Emergency workers were exposed to high doses of radiation; the surrounding population to far less

- A total of 237 occupationally exposed people were admitted to hospitals and 134 were diagnosed with "acute radiation syndrome." Of these, 28 died within the first three months, while at least 14 additional patients have died over the past ten years although these were not necessarily associated with radiation exposure. Two other people died in the explosion, and one more presumably of heart failure.

- Some 200,000 people involved in the initial clean up of the plant received average total body radiation doses of the order of 100 millisieverts (mSv)—a millisievert is a unit of radiation dose equivalent to about 10 general chest X-rays. This dose is about five times the maximum annual dose limit currently permitted for workers in nuclear facilities (20 mSv per year). Average worldwide natural "background" radiation is about 2.4 mSv annually.

An evacuated home within the 30-km exclusion zone credit:Eric Voice

- Some 20,000 liquidators received doses of the order of 250 mSv; a few per cent of them received doses of 500 mSv; and several dozen people received potentially lethal doses of a few thousands of millisieverts.

- Fewer than 10 percent of the 116,000 people evacuated from the "exclusion zone" received doses greater than 50 mSv; fewer than 5 percent received more than 100 mSv.

- More than 400,000 people lived in areas contaminated with more than 555 kBq/square meter[2]— classified by Soviet authorities as areas of strict control, requiring decontamination measures and restrictions on the use of locally produced foods.

- In Belarus, where an estimated 70 percent of the radioactive releases were deposited, about 20 percent of the population (2.2 million people) continue to live in areas where contamination initially exceeded 37 kBq/square meter—a low level not requiring decontamination and other control measures.

- For people outside the former USSR, the highest (national) average radiation dose during the first year after the accident was 0.8 mSv, that means an additional dose equal to about one third of the dose due to natural background radiation in that year.

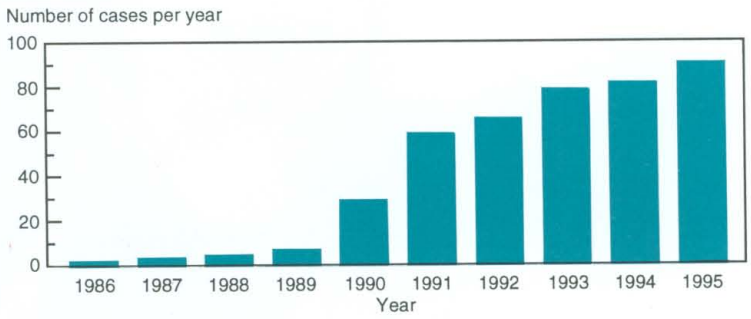
[2] *levels of radioactive contamination in this report are given in kBq per square meter. The Becquerel is equal to one atomic disintegration per second 1 kBq = 1000 disintegrations per second*

An increased number of radiation-related thyroid cancers is now evident

- The radioiodines released by the accident delivered radiation doses to the thyroid glands of people, especially children, in heavily contaminated areas. The short-lived iodines (particularly iodine-131 with a half-life of 8 days) were ingested in foodstuffs, mainly contaminated milk, and also inhaled from the initial radioactive cloud. Radioiodines accumulate in the thyroid, thus irradiating the gland from the inside.

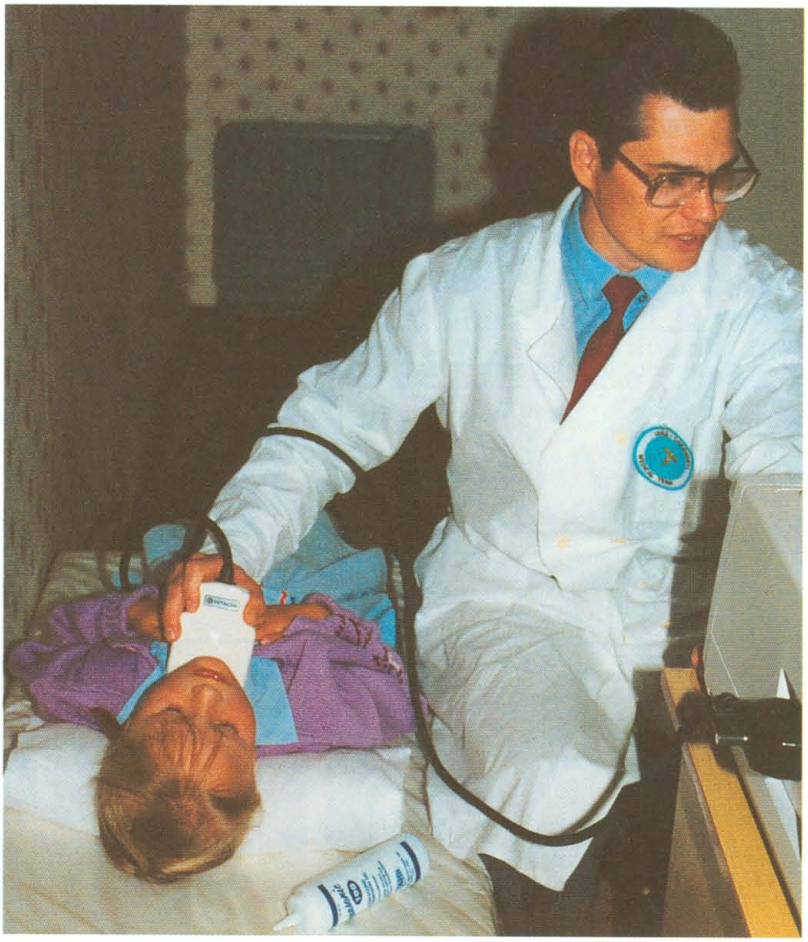
- A sharp increase in thyroid cancer among children from the affected areas is the only major public health impact from radiation exposure documented to date. At the end of 1995, about 800 cases in children under 15 years of age had been diagnosed, mainly in the northern part of Ukraine and in Belarus. Three children among the diagnosed cases are known to have died of the cancer by then—which generally can be successfully treated surgically and by medication.

Number of thyroid cancer cases among children in Belarus



- Based upon the current epidemiological projections, an increase in the incidence of thyroid cancer in adults who received radiation doses as children could occur, with the total number of cases possibly in the order of a few thousands.

- The incidence of thyroid cancer among children born more than six months after the accident has remained at the low levels expected in unexposed populations. This confirmed that the risk of thyroid cancer was only increased among those receiving high thyroid doses in 1986 and not among those exposed only to the continuing low levels of exposure since then.



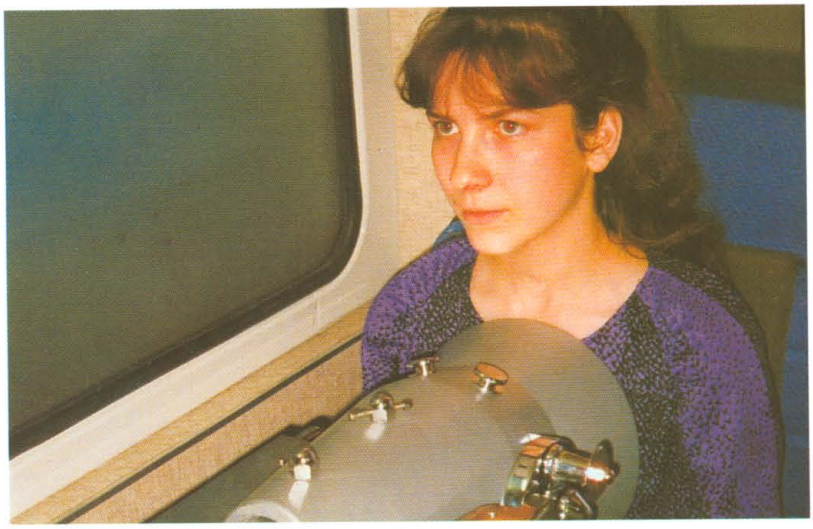
Examination of thyroid glands after the accident credit:Mouchkin/IAEA

Other than thyroid cancer, long term health impacts from radiation have not been detected

- There are numerous reports of increases in incidences of specific malignancies in people living in contaminated zones and among liquidators. These reports are inconclusive, and require further investigation.

- No increase has been detected either in the rate of leukaemia or in the incidences of any malignancies other than thyroid carcinomas because of the accident. Only ten years have passed, however, and cancers other than leukaemia do not usually occur until several years after exposure. Cancer registries need to be monitored and careful studies carried out to determine ongoing public health impacts and confirm predictions.

- There are significant psychological health disorders and symptoms among the populations affected by the accident including anxiety, depression, fatalistic attitudes and psychosomatic disorders caused by mental distress. However, it is very difficult to separate these effects from those caused by the economic decline and the dissolution of the former USSR. What is clear is that these effects are not caused by radiation exposure.



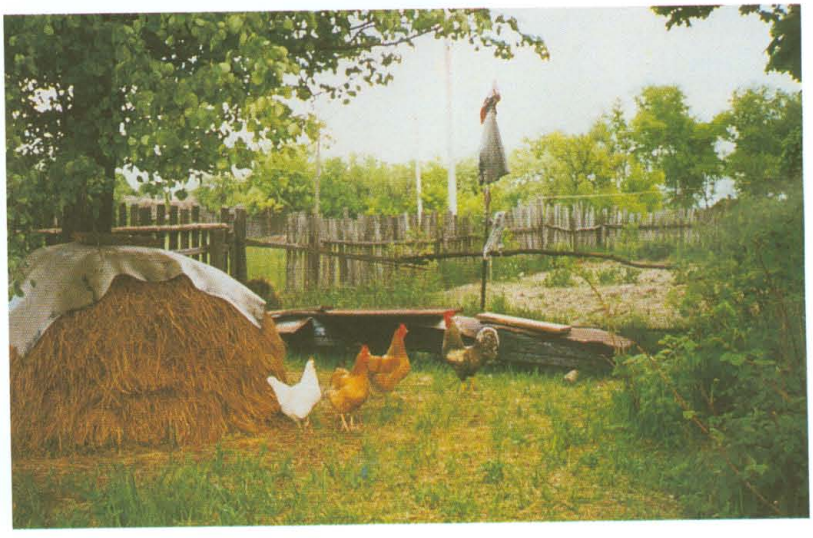
Measuring radiation exposure in Novozybkov Russia
credit: Pavlicek/IAEA

Severe environmental impacts were short term

- Lethal doses of radiation were received by some animals and plants, especially coniferous trees and some small mammals, living within 10 km of the reactor site in the first few weeks after the accident. Because of rapid radioactive decay, however, dose rates around the plant had already declined by a factor of 100 by the Autumn of 1986. Moreover, the natural environment in even these localities had begun to recover visibly by 1989, and no sustained impacts on populations or ecosystems have been observed.

- Direct radiation injury to plants and animals was reported only in local areas within the 30-km exclusion zone. In some cases, chronic dose rates may have reduced the fertility of some animal species inside the zone. But in most instances, long-term effects on plants or animals could not be demonstrated.

- There have been some reports of birth defects among farm animals; but other evidence supports general recovery from radiation damage. The possibility of long term genetic effects remains to be studied.



A farm in the village of Opachichi,within the exclusion zone credit: Eric Voice