

Assessments by International Organizations		WHO Reports and UNSCEAR 2013 Report (1/3) Comparison of Assessments (1/2): Overview
	WHO	UNSCEAR
Purpose	To estimate health risks of residents due to radiation exposure for the first one year after the accident (conservative assessment)	<ul style="list-style-type: none"> <li>To compile obtained information and make an assessment</li> <li>To provide scientific knowledge (realistic assessment)</li> </ul>
Content	<ul style="list-style-type: none"> <li>Preliminary dose estimation</li> <li>Health risk assessment</li> </ul>	<ul style="list-style-type: none"> <li>Time chart and analyses of the nuclear accident of the nuclear accident</li> <li>Release and diffusion of radioactive materials</li> <li>Public exposure doses</li> <li>Occupational exposure doses</li> <li>Health effects</li> <li>Exposure doses and risk assessment for non-human biota</li> </ul>
Time of assessment	Immediately after the accident (data up to September 2011) Data immediately after the accident contains inaccurate information.	After the elapse of a certain period of time from the accident (data up to September 2012) More recent data, if appropriate, is also taken into consideration.
Time of release	Dose assessment: May 2012 Health risk assessment: February 2013	April 2014
Conclusion	The possibility of increases in diseases due to radiation released as a result of the latest nuclear accident is small, and risk increases are ignorable in Japan except for some areas in Fukushima Prefecture, as well as in neighboring countries.	Lifetime doses that the Japanese people will receive due to the nuclear accident are small and it is hardly likely that any health effects of radiation will be observed among Japanese people in the future.

Reports by the World Health Organization (WHO) on dose estimation and health risk assessment\*<sup>1</sup> and the 2013 Annual Report by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) \*<sup>2</sup> are compared and their outlines and key points are introduced here.

The purpose of the WHO Reports is to estimate people's exposure doses for the first one year after the accident and identify areas requiring emergency measures. Therefore, the WHO provisionally assessed the residents' health risks based on limited information available and released the preliminary dose estimation report in May 2012. Later, the WHO released preliminary health risk assessment report in February 2013.

In the meantime, the UNSCEAR regularly reports the status of radiation exposure of respective countries all over the world based on its scientific review of information. It has been continuing research and analysis of the effects of the Chernobyl NPS Accident for years and it also released the report on the effects of radiation exposure caused by Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS in April 2014.

(Related to p.190 of Vol. 1, "WHO Reports (1/4) Outline of the WHO's Dose Assessment" and p.195 of Vol. 1, "UNSCEAR 2013 Report (2/9) Outline of Assessment of Public Exposure Doses")

\*1: WHO Reports on preliminary dose estimation and health risk assessment:

- Preliminary dose estimation from the nuclear accident after the 2011 Great East Japan Earthquake and Tsunami (2012)
- Health risk assessment from the nuclear accident after the 2011 Great East Japan earthquake and tsunami, based on a preliminary dose estimation (2013)

\*2: 2013 Annual Report by the UNSCEAR:

- SOURCES, EFFECTS AND RISKS OF IONIZING RADIATION UNSCEAR 2013, Report, Volume I, REPORT TO THE GENERAL ASSEMBLY SCIENTIFIC ANNEX A: Levels and effects of radiation exposure due to the nuclear accident after the 2011 great east-Japan earthquake and tsunami (2013)

Included in this reference material on March 31, 2015

Assessments by International Organizations		WHO Reports and UNSCEAR 2013 Report (2/3) Comparison of Assessments (2/2): Assessment of Public Exposure Doses and Major Uncertainties	
	WHO	UNSCEAR	
	20 years old (adults); 1 year old (infants)	20 years old (adults); 1 year old (infants)	
Estimation of effective doses for the first one year after the accident (in millisieverts)	(i) Fukushima Prefecture: 1-50 1-50 (ii) Neighboring prefectures: 0.1-10 0.1-10 (iii) Rest of Japan: 0.1-1 0.1-1	(i) Precautionary Evacuation Areas: 1.1-5.7 1.6-9.3 (ii) Deliberate Evacuation Areas: 4.8-9.3 7.1-13 (iii) Non-evacuated districts of Fukushima Prefecture: 1.0-4.3 2.0-7.5 (iv) Neighboring prefectures: 0.2-1.4 0.3-2.5 (v) Rest of Japan: 0.1-0.3 0.2-0.5	
Uncertainties	Large (prioritized the promptness in assessment)	Uncertainties remain although the report intends to achieve more realistic assessment than that in the WHO Reports.	
Major causes of uncertainties in dose assessments	<ul style="list-style-type: none"> <li>Estimation of radioactivity concentrations in the air based on measured values of radiation deposited on the ground surface</li> <li>Information on release of radioactive materials (source terms) and ATDM simulation</li> <li>Compositions and chemical forms of radionuclides</li> <li>Shielding effects of buildings</li> <li>Assumptions for estimation of exposure doses through ingestion of foods</li> <li>Variation in dose coefficients depending on dietary habits</li> </ul>	<ul style="list-style-type: none"> <li>Measured values for radionuclides with short half-lives deposited on the ground surface</li> <li>Changes over time in release rates of radionuclides and knowledge on weather information at the time of their release</li> <li>Composition of particulate and gaseous I-131 in the air</li> <li>Biased selection of samples in food monitoring (highly contaminated items are prioritized)</li> <li>Japanese people's metabolism of iodine (thyroid iodine uptake rate)</li> </ul>	
<p>Note: The WHO's dose estimation is more conservative (overestimated) than that by the UNSCEAR.</p> <p>Explanation of terms:</p> <ul style="list-style-type: none"> <li>Source terms collectively refer to data necessary for dose assessment, i.e., types, chemical forms and release amounts of radioactive materials.</li> <li>Diffusion simulation means to calculate the tendency of diffusion of radioactive materials by combining the source term data and other data such as weather conditions and wind directions, etc.</li> </ul>			

For effective dose estimation, the WHO divided Japan into three zones, (i) Fukushima Prefecture, (ii) neighboring prefectures (Chiba, Gunma, Ibaraki, Miyagi and Tochigi Prefectures), and (iii) the rest of Japan, while the UNSCEAR divided Fukushima Prefecture into three zones, and the other prefectures into (iv) neighboring prefectures (Miyagi, Gunma, Tochigi, Ibaraki, Chiba and Iwate Prefectures) and (v) the rest of Japan.

Both the WHO Reports and the UNSCEAR Report state that their assessments of internal and external exposure doses contain certain uncertainties due to uncertainties inherent to basic data. Sources of such uncertainties explained in these Reports are mostly the same despite some differences in expressions. The assessment by the WHO is generally overestimated than that by the UNSCEAR.

(Related to p.191 of Vol. 1, "WHO Reports (2/4) Effective Dose Estimation Method," p.193 of Vol. 1, "WHO Reports (4/4) Evaluation of Uncertainties," p.197 of Vol. 1, "UNSCEAR 2013 Report (4/9) Estimation of Public Exposure Doses for Each of the Four Groups," p.199 of Vol. 1, "UNSCEAR 2013 Report (6/9) Assessment of Public Exposure Doses: Results," and p.201 of Vol. 1, "UNSCEAR 2013 Report (8/9) Assessment of Public Exposure Doses: Uncertainties")

[Relevant parts in the reports]

Results of effective dose estimation:

- WHO Report on preliminary dose estimation (prepared based on pages 40 to 45 (3. Results))
  - UNSCEAR Report (prepared based on paragraphs 209 to 214 on pages 56 to 57, Annex A (Japanese-language version)) (Original English version: paragraphs 209 to 214 on pages 86 to 87)
- Uncertainties in dose assessments:
- WHO Report on preliminary dose estimation (prepared based on sections 4.7.1 to 4.7.7 of 4.7 on pages 60 to 62)
  - UNSCEAR Report (prepared based on paragraphs 110 to 115 on pages 35 to 36, Annex A (Japanese-language version)) (Original English version: paragraphs 110 to 115 on pages 60 to 61)

Included in this reference material on March 31, 2015

## Conservative assessment

- Based on assumptions that would not lead to underestimation of exposure doses based on uncertain information (conservative assumptions), exposure doses and health risks are assessed on the safe side for emergency measures immediately after a nuclear disaster.
- As a result of conservative assessment, calculated values will be larger than the actual exposure doses.
- Risk assessment based on the calculated values will result in overestimation of health effects.

## Realistic assessment

In the recovery period after a nuclear hazard, current exposure doses and possible future health effects are to be assessed based on assumptions as close as possible to the reality, using all information and measurement data available at that point in time.

In taking emergency measures immediately after a nuclear disaster, exposure doses and health risks are often overestimated from the perspective of mitigating health effects that may be caused by radiation exposure to the extent possible.

In other words, risks are assessed conservatively on the safe side to avoid underestimation. Such conservative assessment is considered to be effective in avoiding the worst situation that may happen. On the other hand, in the recovery period after the completion of emergency measures, exposure situations are to be ascertained more realistically by reflecting on the accident based on fragmentary information and measurement data, and the possibility of health effects into the future are assessed in more detail.

The WHO Report on health risk assessment provisionally calculated health risks based on doses calculated conservatively with limited information and under conservative assumptions. As a result, its risk assessment provided the upper limit but resulted in overestimation as a whole.

The UNSCEAR Report intended to assess exposure levels and radiation risks due to the accident as realistically as possible as of the time when sufficient information was obtained. However, it states that the assessment still contains uncertainties due to the limitations in actual data. For example, there are uncertainties concerning measurement levels of radionuclides deposited on the ground surface and the assumption of radioactivity concentrations in foods. Due to such uncertainties, dose assessment in the UNSCEAR Report is indicated as being likely to be overestimated or underestimated depending on the circumstances.

Included in this reference material on March 31, 2015  
Updated on February 28, 2018