RESULTS OF LONG-TERM STUDIES OF MEDICAL AND RADIOLOGICAL CONSEQUENCES OF THE CHORNOBYL CATASTROPHE (EXPERIENCE, CONCLUSIONS, FORECASTS)

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Background. Four decades after the Chernobyl accident, its long-term consequences have a significant impact on the state of the affected population of Ukraine. The affected population includes participants in the liquidation of the consequences of the accident (PLCA), evacuees and residents of radioactively contaminated areas (RRCA).

Objective. To systematize current data on long-term studies of the medical and radiological consequences of the Chornobyl catastrophe by assessing the structure of oncological and non-oncological morbidity, mortality, disability and dose factors in the main cohorts of victims, as well as to determine the priorities of medical countermeasures on the eve of the 40th anniversary of the accident.

Materials and methods. Review of data from the State Register of Ukraine for suffered persons (PLCA plus evacuees plus RRCA), long-term descriptive and analytical epidemiological international and domestic studies, results of radiation and hygienic monitoring of radioactively contaminated areas and regulatory decisions of 2024–2025 on dosimetric certification. Main indicators: standardized incidence rates (SIR), excess relative risk per unit dose (ERR/Gy), structure of mortality and disability.

Results. As of 01.01.2026, 1,460,626 adults, including 208,545 children, had the status of victims of the Chornobyl catastrophe in Ukraine. The total number of affected adult citizens as of 01.01.2026 compared to 2008 decreased by 582,455 people, or by 31.75% (from 1,834,536 to 1,252,081 people) (Fig. 1).

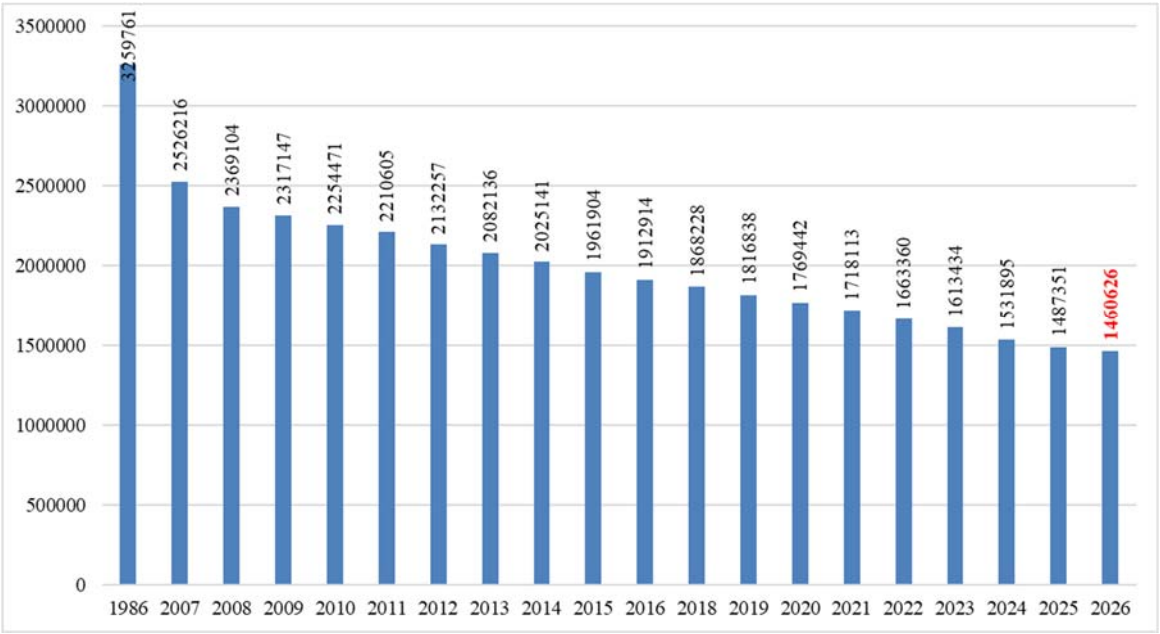

Figure 1. Decrease in the number of people affected by the Chornobyl catastrophe in Ukraine (2008-2026)

The number of PLCA during this period decreased from 276,327 to 135,180, or by 141,147 people (51.08%), i.e. over the past 17 years, more than every second participant in the liquidation of the consequences of the Chernobyl accident has deregistered (died).

The number of adult victims (RRCA plus evacuees) decreased from 1,558,209 in 2008 to 908,336 in 2026, or by 41.71% (649,873 people). The number of children affected by the Chornobyl accident decreased from 534,568 people in 2008 to 208,545 in 2026, or by 326,023 people. Spouse (widow) of a deceased citizen whose death is related to the Chornobyl catastrophe – 39,788.

As of 01.01.2026, 87,206 people (43,727 – PLCA, 43,479 – evacuees and residents of RCT) belonged to category 1 (the presence of a link between the disease that led to disability with the impact of the Chornobyl accident); children disabled by the Chornobyl NPP - 824, the maximum of this group of affected persons was

recorded in 2014 - 117,158 people. In the structure of post-mortem cases of medical expertise of the connection of diseases that led to the death of affected persons, category 1 – 51.25 % (10,807 cases) is absolutely dominant, which, as patients with an expertly verified causal relationship with the impact of radiation exposure and the consequences of the Chornobyl accident and confirmed disability, had a more severe decompensated course of diseases. In second place are the PLCA of the 2A category (22.01%), who participated in the clean-up work at the first stages of the accident and received increased radiation doses.

In the first five years after the accident, residents of the most contaminated areas received an average of about 58% of the total effective dose of radiation for the entire post-accident period. During the first fifteen years, about 80% of the total dose was accumulated, while for the period 2000–2024, the additional accumulation did not exceed 20% of the total dose for 1986–2020 (^{137}Cs from local food and forest products) against the background of heterogeneous territorial pollution [1].

Main effects of the accident: Early effects - acute radiation sickness, cytogenetic damage, cataracts - have already been realized and well described. But the main burden for the healthcare system today is late effects: tumor diseases, cardiovascular pathology, cerebrovascular diseases, bronchopulmonary diseases, thyroid pathology. It is these effects that require not short-term care, but lifelong monitoring, timely diagnostics, maintenance of registries and preservation of the expert system [1].

The total oncological incidence in residents of RCT and evacuees does not exceed national levels on average, while in PLCA there is an increase in total cancer incidence (SIR>1) with distinct signatures for thyroid cancer (the largest increase in PLCA), as well as an increase in the risk of leukemia/lymphomas; for leukemias and myeloma, dose-dependent effects (ERR/Gy>0) are shown.

Epidemiological studies of the NRCRMHO have shown a dependence of the incidence of most non-tumor diseases in affected people on the dose of external radiation, age at the time of exposure and the time elapsed after it; these patterns were most pronounced for coronary heart disease, hypertension, chronic obstructive pulmonary disease, pathology of the vision organs (age-related macular degeneration, involutional cataract) and other somatic diseases [2, 3].

The dominant contribution to the burden of diseases is made up of non-oncological conditions: cardiovascular and cerebrovascular diseases, chronic respiratory (COPD and BA), endocrine and digestive diseases. Most representatives of the cohorts have multimorbidity (3-5 chronic diseases per person) and a steady increase in mortality since the late 1990s, which in the most vulnerable groups exceeds the indicators of the general population. The war of 2022 increased the risks due to the destruction of the medical infrastructure of the northern regions and the complication of access to care [2, 3].

Conclusions. During 2008-2025, there was a significant increase in mortality and, accordingly, a reduction in the number of all categories of affected population, but primarily PLCA. 40 years after the accident, the main burden for affected population is due to non-oncological diseases (primarily cardio- and cerebrovascular), complemented by an increased risk of individual solid and hematological neoplasias in specific cohorts (PLCAs). Health priorities include: restoration of systemic dosimetric certification and control of internal radiation; long-term dispensary follow-up of cardiovascular, endocrine-metabolic, neurological and pulmonological profile; screening and early detection of thyroid and breast cancer, oncohematological diseases and lung cancer in risk groups; support for the functioning of the register of affected population with the transition to an analytical data model; guaranteeing the safety of radiation-hazardous facilities of the Chornobyl NPP industrial site; targeted medical and social programs for persons who were exposed to radiation in childhood. The presented findings can serve as a basis for the correction of antiradiation, clinical and social measures in the near future.

List of sources.

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