

Chernobyl 20 years on

The cancer incidence graphs are still rising

→ Peter McIntyre

Estimates of the death toll from the nuclear reactor disaster at Chernobyl vary widely depending on who you listen to. But with leukaemia rates still rising, and a recent marked increase in solid tumours among the 600,000 workers who were sent in to clean up the mess, the real question is whether the worst may be yet to come.

On 25 April 1986, the crew of number 4 reactor at the Chernobyl nuclear power plant in Northern Ukraine began tests for a routine shut-down. The power plants were of poor design and procedures had become sloppy. As the reactor began to close down, the flow of coolant water diminished and power output rose instead of falling.

At this point, a design fault led to a dramatic power surge that ruptured the fuel elements. Shortly after 1.30 am on 26 April an explosion blew the covering plate and roof off the reactor, releasing fission products into the atmosphere. A second explosion threw out fragments of burning fuel and graphite, and as air rushed in, the graphite moderator burst into flames.

The graphite burned for nine days, releasing about 12×10^{18} Bq of radioactivity into the atmosphere,

made up of xenon gas, iodine, caesium and other radioactive material. Most of the material was deposited close by as dust and debris, while lighter material was carried by the wind over Ukraine, Belarus and Russia. Enough material was carried further afield to cause major concerns in Scandinavia, Europe and the rest of the world.

In the first few hours, firefighters and other emergency teams struggled to get fires under control and to start to make the nuclear reactor 'safe'. About 1,000 people, including on-site staff, were irradiated with up to 20,000 millisieverts (mSv) on the first day. Of these 1000, 58 were to die from the effects of acute radiation syndrome.

On the day of the accident the winds were from the south, blowing the fallout towards Belarus only a dozen kilometres away. Later the wind veered, blowing the fallout towards West Ukraine. Finally, it

came from the north, blowing southwards towards Kiev.

At first, the public was told little about the accident, as secrecy took precedence over public safety. In nearby Prypiat, on the day of the explosion, a teacher took her children onto the bridge to watch the fire. On April 27, 49,360 people were evacuated from Prypiat, with no official announcement. Two days later, weddings were still being held in Chernobyl, and people were celebrating amidst the nuclear fallout.

Communist Party leaders went ahead with the May Day celebrations in Kiev and other cities, despite the radiation cloud covering the area. An international cycle race also went ahead as planned. It wasn't until May 2 and 3, a week after the accident, that 45,000 people were evacuated from a 30-kilometre radius of the power plant. A further 116,000 people were later relocated.



KOSTIN IGOR / CORBIS SYGMA

Where are they now? After the explosion, staff continued to be bussed into work to monitor and maintain the three remaining undamaged reactors. Their flimsy caps and face-masks show how little appreciation there was of the risks of working in such a heavily contaminated environment

While many clean-up workers believed radiation was harmless, there was something akin to panic in Kiev

Between 1989 and 2001, life expectancy for men in Ukraine fell from 66 to 63 years

After two weeks of panic and spontaneous evacuation, on May 6 Anatoly Romanenko, Minister of Health, finally went on state TV. His advice was that people should close their windows and wash their hands and feet.

Over the next period, 600,000 people from Russia, Belarus and Ukraine were involved as “liquidators” or “clean-up workers”, carrying out emergency work and cleaning up contamination. In all about 250,000 people were evacuated from affected areas in Ukraine, Belarus and Russia, and resettled elsewhere. Only a few thousand of these have ever returned.

In those early weeks, while many of the clean-up workers believed that radiation was harmless, there was something akin to panic 100 kilometres away, in Kiev.

Volodymyr Yavorivsky, a Kiev deputy in the USSR Supreme Soviet and a critic of the regime, later told the *Wall Street Journal* how people packed their children into trains, buses and planes. “My seven-year-old daughter went to stay with friends in the Carpathian Mountains, but eventually I learned that it was precisely there that a plume of dangerous radioactive fallout had fallen. Meanwhile the elite had their children evacuated to safe zones on the first day of the accident.”

Today, 20 years later, there are still two truths about Chernobyl. The conservative line is that the explosion was directly responsible for 58 deaths and about 4,000 cases of thyroid can-

cer in children (attributing only nine child deaths from thyroid cancer to radiation). The UN Atomic Energy Agency predicts that there will eventually be 4,000 deaths as a result of Chernobyl. A report in September 2005, *Chernobyl: The True Scale of the Accident*, endorsed by UN AEA, the World Health Organization and the UN Development Programme, said that “no evidence or likelihood of decreased fertility among the affected population has been found, nor has there been any evidence of increases in congenital malformations that can be attributed to radiation exposure.”

The other truth suggests a world-wide cover-up of catastrophic consequences. In the run-up to the 20th anniversary this year, the European Greens launched *The Other Report on Chernobyl*, claiming that fallout contaminated 40% of Europe’s surface area, and predicting 30,000–60,000 excess cancer deaths. The British *Guardian* newspaper even carried a report claiming that 500,000 people have already died because of the accident, although this figure is widely disputed.

The lack of agreement on data relating to the number of deaths or cancers caused by Chernobyl is in part because all figures are seen as having a political angle. But there are also genuine difficulties in understanding and interpreting the data.

In 1986, soon after the disaster, the Research Centre for Radiation Medicine was established to address an anticipated increase in cancer

cases and to treat acute radiation syndrome and other diseases. Today it is housed in a ten-storey building in a Kiev suburb, treating 400 adults and 134 children who are considered ‘victims of Chernobyl’.

The centre has collaborated with the US National Cancer Institute and with researchers from France, Germany, Italy and Japan to try to predict how many people will develop cancer because of the Chernobyl explosion.

Anatoly Prysyzhnyuk, head of the cancer epidemiology laboratory at the centre, took charge of data collection soon after the accident, visiting contaminated areas – including his parental home at Narodychi – and making studies of what he found.

Prysyzhnyuk has worked on a range of studies with a Russian team and a French team from the International Agency for Research on Cancer in Lyon.

His best estimate is that there has been an increase of more than 8,000 cancer cases in the affected areas of Russia, Belarus and Ukraine. However, he says that there was already evidence of a rising trend in cancers before Chernobyl, and when this is taken into account the real number of ‘excess cancers’ is about 5,400 from 1986 to 2004.

In the year following the accident there were repeated reports from districts around Chernobyl of large increases in cancer. He says that, when he investigated, he found many were due to the improvements in registration.



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A potential timebomb.

Dimitry Bazyka, from the Research Centre for Radiation Medicine in Kiev, says the biggest rise in solid tumours caused by the Chernobyl explosion is still to come

The most alarming statistic is the falling life expectancy in Ukraine. Between 1989 and 2001, life expectancy for men in Ukraine fell from 66 to 63 years and for women from 75 to 73.8 years. In 2001 the European figures for life expectancy were 75.2 years for men and 81.4 years for women.

The economic situation, a rise in poverty, and an increase in drinking have all been implicated in shortening life spans. However, the Chernobyl accident, the massive dislocation of populations, anxiety about future health prospects and the increase in cancers are all factors.

Dimitry Bazyka, an immunologist and deputy director of the Research Centre for Radiation Medicine in Kiev, has lived with the after-effects of Chernobyl personally and professionally. His father, Anatoli Bazyka, had been a doctor working in an area of the Soviet Union where nuclear testing was carried out, but in 1986

had just retired. On the day of the accident he was visiting land he had bought for his retirement home close to the Chernobyl power station. He received a significant dose of radiation, and three months later he was diagnosed with liver cancer, which rapidly killed him.

Bazyka says his father was an example of the way that radiation promotes existing cancers. "We cannot say that his cancer started on 26 April, when three months later it was manifested clinically. It started several years before. But after the second irradiation it started to move very quickly. So this is what we mean by 'promoting' cancer."

Later come the cancers induced by radiation: leukaemia, thyroid cancer, lung, urinary, renal, colon and breast cancers. The question is: How many, and how much later?

Using protocols established at the International Commission on Radiation Protection, the first predic-

tions in 1986 were of 50,000 deaths worldwide from all causes.

Since 1996, there has been a joint study between Ukraine, Belarus and Russia with France and Germany, of cancers, child mortality and other diseases in the most affected areas. A report on data for eight years is due this year.

Leukaemia is recognised as a marker for radiation-induced cancers, since it is induced many years earlier than solid tumours. The three countries have completed a separate study of leukaemia cases in clean-up workers, working with the US National Cancer Institute. The figures are not due to be released until later this year, but are expected to show a significant increase, with leukaemias in this group running at more than twice the rate expected in a similar-sized population.

Sergeiy Klymenko, a researcher at the Institute of Clinical Radiology in Kiev, says that these cases are very



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Vicious circle. Sergeyi Klymenko, from the Institute of Clinical Radiology in Kiev, says foreign tissue banks won't help them find bone marrow donors because they have too little experience handling the cells. "But if you cannot get access to donors you cannot gain experience"

hard to treat. "We can see that Chernobyl leukaemias are worse than spontaneous leukaemias. The Chernobyl cases have a lot of negative prognostic markers, and we can see in the clinic that they behave worse. The complete remission rate is lower and the survival is shorter."

So not only are clean-up workers more likely to develop leukaemia, they are much more likely to die. The overall survival of those with acute myeloid leukaemia is about half of other AML patients.

The Kiev team is keen to treat these patients with allogenic bone marrow transplantation. This is not yet a core programme in the Ukraine, partly because of expense and partly because of lack of matching donors. A blood and bone marrow donor reg-

istry run by the former Soviet Union was closed down a few years after the Soviet Union broke up. Klymenko says: "We cannot apply to world tissue banks for donors. There is a vicious circle. In order to apply for foreign donors we have to demonstrate we have enough experience to use these cells, but if you cannot gain access to donors you cannot gain enough experience."

Compared with the pattern of cancers in Japan after nuclear bombs were dropped on Hiroshima and Nagasaki, Ukraine is seeing cancers later, and it is seeing a steadily rising graph, rather than peaks as exhibited in Japan.

Bazyka says that the graph of leukaemias is still rising, which has worrying implications for solid tumour cancers. "We can predict that

the increase in cancer numbers will be later than in Japan. Not 10 to 20 years but maybe 20 to 50 years later."

They are now beginning to see a rise in lung and colon cancers among clean-up workers and also breast cancer. "We have a cohort of 6,000 females who were clean-up workers and the numbers are higher in this cohort than in Ukraine in general. Thirty years ago the rates of breast cancer were quite low in this country, lower than in European countries, but now there is a dramatic increase."

Many nuclear industry professionals seriously underestimate risk, says Bazyka. He recalls a visit to Slavutich (built to replace the neighbouring town of Prypiat), where one nuclear worker who had been exposed to radiation told him he was sure that there were no harmful effects. "Five minutes later he told me about a doctor who had saved his life by finding he had renal cancer and carrying out surgery. He insisted it was not connected to radiation."

The term "Chernobyl victims" is widely used in Ukraine. A sense of fatalism is the flip side of the poor understanding of risk by many of the clean-up workers, and it is compounding the threat to their lives. Despite the neglect suffered by Ukraine's public healthcare system as the country decides which direction to move in, many of these cancers can be treated effectively provided they are picked up early, as the data from Ukraine's revamped and highly effective cancer registry can demonstrate. "Our big problem is that people don't know about survival," says Liudmila Goulak, head of the cancer registry. "People are afraid of cancer. Some people avoid treatment and prepare for death. Our data show that a lot is being done for people with cancer and a lot of people are being cured."