

Purpose

- To identify areas requiring emergency measures in response to the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS
- To estimate exposure doses for the first one year after the accident for that purpose
- To assess health risks of people in Japan and the whole world based on the estimated doses

Assessment method

- Set conservative conditions for dose estimation and assess exposure doses
- Estimate doses both from internal and external exposure
- Estimate exposure doses by age (one year old (infants), 10 years old (children), and 20 years old (adults)) and by area

The WHO is an organization responsible for assessing health risks posed by radiation in an emergency. Therefore, after the accident at TEPCO's Fukushima Daiichi NPS, it conducted assessment of exposure doses for the first one year regarding people in Japan and the whole world for the purpose of identifying areas and groups of people for which emergency measures should be taken.

The WHO assessed doses due to exposure to radiation via four pathways: (i) external exposure from the ground surface, (ii) external exposure from radioactive plumes (p.29 of Vol. 1, "Effects of Reactor Accidents"), (iii) internal exposure through inhalation, and (iv) internal exposure through ingestion. Doses due to external exposure via (i) and (ii) and internal exposure via (iii) were estimated through simulation based on information on contamination density on the soil surface as of September 2011, while doses due to internal exposure via (iv) were estimated based on the measurement values for foods and drinking water.

People's exposure doses are to be calculated by summing up estimated values for (i) to (iv), but in order to avoid underestimation, the WHO set conservative assumptions and calculated the largest exposure doses imaginable. Concretely, the WHO adopted the preconditions that protective measures such as deliberate evacuation, sheltering indoors, or shipping restrictions on foods were not at all taken.

As exposure doses vary by area and age, the WHO estimated doses by dividing areas into Fukushima Prefecture, neighboring prefectures (Chiba, Gunma, Ibaraki, Miyagi and Tochigi Prefectures), the rest of Japan, neighboring countries and the rest of the world, and by dividing people by age into those aged one year old (infants), 10 years old (children), and 20 years old (adults) at the time of the accident.

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Assumptions for risk assessment

- Assuming that there is no threshold dose for radiation carcinogenesis, the linear model and the linear quadratic model were adopted for dose-response relationships for solid cancer and leukemia, respectively.
- Dose and dose-rate effectiveness factors (DDREF) were not applied.

Results

- People's exposure doses were below all thresholds of deterministic effects (tissue reactions).
- When using a method to avoid underestimation of risks, among people of either gender in a specific age group in the most affected area, the lifetime risk of developing some types of tumors is estimated to increase slightly. However, this merely shows a relative increase against the baseline (lifetime risk of naturally occurring tumors) and does not show an increase of the absolute risk of developing tumors.
- Risks of heritable effects due to radiation exposure are further smaller than the risks of generating cancer.
- The results suggest that increases in the incidence of diseases attributable to the additional radiation exposure are likely to remain below detectable levels.

Conclusion

- Values in this Report are for roughly ascertaining current risk levels and are not intended to predict future health effects.

The WHO's health risk assessment was conducted for the purpose of examining the scopes of people to be subject to health management and diseases whose incidence should be monitored. This assessment was based on exposure doses estimated under considerably conservative assumptions in order to avoid underestimation. Accordingly, resulting values in this Report are for roughly ascertaining current risk levels and are not intended to predict future health effects.

[Relevant parts in the reports]

- WHO Report on preliminary dose estimation (Tables 3 and 4 on pages 44 to 47)
- WHO Report on health risk assessment (pages 8 and 92 to 93, and Table 43 on page 156)

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