World Health Organization

Ionizing radiation and health

AIDE-MÉMOIRE

For enhanced country action on ionizing radiation protection

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Ionizing radiation is energy released in the form of electromagnetic waves or particles. It is naturally present in the environment and can also be generated by human activities.

Natural sources of ionizing radiation include cosmic rays from space, radioactive materials in the Earth's crust, such as radon gas, and food and drinking-water. Human-made sources include medical procedures like diagnostic X-rays and radiotherapy, as well as nuclear power generation. Past nuclear accidents and nuclear weapons testing also contribute to the current radiation levels in the environment.

Exposure to high doses of ionizing radiation can lead to severe radiation injuries, such as acute radiation syndrome and skin burns. Exposure to radiation, even at low doses, can increase the risk of cancer and other health issues. Children and adolescents are at higher risk. Prenatal exposure may impact brain development.

To minimize risks, occupational and medical exposures should be carefully controlled. In the event of radiation emergencies, such as nuclear accidents, immediate measures should be taken to protect public health and mitigate exposure.

WHO support to countries

- Provides evidence-based policy options, guidelines and tools on radiation safety in medicine, radon control, and emergency preparedness and response.
- Advises governments on establishing and implementing radiation safety standards and reference levels.
- Provides comprehensive information on national radon initiatives, including surveys, concentration levels, regulations, and mitigation measures to manage radon exposure and associated health risks.
- Supports national capacity building activities for public health response to radiation emergencies.
- Offers information on the health effects of ionizing radiation and related management.
- Provides a compendium of available interventions for effectively managing ionizing radiation.

✓ Checklist

Policies & actions

☐ National radiation protection regulations in place

☐ National radon action plan and radon reference levels established

☐ Radioactivity in food and drinking water managed

☐ National policies and plans for prevention, preparedness, monitoring, response and recovery after radiation emergencies in place

☐ International Health Regulations (IHR) (2005) implemented

☐ Radiation monitoring system with criteria for emergency response activation implemented

☐ National emergency response plans developed

Awareness raising & capacity building

☐ Information about radon's health risks and control measures provided

☐ Safety culture in the medical use of radiation (e.g., to reduce unnecessary exposure) promoted

Key elements for country action

Governance

- Cooperate across sectors, such as industry, agriculture, housing, and labour. This collaboration should involve health professionals, decision makers and the public to raise awareness and minimize the adverse health effects of ionizing radiation, including measures to reduce exposure.
- Ensure health gains from sound management of ionizing radiation are considered in all relevant policies outside the heath sector.

Policies & action

- Establish and implement national radiation protection regulations to protect the public, workers, and patients.
- Implement a radiation monitoring system to detect and assess environmental radiation, such as from radon and radioactivity in food and drinking-water.
- Manage radioactivity in food and drinking-water, according to the international radiation safety standards.
- If appropriate, establish a national radon action plan, reference levels for radon concentrations in homes, high-occupancy public buildings, and workplaces, alongside national regulations and building codes for radon prevention in new buildings and mitigation in existing buildings.
- Incorporate radon as a risk factor in national strategies on cancer control, tobacco control, energy conservation and indoor air quality, and health promotion programmes for the public and workers.
- Promote education and training on radiation protection for workers in health and other sectors.
- Establish national dose registers for persons occupationally exposed to ionizing radiation.
- Develop or update national policies and plans for the prevention, preparedness, monitoring, response, and recovery in case of radiation emergencies. These plans should take into account the country's risk profile, potential scenarios, and the needs of vulnerable populations.
- Implement international agreements, such as the International Health Regulations 2005 [IHR (2005)], into national laws.
- Ensure access to radiation-related expertise, as appropriate.

Awareness raising & capacity building

- Raise awareness and educate the public, policymakers, and health practitioners about the health risks of radon exposure and the importance of control measures.
- Promote a safety culture in the medical use of radiation and avoid unnecessary medical radiation exposure.
- Support, through coordination, capacity building activities (e.g. training, exercises).

Additional information:

Main resources:

- Environmental radiation exposure: https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/environmental-exposure/
- Radiation. Medical exposure: https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/medical-exposure/
- Radiation. Emergencies: https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/emergencies
- Fact sheet. Ionizing radiation and health: https://www.who.int/health-topics/radiation#tab=tab_2
- GHO Radon database: https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/gho-phe-radon-database
- Radiation: https://www.who.int/health-topics/radiation
- Radiation emergencies: https://www.who.int/health-topics/radiation-emergencies
- Radon: https://www.who.int/health-topics/radon
- Compendium of WHO and other UN guidance on health and environment (WHO, 2024)

Please note: This aide mémoire provides summary information on ionizing radiation and health. More detail on radiation and other environmental health topics is provided in various other materials.