu-238 and Pu-239.

Despite the measures taken, the problem of presence of radionuclides in food remains an acute one, in particular in the private sector. Whereas in the public sector milk and meat comply with existing norms, privately owned farms sometimes produce and sell these foodstuffs contaminated beyond the acceptable limit. Contaminated milk (over 370 Bq/kg) was found during 1991-1993 in Volyn, Zhytomyr, Rivne and Chernihiv regions, and on individual farms these indices vary from 1500 to 3000 Bq/kg .

High levels of Cs contamination have been found in mushrooms and other forest fruit in Volyn, Kyiv, Zhytomyr, Rivne and Chernihiv regions. To prevent radioactive contamination of milk, mineral fertilizers have been spread over the acid soils of 12 thousand private farms, and 62 thousand hectares of clean pastures have been allocated additionally.

MEDICAL CONSEQUENCES

Immediately after the accident at the orders from the Communist party, there began a real political and propagandist battle in interpreting the possible medical consequences of Chornobyl. The official representatives of Soviet medicine, as well as some representatives of the nuclear industry complex in the West tried to deny any consequences of Chornobyl for human health. For that people called those people "Chornobyl nightingales" which meant the extreme optimists. On the other hand, there were "black pessimists" who forecast nearly death of the entire Ukrainian people.

The truth is that medical consequences are undoubtedly there, but taking into account an exceptional complexity and multiple factors of the process, its durability, it is very difficult today to give their final quantitative estimate. This explains huge discrepancies in data about deaths from the accident given by authors from different organizations. At the same time it is immoral to deny serious medical consequences for the health of people in Ukraine and Belarus which appeared recently in some respectable western publications. It could be compared to publications in anti-Semitic newspapers where they say there were no gas chambers in Auschwitz nor Babyn Yar crimes.

Today 360 thousand liquidators live in Ukraine. They need treatment or permanent medical supervision, rehabilitation and compensation for the damage to their health regardless of its nature. Now, 35 thousand of them are invalids. In addition, 3.1 million people

live or, in the year of the accident, lived in the contaminated territories. Among them there are 1 million children.

The most complicated task is the evaluation of medical and biological consequences of the accident, as they relate to multi-factor effects including both objectively measurable dose loads, the levels of the contamination of the environment and the factors of social and psychological nature which can not be assessed quantitatively. Uncertainty in the assessment of the situation, distrust to the information, ignorance of the objective information about biological effect of radiation, sometimes false rumors, etc. objectively result in stress to which organism reacts unpredictably and inadequately to the exposure.

Despite the fact that a relatively small number of people died immediately after the accident (31 person died of the acute forms of radiation sickness), the long-term consequences are grave and cause great tension in the work of state agencies and medical service of Ukraine. For example, 5,000 people have lost ability to work. The sickness of 30,000 "liquidators" is officially attributed to the aftermath of the catastrophe. According to the Greenpeace-Ukraine organization, over 32,000 people died as a result of the accident. The population mortality in the most affected regions increased by 15.7% compared to the pre-accident period.

As a consequence of inhaling aerosols containing iodine 131 immediately after the accident, 13,000 children in the region

experienced radiation doses to the thyroid of more than 2000 roentgen equivalents, which means they received at least twice the maximum recommended dose for nuclear industry workers for an entire year. Up to 4,000 of these children had doses as high as 2,000 roentgen equivalents. Because iodine collects in the thyroid gland, these children have developed chronic inflammation of the thyroid often giving rise to thyroid cancer. It has been estimated that within five years of the disaster the number of thyroid cancer had grown from 5 to 22 a year, and from 1986 to the end of 1995, 589 cases of thyroid cancer were recorded in children and adolescents. Ukraine's overall rate of thyroid cancer among children has increased about 10-fold from pre-accident levels and is now more than four cases per million.

On another subject, a group of Kyiv researchers has conducted a medical survey of a group of liquidators and has found that the majority of these people had the constant fatigue syndrome accompanied by depression of a certain subclass of lymphocytes, the so called natural killer cells which have the power to kill the cells of tumors or virus infected cells. The defects of natural immune system got the name of "Chornobyl AIDS" which in the nearest future could cause the increased rate of leukemias and malignant tumors, as well as makes a person more susceptible to "normal infections" like bronchitis, tonsillitis, pneumonia etc. which last longer and acquire grave clinical forms.

Chornobyl has given rise to a psychological syndrome comparable to that suffered by veterans at wars in Vietnam and Afghanistan. Among children evacuated from the zone there has been a ten- to 15-fold increase in the incidence of neuropsychiatric disorders.

The birth rate in the contaminated areas has sharply decreased, and mortality has increased. It negatively affects an overall demographic situation in Ukraine leading to its depopulation.

Since 1987 the overall morbidity among adult population of Ukraine in general has risen by 3.6%, and among the Chornobyl victims it grew by 3.8 times. Whereas the general children's morbidity in Ukraine within this period fell by 15%, among the children of Chornobyl it grew by 2.1 times. The initial disability among liquidators has grown up to 25 times, among the people evacuated from Chornobyl and resettled persons it grew by 4.6 times, and among the population of contaminated areas it increased by 1.7 times. The incidence of leukemia among liquidators aged 30 to 39 is higher than average. According to the Ministry of Health statistics, the deaths of 2,929 people are officially attributed to the radioactive emanation. As of today only 19.8% liquidators could be considered "practically healthy", and among the evacuated population this ratio is only 21%, whereas for the population of contaminated areas the figure is 24%.

ECONOMIC CONSEQUENCES

Over the first years following the Chornobyl NPP accident, before the collapse of the Soviet Union, funds for the implementation of the operations aimed at the elimination of the accident consequences were allocated from the former Soviet Union budget.

From 1992 to 1996, total amount of costs which were allocated from the Ukrainian budget for the elimination of the accident's consequences exceeds US \$3 billion. Ukraine's budget for 1996 alone provides for these purposes more than US \$600 million, and we will have to make such payments for a long period of time.

At the end of 1991, pursuant to the Decree of the Verkhovna Rada of Ukraine, the specialized Fund For The Implementation Of Measures For The Elimination Of The Consequences Of The Chornobyl Disaster And Social Protection Of The Population was established as a component part of the state budget of Ukraine. Since 1992, the operations have been financed from this fund.

The Chornobyl fund is made up at the expense of the allocations from enterprises and economic entities, regardless from enterprises and economic entities, regardless of subordination and type of ownership, in the amount of 12% of the wages fund, the money paid to be charged to the cost of the product.

The assets of the fund are spent on the following:

- payment of compensations and benefits;
- social security payments;

payments related to pension benefit privileges;

capital investments;

other expenditures for the implementation of operations for the elimination of the consequences of the Chornobyl disaster.

Unfortunately, because of the grave economic crisis, the tendency toward cutting the specific share of the "Chornobyl" funds against the state budget has become quite distinct. For instance, in 1995 it was only 5% compared to 15.7% in 1992.

The Chornobyl accident also resulted in the destruction of the entire complex of traditional popular culture on a significant area of Ukrainian Polissya which was associated with the mass migration and dispersion of the indigenous residents in a new ecological and geographic, as well as ethnic and cultural environment. Under these disastrous circumstances, a decision was made aimed at conservation of historical and cultural legacy of this region in order to foster social and cultural rehabilitation and adaptation of the accident affected population to their new areas of residence.

The remains of material and spiritual culture of the accident-affected area feature unique relic attributes which root in remote past and are invaluable for the restoration of the ethnic history of Ukrainian and other Slavic peoples.

LEGISLATION ON CHORNOBYL

The disaster has posed a number of issues of administrative, social, medical and biological character.

To deal with the legal side of the problem, a special committee was established in the Ukrainian Parliament, and a special Ministry for Chornobyl Affairs was created within the Ukrainian Government. These bodies adopted several dozens of laws, regulations and instructions of unique and unprecedented character.

On February 28, 1991 the Verkhovna Rada of Ukraine passed the "Law On The Status And Social Protection Of Citizens That Have Sustained Damage As A Result Of The Chornobyl NPP Disaster" which provided, through attracting a significant amount of financial and material resources, for protection both of those who participated in the accident cleanup operations and the people resettled from the contaminated areas.

A special 12% tax (often called "Chornobyl tax") has been introduced to raise funds for dealing with the disaster's aftermath.

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Chornobyl NPP Disaster". In December 1991, July 1992 and in the end of the year 1995, this Law was modified by a number of legislative additions and amendments.

Pursuant to the adopted laws, citizens are entitled to indemnification of damage caused to their health and property by the Chornobyl disaster as well as priority medical care, compensations and benefits for living and working in the contaminated areas. Depending upon the risk produced by the radiation on the human organism, the laws defined the categories of citizens who had sustained damage as a result of the disaster and, therefore, qualify for over 40 types of benefits and compensations.

At present, the money that is spent directly on the social protection of the affected population constitutes 60% of the funds assigned for the measures toward the elimination of the effects of the Chornobyl accident and social protection of the population.

In spending the money, the protection of health of the survivors is considered top priority. This includes preferential medical care, free-of-charge preferential dental care, free prescription medication, annual preventive medical examination by health specialists and treatment at the specialized medical centers. A significant amount of the money is allocated for the improvement of the survivors' health and recreation, supply of ecologically clean foodstuffs.

Chornobyl invalids of groups I and II are entitled to motor vehicles free of charge. Benefits and compensations are envisaged for

children affected by the Chornobyl disaster, depending upon the levels of the radioactive contamination in the area where they lived or continue to live.

CURRENT CHORNOBYL PROBLEMS AND PRIORITIES

No matter how complex reasons of the accident are, first and foremost, it's certain that they are due to shortcomings of the construction which let the source of utmost danger be operated with inadequate safety system. These circumstances in conjunction with low-quality regulatory documentation were among the main reasons of the accident.

Over past years a complex of measures has been taken to improve construction of the reactor's separate units and nuclear, radiation and fire safety as well as to improve the quality of operational documentation, which helped to increase reactor and plant safety. There have been laid the foundations for nuclear legislation of Ukraine and independent bodies for the state regulation of nuclear and radiation safety created. All of this contributes to safety in using nuclear energy in general.

The decommissioning of Chornobyl NPP is an issue of concern to many in the world. With regard to this matter, as recently as on April 18 the Ukrainian Parliament, at its hearings, reconfirmed our intentions to decommission the Chornobyl NPP by the year of 2000 laid down in the Memorandum of Understanding concluded between

the Government of Ukraine and the Governments of G-7 and the European Commission in December 1995. Over April 19, 1996 G-7 Nuclear Summit in Moscow, Ukrainian President Leonid Kuchma entirely confirmed the decision to close Chornobyl NPP. But without real and concrete financial assistance by the world community Ukraine is unable to go through it alone because of the extremely difficult economic situation. Thus, over April 1996 Moscow G-7 summit we were pleased to hear from G7 representatives the confirmation of December 1995 agreement under which the G-7 pledged some \$2.6 billion of credit lines and \$512 million in grants, though the real needs may be higher.

The other priority activities regarding minimization of the consequences of the Chornobyl accident are:

- protection of the population against irradiation the sources of which are located in the zone, and radioactive protection of the personnel working in the zone;
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- ensuring proper infrastructure necessary for carrying out activities and staying of people within the zone.

Careful investigation of the damaged 4th unit gives every reason to think that the safety of the Shelter site may be reliably ensured for only seven years, not 30, as is widely stated. Hence, the need to develop, on a competitive basis, a project offering the ultimate solution to the nuclear and radiation risks.

The exclusion zone, where there are more than 800 radioactive waste disposal sites are located, is another source of danger and public anxiety. It is necessary to complete relevant designs, to select the general contractor and to commence waste treatment and localization works. Law enforcement and fire protection status within the zone has to be improved; the cooling water pond and the river Prypyat flood-lands problems should also be eliminated.

US ASSISTANCE ON CHORNOBYL RELATED ISSUES

The major role in G-7 efforts is played by the United States. It is noteworthy that programs of assistance to my country on Chornobyl related areas already launched with the help of the US Government could be described as promising and helpful in some areas and still only promising in the others.

First of all, I should express the deep appreciation for the efforts of the US Government to help Ukraine to cope with the nuclear safety problems we inherited from the old Soviet regime in nuclear power

sector. These projects were implemented through the programs developed by the Department of Energy, Nuclear Regulatory Commission and the Department of Defense. In this regard, let me mention the establishing and equipping of the training center for nuclear power plants operators in Khmelnytsky and various training courses delivered there. The joint venture of the Westinghouse Corporation with the Ukrainian partner from Kharkiv recently became operational and would allow Ukraine to produce necessary pieces of equipment to further increase the safety level at our nuclear power facilities.

The earmarking by the Congress of significant funds for further development of the nuclear safety assistance programs creates some optimism for the nearest future. The Government of Ukraine is very grateful to those Senators and Congressmen who backed this earmark. Out of US \$225 million for 1996 assistance to Ukraine, \$50 million to \$70 million could be spent for energy sector and nuclear safety needs, including \$3 million for the establishment of the International Research Center in Chornobyl and \$2.5 million for enhanced fire safety measures at the plant's unit number three.

The US Government helped to maintain capabilities of about a dozen and a half US NGOs dealing with Chornobyl victims assistance. Medical supplies and pieces of equipment we received from DOD excess supplies and largely private sources were leveraged by various US NGOs from small US Government grants which helped these

private religious, non-profit or cultural organizations, as well as organizations of Ukrainian Americans, to provide humanitarian and medical assistance for about US \$35 million in the last three to four years. The DOD earmarked some funds for programs in the field of Chornobyl related cancers which, we hope, will make a difference at least for some of the innocent victims of the catastrophe. We expect a new portion of humanitarian shipments to arrive in Ukraine this week, the week of the tenth anniversary of the tragedy.

Two weeks ago many people in this country and around the world had a chance to see a broadcast on CNN TV network with the objective coverage of the status of Chornobyl related consequences. I think the majority of viewers were shocked to learn that the research projects, needed not only for Ukrainians but for the whole mankind, are not funded enough. The same is true for environmental cleanup programs which have been promised by the international community at some point but afterwards largely forgotten.

Having read in the USAID 1993 annual report on assistance to the NIS that USAID was considering the plan to help us to reduce contamination of the Dniipro River basin, the water supply source for 30 million Ukrainians, we were encouraged. We were much less encouraged reading exactly the same provisions in corresponding reports a year and two years later. Mr. Yuri Kostenko, my successor at the position of the Minister of environmental protection and nuclear safety of Ukraine, visited this country a number of times asking for

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one mobile laboratory at least for monitoring the level of contamination, not even speaking about the reduction of existing contamination. We never got one. Announced and publicized program for reducing the water contamination for 30 million Ukrainians ended up as of today in providing of one mobile water purification system producing 5 liters of clean water per minute at a children's hospital in Kyiv. To the best of my knowledge, the mentioned assistance project lacks funds for establishing the production line of such water purification systems. The fact that at least one such system was produced took place only because of Senator Moynihan and Congressman Rangel support.

We understand that we live in the era of budget constraints, that assistance funds already established are limited, and that other priorities do exist. But let me draw your attention to the fact that a lot of activities that have already been launched and those which need to be undertaken are of global importance. Nuclear technologies are so widespread that other disasters may occur. In helping us to cope with the legacy of Chornobyl, the wealthy nations would learn how to solve such problems for themselves in the case the accident should occur.

I would like to appeal for the common sense and reason and to ask the United States Congress to consider the special piece of legislation for special funding of research and monitoring assistance programs of global significance such as long-term health, genetic and

environmental effects of radioactive contamination. Ukraine never refused to cooperate in these matters and would bear its part of the burden.

The Ukrainian government has assisted, in every possible way, to the organization of cooperation and is financing an extensive program of scientific substantiation, as well as conducting works on the elimination of the disaster consequences. Chornobyl zone offers unique opportunities for the complex researches of consequences of nuclear and radiation accidents in natural environment and for systematization of the results of exposure to constant radiation for vegetation and animal world.

The government of Ukraine calls upon all countries, international organizations and research centers to take part in the establishment and operation of the International Chornobyl Center on nuclear safety, treatment of radioactive wastes and radioecological researches. Joint activities under the auspices of the International Center will enrich methodological arsenal, considerably replenish data base for further theoretical and practical researches in the field of knowledge concerned with radiation impact on the nature and living organisms.

We expect that through the efforts by governments of separate countries and international organizations the world community will made decisive steps towards the liquidation of consequences of the most serious technological catastrophe in the history of humanity.

Ladies and gentlemen,

To my deep conviction, mankind has yet to fully realize the dramatic consequences of the Chornobyl accident and the warnings it brings. The bells of Chornobyl are especially distinctly heard these days. Let us listen carefully to these chimes, for they remind us about the terrible tragedy and warn about the necessity to avert new disasters in the future.

**STATEMENT BY
ALEXANDER B. KUZMA
Director of Development
Children of Chornobyl Relief Fund**

**Chornobyl 10th Anniversary Hearing
Commission on Security & Cooperation in Europe**

Tuesday, April 23, 1996

Mr. Chairman and Distinguished Members of the Commission:

On behalf of the Children of Chornobyl Relief Fund, I would like to thank you for giving me the opportunity to address this Commission on the aftermath of the Chornobyl nuclear disaster.

Since 1990, our foundation has been heavily involved in providing emergency relief to the affected region. We have launched sixteen airlifts and numerous smaller shipments, delivering more than 1000 tons of humanitarian assistance valued at \$38 million U.S. dollars. We have also developed long-term hospital partnerships and physicians' training programs designed to upgrade the quality of care at pediatric centers which specialize in the treatment of children with cancer and radiation-related illnesses. In the course of our relief missions, we have become quite familiar with a wide range of health problems which have been on the rise since 1986 and we are concerned about the lack of attention to these problems.

The sharp increase in thyroid cancer in children has been well-documented. In Ukraine alone, nearly 300 cases have been verified, and the rate in Belarus is higher.

These statistics need to be considered as the "tip of the iceberg". The highest incidence of cancer usually occurs between ten to fifteen years after exposure and there are thousands of children who are suffering from enlarged thyroids and other conditions which indicate that they are at risk for cancer in the future.

Even more troubling are the overall demographic trends in Ukraine and Belarus. According to the UN Office on Population, these are the only two nations in Europe which are experiencing a negative birth ratio. Traditionally, Ukrainians have prided themselves on large families and healthy children. Yet in 1992, there were 40,000 more deaths than live births throughout Ukraine. This ratio has declined steadily, so that in 1995 there were 174,000 more deaths than live births. (Source: Ukrainian Ministry of Health) The economic hardships facing many families have clearly affected birth rates, however environmental factors must also be considered.

The Boston Globe reported in January of this year that infertility among Ukrainian men is the highest in the world, and the New York Times reports that the life expectancy of Russian men has dropped by 10 years since Chornobyl. Economics and stress alone cannot account for this deteriorating situation, and the cause of these trends call for much closer scrutiny.

Today, infant mortality in Ukraine stands at twice the European average - 14.3 deaths per 1,000 live births. And recent studies by the Ukrainian Ministry of Health - Office of Children's and Maternal Health have shown that prenatal and post-partum complications have increased much more sharply in regions which were contaminated by fallout from Chornobyl as opposed to areas that were

uncontaminated. Two weeks ago, at a conference at Yale University, Dr. Anna Petrova of Belarus and Dr. Olesya Hulchyn of Ukraine presented startlingly similar results from epidemiological studies on women's reproductive health. Several striking patterns emerged. Anemia among pregnant women has risen to alarming levels - over 60 % in regions affected by radioactive fallout (1 to 5 curies per square kilometer). Anemia is only one factor which greatly reduces the ability of mothers to deliver healthy babies. Hypoxia and increases in other, normally rare conditions have also had a severe effect on the survival rate of newborns and young mothers.

A study under the supervision of the University of Illinois School of Public Health is currently underway to track more than 15,000 mothers and newborns in six provinces of Ukraine to determine the effect of economic and environmental factors on maternal and children's health. This study has received extremely modest funding from the Soros Foundation and the World Health Organization, yet has made much more substantial progress than many studies which have received far greater financial support from Western agencies.

For some time now we have received persistent reports from the Ukrainian health ministries that the rate of birth defects has doubled in areas closest to the evacuated regions. A team of Japanese health experts from the University of Hiroshima studied more than 30,000 fetuses and newborns in contaminated regions of Belarus. Their findings were reported by UPI and the Kyodo News Service in 1994, but received scant attention in Western news publications. The Japanese team observed nearly twice as many birth defects as would be normally expected. Cleft palates, missing digits, extra digits, deformed critical organs and other malformations have been reported with greater frequency since Chornobyl. In areas with higher levels of contamination (between 5 and 10 curies of cesium per square kilometer), the rate of birth defects has risen eight-fold.

During repeated visits to the neonatal ward at the Kyiv Institute of Pediatrics, Obstetrics & Gynecology I have witnessed numerous children with defects that I have never seen in the United States. Dr. Valery Kuznetsov, the director of the Neonatal Division at the Institute has noted that since Chornobyl, the number of birth defects has increased sharply and the number of children with multiple defects has also increased. Arguably, these are anecdotal reports but they deserve much broader followup. Members of the Commission who watched the recent CNN documentary on Chornobyl may have been struck by the irony that Western scientists know more about Chornobyl's impact on wild voles and field mice than they know about the genetic impact on the human population of Ukraine. Clearly priorities in the research establishment need to be shifted, or at least the same level of diligence and a comparable sense of urgency needs to be applied to human health studies.

Many Western scientists - particularly those involved with the International Atomic Energy Agency (IAEA) - have been eager to dismiss widespread reports of severe health effects by ascribing them to "radiophobia", - supposedly unfounded fear of radiation, and psychological stress. Without even looking at the population in question, some researchers have adopted the posture of the Soviet government in the early days following the accident, accusing the Western media of exaggerating the accident's effects and by promoting the stereotype of Belarusians and Ukrainians as hysterics or hypochondriacs.

This kind of bias is antithetical to the principles of scientific inquiry. It has already embarrassed many well-respected scientists who prior to 1992 emphatically denied that thyroid cancer might be appearing in significant numbers of children in the Chornobyl zone. Now that the link between Chornobyl's fallout and the explosion in thyroid cancer has been conclusively established, we believe that the scientific community needs to assume a more open-minded attitude

towards other health concerns expressed by Ukrainian and Belarusian physicians. There is a great deal more that we can learn about radiation health effects, and the tragedy of Chornobyl has created an open laboratory for this type of intensive public health research.

There is mounting evidence that the 3.4 million people who were exposed to excess levels of radiation since 1986 have reason to be worried about their health and their future. According to declassified Soviet documents which were published in the Russian newspaper *IZVESTIYA* in 1992, there is no question that thousands of Soviet citizens were stricken with acute radiation sickness in the first weeks following the accident. Even as he was downplaying the accident's severity to the Western press, then Soviet President Gorbachev was receiving daily reports from the field which contradicted his adamant denial of serious health consequences.

Before committing suicide one year to the day after the Chornobyl crisis began, Russian nuclear minister Igor Ligachev admitted to his colleagues that he had misrepresented the scope of the accident to the IAEA. Exhaustive research completed by American, Ukrainian and Swedish scientists has now established that the amount of radiation released from Chornobyl was three times higher than the estimates offered by the Soviets in Vienna in 1986. (See *The Chornobyl active phase: Why the "official view" is wrong*, Alexander R. Sich, Nuclear Engineering International, Nuclear Safety, April, 1996) The original Soviet estimates can no longer be considered a sound basis for further discussion and the time has come for the IAEA to overhaul its assessment of Chornobyl's impact. By clinging to them, the IAEA only undermines its credibility.

In 1992, when the President of our Foundation and other experts testified on the Chornobyl aftermath before the Senate Subcommittee on Nuclear Safety, there were grave concerns expressed about the lack of research focusing on the highest

risk population - the nuclear cleanup workers and the families which were evacuated from some of the most highly contaminated zones. Regrettably, there has still been little progress made in studies of these critical populations. We still do not know the number of casualties among the 600,000 soldiers, miners, firemen and construction workers - most of them in their 20s and 30s at the time of the accident - heroic young men who risked their lives to contain the spread of radiation. We still do not know the leukemia and cancer rates among the 11,000 Ukrainian children who were evacuated to Cuba for treatment. And there are several large clusters of Chernobyl evacuees living in the cities of Kharkiv and Kyiv and smaller settlements surrounding Kiev and Minsk who would be easily accessible and of prime interest for long-term health studies. We are mystified as to why more effort has not gone into studying their condition.

Regardless of the continuing debate over Chernobyl's ultimate health impact, the Children of Chernobyl Relief Fund has made a long-term commitment to upgrade the quality of care for pediatric and adolescent patients in Ukraine. Although we are proud of CCRF's role as the leading private voluntary organization providing medical aid to Ukraine, we recognize that there are many other groups which are also making vital contributions to the international relief effort: the Catholic Medical Mission Board, the Ukrainian Diabetes Project, the Cincinnati-Kharkiv Sister Cities Program, the Ukrainian National Women's League of America, the Thoughts of Faith program based in Milwaukee, Tennessee's Share the Dream, the Ukrainian Orthodox Church of the USA to name a few. In Belarus, we have long admired the successes of such organizations as CitiHope and the Ramapo High School Children of Chernobyl campaign - truly a model for caring schoolchildren everywhere.

Despite the progress we have made, our Board and our volunteers are painfully aware of the grim realities we face in Ukraine, and we are humbled by

the enormity of the task that lies ahead, in rebuilding the medical infrastructure of this devastated region. As efficient and committed as we and our colleagues may be, the private voluntary sector cannot accomplish its task without substantial assistance from the corporate and government agencies. As Western companies expand their investments in the former Soviet Union, they should be encouraged to apply the principles of community involvement and good corporate citizenship, which have become standard in Europe and in the United States. Hospital development and community health programs can build trust and solidarity between American businesses and their East European partners. We cannot expect Ukraine and other former Soviet republics to make a healthy transition to a new democratic order, or to build a robust economy if their workforce remains sickly and their children's future remains under a cloud. A wonderful example of progressive charitable activity has been a women and children's health initiative which the Monsanto Company and its subsidiary, Searle Pharmaceuticals have launched in three rural provinces in Ukraine. The program offers prenatal screening, nutrition and immunization to help reduce infant mortality in regions which have been heavily affected by environmental degradation and infectious disease. This cost-effective program can build on similar initiatives which have proven very successful in improving women's and infants' health in several American cities.

The Chernobyl disaster remains one of the most profound and pivotal events in East European history - indeed, in the history of the world. We cannot afford to minimize its impact or to turn our backs on its victims.

We believe, based on our experience, that the people of the United States can build rewarding relationships with the people of Ukraine and Belarus by addressing the issue of Chernobyl head-on. Our government can enhance its stature as a compassionate world leader by providing continued funding for health

programs in the CIS. Given the likelihood that health effects in the Chornobyl region will intensify over the next five to ten years, USAID should continue to provide funding for health programs in Ukraine and Belarus beyond the current 1998 cutoff date. To reduce costs and maximize the efficiency of government programs, funding should not be wasted on redundant fact-finding missions but should be channelled through organizations with a proven track record - groups which have completed their needs assessments and developed a viable infrastructure on the ground.

Chornobyl is a unique disaster and it requires unique approaches, but as a nation, we have a great deal of expertise and appropriate technology to offer. We should not be afraid to tap our generosity of spirit. The children of Chornobyl share a legacy with all the children of the Nuclear Age and their future should be the concern of every society in every corner of the world.

Thank you.

Testimony
of Dr. Natalia Lakiza-Sachuk, Prof. Serhiy Pyrozhhkov
The National Institute for Strategic Studies of Ukraine and Prof. Mykola Omeljanets,
Ukrainian Center of Radioactive Medicine, Ukraine

*Chornobyl 10th Anniversary Hearing Commission on Security &
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Ten years after Chornobyl: Socio-demographic consequences for Ukraine

After its independence due to the peaceful disintegration of the Soviet Union, Ukraine joined the world community as its 22nd largest country. After Russia, Ukraine has the largest population, the largest army, and the largest economy of any of the post-Soviet states. After Russia, it has the most advanced technology and highest educational and scientific level of population. Ukraine is about the size of France in both territory and population, and ranks as a major European state. The geographical center of Europe is situated on the territory of Ukraine. For all of these reasons, development and the situation in Ukraine, favourable and unfavourable, must necessarily be important for the neighboring countries and for the whole World.

Ukraine is also the site of the Chornobyl nuclear reactor, the source of the greatest nuclear reactor disaster experienced on the planet since the atomic bombs were dropped on the Hiroshima and Nagasaki in 1945, and its territory is dotted with additional nuclear power plants of similar design.

On April 26, 1986, at 1:23 am, reactor number 4 at the Chornobyl Atomic power Station exploded. Subsequent investigations revealed that tests that were being conducted on the operating and backup systems were mismanaged. The plant was immediately shut down. Nonetheless, a large amount of radioactive steam was released into the atmosphere during the explosion. The highest amount of radioactive fallout was registered in the vicinity immediately surrounding Chornobyl. The atomic energy station and the nearby town of Prypiat are located in northern Ukraine, 90 km north of Kyiv (Kiev), the capital of Ukraine, a city with population of 2.8 million people.

In contrast to numerous extraordinary catastrophies and disasters, the nuclear reactor explosion at the Chornobyl Atomic Power Station has a number of specificities, making it extremely dangerous in the economic, social and medical sense.

First, the disastrous consequences involve large masses of people. About 62 mln people in the countries of the former Soviet Union were exposed to ionizing irradiation. Of them, 18 mln people were exposed to relatively high irradiation, 4,5 mln people - to high, and 1 mln people - to very high irradiation.

Second, the people got radiation simultaneously from all factors of radiation accident (radioactive cloud, radioactive trail, and fall-outs), both from external and internal sources.

Third, very high levels of ionizing irradiation, going beyond the background level, will continue to exert an adverse effect upon human organisms of the present and future generations during hundreds of years.

Fourth, it is almost impossible to liquidate the consequences of the disaster in an observable future in view of long-term preservice of radionuclides in the surrounding.

Fifth, big financial, material labour resources are required for a liquidation of the disaster consequences. Sixth, there is a need for the special programs of follow-up of health for many millions of people during several generations lifetime.

The accident at the Chornobyl Atomic Power Station is a tragedy not only of the Ukraine alone. It had great implications in terms of the socio-economic life, technical-engineering statuses, and provision of medical service for large population groups in the neighbouring countries. The mere fact of the expediency of using atomic power for peaceful purposes is questionable now.

Total amount of radiation released as a result of the explosion at Chornobyl was originally reported as 50 mln curies by Soviet authorities. During the past decade, subsequent research in Europe and North America and new calculations have resulted in revised estimates of up to 260 mln curies. In comparison, the amount of radiation released at Three Mile Island in 1979 is estimated at 15 mln curies.

Disaster has had an influence on the vast territories over the world. Excessive levels of radiation recorded in northern Scandinavia, Wales, Ireland, northern Italy, Greece, coastal Alaska in the first weeks after the explosion. However, the heaviest problems arise out of this disaster for the people of Russia, Belarus and especially Ukraine where the nuclear reactor blasted and is still burning. At that time, the prevailing winds were directed north to north-west, so the Belarus received the most widespread deposit of radioactive fallout.

With subsequent shifts in the direction of the wind, as well as rainfall, northern regions of Ukraine, as well as the southern border of European Russia received radioactive fallout.

The total area of soil contaminated in Ukraine with Ce-137 at density from 1 Qu and more is over than 4,6 mln hectares - that constitute more than 5% of its territory. A permanent 30 kilometer "dead-zone" was established around the power station where human habitation is forbidden. There lived almost 3 mln people on this territory who have been affected from the consequences of Chornobyl disaster. Over 300,000 people were resettled to the safe areas during the evacuation after the catastrophe. In addition, about 200,000 people more or 40 % of planned to resettled population, are ready to move. In connection with economic crises, the works due to the liquidation of Chornobyl explosion consequences were limited during the last years. Due to the same economic reasons, it is still under the consideration a question to include Kyiv in the list of contaminated territories.

About 5 mln people continue to live now in the areas with a varying degree of radioactive contamination in the Ukraine. About 1 mln people of them reside in the settlements which by the Government of Ukraine granted various kinds of privileges in view of an increased introduction to human organism of radionuclides with locally produced milk. These data illustrate only one big aspect of socio-demographic implication of the Chornobyl explosion.

A serious result of this disaster is the emergence in Ukraine of a new demographic catastrophe after the year 1986. We can say with certainty that Chornobyl disaster has become the heaviest event in a demographic development of the country after the end of the Second World War, has made the significant contribution in the worsening of a modern demographic situation and perspectives of Ukraine's population reproduction. As a result of the accident, the normal demographic processes were disturbed and their negative tendencies were stimulated. Other factors - social tensions, economic instability and decrease of standards of life of Ukraine's population - due to a new geopolitical situation and transition period - make the situation much worse. The population has sharply reacted on total changes in environmental, socio-economic and political transformations during last 10

years: first, with curtailment of activities in a normal - economic, matrimonial and educational behaviour; and second, with unexpected increase of after stress reactions. Based on the analysis of the current and previous statistical data of population reproduction in Ukraine we concluded that within 1986-1995 years there had occurred changes in all demographic parameters, such as number and structure of population of Ukraine, the birth rates and infant mortality rates, causes of mortality and the migration level. Decrease of birth rate and population aging, formation of families which do not reproduce themselves - these are the features of Ukrainian population today.

According to the international comparison of population reproduction indices - the birth and death rates of population and its natural increase - Ukraine has tendency to move on the worse range places during the 5 last years. As for the birth rate (10.0 ‰) takes last place among former republics of the USSR, death rate of population (14.7‰) - the "honorary" 2nd place among developed countries of the world, by infant mortality rate (14 per 1,000 live births) - stands at twice the European average, by the human life span (68 years) - 86th place over the world. From the 1991 there is a depopulation in Ukraine, which has reached more than 500,000 persons till 1995.

The UN office on population reported that in 1994 there were only two nations in Europe with negative population growth - Ukraine and Belarus. The report attributed this decline in part to increased infant mortality and adverse health conditions stemming from Chornobyl disaster.

Because of the mistaken evaluation of scope of the Chornobyl catastrophe during the first post-disaster years and the wrong scientific approach toward taking appropriate,

antiradiation measures, there was no clear demographic strategy in the radioactive ecological disaster areas. It is now recognized that changes in the medical-demographic situation in the areas of radioactive contamination are directly linked with the negative effects of socio-economic conditions of life, work and nutrition of the population, becoming still worse after the accident, and with low level of prophylactic and curative-diagnostic measures.

During last years there have taken place dramatic changes, due to radiation, in the very foundation of normal reproduction of the future generations and reproduction of the nation. Women of the childbearing age and children born during the first years after the explosion appeared to be most subject to being affected by its consequences. It was noted that the former had a worse state of the reproductive system, course of pregnancy and labour and in many cases developed a greater incidence of complications, and the latter showed a worse condition of the fetuse and newborns. The morbidity and mortality increased among them. There was a leveling off of boundaries in health statues of the residents of these categories in the clean and contaminated areas. The demographic behaviour of the spouses changed, and the main tendency is either - postponement or refusal from giving birth to a next child.

In many areas with a strict radiation observance, there was rapid decrease in the birth rate making thus 30% in 1987 in comparison with the level of 1986. If in our earlier investigations this peculiar feature was associated by us with the processes of evacuation, moving away of pregnant women in order to improve their health, not wanting to conceive at such a critical time, etc., a more thorough study has revealed significant faults of the possibility to realize the reproductive intentions of the population. Thus, in the areas of a strict radiation observance, in 1987 versus 1985 there was 2.2 times more still-born children, 2.6 times more born deficient children, 1.9 times higher the level of perinatal death, and 1.5 times higher childrens death. The decline of birthrates in contaminated areas now is more intensive and has more low levels than in Ukraine as a whole.

In recent years, the level of infant mortality has increased by 51%. The main causes of death were respiratory diseases and neoplasms. Infant mortality in contaminated regions is still higher than in clean control areas. The level of deaths among girls during the 1st year of life after disaster, in comparison with boys, is still 1.5-2.0 times higher in some contaminated regions. In some of these areas, the proportion of boys among the newborns is higher than that of girls (about 140 boys per 100 girls, when norm is 105 per 100) untill this time, that is linked with the effect of radiation on the genetic apparatus. It has been found that exposure to irradiation on fathers and mothers sexual glands may lead to a damage of X chromosome, resulting in the increase of boys born to these parents. When the sexual glands of both parents, and especially a pregnant mother, are exposed to irradiation, there is the prevalence of girls born to these parents.

Changes in the childbearing function seen during that period were accompanied with an increased rate of womens death in comparison with mens deathrates, the main causes being tumours, diseases of the endocrine system, blood and hemopoietic organs, etc. Apart from these, other reasons were also noted which had not been registered before the accident. They included all kinds of complications developing during pregnancy, delivery and post-delivery period. All this reflects the worsening of general and reproductive health of women during the post-accident time.

Currently in Ukraine every 8-12 family is childless. The Boston Globe (01/26/96) reports that Chornobyl has fueled a massive infertility crisis in Ukraine" - half of all men between the ages of 13 and 29 have the problems of fertility - the highest infertility rate in the world.

The younger female generations who enter fertile age after the Chornobyl plant explosion do not show a sufficiently good health. According to the last examination data, every 5-6th girl has either a therapeutical or gynecological injury that may adversely affect her reproductive function and realization of her maternity plans.

The results of the medical-demographic investigations indicate the negative effect of radiation situation in Ukraine upon the state of other human organisms systems - endocrine, immune and cardiovascular and hence a significant health impairment beginning from the year 1986. The morbidity of entire population and by all classes of diseases increased 2.2-fold.

Specially, arise is noted in the birth anomalies, diseases of blood and hemopoietic organs, thyroid gland hyperplasias, and neoplasms. The indices for malignant deseases and their dynamics reflect the tendency of rise characteristic of the whole country. According to the theoretical estimates of specialists, the excess of oncological morbidity over spontaneous level on the controlled territory may reach about 10%. The percentage of population rated as healthy individuals in the results of the examination conducted during last three years decreased in the average to 1/3 of the whole population. Among the residents of the controlled territory, i.e. the territory being to some or other degree contaminated with radiation, this indice decreased by half. Such decrease in the proportion of healthy subjects during last three years is noted both among the adult and children.

Losses in Ukraine's population and the negative changes taking place in its the nation's gene pool today promote conditions for the further worsening of the population's reproduction potential, and the qualitative degradation of the Ukrainian nation may be the result.

Geneticists conclude that the basis and motivation for modern population reproduction have also changed. Before, the survival of individuals possessing physical health was matched in necessity by the survival of the most skilled and intellectually developed, for the development and preservation of civilization. Today, however, taking into account the catastrophic genetic and environmental degradation, it is mainly physically

healthy individuals, those with no heart or lung diseases, etc., that have a real chance to survive and bear their posterity. It means the priority of the physical health factor over the intellectual. Besides this, the human-created air, soil and water pollution in most oblasts of Ukraine, which alongside the Chernobyl consequences have acquired a global significance, are the cause of much genetic damage, that can potentially develop like an avalanche. The result would be a decrease in the birth rate and an increase of birth defects, crippings from birth, and hereditary diseases, as well as the appearance of new diseases.

The farther analysis of the dynamics of medical-demographic processes and health status of the irradiated persons in Ukraine clearly shows the so-called latent period with a duration of 3-4 years after the catastrophe. Within this period after 1986 there has taken place a recovery of the level of the main demographic indices (birthrate, infant mortality, mortality with respect to the causes, etc.) This phenomenon agrees with the existing theories about post-radiation effects and may be linked both with the decrease in irradiation level, and with the development in human organisms of reparation processes - a recovery of the structure and function of cellular apparatus damaged by radiation or other agents.

Considering the results of study of health of the population of Hiroshima and Nagasaki after nuclear bomb catastrophe, the concepts concerning a non-threshold action of irradiation, and our own data about the short-term consequences of the Chernobyl accident, we can mark the fifth to tenth post-accident years as the beginning of the period of the development of its remote consequences.

Hypothetically, we can single out the following main remote medico-demographic consequences of the accident:

- an increased frequency of tumours of the thyroid gland, predominantly in children, with a possible lethal outcome, this being higher in women compared to men;
- an increase in the appearance of leukemia (five years after irradiation) with an increased mortality level within 8-13 years;
- a decrease in the birthrate level due to diseases of the sexual sphere in women within 6-12 years;
- an increase (to 20-30 % until 2000 year in contaminated areas) in the mortality among young children due to diseases that might occur during the intrauterine development and juvenile age;
- an increase in the mortality rate of adult people due to the onset of tumours of various localization and of children who were irradiated during the intrauterine development due to a wider spectrum of tumours, (beginning from the 10th year after the accident);
- an increase in the mortality level among middle-aged people due to wide spread chronic diseases and illnesses that developed in association with a participation in liquidation of the accident;

- a possible many-fold increase in the level of genetic effects in the second generation people born from the irradiated subjects of the first generation (20-25 years after the accident);

- a possible decrease of the lifespan resulting from excessive mortality due to the above-listed causes.

All this taken together creates a threat that Ukraine will have not only quantitative reduction of population but also significant worsening of its health, the qualitative indices of its intellectual development, degradation of genetic found and, finally, the total destabilization of demographic development in the whole. By the contrast with economic and political, the demographic crisis is more inert, prolonged in time and harder for control, that has the distant negative consequences for independent stable development of the country.

In view of the adverse action of all above-described factors of the Chernobyl catastrophe, the Government of Ukraine, and earlier the Soviet Union, have adopted a number of the decrees aimed at social, economic and medical protection of persons who took part in liquidation of the accident, who were evacuated and who reside in the controlled areas. In 1991, the Decree about the status and social protection of citizens affected by the Chernobyl accident was adopted in Ukraine.

The above - said measures of the demographic policy concerned, in general, two spheres of life - socio-economic and legal. The problems of moral and psychological status were solved to a lesser degree. Lack of first-hand information and distrust in information given at later periods gave rise to a stress reaction in the population. All this taken together with health impairment proceeding against the background of dramatic changes in the socio-economic situation in the country strongly influenced the formation of the main demographic principles and their realization by the population of Ukraine. The above facts show that the measures taken for radiation and social protection of the population are inadequate and there is an urgent need for the development and implementation of additional measures in the demographic and social policy.

The people of Ukraine, and especially women and children, who continue to reside in the contaminated territories and who were subjected to different degrees of radiation exposure, should be referred to as a special demographic group requiring a long-term medical-demographic control, social protection, and all kinds of assistance in the organization and realization of their childbearing behaviour.

Without such measures inside country, and the efforts of people outside of Ukraine, it is impossible to imagine not only Ukraine's prosperity but even survival in the nearest future.

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