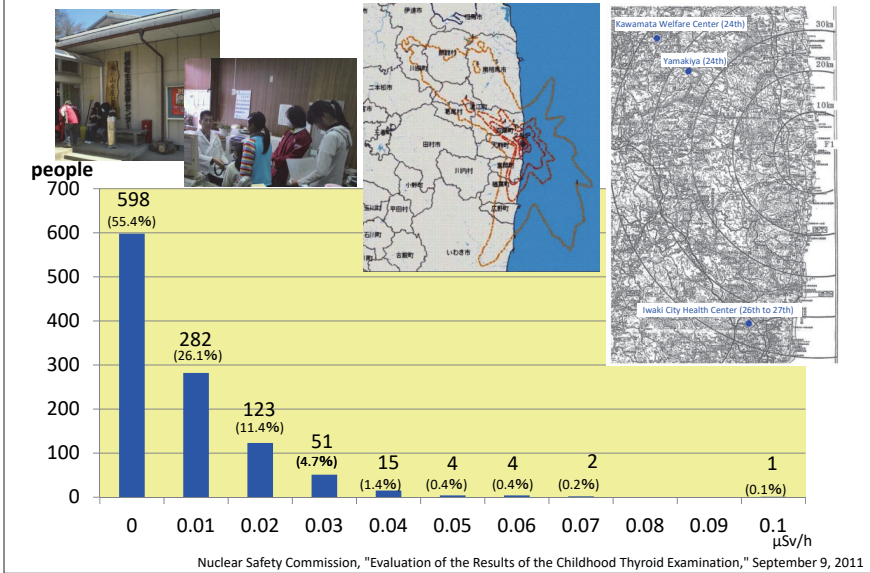


# Childhood Thyroid Examination



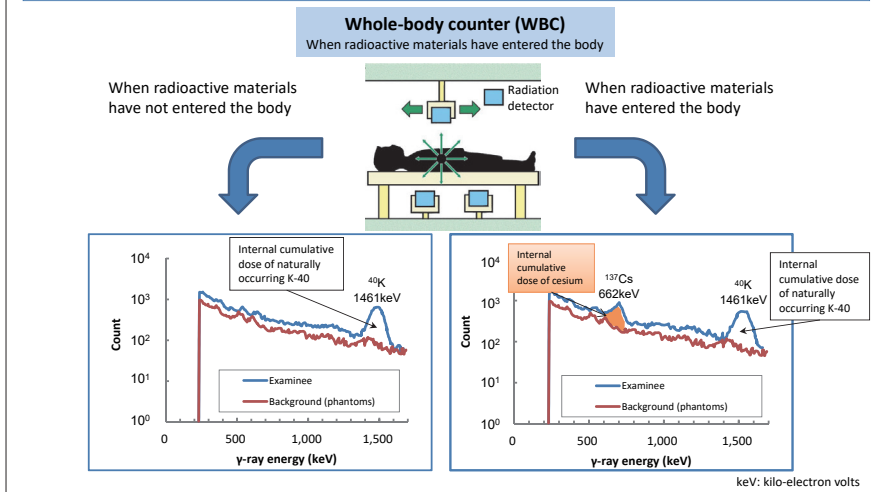
Based on estimates by SPEEDI on March 23, 2011, the Local Nuclear Emergency Response Headquarters conducted the Childhood Thyroid Examination to ascertain health effects of radiation on children in response to a request from the Technical Advisory Organization in an Emergency of the Nuclear Safety Commission of Japan (dated March 23 and 25). The figure shows the results for 1,080 children for whom measurement was conducted properly, out of 1,149 survey targets. The figure excludes the results for 66 children for whom simplified measurement was not appropriate due to environmental doses at their measuring spots (proper evaluation based on simplified measurement was difficult due to high ambient dose rates) and for three children whose ages were unknown. However, for all children who received the examination, measured values were below 0.2  $\mu\text{Sv/h}$ , which is set as the standard screening level by the Nuclear Safety Commission of Japan.

Included in this reference material on March 31, 2013

Updated on March 31, 2017

# Internal Exposure Measurement Using a Whole-body Counter

**Whole-body counter (WBC):** A device to measure radiation from radioactive materials within the body. It can measure radionuclides emitting  $\gamma$ -rays, such as Cs-134 and Cs-137.



A whole-body counter is a device to measure  $\gamma$ -rays emitted from the body. As  $\gamma$ -ray energy differs by radionuclide, if a specific amount of energy, for example, 1,461 keV, which is the  $\gamma$ -ray energy of radioactive potassium (K-40), is counted, this can be interpreted as  $\gamma$ -rays emitted from K-40 in the body. The  $\gamma$ -ray energy of Cs-137 is 662 keV.

Potassium is an essential element for a living organism and approximately 0.01% of it is radioactive. Radioactive potassium is mainly dissolved in cellular water and exists in muscles but not so much in fat cells that contain little water.

As radioactive cesium spreads all over the body, the internal dose of cesium is measured using a whole-body counter.

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## Results of the Internal Exposure Measurement Using a Whole-body Counter

Targeting the residents of the Evacuation Areas and the areas where internal and external exposure doses are likely to be higher than in other areas based on the results of the environmental monitoring survey, etc. (Yamakiya District in Kawamata Town, Iitate Village and Namie Town), the internal exposure measurement using a whole-body counter commenced on June 27, 2011. The targeted areas were expanded sequentially, and measurements were conducted for a total of 328,354 people by November 30, 2017. For over 99.9% of them, committed effective doses due to Cs-134 and Cs-137 were below 1 mSv and even the maximum measured value was below 3 mSv. Measured values were all unlikely to cause any health effects.

- (i) Targeted local governments: All 59 municipalities in Fukushima Prefecture
- (ii) Organizations that conducted the measurement  
Fukushima Prefecture; Hirosaki University Hospital; Minamisoma City General Hospital; Japan Atomic Energy Agency; Niigata Prefecture Radiation Examination Office; Hiroshima University Hospital; Nagasaki University Hospital; Japanese Red Cross Otsu Hospital; Mori no Miyako Industrial Health Association; National Hospital Organization Kanazawa Medical Center; Ehime University Hospital; and the National Institute of Radiological Sciences
- (iii) 'Mobile measurement' using whole-body counter vehicles outside Fukushima Prefecture  
Fukushima Prefecture runs whole-body counter vehicles for mobile measurement so that evacuees outside the prefecture can also receive measurement. By March 2016, mobile measurement was conducted in 38 prefectures including the Tokyo Metropolis (other than Aomori, Ibaraki, Niigata, Ishikawa, Shiga, Hiroshima, Aichi and Nagasaki Prefectures), where there is no permanent organization to which Fukushima Prefecture commissions the measurement.
- (iv) Measurement results (committed effective doses) (Results up to November 2017 were released on December 26, 2017.

	Jun. 27, 2011 – Jan. 31, 2012	Feb. 1, 2012 – Nov. 30, 2017	Total
Less than 1 mSv	15,384 people	312,944 people	328,328 people
1 mSv	13 people	1 person	14 people
2 mSv	10 people	zero	10 people
3 mSv	2 people	zero	2 people
Total	15,409 people	312,945 people	328,354 people

\* Committed effective dose: Assuming that until the end of January 2012, a person ingested radiation once on March 12, 2011, and, from February 2012 onward, a person orally ingested the equal amount of radiation every day from March 12, 2011, to the day preceding the measurement date, the person's lifetime internal doses are calculated by summing up the doses for fifty years in the case of an adult and for the years elapsed until becoming 70 years old in the case of a child.

Prepared based on the website of Fukushima Prefecture, "Results of the Internal Exposure Measurement Using a Whole-body Counter"

Targeting the residents of the Evacuation Areas and the areas where internal and external exposure doses are likely to be higher than in other areas based on the results of the environmental monitoring survey, etc. (Yamakiya District in Kawamata Town, Iitate Village and Namie Town), the internal exposure measurement using a whole-body counter commenced on June 27, 2011. The targeted areas were expanded sequentially, and the measurements were conducted for a total of 328,354 people by November 30, 2017. For over 99.9% of them, committed effective doses due to Cs-134 and Cs-137 were below 1 mSv and even the maximum measured value was below 3 mSv. Measured values were all unlikely to cause any health effects.

Included in this reference material on March 31, 2013

Updated on December 31, 2017

## Internal Exposure due to Foods

- Radioactive cesium is eliminated from the body over time.
- The internal exposure measurement using a whole-body counter being conducted at present examines the effects of radiation that is ingested orally on a daily basis.
- Measured values exceeding 1 mSv are considered to be mostly caused by radiation **derived from wild plants or animals**. Since March 2012, values exceeding 1 mSv have not been detected.

\* Reference:p.73 of Vol. 2, "Mushrooms, Mountain Vegetables and Wild Bird and Animal Meat"

- Q. What if the measurement using a whole-body counter detected any value exceeding the detection limit?
- A. The relevant person may have eaten a lot of foods – not allowed in commercial markets – that contain radioactive cesium at high concentrations, e.g., wild mushrooms, wild plants, wild bird and animal meat (wild boars, bears, etc.).

Prepared based on the following:

Masaharu Tsubokura, et.al. "Reduction of High Levels of Internal Radio-Contamination by Dietary Intervention in Residents of Areas Affected by the Fukushima Daiichi Nuclear Plant Disaster: A Case Series," PLoS One. 2014; 9(6): e100302., US National Library of Medicine, National Institutes of Health, Published online 2014 Jun 16

As radioactive cesium is eliminated from the body over time, the radioactive cesium that people ingested immediately after the earthquake has mostly been eliminated.

The internal exposure measurement using a whole-body counter being conducted at present examines the effects of radiation that is ingested orally on a daily basis. Measured values exceeding 1 mSv per year are considered to be mostly caused by radiation derived from wild plants and animals. As long as people eat only foods distributed through regulated commercial marketplaces, their annual internal doses will not exceed 1 mSv. If the annual internal dose exceeds 1 mSv, the relevant person may have eaten a lot of foods – not allowed in commercial markets – that contain radioactive cesium at high concentrations. In particular, cases have been reported where wild mushrooms are suspected to cause high internal doses.

Included in this reference material on March 31, 2013

Updated on December 31, 2017

## Self-Protection against Internal Exposure

- General protection against radioactive cesium  
It is very effective to
  - Have knowledge on foods that contain a high level of radioactive cesium
  - Avoid eating the same food continuously
  - Try to eat a variety of foods produced in diverse areas.
- Current status in Fukushima
  - Continued ingestion of radiation is unlikely except from foods.
  - There is no significant difference whether one selects foods and water produced locally or selects those produced in other areas.
- Obtaining accurate information is extremely important.

Prepared based on the material released by the 9th Opinion Exchanges, Foodservice Industry Research Institute (September 3, 2012)

In order to avoid further internal exposure, it is effective to have knowledge on foods that contain a high level of radioactive cesium, avoid eating same food continuously, and try to eat a variety of foods produced in diverse areas. Obtaining accurate information is extremely important.

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