Expert Meeting Regarding the Status of Health Management of Residents Following the Accident at the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station

Interim Report

December 2014

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Note:

- Where required, glossaries and supplemental clarifications are written in the relevant section in items numbered 1), 2), 3) and so on, and in footnotes at the bottom of each page.
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I. Introduction

On March 11th, 2011 at 2:46 pm, a magnitude 9.0 earthquake occurred off Sanriku as its epicenter. Units 1-3 of the *Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station* (referred hereinafter as "the nuclear power station"), which was in operation at the time, failed to cool the nuclear core by loosing electric power and halting the cooling system as a result of the earthquake and the tsunami, finally leading to a meltdown of the fuel in the core. In the process, a large amount of hydrogen gas was produced, which accumulated inside the reactor buildings of Units 1 and 3, causing hydrogen explosions in Unit 1 on March 12th, and in unit 3 on March 14th . Also, the hydrogen gas, which seemed to be flowed from Unit 3, caused hydrogen explosions in Unit 4, adjacent to Unit 3.

Immediately following the accident at the nuclear power station (hereinafter referred to as "the nuclear accident"), the government responded to the residents of the surrounding areas as follows. Firstly, on March 11th at 9:23 pm, on the basis of the *Act on Special Measures Concerning Nuclear Emergency Preparedness* (Act No. 156, of December 17th, 1999), it issued "*Evacuation Instructions*" for those living within a 3 km radius of the nuclear power station, and "*Indoor Evacuation Instructions*" for those living within a 3-10 km radius. Subsequently, on the following 12th of March, the scope of *Evacuation Instructions* was enlarged from 3 km to 10 km, and later on that same day to 20 km. After that, on April 22nd in the same year, it categorized districts outside the 20 km radius whose effective radiation dose per one year could exceed 20 mSv as "*Deliberate Evacuation Settlement*", and issued "*Evacuation Instructions*" for these districts. The population in the evacuation-related areas amounted to about 88 thousand people.[1)]

The radioactive materials that were released into the atmosphere as a result of the accident spread as radioactive plumes (radioactive clouds)[2)], causing external radiation exposure and internal radiation exposure (mainly through inhalation), while at the same time precipitation brought them to ground level by rain and such, where they came into contact with buildings, soil and field crops, causing external radiation exposure and internal radiation exposure (mainly by ingestion). In order to reduce the effect of the environmental pollution caused by the radioactive materials from the accident to human health or the living environment rapidly, measures were implemented towards soil decontamination and such, which are continuing at present. Also, investigations into radioactive materials present in collected foodstuffs, including drinking water, were initiated from March 16th of that year [1], and measures to secure food safety, such as the collection of foodstuffs that exceed reference criteria (which until March 31st, 2012 were provisional regulation criteria), restrictions on shipment and intake and such, continue to be implemented.

Such various responses have been initiated in order to prevent effects on health due to radiation

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1) This tally was calculated by the Nuclear Disaster Victims′ Support Team on the basis of polls conducted in each of the cities, towns and villages in relation to data of Residential Basic Book (as at 11th March 2011).

2) A condition that radioactive materials as gas flow with the atmosphere similar to smoke is said as radioactive plumes. They become a cause of external radiation exposure or internal radiation exposure.

by reducing additional radiation exposure[3] to residents, but it has become necessary to gain an understanding of the radiation exposure dose of residents that have been actually exposed to radiation from the nuclear accident, and to put in place appropriate health management measures. As regards health management for residents following the nuclear disaster, based on current scientific knowledge and experience from past cases, determinate ideas are being sought from international organizations such as the World Health Organization (WHO), the International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency (IAEA). Against this background, in the 2011 fiscal year, Fukushima Prefecture set up a committee of specialists in medicine and radiation, and has been conducting the *Fukushima Health Management Survey*.

In June 2012 the "*Act on Promotion of Support Measures for the Lives of Disaster Victims to Protect and Support Children and Other Residents Suffering Damage due to Tokyo Electric Power Company's Nuclear Accident*" (Act No. 48 of June 27th, 2012) was adopted, and, in the article 13, provided that the government carry out necessary measures with regard to survey and such on the effect of radiation to health. Furthermore, based on the article 5 paragraph 1 of the same law, "*the Basic Framework on the Promotion of Support Measures for the Lives of Disaster Victims*" (Cabinet Decision of October 11th, 2013) were drafted, and as a specific measure, "*(13) Investigations into the Influences of Radiation on Health, and the Provision of Medical Care, etc.*" in "*3. Support For Disaster Victims*" pertaining to the article 13 of the act, it was decided "to convene a new expert meeting, in order to gain an understanding of the present situation and issues of health management following the accident, and the reform of future support for Fukushima prefecture and the prefectures surrounding Fukushima".

On the basis of this situation, in order to consider investigation and evaluation of radiation exposure dose, health management, reform of measures related to medical care and such from professional viewpoints, the "*Expert Meeting Regarding the Status of Health Management of Residents Following the Accident at the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station*" (hereinafter referred to as "the Expert Meeting") convened from November 2013, and has met for deliberations 14 times to date.

The health effects on residents as a result of this accident can broadly be divided into two main categories: ①what is seen as biological effects due to radiation exposure, and ②mental and physical effects following evacuations and anxiety as a result of the nuclear accident. Category ① is the area be examined by the Expert Meeting as health management following radiation exposure, but it needs medium to long-term actions, and at this point in time there is as yet a limit to what can be evaluated. Moreover, Category ② requires the promotion of various actions that need to be pursued by a number of relevant ministries and agencies, involving many fields that would be difficult for the Expert Meeting convened by the Ministry of the Environment to make recommendations about at this point in time, and it was not possible to have discussions about

[3] Additional radiation exposure to natural radiation exposure.

overall support for the health issues involving the victims of the nuclear accident. In this respect, expression was given to a desire for a cross-governmental consideration to be conducted in the future within a separate framework. This report is an interim summary of the discussions, largely pertaining to ①, that took place at the Expert Meeting, with the purpose of quickly bringing to measures that are feasible at this time utilizing the scientific knowledge of the Expert Meeting, and presents professional advice regarding necessary measures.

– *Fukushima Health Management Survey* in Fukushima Prefecture – [2][3][4]

In the aftermath of the diffusion of radioactive materials due to the accident at the *Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station*, the subsequent evacuations and such, "*Fukushima Health Management Survey*" was conducted in Fukushima prefecture from June 2011 in an effort towards maintaining and improving the health of the inhabitants of the prefecture in the future by means of understanding their condition of health and linking this to early prevention, early detection and early treatment of disease as well as assessments of their radiation doses.

Specifically, the "*Basic Survey*", which estimated external radiation exposure by means of individual behavioral records and a map showing radiation dosage rates, the "*Detailed Survey*" which is made up of four surveys, including "*Comprehensive Health Check*", the "*Thyroid Ultrasound Examination*", the "*Mental Health and Lifestyle Survey*" and the "*Pregnancy and Birth Survey*" were implemented. Moreover, a file named "Fukushima Health Management File" was created, in which the inhabitants of Fukushima prefecture could individually enter and save the results of their various surveys and examinations, and was forwarded to the respondents of the "*Basic Survey*" and the subjects of the "*Thyroid Ultrasound Examination*".

In order to obtain professional advice and such in relation to these surveys, Fukushima prefecture in May 2011 put in place the investigative *"Health Management Survey Exploratory Committee* (which has met 16 times to date), which discusses methods and such, manages the progress of the surveys, evaluates them and such.

The national government has contributed 78.2 billion yen in grants to the "*Fukushima Residents Health Management Fund*", which was established in order to carry out the work required to enable the health management of the inhabitants in Fukushima prefecture over the mid to long term, and has been providing extensive support. In addition, it has been providing budgeting assistance to courses at Fukushima Medical University, which is carrying out and providing cooperation for the *Fukushima Health Management Survey*.

In the light of these conditions, article 39 of the *Act on Special Measures for Fukushima Reconstruction and Revitalization* (Act No. 25 of March 31st, 2012) states that "Based on the *Basic Guidelines for Reconstruction and Revitalization of Fukushima*, Fukushima prefecture may carry out a health management survey (meaning a survey to estimate radiation exposure, conduct health checkups on thyroid cancer in children, and otherwise manage residents' care properly; the same shall apply hereinafter), covering persons who had addresses in Fukushima as of March 11, 2011 and others equivalent thereto." and the article 41 of the same law further stipulates that "The national government shall provide Fukushima prefecture with technical advice and information or otherwise take the measures necessary for carrying out a health management survey."

The name of the survey, meanwhile, was changed on April 1st, 2014 from "*Kenmin Kenkou Kanri Chosa*" into "*Kenmin Kenkou Chosa*" in Japanese.

II. Basic Approach

1. Health Risks based on Radiation Exposure Dose (Adoption of the LNT Model)

Biological effects due to radiation exposure can be divided into two types, depending on the mechanism by which such effects took place: deterministic effects (tissue reactions) and stochastic effects (cancer and hereditary effects[3]) [5].

Deterministic effects (tissue reaction) are manifested by large numbers of cells in organ and tissue dying off or degenerating, and typically, after an incubation period of several days or weeks, become evident through hematopoietic damage, hair loss or skin damage. Stochastic effects, on the other hand, include cancer and hereditary effects, when DNA in cells is damaged and the genes undergo a sudden modification, which is thought to lead to a further build-up of genetic changes. The occurrence of sudden genetic changes connected to cancer and hereditary effects is called stochastic effect, because it depends on chance, and because increment in radiation exposure dose leads to an increasing probability of the incidence.

The results of a survey of about 120 thousand atomic bomb survivors confirmed that a radiation exposure dose higher than 100-200mSv (in a single exposure over a short period) leads to an increase in mortality from cancer [6]. Even if cancer mortality due to radiation did increase at lower doses as well, statistical fluctuations in carcinogenesis due to other causes were obscuring it, making it difficult to produce epidemiological proof of an increased carcinogenic risk [6]. Furthermore, epidemiological surveys have not shown any increase in hereditary effects to date.

So far no occurrences of deterministic effects (tissue reaction) as a result of the nuclear accident have been confirmed, and with regard to biological effects of radiation, stochastic effects, in particular carcinogenesis, has been the main subject of investigations. As noted above, no clear evidence has been found that low radiation doses, lower than 100mSv, increases the risk of cancer, but the ICRP, from a perspective of radiation protection, utilizes a LNT (linear non threshold) model[4]. Since major international organizations such as the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the World Health Organization (WHO) also use the LNT model for estimating the risks from radiation exposure, this Expert Meeting has also decided to investigate health risks of residents on the basis of radiation exposure doses with the LNT model as its premise.

2. Assessments by International Organizations

The two international organizations, WHO and UNSCEAR, have each published their own results of investigations into the health effects from this nuclear accident on the community residents.

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[3] Refers to the effect by radiation exposure in genitalia (testes and ovaries).

[4] A model that quantifies the risk of carcinogenesis proportionate to the increase in radiation exposure. It is also said as Linear Non-Threshold model.

(1) Assessments by WHO

Estimating the radiation exposure doses due to the nuclear accident suffered by residents using data up to September 2011, WHO has held a WHO expert meeting for health risk assessment, which prepared evaluations, based upon these estimations. This resulted in the publication of the *Health Risk Assessment from the nuclear accident after the 2011 Great East Japan earthquake and tsunami* [7] (hereinafter referred to as "the WHO Report").

<Health Effect Assessments Presented in the WHO Report>

WHO aimed at getting a complete picture of the health risks of residents accompanied by radiation exposure due to the nuclear accident in Fukushima as soon as possible, used only air dose and radiation dose in foodstuffs, and in order to reduce the possibility of underestimation, selected assumption for estimates and evaluations. Based upon these estimations of radiation doses, the lifetime attributable risk (LAR)[5] and the risk during the fifteen years following the nuclear accident of contracting leukaemia, breast cancer, thyroid cancer and all solid cancers were tentatively calculated by age (at age 1 year, age 10 years and age 20 years) and by gender.

As a result, it was calculated that the lifetime attributable risk would increase by several tens of percent for thyroid cancer and several percent for leukaemia, breast cancer and all solid cancers to the baseline risk[6] among one-year-old infants in areas where the contamination was most obvious, but it was pointed out that, since the baseline risk was originally low, the excess incidence would be in small numbers. Outside these areas, they concluded that the predicted risks were low even within Fukushima prefecture, which would not be expected to increase above the natural variation in baseline rate.

These risk assessments, which offered helpful information for the need and level of priority of health management measures in residents, indicate that it was variable to continue conducting *Fukushima Health Management Survey* including *Thyroid Ultrasound Examination* in Fukushima prefecture.

In the meantime, although hereditary effects have been observed in animal experiments, they have never been verified in studies concerning the children of atomic bomb survivors or children of patients who have received radiation treatment, and even with the results of animal experiments as a premise, the report points out that the risk of hereditary disease appearing in the offspring of an individual who was exposed to radiation is far lower than the individual's own lifetime risk of cancer. Furthermore, the report concludes that no incidences of diseases have occurred among residents as a result of deterministic effects (tissue reaction) by radiation exposure of residents due to the accident, nor will increase cataracts, cardiovascular disease, and antenatal influences due to radiation exposure (embryonic mortality, malformation, mental retardation etc.).

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[5] The additional incidence rate by radiation exposure on the probability of cancer incidence over a lifetime (up to the 89 years old).

[6] Risk in case of no radiation exposure due to the accident.

(2) Assessments by UNSCEAR

While at an early stage, with the purpose of collecting estimations of health risks and such on the residents quickly, the WHO conducted health risk evaluations based on information gathered by September 2011 and taking care to avoid underestimates, UNSCEAR made more detailed estimations of radiation exposure doses of residents based on information gathered up to September 2012, and produced assessments about health effects and such using these information. In particular, it provided estimates of radiation exposure doses for the residents from *Evacuation Settlement* within a 20 km radius for each of the evacuation scenarios, which were not estimated in the WHO Report. UNSCEAR did not consider the possibility of a decrease in radiation exposure levels as a result of decontamination, but it proceeded with scientific assessments for each item of some types of data related to the nuclear accident, the release and dispersion of radioactive materials, radiation exposure doses and health effects of residents and workers, and radiation exposure doses and risk assessments for flora and fauna other than humans, and on April 2nd, 2014 published these in a report (*Levels and effects of radiation exposure due to the nuclear accident after the 2011 great east-Japan earthquake and tsunami* [8] (hereinafter referred to as the "UNSCEAR 2013 Report")).

<Assessment of Health Effects for Residents in the UNSCEAR 2013 Report>

According to UNSCEAR's assessment, the overall volume of radioactive materials released into the atmosphere as a result of this nuclear accident was one-tenth for iodine 131 and one-fifth for cesium 137 of what was released at the Chernobyl nuclear power station accident (hereinafter referred to as the "Chernobyl accident"). While it is important to identify Iodine 131 for determining absorbed doses of the thyroid gland, it existed for only a relatively short period after the accident[7]. Furthermore, while it was estimated that the evacuations largely reduced the radiation exposure dose of residents, it was pointed out that evacuation-related deaths and mental and social issues did occur.

With regard to radiation exposure due to the nuclear accident, the report states that deterministic effects such as acute radiation syndrome and others were not observed, and that a slight increase in cancer risk was implied, which would not be expected discernible over the baseline level.

In comparison with radiation exposure doses observed actual increases of thyroid cancer in past epidemiological studies, it was pointed out that the thyroid absorbed dose of the greater part of the residents was lower than those doses. Although the report notes that some of the residents that received a high dose may have reached such levels, it states that since the radiation exposure doses to residents from this nuclear accident were lower in comparison to the Chernobyl accident[8], there is no expectation of a large increase of thyroid cancers, as occurred after the Chernobyl accident.

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[7] The half life of Iodine 131 is about 8 days.

[8] The UNSCEAR 2013 Report states "The collective effective dose to the population of Japan due to a lifetime exposure following the FDNPS accident is approximately 10-15% of the corresponding value for European populations exposed to radiation following the Chernobyl accident. Correspondingly, the collective absorbed dose to the thyroid was approximately 5% of that due to the Chernobyl accident."

Although as a result of *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*" in Fukushima prefecture relatively many nodules and cysts were found, this was understood to be the result of highly precise and intensified screening. Since furthermore similar results were found in a survey conducted in areas that had not been subjected to the effects of the accident (the "*Three Prefectures Survey*" described below), it was concluded that the results were not related to radiation exposure.

Increases in leukaemia and breast cancer were also not anticipated, and it was judged that there would be no increases in miscarriages, perinatal mortality, congenital effects or cognitive impairment due to prenatal radiation exposure. Furthermore, it was thought that there would be no discernible increase in hereditary disease in the offspring of those who were exposed to radiation due to the accident.

(3) Position of the Expert Meeting with regard to the Two Reports

Regarding assessment of radiation exposure dose, while WHO made preliminary estimations based on data acquired up to September 2011, UNSCEAR used data acquired over a longer period of about a year and a half, and produced relatively more detailed estimates, and therefore it was judged that basically the estimations of radiation exposure dose in the UNSCEAR 2013 Report were more reliable.

However, as discussed in the UNSCEAR 2013 Report, doses were assessed using measured data as far as possible, but since doses before and during evacuation were based on estimated values for release of radionuclide and a simulated calculation of atmospheric dispersion, there is a large degree of uncertainty. Furthermore, the report aimed at estimating average dose for each of the districts and areas, and does not provide estimates for dose distributions of individuals within these groups. As discussed below, upon consideration with the various data, this Expert Meeting can agree with UNSCEAR's assessment that it can at least be concluded that radiation exposure doses were lower than those following the Chernobyl accident.

UNSCEAR's point of view with regard to health risks, which is that "No discernible increased incidence of radiation-related health effect is expected", does not differ greatly from that of WHO. Furthermore, the report states that since it is thought to be statistically inaccurate method, it "decided not to use (LNT) models to project absolute numbers of health effects among populations exposed at such levels (doses of the order of 100 mSv or less)". In addition, in the light of uncertainties with regard to dose estimates, UNSCEAR suggests "doses towards the upper bounds of the ranges of the estimated radiation exposure dose could theoretically imply an increased risk for infants that might lead to discernible increases in the incidence of thyroid cancer". The Expert Meeting agrees with these assessments.

III. Investigation and Evaluation of Radiation Exposure Dose

1. Basic Approach

In order to collect basic information for considering the scope of the group expected to have health risks due to radiation from the nuclear accident (age, scope of injuries, diseases and such) and the health risk, we conducted an investigation and evaluation of the radiation exposure dose among residents. In doing so, we made an effort to understand the information of radiation exposure dose of residents accumulated over the three years following the accident, in addition to exposure immediately after the accident. This was not intended to determine radiation exposure dose of individual residents, but rather intended to understand the trends in radiation exposure dose of residents as characteristics of the group.

From a viewpoint of determining radiation exposure dose based on data with as few errors as possible, we focused on the actual measured data, such as values measured with personal dosimeter as personal monitoring data, the *Infant Thyroid Dose Survey* (described below) by survey meters and values measured with whole body counters[10)]. We made efforts to evaluate the reliability, accuracy (variation in measured values), validity and precision (deviation from the real values) of these values.

However, since the amount of personal monitoring data measured immediately after the accident is limited, we also examined the validity of the values estimated using a model that utilizes the results of calculations, such as air dose rate, environmental monitoring data including concentration of radioactive materials in the atmosphere and soil, and atmospheric diffusion simulation, by comparing these data with the actual measured values. In doing so, we paid particular attention to the UNSCEAR 2013 Report, which conducted a comprehensive dose evaluation based on the radiation exposure dose of the residents due to the nuclear accident, to contribute to above aims.

Among data used for understanding radiation exposure dose and evaluation indicated in domestic and foreign documents, there are some variation and measurement errors of the data within the subject groups, and uncertainty in models and parameters used for evaluation, regardless of whether they are actual measured values or estimated values, and in this interim report we have made efforts to indicate such uncertainty (variation and uncertainties) concerning the cited radiation exposure dose data and such, where possible. Based on these premises, we examined them, categorizing in “external radiation exposure” and “internal radiation exposure”.

Whereas the Expert Meeting endeavored to cover as much of the published data and documents

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10) An effective dose, defined by the ICRP as dose for protection, is calculated based on phantom of the human anatomy and physiologic dynamic models, and cannot be actually measured. Therefore, we deemed the value indicated by the dosimeter (personal dosimeter and survey meter), which was calculated using human body phantom, which is proposed by International Commission on Radiation Units and Measurements (ICRU), as measured value. For internal radiation exposure dose, we estimated radiation intake based on the residual radiation measured with a whole body counter, and deemed the committed dose calculated by multiplying this value by the dose coefficient as a measured value.

as possible, studies on estimation of radiation exposure dose in relation to the nuclear accident are ongoing at several research institutions, and we therefore need to continue to understand and collect new insights in the future.

2. Investigation and Evaluation of Radiation Exposure Dose

(1) External Radiation Exposure

<Within Fukushima Prefecture>

①Estimation of External Exposure within Fukushima Prefecture

A. Values Measured by Using Personal Dosimeters

Some municipalities within Fukushima prefecture are announcing the results for the external radiation exposure measured by personal dosimeters distributed to the residents. The measured periods and behavioral patterns of residents as subjects vary from municipality to municipality, but the values are converted into annual dosages[11]. The Expert Meeting collected the results of measurements and calculated averages for each municipality and used these as a resource [9].

In the 2011 fiscal year[12], the highest measured average value within nine municipalities obtained was 1.7mSv per year. Moreover, in the 2012 fiscal year[13], the highest average measured within 17 municipalities obtained was 1.4mSv per year.

Decay and the like were not considered under these averages per municipality. Furthermore, the external radiation exposure dose for residents who lived in *Evacuation Settlements* was taken at the area where they evacuated to after a certain period of time after the accident, in the same way as it was taken in other areas; no external radiation exposure dose was measured during the evacuation.

B. Estimation of External Radiation Exposure by Domestic Experts

a) Evaluations in the *Fukushima Health Management Survey* "*Basic Survey*"

The *Fukushima Health Management Survey* "*Basic Survey*" in Fukushima prefecture estimates the cumulative effective dose due to external radiation exposure during the four months following the accident, on the basis of behavioral records of residents including evacuees, and a dose rate map. Out of a total amount of 421,394 people[14] whose evaluations were completed, 99.8% evaluations were less than 5mSv, the highest value was 25mSv and the average value was 0.8mSv.

Among these, 99.9% of those in the northern districts of the prefecture, including areas that were surveyed earlier[15] (Yamakiya district in Kawamata town, Namie town and Iitate village), and 98.7%

[11] If measured results released by municipalities were not calculated into dose in 1 year, secretariat of expert meeting calculated them.
[12] Measured about three months between September 2011 and February 2012.
[13] Measured about three months between May 2012 and March 2013.
[14] Excluded radiation-related workers. As of June 30th, 2014.
[15] In *Fukushima Health Management Survey* "*Basic Survey*", before the entire population of Fukushima prefecture was surveyed, an earlier survey was conducted among approximately 29,000 residents in Kawamata

of those in the Soso district had less than 5mSv, the maximum value for each of these areas was 11mSv and 25mSv respectively, and their average values were 1.4mSv and 0.8mSv respectively [10].

b) Estimated Values by JAEA

The Japan Atomic Energy Agency (hereinafter referred to as JAEA) considered the 18 evacuation scenarios[16] that were used in the tentative calculations during the development process of a system for evaluating external radiation dose in the *Fukushima Health Management Survey* "*Basic Survey*", and reported the estimated values for effective doses due to external radiation exposure over a year from March 15th-16th, 2011 (including internal radiation exposure due to inhalation) [11]. This report estimated doses as 0.33-52mSv for the 50-95 percentiles by three lifestyle patterns (3 patterns being living at home, working indoors and working outdoors) among residents who mostly lived in *Restricted Settlement* and *Deliberate Evacuation Settlement*.

C. Estimation by UNSCEAR

The UNSCEAR 2013 Report presented the average values for effective doses of external radiation exposure and internal radiation exposure due to inhalation over one year following the accident outside *Evacuation Settlement*, by administrative district (cities and others), as shown in table 1-1 [8]. In addition, it also estimated average values of effective doses over one year following the accident in *Precautionary Evaluation Settlement*[17] and *Deliberate Evacuation Settlement*[18] by the 18 evacuation scenarios mentioned above in table 1-2 [8].

Town (Yamakiya district), Namie Town and Iitate Village from June 2011. Effective doses of external radiation exposure over the first four months following the accident were estimated based on an analysis using a dose evaluation system developed by the National Institute of Radiological Sciences (NIRS).

[16] Model case scenarios for the behavioral patterns of the residents of each of 18 cities, towns, villages or districts, constructed on the basis of actual areas they evacuated in, transit times and such.

[17] Futaba town, Okuma town, Tomioka town, Naraha town and Hirono town, and parts of Minamisoma city, Namie town, Tamura city, Kawauchi village and Katsurao village according to the UNSCEAR 2013 Report.

[18] Iitate village and a part of Minamisoma City, Namie town, Kawamata town and Katsurao village according to the UNSCEAR 2013 Report.

Table 1-1 Estimated value of effective doses due to external radiation exposure and internal radiation exposure by inhalation over one year following the accident outside the *Evacuation Settlements*:

Range of averages by administrative districts (Unit: mSv)

Age	External Radiation Exposure + Internal Radiation Exposure due to Inhalation
Adult, 20 years	0.0-3.3
Child, 10 years	0.0-4.7
Infant, 1 year	0.1-5.6

Source: UNSCEAR 2013 Report, page182 Table C6

Table 1-2 Estimated value of effective doses[19] over one year following the accident in *Precautionary Evaluation Settlements* and *Deliberate Evacuation Settlements*: Range of averages by evacuation scenario (Unit: mSv)

Age	Precautionary Evaluation Settlement	Deliberate Evacuation Settlement
Adult, 20 years	1.1-5.7	4.8-9.3
Child, 10 years	1.3-7.3	5.4-10
Infant, 1 year	1.6-9.3	7.1-13

Source: UNSCEAR 2013 Report (Japanese version), page33 Table 6

<Outside Fukushima Prefecture>

① Estimations of External Radiation Exposure by Domestic Experts

Miyagi prefecture, in a simple calculation conducted in October 2011, estimated external radiation exposure doses over 1 year from March 14th 2011 as 4.1mSv and 2.8mSv respectively for 2 out of 12 locations, and 1.0mSv or less for the 10 other locations [12], based on air doses and such occurring in the southern districts of Miyagi prefecture.

Tochigi prefecture conducted a survey between the end of January and the end of March 2012, measuring the individual external radiation exposure doses among 3,099 children in 10 cities and towns, using personal dosimeters, and reported that a maximum level was 0.4mSv and that 88.1% of the subjects had 0.1mSv or less, over the two-month period. Furthermore, based on time series data by monitoring posts and survey meters, the cumulative dose over one year following the accident

[19] The effective doses here include both external radiation exposure and internal radiation exposure by inhalation or ingestion before or during evacuation.

based on air dose rate was estimated as 0.6mSv in the central prefectural area and as 2.0mSv in the northern prefectural areas [13].

② Estimation in Six Prefectures Surrounding Fukushima by UNSCEAR

In the UNSCEAR 2013 Report, the effective dose due to external radiation exposure and internal radiation exposure by inhalation over one year following the accident were estimated by administrative districts of six prefectures surrounding Fukushima are estimated as shown in table 2 [8].

Table 2 Estimated values of effective dose due to external radiation exposure and internal radiation exposure by inhalation over one year following the accident in six prefectures surrounding Fukushima: Range of averages by administrative districts (Unit: mSv)

	Adult, 20 years	Children, 10 years	Infant, 1 year
Chiba prefecture	0.1-0.8	0.1-1.0	0.1-1.1
Gunma prefecture	0.1-0.6	0.1-0.8	0.1-0.9
Ibaraki prefecture	0.1-0.6	0.1-0.9	0.1-1.0
Miyagi prefecture	0.1-0.3	0.1-0.9	0.1-1.0
Tochigi prefecture	0.1-1.2	0.1-1.7	0.2-2.0
Iwate prefecture	0.1-0.3	0.1-0.5	0.1-0.6

Source: UNSCEAR 2013 Report, page182 Table C6

(2) Internal Radiation Exposure

①Internal Radiation Exposure Caused by the Release of Radioiodine at the Early Stage of the Accident

<Within Fukushima Prefecture>

A) Measured Values in Fukushima Prefecture

Data measuring the thyroid radiation exposure[20)] at the early stage of the accident are extremely

[20)] Equivalent dose is dose as indicator for stochastic effect to human tissues and organs (here thyroid gland). It can be calculated multiplying absorbed dose in human tissues and organs by dose weighting factor, which correct differences by type and energy of radiation. Sv is used as the Unit.

limited. In end of March 2011, the Nuclear Emergency Response Headquarters conducted *Infant Thyroid Dose Survey* among 1,149 residents in three municipalities (Iwaki city, Kawabata town and Iitate village),which had an *Indoor Evacuation Settlement* or where simulation of released iodine 131 showed a possibility of high levels of thyroid equivalent dose [14] [15] [16] [17].

As a result, out of the 1,149 persons who were examined, after exclusion of 66 persons who could not be to measured adequately due to a high environmental radiation dose and three persons whose ages were unknown, 1,080 persons had a level of below 0.2μSv/h of actual values (which is equivalent to the screening level[21)] set by the NRA as 100mSv of thyroid equivalent dose for a one-year-old infant [15].) subtracted background levels from the indicated values in the survey meter. Furthermore, among the 1,080 persons, 55% had the doses of 0μSv/h and 99% had a level of less than 0.04μSv/h, while in the remaining 1 % the highest amount was 0.1μSv/h [14].

B) Estimation of Internal Radiation Exposure by Domestic Experts

a) Estimated Value by Medical Radiation Research Center

The estimated values of radiation exposure dose using the measured values, environmental measured values and such were calculated by the Medical Radiation Research Center as a consignment program of the Ministry of the Environment in the 2012 fiscal year.

Specifically, directly measured data of radioiodine within the thyroid gland, measured data of radioactive cesium in the whole body and other monitoring data and results in model simulation of released radioactive materials in the environment were comprehensively evaluated as basic data for estimation of the initial internal radiation exposure, and thyroid radiation exposure dose of community residents were estimated by cities, towns and villages.

As a result, 90 percentile of thyroid radiation exposure dose for one-year-old infants in each group was 30mSv in Futaba town, Iidate village and Iwaki city and 20mSv in Okuma village and such, and the others did not exceed this result [18]. Furthermore, the Medical Radiation Research Center stated that the estimated values in areas where only simulation was calculated were more likely to be overestimated.

b) Estimated Values in Namie town by Hirosaki University

[21)] On March 23th, 2011 the Nuclear Safety Commission preliminarily calculated thyroid equivalent dose of one-year-old infants between 6:00, March 12th and 0:00, March 24th, using information of source of iodine 131, inversely estimated from the environment monitoring results, using the *System for Prediction of Environmental Emergency Dose Information* (SPEEDI), and found that there was a possibility that the equivalent dose might be over 100mSv in the north-west and south-south-west of the *Indoor Evacuation Settlements*. This calculation was conducted under the conservative assumption that the infant had spent each of the days mentioned out of doors. Based on this result, Nuclear Safety Commission set the screening level as 0.2μSv/h equivalent to 100mSv of thyroid equivalent dose for one-year-old infants, and proposed to contact a professional institute if values exceeded this after subtracting the background from indicated values in survey meter. (Source: Nuclear Safety Commission "Result in Survey of Infant Thyroid Radiation Exposure". September 9th, 2012)

Hirosaki University conducted a survey for measurement of thyroid radiation exposure during April 12th-16th, 2011, among 62 residents in Namie Town[22] using a scintillation spectrometer. As a result, the thyroid equivalent dose was estimated at 4.2mSv as the median value and 23mSv as maximum value for infants, and 3.5mSv and 33mSv for adults [19].

C) Estimation of Internal Radiation Exposure by UNSCEAR

In the UNSCEAR 2013 Report, the thyroid absorbed dose over one year following the accident outside *Evacuation Settlements* [8] was estimated as shown in table 3-1. Also, thyroid absorbed dose in *Precautionary Evaluation Settlements* and the *Deliberate Evacuation Settlements* over one year following the accident are estimated as per table 3-2 [8], similar to external radiation exposure. On releasing the UNSCEAR 2013 Report, UNSCEAR stated that its analysis corresponded with the evaluations in WHO Report, and that the uncertainty of in the evaluations had been reduced by using more data than WHO Report had.

Table 3-1 Estimated values of thyroid absorbed dose over one year following the accident outside *Evacuation Settlements*: Range of averages by administrative districts (Unit: mGv)

	Adult, 20 years	Child, 10 years	Infant, 1 year
Thyroid Absorbed Dose	7.8-17	15-31	33-52
External Radiation Exposure and Internal Radiation Exposure by Inhalation	0.1-9.6	0-16	0.2-19
Internal Radiation Exposure by Ingestion	7.8	15	33

Source: UNSCEAR 2013 Report, page188 Table C10

Table 3-2 Estimated values of thyroid absorbed dose over one year following the accident in *Precautionary Evaluation Settlement* and *Deliberate Evacuation Settlement*: Range of averages by evacuation scenario (Unit: mGv)

Age	Precautionary Evaluation Settlements	Deliberate Evacuation Settlements
Adults, 20 years	7.2-34	16-35
Children, 10 years	12-58	27-58
Infants, 1 year	15-82	47-83

Source: UNSCEAR 2013 Report (Japanese version), page33 Table 6

[22] 45 evacuees from Minamisoma city and 17 residents from Tsushima District of Namie town.

<Outside Fukushima Prefecture>

A) Estimated Value for Ibaraki Prefecture by JAEA

JAEA states According to estimation using environmental monitoring data, that the committed dose equivalent of one-year-old infants due to inhalation in Tokai village in Ibaraki prefecture was 1.8mSv under a realistic scenario and 9.0-15mSv under an overestimated scenario[23] [20][21][22].

B) Estimated Values for Tochigi Prefecture

The "Intellectuals' Meeting for Health Effect of Radiation" established by Tochigi prefecture evaluated that the result of "internal radiation exposure by radioiodine is less than 5mSv for infants (less than 1 year old)" as indicated by the WSPEEDI would be valid[24] [13].

C) Estimated Values in the Six Prefectures surrounding Fukushima by UNSCEAR

In the UNSACEAR 2013 Report, the thyroid absorbed dose over one year following the accident within the six prefectures surrounding Fukushima was estimated as shown in table 4 [8].

[23] Here, the equivalent dose values (mSv) based on reference are shown, but with regard to the same situation UNSCEAR in its report uses absorbed dose values (mGv), which are physical quantities. Equivalent dose = dose weighting factor × absorbed dose; the dose weighting factor for beta rays and gamma rays is 1, which means that the value of an equivalent dose (mSv) is equal to that of an absorbed dose (mGv).
[24] See footnote 23.

Table 4 Estimated value of thyroid absorbed dose over one year following the accident in the six prefectures surrounding Fukushima: Range of averages by administrative districts (Unit: mGv) [25)]

		Adult, 20 years	Child, 10 years	Infant, 1 year
Chiba Prefecture	Thyroid Absorbed Dose	2.3-4.2	4.6-7.7	9.7-13
	External Radiation Exposure and Internal Radiation Exposure by Inhalation	0.2-2.1	0.2-3.3	0.3-4.0
	Internal Radiation Exposure by Ingestion	2.1	4.3	9.4
Gunma Prefecture	Thyroid Absorbed Dose	2.3-3.5	4.6-6.5	9.7-12
	External Radiation Exposure and Internal Radiation Exposure by Inhalation	0.2-1.4	0.3-2.2	0.3-2.6
	Internal Radiation Exposure by Ingestion	2.1	4.3	9.4
Ibaraki Prefecture	Thyroid Absorbed Dose	2.3-3.6	4.6-6.7	9.7-12
	External Radiation Exposure and Internal Radiation Exposure by Inhalation	0.2-1.5	0.3-2.4	0.3-2.9
	Internal Radiation Exposure by Ingestion	2.1	4.3	9.4
Miyagi Prefecture	Thyroid Absorbed Dose	2.2-3.6	4.6-6.8	9.6-12
	External Radiation Exposure and Internal Radiation Exposure by Inhalation	0.1-1.5	0.2-2.4	0.2-3.0
	Internal Radiation Exposure by Ingestion	2.1	4.3	9.4
Tochigi Prefecture	Thyroid Absorbed Dose	2.3-5.1	4.6-9.1	9.7-15
	External Radiation Exposure and Internal Radiation Exposure by Inhalation	0.2-3.0	0.3-4.8	0.4-5.8
	Internal Radiation Exposure by Ingestion	2.1	4.3	9.4
Iwate Prefecture	Thyroid Absorbed Dose	0.6-1.4	1.3-2.5	2.7-4.2
	External Radiation Exposure and Internal Radiation Exposure by Inhalation	0.1-0.9	0.2-1.4	0.2-1.7
	Internal Radiation Exposure by Ingestion	0.5	1.2	2.6

Source: UNSCEAR 2013 Report, page 188, Table C10

[25)] For the estimated value of thyroid absorbed dose, the UNSCEAR 2013 Report takes into consideration the external radiation exposure from radioactive materials in air and on surface, internal radiation exposure by inhalation of radioactive materials in the air and internal radiation exposure by later ingestion.

②Other Internal Radiation Exposure

<Within Fukushima Prefecture>

A. Measure Value of Internal Radiation Exposure by the Whole-Body Counter

Fukushima prefecture has been conducting dose evaluations of internal radiation exposure using the whole-body counter for inhabitants (including evacuees living outside the prefecture). Out of 15 thousand people examined between June 2011 and January 2012, assuming that they inhaled on March 12th 2011, 99.8% of the subjects had less than 1mSv (the maximum value was 3mSv) of committed effective dose. For approximately 212 thousand people (as a cumulative number[26)]) examined between February and October 2012, at least 99.9% had less than 1mSv (the maximum value was 1mSv) of committed effective dose, when maximum dose was estimated, on the assumption that an equal amount was ingested daily for a year from March 12th, 2012 [23][24].

Also, a survey conducted in fall 2012 in Fukushima prefecture, among a non-biased group of subjects without bias in sampling, reported that the whole-body counter measured results were lower than the limit of detection for all subjects [25].

B. Estimated Values of Internal Radiation Exposure

A survey by duplicated method among 100 households, conducted by Consumer Co-operative COOP Fukushima from November 2011 to March 2012, detected at least 1Bq of cesium per kilogram for 10 households. It is estimated that if the same meal as detected were eaten for a year, the effective dose of radioactive cesium would become 0.02-0.14mSv or less [26].

On the basis of a survey of supermarket baskets (conducted in September and November 2011), the Ministry of Health, Labour and Welfare estimated that if an average meal were taken for one year in Fukushima prefecture, the committed effective dose due to radioactive cesium (the sum of cesium 134 and cesium 137) would be 0.019mSv [27]. Based on the latest survey (conducted in February and March 2014), it estimated the committed effective dose as 0.0017-0.0019mSv [28]. Also, based on a survey by duplicated method which the Ministry conducted in March 2013, this was estimated as 0.0009mSv for the average value of committed effective dose in infants and as 0.0017mSv for that in adults [29]. Both surveys showed 1mSv per year or less as the upper limit for the radiation exposure dose from radioactive materials in food.

[26)] As the number of persons examined internal exposure measurement by whole-body counter by October 30th, 2014, 227 thousands persons, reported by Fukushima prefecture, subtracting the 15 thousands persons who were examined by January 31st, 2012. Because of inclusion of some persons examined several times since February 1st, 2012, this numbers are not absolute.

C. Estimated Values by UNSCEAR

In the UNSCEAR 2013 Report, based on the measured values of the food on the market in Fukushima prefecture, estimated effective doses by ingestion in Fukushima prefecture are as shown in table 5.

Table 5 Estimated average value of effective dose by ingestion over one year following the accident in Fukushima prefecture (Unit: mSv)

	Adult, 20 years	Child, 10 years	Infant, 1 year
Fukushima prefecture [27)]	0.9	1.2	1.9

Source: UNSCEAR 2013 Report, page182 Table C6

<Outside Fukushima>

A. Estimated Values of Internal Radiation Exposure

On the basis of a survey of supermarket baskets (conducted in September and November 2011) the Ministry of Health, Labour and Welfare estimated that if an average meal was eaten for one year, the committed effective dose due to radioactive cesium (the sum of cesium 134 and cesium 137) would be 0.002-0.017mSv [27]. Based on the latest survey conducted in Iwate, Miyagi, Ibaraki, Tochigi and Saitama prefectures (conducted in February and March 2015), it estimated 0.0009-0.0017mSv as the range of average values of committed effective dose for infants and adults [28]. Also, the Ministry, based on a survey by duplicated method conducted in Iwate, Miyagi, Ibaraki and Saitama prefectures (March 2013), estimated 0.0003-0.0017mSv as the range of average values in committed effective dose for infants and adults [29]. Both surveys showed the upper limit for the radiation exposure dose from the radioactive materials in food to be below 1mSv per year.

B. Estimated Values of Internal Radiation Exposure by UNSCEAR

The UNSCEAR 2013 Report estimated internal radiation exposure by ingestion in the six prefectures surrounding Fukushima prefecture as shown in table 6 [8].

[27)] Although estimated values of individuals were not noted in *Precautionary Evaluation Settlements* and *Deliberate Evacuation Settlements*, the same numbers for internal radiation exposure by ingestion are applied in same prefecture, and the dose in the location they evacuated to was considered.

Table 6 Estimated value of effective dose of internal radiation exposure by ingestion over one year following the accident in the six prefectures surrounding Fukushima (Unit: mSv)

	Adult, 20 years	Child, 10 years	Infant, 1 year
Chiba prefecture	0.2	0.3	0.5
Gunma prefecture	0.2	0.3	0.5
Ibaraki prefecture	0.2	0.3	0.5
Miyagi prefecture	0.2	0.3	0.5
Tochigi prefecture	0.2	0.3	0.5
Iwate prefecture	0.1	0.1	0.2

Source: UNSCEAR 2013 Report, page182 Table C6

-Uncertainties in estimation by UNSCEAR-

UNSCEAR stated uncertainties in dose estimation in UNSCEAR 2013 Report as follows.

The estimates of dose due to external exposure (average in districts) were largely based on measured levels of radionuclides deposited (radioactivity per an area) on the ground, but the deposition density measured by each district has a variation of half to twice in comparison to the average values. The district-average doses estimated were considered to be accurate within a factor of two. The variability of the absorbed doses to the thyroid from inhalation of iodine 131 could be from 30-50% of the district-average dose up to about two to three times higher than the district-average dose.

UNSCEAR produces estimates of external radiation exposure dose for population groups who are assumed to have resided in wooden houses for a certain period of time. For people in concrete multi-storey apartments or wooden plastered houses, which have a shelter effect, doses would be about 25% or 50% respectively of those estimated for people assuming in wooden houses. Another uncertainty of the estimates of external exposure is an amount of time spent indoor as a presupposition of estimates.

Internal radiation exposure due to inhalation and external radiation exposure before and during evacuation of the people who had undergone *Precautionary Evacuation Settlement*, and who were evacuated in March 2011, was estimated from: ①information of radioactive materials released by the nuclear accident (source term) and ②the results of a simulation of the process of transportation and diffusion in the atmosphere and deposition on the ground of radioactive materials. Since there are significant uncertainties in the simulation results, the settlement-average effective doses and absorbed doses to organs for these population groups may be over- or underestimated by a factor of up to 4 to 5. In addition, within Fukushima Prefecture, there was no measurement data for the ratio of particulate and gaseous forms of iodine 131 released by the nuclear accident, which led to uncertainties in the estimations of thyroid doses absorbed by inhalation.

The estimation of doses from ingestion during the one year following the accident is based on the measurements of density of radioactive materials for foodstuffs as marketed. It is likely that some kind of foodstuffs which are considered highly contaminated were selectively measured particularly early after the accident, because these measurements are done for the restrictions on food supplies and absorption. It is therefore, likely that the estimates are overestimates, as these measured values were used. Moreover, whereas the evaluation by UNSCEAR basically assumed that food as domestic products was completely produced within the area they evaluated, if it had been assumed that only 25% of food consumed in Fukushima Prefecture was from the prefecture, then the estimated values of internal radiation exposure dose from ingestion would have been overestimated by a factor of about three. On the other hand, the possibility could not be excluded that some residents in the *Deliberate Evacuation Settlements* may have consumed locally-grown food and such with high concentrations of radioactive materials before their evacuation.

(3) Conclusions Regarding Investigation and Evaluation of Radiation Exposure Dose

① Conclusions Regarding External Radiation Exposure

Although issues remain with respect to the response rate [10], dose estimates by the *Fukushima Health Management Survey* "*Basic Survey*" were evaluated as quite reliable for understanding the overall trends, since the 18 scenarios that acted as hypotheses for the estimates and indoor shielding factors, etc. were examined by experts [30].[28)] The external radiation exposure doses for the 4 months following the accident estimated by the *Fukushima Health Management Survey* "*Basic Survey*" were 5mSv or less for the most part, and the maximum value was 25mSv. For the external radiation exposure doses of the residents measured by the cities, towns and villages in Fukushima prefecture using personal dosimeters available, the highest value of the average values that could be obtained was 1.7mSv per year in the 2011 fiscal year and 1.4mSv per year in the 2012 fiscal year.

Also, the estimated results in Miyagi prefecture and Tochigi prefecture were quite similar to those estimated by the UNSCEAR 2013 Report.

In any case, the Expert Meeting evaluates that we have not found any results which deny the estimations in the UNSCEAR 2013 Report, as a result of understanding the external radiation exposure doses adding measured values and such that are known today.

② Conclusions regarding Internal Radiation Exposure

The maximum value of measured values of the 1,080 people in the *Infant Thyroid Dose Survey* conducted in the latter part of March 2011 was half the value of the screening level. The results of this *Infant Thyroid Dose Survey* need to be interpreted as measure values rather cautiously, because of the uncertainties in the iodine intake scenario, the validity of the measurement method for background values and such. However, since the quality of the surveywas sufficiently reliable to be used for screening examinations, they are a valuable indicator for understanding the level of radiation exposure at the early stage of the accident. The fact that National Institute of Radiological Sciences, under a consignment program of the Ministry of the Environment is also conducting dose estimations, using data measured in this survey [18] suggests that they are valuable results for understanding trends in this group.

Moreover, according to the UNSCEAR 2013 Report, the maximum of the averages in estimated values of the thyroid absorbed dose for one-year-old infants over one year following the accident was 83mGy.

However, the Expert Meeting felt that the possibility of some infants having received 100mGy or more of thyroid absorbed dose among the residents who evacuated by evacuation instructions

[28)] The response rate of questionnaire for *Basic Survey* including short version is 26.4% in June 30th, 2014.

cannot be completely dismissed, because all of these measured values and the values estimated by domestic and global experts and such have uncertainty, and because the dose varies by behavioral styles of individuals.

For the thyroid internal radiation exposure dose at the early stage of the accident, the estimated values by JAEA as well as the evaluation by "Intellectuals' Meeting of Health Effect by Radiation" in Tochigi prefecture were quite similar to the result estimated in the UNSCEAR 2013 Report.

The internal radiation exposure due to radioactive cesium (cesium 134 and cesium 137) taken over one year following the accident are mostly thought to be less than 1mSv of committed effective dose both inside and outside Fukushima prefecture for residents whose dietary habits were based on commonly distributed foodstuffs. Moreover, taking into account the measured results by whole body counter conducted one year or later after the accident, it is estimated that the additional internal radiation exposure will be below the limit of detection, provided the same dietary habits are maintained in the future.

In conclusion, as a result of attempts to come to an understanding of internal radiation doses with the addition of the measured values that are known today, the assessment of the Expert Meeting is that no results have been found which contradict the estimations by the UNSCEAR 2013 Report, although the uncertainty is higher in comparison to that in external radiation exposure.

③ Direction of the Future Research by the National Government

The Expert Meeting has conducted evaluation, based on measured values that are known today, as well as on values estimated by domestic and global experts. Since there is always uncertainty and limitation when dealing with these data, it is important to continue collecting various types of measured data and to continue to assess their validity in the future. Moreover, with regard to the exposure radiation dose at the early stage of the accident, since a number of research institutes are undertaking studies into evaluation of radiation exposure dose due to the nuclear accident, it is desirable further to promote researches in the future, and to make special efforts to understand those groups deemed to have received high doses of radiation exposure.

Specifically, in terms of the external radiation exposure, it is important to conduct estimations of radiation exposure dose that reflect the shelter effect during the evacuation of those in *Evacuation Settlements* and such. Also, for areas surrounding Fukushima prefecture, it is important to conduct more detailed accurate atmospheric diffusion simulations, because it is thought that a plume with rather high concentration may have drifted into the northern part of Ibaraki prefecture at one time, and because it is estimated that there were large variations in the deposition of radioactive material due to the weather conditions and such.

For the internal radiation exposure dose by ingestion, it is important to continue to further refine these values, taking into account of the status of radioactive materials in drinking water, the

distribution of food and others. In particular, it is thought that learnt insight about iodine 129 should be valuable for the estimation of radiation exposure dose due to iodine 131.[29)] Moreover, as pointed out in the UNSCEAR 2013 Report, it is desirable to make a detailed evaluation of metabolism of iodine consumed in the human body, taking into account the characteristics of Japanese dietary habits.

[29)] Iodine 129 is one of the radioactive isotopes of iodine whose half life is 16 million years. It is believed that a very small amount of iodine 129 was discharged into the atmosphere by the nuclear accident. It is thought that the relationship between iodine 129 and iodine 131 is helpful for estimating amount of iodine 131. .

IV. Status of Health Management and its Measures

Since actions taken so far were related to health management, the *Fukushima Health Management Survey* has been conducted in Fukushima prefecture. The *Fukushima Health Management Survey*, which examined a wide range of the population immediately following the accident, under conditions of insufficient information and experience, when there were social chaos and formidable technical issues, is thought to have been an appropriate and cautious early response. However, following three years since the accident, as we now have a fairly good understanding of radiation exposure dose and health status of the inhabitants, we have come to a point where we need to reconsider actions contributing to improvement and adjustment of context in the survey and maintenance and promotion of health of inhabitants, based on analysis and evaluation of current results and outcomes of the *Fukushima Health Management Survey*.

The status of the *Fukushima Health Management Survey* should be examined by the *Health Management Survey Exploratory Committee*, but as a national expert meeting we would like to make some suggestions from a scientific viewpoint, as a contribution to the examinations of this committee, whilst offering our respect to the important programs under efforts by related persons such as Fukushima Prefecture, the *Health Management Survey Exploratory Committee* and Fukushima Medical University as well as to the cooperation by the inhabitants.

1. Predicted Health Risk

As to date there has not been any confirmation about the occurrence of any deterministic effects (tissue reactions) related to the nuclear accident, we do need to primarily examine cancer in terms of biological effects caused by the radiation exposures. If the radiation exposure dose was low, there will be a low risk of cancer due to the radiation exposures, and effect of other various factors (such as lifestyle and environmental factors) will become more significant, hence it is anticipated that even if we expand the number of survey subjects, it would be difficult to detect a statistically significant difference. The WHO Report and the UNSCEAR 2013 Report, which conducted health risk assessments based on estimations of radiation exposure dose, stated that “No discernible increased incidence of radiation-related health effect are expected”. Similar to these evaluations by international organizations, the Expert Meeting concluded that it would hardly be possible to detect any statistically significant differences in the incidence rate of cancer in Fukushima prefecture and the prefectures surrounding Fukushima, based on the radiation exposure dose due to the nuclear accident.

Moreover, we concluded that there was no expectation of any discernible increase in hereditary effects due to the radiation exposure.

Furthermore, based on the radiation exposure dose of residents due to the accident, there was no

expectation of any increase in deterministic effects (tissue reactions) including cardiovascular diseases and cataracts, as well as on infertility or any effect on fetuses in the future. These assessments are the same as the assessments by the WHO Report and the UNSCEAR 2013 Report.

2. Actions Taken So Far

Fukushima Prefecture offers a "*Comprehensive Health Check*" to its residents, particularly to those who have been residing in *Evacuation Settlements* and such, in order for them to gain a good grasp of their own health status and to promote prevention of lifestyle related diseases and early detection and early treatment of diseases by themselves [31].

Specifically, for the residents and such in *Evacuation Settlements*[30] and other areas, it offered:

- Recommendations to participate in cancer screening
- Enforcement of *Comprehensive Health Check* for understanding the effects of prolonged evacuation living, anxiety to radiation and such on health and early detection and early treatment of diseases.

The *Fukushima Health Management Survey* "*Comprehensive Health Check*" is conducted once a year, with the subjects divided into three groups: aged 0-6 years old (pre-schoolers), aged 7-15 years old (Students in the 1st grade of elementary school to the 3rd grade of junior high school students), and aged 16 years and older. All age groups receive a blood count,[31] and for those aged 16 years and older, a serum creatinine and such are added to the items of the Specific Health Check-ups.[32]

Specifically, these health examinations are conducted for people aged 15 years or younger in designated medical institutes where a specialist of pediatrics works, and conducted for people aged 16 years and older as "additional to examinations in comprehensive health check-ups (Specific Health Check-ups and Health Check-ups)".In addition, mass health check-ups at public facilities and such and individual health check-ups at designated medical institutes are conducted for those who are not subjects of the "comprehensive health check-ups", and those were unable to receive them and such. For inhabitants who have been evacuated outside the prefecture or have moved to other prefectures (but were residing in the Fukushima Prefecture at the time of the accident), an opportunity of receiving them at designated medical institutes is provided for all groups, including those aged 15 years and younger and those aged 16 years and older. In all cases, notifications are sent to all the subjects, and participation is recommended.

Furthermore, for inhabitants outside *Evacuation Settlements*, it provides

- Recommendations to participate in existing health check-us and cancer screening

[30] Tamura city, Minamisoma city, Kawamata town, Hirono town, Naraha town, Tomioka town, Kawauchi village, Okuma town, Futaba town, Namie town, Katsurao village, Iitate village and a part of Date city (areas related to *Specific Spots Recommended for Evacuation*).

[31] This indicates red blood cell count, hematocrit, hemoglobin, platelet count, white blood cell count and differential leukocyte.

[32] This is provided in the article 20 of Act on Assurance of Medical Care for Elderly People (Act No. 80 of 1982).

- An opportunity to participate for people who do not have an opportunity to participate in existing health check-ups (19 to 39 years old)

The items in these health check-ups are the same as those in the Specific Health Check-ups.

In addition, "*Mental Health and Lifestyle Survey*" [32] and "*Pregnancy and Birth Survey*" are also conducted [33].

In the prefectures surrounding Fukushima, no health surveys have been conducted by the prefectural government up to this time. Iwate prefecture [34], Miyagi prefecture [12], Tochigi prefecture [13], and Gunma prefecture [35] have all come to the conclusion, following a meeting with experts, that a health survey is not necessary. Neither the WHO Report nor the UNSCEAR 2013 Report indicated necessity to conduct such a survey in the prefectures surrounding Fukushima.

3. Future Directions of Measures

In the expert meetings, the opinion was expressed that since the health effect due to low radiation exposure dose had not fully been made clear scientifically, an actual feasibility survey considering the risk of cancer should be conducted, but others suggested that, as it is accepted that the increased risk is too small to observe, such a survey is would not be desirable from an ethical viewpoint, considering the physical and mental burden it would impose on the subjects. Also, whereas it was argued that "If there is uncertainty in the radiation exposure dose, it would be difficult to conclude that "health effects are not expected", others argued that even if the uncertainty was taken into account, it was still difficult to distinguish any increase of cancer and such by an epidemiological survey.

Moreover, with regard to the *Fukushima Health Management Survey* "*Comprehensive Health Check*", when it was argued at the expert meeting that a qualitative test of uric blood[33)] and others should be added to the items to be examined, and that the content of the surveys should be made the same for both inside and outside evacuation settlements, this was countered by the opinion that items shouldn't be added lightly, without giving consideration to the issue of false positive results when people without symptoms are given health checks. In particular, blood count was introduced not only as a basic item to examine hemodyscrasia, etc., but also as a measure to ease the anxiety of residents regarding leukaemia and other diseases, and therefore, infants, who are more vulnerable to the burden of blood drawing, and the other subjects can receive a blood test every year on a voluntary basis, but this situation may be reconsidered in the future.

At this time, because we have not identified any specific items of examination that would determine health effects due to radiation, and based on international evaluations such as

[33)] Simple screening to examine contamination of blood in urine, and present the result as (++) (+) (±) (-) and such based on the grade.

UNSCEAR's, the expert meeting concludes that it is important to thoroughly promote the measures to control cancer, including thyroid cancer, that have been in place until now. Specifically, in order to raise the participant rate in all cancer screenings recommended as Measure-type Screenings[34], it is important to make a further effort to maintain an environment that enables residents to participate in each of such cancer screenings, as well as to promote the public health activities on a continuous basis with regard to cancer prevention for community residents. In cancer screening and Specific Health Check-ups, it is desirable to take the time to explain the results of an examination carefully and to use it as an opportunity for conducting health consultation, including anxiety to radiation and such. Furthermore, it is desirable to domestically and internationally release results analyzed and evaluated scientifically in an accurate and ongoing fashion whilst giving due consideration to individual information and to serve local residents as well as society at large, as well as managing such data based on health check-ups and health screenings in an integrated fashion and putting it to use in residential health management.

It is also important, for the purpose of watching over residents' health, to gather information and monitor changes in information on cancer incidence, and the National Cancer Register[35] could be used as an accurate source of such information.

Regional Cancer Registries have been in place throughout all prefectures from the 2012 fiscal year, but in Fukushima prefecture a Regional Cancer Registry has been in use since 2010, before the disaster, and visiting registration[36] has been in place in order to obtain a high accuracy in the registration. Also, along with legislation around cancer registration[37], the improvement of the registration system is underway across the country, while some have expressed a desire to make it possible to gather diagnostic information at medical institutes outside the prefecture as appropriate in the future. With regard to diseases other than cancer, it is desirable to make joint efforts to understand them, because it would allow us to understand longitudinal changes in disease-related data in each area, utilizing existing data such as the *National Health Insurance Claims and Health*

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[34] Cancer screening in Japan includes "Measure-type Screening" as represented by mass screening in cites, districts, towns and villages and "Voluntary-type Screening" as represented by Ningen Dock check-up. Measure-type Screening is conducted to reduce cancer mortality rate in the community and such, in which we select cancer screening with established effectiveness to gain benefit fairly for participants. On the other hand, Voluntary-type Screening has various method of screening including examination without established effectiveness as cancer screening, because it is medical services spontaneously provided by medical institutes. But, it has merit that individuals can choose the screening based on their purpose and their choice.

[35] Cancer registry is mechanism for registering, investigating and analyzing morbidity, survival and other situation of cancer, and it is recognized to be essential for investigating basic data in cancer control such as number of cancer patients, mobility rate, cancer survival rate, understand of treatment effects. *Cancer Registry Promotion Act* (Act No. 111 of December 13th, 2013), adopted in December 2013, will be enforced in January 2016, and this act defined National Cancer Registry as "recording domestic information related to morbidity, diagnosis and treatment, survival and such in database, and preserving it by national government in accordance with provision of this act, for use and provision of it by national government and prefecture". This National Cancer Registry provided to understand mobility, diagnosis and treatment, survival, and such as accurate as possible, strictly protecting personal information, and to make all of hospitals reporting them.

[36] The purpose of visiting registration is to gather necessary information through a visiting medical institute and inspecting medical records and such by officers of the cancer registry.

[37] See footnote 35

Check-ups Database.[38)]

Above all, it becomes possible to have a good grasp of trends of different types of cancer in each area of Japan by utilizing the National Cancer Registry and such, but it takes a highly professional expertise to analyze them. For this purpose, the national government should establish a research team, understand the trends in morbidity of different types of cancer using standardized methods, and share information with local governments and residents on a regular basis. For other diseases besides cancer, it is desirable to apply the same approach, utilizing existing databases and such.

4. Thyroid Cancer

As discussed above, it is anticipated that the cancer risk due to radiation exposure as a result of the nuclear accident will be low. However, as we have previous experiences with regard to increased cases of thyroid cancer for infants following the Chernobyl accident, it is imperative that we pay the utmost attention to a possible increase in thyroid cancer. For this reason, the expert meeting spent much time on discussions related to thyroid cancer.

(1) General Information on Thyroid Cancer

① Epidemiology of Thyroid Cancer

The age-adjusted incidence rate of thyroid cancer is known to be on the increase in recent years in the United States of America [36], South Korea [37], Japan [38][39]. However, since the age-adjusted mortality rate from thyroid cancer changed at a lower pace than that of incidence, it has been pointed out that improvement and spread of diagnostic imaging technology such as an ultrasound examination has contributed to the detection of early stage thyroid cancers. Also, characteristically, the incidence of thyroid cancer increases with age, and in 2010 the estimated value for the national incidence rate (per 100,000 persons) was 0.4 for males and 1.9 for females among those aged 15-19 years, 4.9 for males and 17.9 for females among those aged 40-44 years, and 12.4 for males and 26.3 for females among those aged 60 to 64 years [40].

In Japan too, since ultrasound examinations are performed more and more in recent years during the Ningen Dock check-ups and such, the frequency in detection of thyroid abnormal findings (including cysts, nodules and cancers) has increased. One study reported that the detection rate of

[38)] Data of medical receipts (health insurance claims) and data of Specific Health Check-up and Specific Health Guidance were gathered into the *National Health Insurance Claims and Health Check-ups Database* until 2009. For use of this data, article 16 of "*Act on Assurance of Medical Care for Elderly People*", which was enforced in 2008, provides that Ministry of Health, Labour and Welfare may examine and analyze these for certain matters for planning, promotion and evaluation of *National Medical Expenditure Controlling Plan*. Also, data may be released for use in t purposes other than these, provided the use has a specific purpose, such as research contributions to policy measures, or contributions to scientific research, and has a high public interest.

thyroid nodules was 0.78-5.3% by palpation and 6.9 to 31.6% by screening with ultrasound examination. [41] When thyroid ultrasound examinations were performed from 2004 to 2009 on 21,856 people who were going through Ningen Dock check-up, (20-93 years old, with an average age of 49.7 years), 46.3% of the all subjects (38.1% for males, 57.4% for females) had abnormal findings. [41] This report further indicated that the detection rate by ultrasound examination was 27.10% for females and 12.77% for male in nodules, and 0.72% for females and 0.25% for male in thyroid cancers.

Latent cancer (cancer that is not discovered until a morbid anatomy[39]) in the thyroid gland is quite prevalent in adult population, and its prevalence is reported to be 10-30% in Japan [41][42]. The average size of a latent thyroid cancer is almost always less than 2-3 mm, and most of them are smaller than 1mm [42].

The knowledge regarding epidemiology of thyroid gland shown above applies to adults for the most part, and it is therefore important to note that we do not have as much of these data for children. Latent cancer for infants is not reported, and thereby there are a lot of unknown areas.

② Clinical Issues of Thyroid Cancer

The natural history of infant thyroid cancer is still unclear. Generally speaking, although thyroid cancer among young people has a higher prevalence of lymph mode metastasis or distal metastasis than it has in adults, it is known to have a good long life expectancy [43].

Most thyroid cancers can be treated by surgery. However, often a surgery scar is left, and where a total extirpation of thyroid gland is required, the patient needs to continuously take thyroid hormone after the surgery as a result, and calcium replacement therapy and such may often be required for hypoparathyroidism[40]. Complications from the surgery for thyroid cancer include recurrent nerve paralysis[41] and as previously noted, hypoparathyroidism after the extirpation of thyroid gland, is typical, while the frequency of these complications seems to vary greatly depending upon the stage of the disease, operative method, facilities and such [44]. As the frequency of thyroid cancer in infants is not as high it is in adults, it is highly recommended that the surgery be performed based on

39) Morbid anatomy is often conducted to examine the cause of a disease, and is based on consent of the bereaved family or the patient's own will before they die. In such cases, thyroid cancer are eventually found as a result of morbid anatomy of persons who died from causes other than thyroid cancer, and such lesions are referred to as latent cancer of thyroid gland.

40) Parathyroid hormone, which is secreted by the parathyroid gland around thyroid gland, has an important role in maintaining a balance of calcium and phosphorus in inside the body. Extirpation of parathyroid gland following that of the thyroid gland sometimes leads to hypoparathyroidism, and a reduction of parathyroid hormone, causing hypocalcemia and hyperphosphatemia. The hypocalcemia sometimes causes spasms in the limbs and convulsive seizures.

41) The recurrent laryngeal nerve is a branch of the vagus nerve, which is one of the twelve cranial nerves. The recurrent laryngeal nerve controls the motion of the vocal folds, and since its nerve fiber is located near the thyroid, the nerve may be paralyzed by damage brought about by surgery of the thyroid gland and infiltration of thyroid cancer. A common symptom is hoarseness of the voice (trachyphonia).

an opinion from an experienced specialist.

③ General Issues on "Thyroid Cancer Screening”

Based on the previously stated characteristics of thyroid cancer, when conducting a “thyroid cancer screening” (this refers to the thyroid ultrasound examination for people without any symptoms) as a Measure-type Screening, the following considerations need to be thoroughly taken into account as a general issue.

First, “a thyroid cancer screening” may reveal the type of small thyroid cancer that would not have any symptoms until a person dies of other causes. Such a discovery of cancer may result in mental and physical distress, in such forms as additional examinations and treatments, as well as anxiety caused by the discovery itself.

Second, there is the issue of false positives. A false positive in cancer screening refers to a case in which the examination mistakenly detects a positive case when there is no cancer. In such cases, the patient would experience a physical burden through subsequent detailed examinations in the process of determining the diagnosis of not having cancer, and go through a mental burden with the anxiety around having cancer. Even though very thorough judgments are made at the stage of ultrasound examination, there are cases which cannot be determined by cytology of the *Confirmatory Examination*, with the final judgment made by pathological diagnosis following surgery. Utmost care must be taken when dealing with uncommon cancers such as thyroid cancer since increases in the frequency of examinations and the number of subjects theoretically leads to increasing cases of a false positive and it is not possible to eliminate false positives due to the characteristics of clinical examinations.

Third, because a detailed and large-scaled thyroid ultrasound examination for infants by specialists is unprecedented, we have no confirmation that early detection of thyroid cancer without clinical issues will lead to a reduction of death rates due to thyroid cancer.

Taking into account the above factors, and considering that thyroid cancer is relatively rare, it has not been proven by scientific evidence that “thyroid cancer screening” should be conducted as a public health measure. Therefore, “thyroid cancer screening” is not included in the currently implemented cancer screenings as Measure-type Screening.

Conversely, in terms of thyroid ultrasound examinations as a Voluntary-type Screening[42)], when the pros and cons are taken into consideration at an individual level, the previously discussed arguments may not be applicable to all cases. In particular, there was an opinion that it could lead to the preservation of QOL[43)] through an early treatment applied as a result of early detection by ultrasound examinations before the symptoms became obvious, or relief of anxiety for those who

[42)] See footnote 34.
[43)] Quality of Life. It is translated into “Seikatsu-no-Shitsu” or “Seimei-no-Shitsu” in Japanese.

find through an examination that they do not have cancer.

(2) Actions Taken so far on Thyroid Cancer

① *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*" [45][46]

Since an increase of thyroid cancer among infants was reported in the aftermath of the Chernobyl accident, we had the same concerns immediately after the nuclear accident this time also. Therefore, Fukushima Prefecture has conducted the *Thyroid Ultrasound Examination* as part of *Fukushima Health Management Survey* among all inhabitants who were approximately 18 years old or younger at the time of the nuclear accident, in order to gain a good grasp of the thyroid condition of children, and to look after their health for a long period.

First, as "*Initial Screening*" to gain the current situation, examinations were conducted from October 2011 to March 2014 among approximately 370 thousand people[44], while following the 2014 fiscal year, they will be conducted as a "*Full-scale Screening*" among 385 thousand people[45], once every two years to those who are 20 years of age or younger and once every five years to those older than 20 years.

The preliminary results from the "*Initial Screening*", reported at the end of June 2014, indicated that 104 people (the average age at the *Confirmatory Examination* was 17.1 years old, the range was 8-21 years old, and the mode was 19 years old) were diagnosed as "malignant or suspected" as a result of cytology in the *Confirmatory Examination*, and among them, thyroid cancer was confirmed for 57 patients following surgery (55 of them were papillary thyroid cancer and 2 were poorly differentiated thyroid cancer) [47].

The *Thyroid Ultrasound Examination* as *Primary Examination* reported that about half the participants were in Grade A2 (meaning that nodules of 5.0mm or less[46] or cysts of 20.00mm[47] or less were identified"). Grade A2, similar to Grade A1[48], means only follow-up is necessary, and there seem to be no problems in clinical practice. However, because there were no existing data that could be used as reference, they were often treated as "abnormal" or "disease" during the beginning of the *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*", resulting in confusion. The *Survey of Prevalence of Nodular Thyroid Diseases and others*[49] [48] which was

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[44] Inhabitants in Fukushima prefecture born between April 2nd, 1992 and April 1st, 2011.
[45] Inhabitants of Fukushima prefecture born within approximately 1 year after the nuclear accident (Inhabitants in Fukushima prefecture born between April 2nd, 1992 and April 1st, 2011) were added as participants.
[46] "Nodule" is solid protuberance grown in a part of thyroid gland.
[47] In *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*", "Cyst" is referred as a bag with fluid in thyroid gland. Although there is cyst with nodule, they are diagnosed as nodule but not cyst in *Fukushima Health Management Survey*.
[48] Grade A1: Grade in cases where that nodules and cysts were not found.
[49] This was conducted as a consignment program commissioned by the Ministry of the Environment in the 2012 fiscal year with children aged 3-18 years as subjects in Aomori prefecture, Yamanashi prefecture and Nagasaki

conducted in Aomori, Yamanashi and Nagasaki prefectures with the above situation in mind (a consignment program for surveys commissioned by the Ministry of the Environment in the 2012 fiscal year; hereinafter referred to as the "Three Prefectures Survey"), has made it apparent that the results of the *Primary Examination* in *Fukushima Health Management Survey* are not very different from those in other areas, as shown in Table 7, and explanatory meetings with the purpose of deepening understanding with regard to *Thyroid Ultrasound Examinations* are being held at schools and such in Fukushima prefecture.

Moreover, recognizing that support for patients who needed to receive *Confirmatory Examination* because they were categorized in Grade B or Grade C[50] and their guardian against their anxiety, a system conducting a psychological support for individuals by support teams[51] was created.

② Thyroid Cancer Detected at "*Initial Screening*"

It has been suggested that thyroid cancer detected at the "*Initial Screening*" may be due to radiation exposure as a result of the nuclear accident, but taking into consideration of the following points, at this stage we do not have substantial grounds for accepting that those cases are due to the nuclear accident,.

i. Radiation exposure dose in thyroid gland among residents after this nuclear accident has been evaluated to be much lower than the radiation exposure dose after the Chornobyl accident [8]
ii. Since the increase in thyroid cancer due to the Chernobyl accident was reported 4 to 5 years after the accident, this period is different from that when the "*Initial Screening*" was conducted (about three years after the nuclear accident) [49].
iii. People for whom the increase in thyroid cancer was reported after the Chernobyl accident were primarily children who were infants at the time of the accident [50], while in the "*Initial Screening*" there were no infants (5 years old or younger at the time) diagnosed as having thyroid cancer or suspected of having thyroid cancer.
iv. The results of the "*Primary Examination*" were not measurably different from those of the *Three Prefectures Survey*, although the number of population as the subjects was small.

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prefecture.

[50] Grade B: Grade where nodules of 5.1 mm or more, or cysts of 20.1mm or more were found. Grade C: Grade given where *Confirmatory Examination was required immediately*, based on the status of the thyroid gland. Persons diagnosed as grade B or grade C are examined in detailed ultrasound examinations and then receive a blood test and urinary test. If needed, they also receive "fine-needle aspiration cytology", which obtains cells from nodules in order to ascertain their form and such under a microscope.

[51] An expert team including psychiatric social workers and nurses specialized in mental care. This is organized at Fukushima Medical University, in order to provide individual psychological support such as control of anxiety in transition from *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*" to medical insurance treatment to participants diagnosed as grade B or grade C in *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*" and their guardians.

v. When conducting thyroid ultrasound examinations as screening of adults, the detection rate of the thyroid cancer is about 10 to 50 times the morbidity rate[52] [40][41].

The UNSCEAR 2013 Report points out that, considering the uncertainties in the estimation of radiation exposure doses, the infant cohort who received the highest dose of radiation exposures within the estimated radiation exposure dose could in theory have an increased risk of thyroid cancer, and that this should be followed up meticulously and further evaluated, while also stating that observation of large numbers of cysts and nodules in "*Initial Screening*" is "a consequence of the intensive screening", and "not of additional radiation exposure resulting from the accident", based on the results of *Three Prefectures Survey*.

Table 7 Comparison between preliminary results of the *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination* (*Initial Screening*)" and the result of the *Three Prefectures Survey*

	Fukushima Health Management Survey "Thyroid Ultrasound Examination (Initial Screening)" (Until the End of June 2014)[47]	Three Prefectures Survey (Conducted in the 2012 fiscal year)[48]
Participants	296,026[53] (100.0%)	4,365 (100.0%)
Age	0-18 years old at the accident[54]	3-18 years old
Grade A1	152,389 (51.5%)	1,853 (42.5%)
Grade A2	141,063 (47.7%)	2,468 (56.5%)
Grade B	2,236 (0.8%)	44 (1.0%)
Grade C	1 (0.0%)	0 (0.0%)
Final diagnosis of "Cancer"	57	1[55]

③ Status in Prefectures Surrounding Fukushima

As mentioned above, none of the prefectures neighboring Fukushima has so far initiated a health

[52] Numbers calculated by secretariat based on detected rate of thyroid cancer in participants in Ningen Dock check-ups between 2004 and 2009, and on estimated national morbidity rate of thyroid cancer in 2010.
[53] Number of people whose results of *Primary Examination* were already available as of the end of June 2014.
[54] See footnote 44.
[55] Among 44 subjects who were classified as grade B, detail results of 31 subjects were available, including one subject diagnosed as cancer.

survey, and the UNSCEAR 2013 Report and others do not point out a need to undertake a similar action.

With regard to thyroid cancer, it has been suggested that "Since the situation in the prefectures surrounding Fukushima is similar to that in Fukushima prefecture, where the radiation exposure dose immediately after the accident is not clear, the authorities in the prefectures surrounding Fukushima should conduct *Thyroid Ultrasound Examination* and such for children, similar to Fukushima prefecture". In actuality, based on this opinion, some cities, towns and villages have of their own accord conducted *Thyroid Ultrasound Examination*, examination for internal radiation exposure dose by the whole body counter and such, or have subsidized part of their cost.

(3) Directions for Future Measures in Fukushima Prefecture

As mentioned above, conducting a "*Thyroid Cancer Examination*" as a *Measure-type Screening* lacks scientific evidence, therefore, it is not pointed out there is no indication that such a screening will be conducted on a nation-wide basis. However, with regard to the residents in Fukushima prefecture, as it is speculated that the residents have been exposed by the radiation due to the nuclear accident (particularly exposure to iodine at the early stage of the accident), and as a lot of incidences of infant thyroid cancer were reported after 4-5 years following the Chernobyl accident, the *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*" has been conducted, out of a concern for the possibility of increment in risk of thyroid cancer for infants who received radiation exposure and in order to reduce anxiety of inhabitants and to manage their health, and we need to examine directions of future measures taking into account these details.

The UNSCEAR 2013 Report also points out that doses towards the upper bounds of the ranges of the estimated radiation exposure dose could theoretically imply an increased risk for infants, which might lead to discernible increases in the incidence of thyroid cancer, and that it is necessary to continue to evaluate the status by closely monitoring the target population, taking into account uncertainties in estimation of radiation exposure dose. Above all, the Expert Meeting evaluates that it was an adequate response to implement the *Fukushima Health Management Survey* "Thyroid Cancer Examination", and that such efforts should be continued going forward.

So far, more than 80% of the target population have gone through an examination over three years since the beginning of the survey, which has led to actual detection of thyroid cancer and its treatment, and at the same time, a number of issues relative to the examinations have been identified and valuable knowledge is being shared. In view of the above findings, the Expert Meeting examined potential issues under discussion, and the *Health Management Survey Exploratory Committee* tackles them for further improvement.

First, as it is important to conduct necessary health management in response to the radiation exposure dose, we need to further discuss whether it would be the best approach to provide the same

actions to large sections of the population including those who have been exposed to small amount of dose. Specifically, it is thought that the scope of subjects and intervals of examinations would be the issues under discussion. For examining improvement of the *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*", it is important to go through the process of comprehensively and carefully verifying "*Initial Screening*" and the first term of "*Full-scale Screening*", to discuss them with relevant persons, and to reach consensus with inhabitants. It is desirable to discuss based on complete and up to date information in each verification, and to investigate the best course of action for inhabitants. Also, it is necessary to make every effort in communication with residents, such as providing more pre-examination explanatory sessions based on information regarding estimation of the number of incidences of thyroid cancer and such.

Moreover, the Expert Meeting thought that it was important to further improve the *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*" as a survey to gain scientific evidence to whether thyroid cancer would increase or not. In particular, it is desirable that the survey will further improve as epidemiological follow-up research, as mentioned in the WHO Report [7], in order to adequately analyze the relationship with radiation exposure. In the process, it is imperative to continuously make an effort to understand and collaborate with the subjects in accordance with the "*Ethical Guidelines in Conducting Clinical Studies*" [51] and such. Also it is important to examine statistical power[56] from a statistical viewpoint and to further improve the survey system for properly analyzing the relationship with radiation exposure.

To do so, with regard to the *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*" in Fukushima prefecture, the national government should support Fukushima prefecture in developing a survey system which allows them to follow up subjects, including those who have moved outside Fukushima prefecture for long periods, and to collect clinical data[57] needed for the analysis, taking the utmost care not to overburden the subjects.

(4) Directions for Future Measures in Prefectures Surrounding Fukushima

Although currently available data of radiation exposure dose are limited for areas other than Fukushima prefecture, it is quite unlikely that people who reside in the prefectures surrounding Fukushima have been exposed to more radiation dose than the people who lived in the evacuation areas and such in Fukushima prefecture. Particularly, in terms of radiation exposure by radioactive iodine, as shown in table 3-1, table 3-2 and table 4, there are no data indicating that more radiation exposure doses have been detected in the people in the prefectures surrounding Fukushima.

[56] The probability of accurately detect statistically significant differences

[57] It is important to collect essential and detailed clinical data such as age, past history of diseases, history of medical radiation exposure, lifestyle, existence of symptoms, histopathology, therapeutic progress, and operative method, because we need to match their conditions and to allow for the effect of other factors related to incidence of thyroid cancer (confounding factors) in analysis of epidemiological survey.

However, as it was also pointed out that there was not sufficient data on internal radiation exposure for the prefectures surrounding Fukushima at the early stage of the accident and that uncertainty remained, we examined the *Thyroid Ultrasound Examination* for infants, and suggested that it would not be too late to conduct a survey if necessary, based on the results of the *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*".

There are some residents in the prefectures surrounding Fukushima who, out of a concern and anxiety regarding thyroid cancer, desire to undertake *Thyroid Ultrasound Examination* for infants as a countermeasure. Many felt that, if the policy was instigated across the board, great discretion would be required, because if infants without symptoms were to undergo a *Thyroid Ultrasound Examination,* thyroid cancers that are not associated with radiation exposure and which have no effect on life expectancy could be discovered at acertain frequency, and numerous problems around false positives could emerge. On the other hand, there was another opinion that the opportunities of adequate examination should be provided to those who wish to receive the examinations, while giving sufficient explanations on the meaning and the pros and cons of the examination. In either case, we first need to take a wait and see stance and see how the *Fukushima Health Management Survey* "*Thyroid Ultrasound Examination*" makes progress. Careful explanation of the information gained through individual health consultation and risk communication and such for residents with an anxiety to thyroid cancer are also important.

Therefore, the national government ought to give further support to individual consultations and risk communication by municipalities of the prefectures surrounding Fukushima. On such occasions, it is desirable to respect the status of each area and the directions taken by the municipalities, and to give careful consideration, allowing them to flexibly develop their programs, based on the needs of the area.

V. Physical and Mental Effects following Evacuation and Anxiety due to Nuclear Accident

Although the expert meeting primarily focused on the biological effects of the radiation exposure, it has been pointed out that, since it has been recognised that this nuclear accident has brought with it mental and physical problems associated with the evacuation and such, it would be more important to deal with these. In particular, in addition to the anxiety vis-à-vis the radiation, it was pointed out that the changes in lifestyle due to long-term evacuation and, anxiety, stress and such from the inability to make realistic life plans, have resulted in worsening health indicators such as blood pressure, obesity and blood glucose, and that there is a concern that these conditions might become worse in the future, rather than improve.

These bad physical and mental conditions following evacuation and anxiety have not been dealt with lightly from the beginning, and, the grasp of the situations and proactive support have been already available in the *Fukushima Health Management Survey* "*Mental Health and Lifestyle Survey*" and other means, but we need to examine them further and discuss them, as it is important to conduct measures of health management for comprehensive grasp of both physical and mental issues. Also, exhaustion among officials in community government such as public health nurses, who bear the responsibility for health management, has become a big problem, and we need to further promote measures from a position of "helping the helpers". We need them in terms of creating a sustainable support system for health promotion of residents in *Evacuation Settlements* and all inhabitants.

At the same time, it is also necessary to continuously promote measures of individual health consultation and risk communication, including mental care. For residents with anxiety towards current radiation exposure, it would be useful to advise them that they can measure their own radiation exposure dose by using a personal dosimeter when necessary. Furthermore, continuous actions should be made to prevent lifestyle-related diseases and their complications by maintaining and promoting the health of residents through improvements to lifestyle such as diet, physical activity and such.

In the face of adverse health effects caused by these various factors, it is important that the relevant ministries and agencies work together collaboratively to promote their measures.

VI. Conclusion

In compiling this interim report, with due respect for reports by international organizations such as UNSCEAR, we, the expert meeting, have made the actual measurement data of individual radiation exposure dose, which are such an important resource, the object of our discussions, and used them to come to our assessments.

We have not found any evidence of biological effects due to the radiation exposure up to this time, and have concluded that there was little possibility that the risk of some diseases would increase by radiation exposure going forward. However, as we have uncertainty in the estimation of radiation exposure dose, and as we recognize that this issue must be dealt with on a mid to long-term basis, we need to monitor trends of thyroid cancer, towards which residents feel a great anxiety, carefully.

As health management for the residents ought to be dealt with depending upon the radiation exposure dose, it is important to promote existing measures for health promotion and conduct monitoring of disease trends by utilizing the National Cancer Registry and such in areas where the dose level is deemed rather low.

As it is the first time we have experienced such a nuclear power station accident in Japan, immediately after the accident, confusing information with regard to the health effects due to the radiation exposures was disseminated. Because of the lack of reliable information about the accident, in addition to a large scale urgent evacuation taking place, Fukushima prefecture in particular found itself in a very chaotic situation. The *Fukushima Health Management Survey* which was initiated during the chaotic time, and which has been in place for more than three years now, deserves high praise. Above all, it is our sincere hope that this *Fukushima Health Management Survey* will promote health for the suffering inhabitants of Fukushima prefecture. Additionally, it should be utilized internationally as a resource of scientific evidence.

This interim report is a compilation of items listing actions and investigations necessary at this stage, based on the results of assessments of radiation exposure doses obtained to date and the outcomes of the scientific and medical discussions. Because the wishes and concerns of residents must be communicated and understood when proceeding with these measures and such, the national government should follow the trends in the *Fukushima Health Management Survey* closely, and make an effort to collect and analyze the data through relevant ministries and agencies, and examine them scientifically from a wide range of angles, as well as understand the true situation through communication with the residents.

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[42] Guideline for diagnosis of thyroid tumor, 2 Diagnosis and non-surgery management CQ3. Japan Society of Clinical Oncology

[43] Guideline for diagnosis of thyroid tumor, 1 Epidemiology CQ2. Japan Society of Clinical Oncology

[44] Guideline for diagnosis of thyroid tumor, 3-a Papillary cancer, column7. Japan Society of Clinical Oncology

[45] Fukushima Prefecture. About Thyroid Ultrasound Examination in "Fukushima Health

Management Survey". Fukushima prefecture
[46] What is "Thyroid Ultrasound Examination" in Fukushima Health Management Survey? The Radiation Medical Science Center for Fukushima Health Management Survey
[47] The 16th meeting of Health Management Survey Exploratory Committee (August 24th, 2014). Document 2-1 "Summary of result of "Thyroid Ultrasound Examination (Preliminary examination)" in Fukushima Health Management Survey (Provisional version)". Fukushima prefecture
[48] Report of Research Project on Radiation Effects by Nuclear Disaster, 2012 fiscal year (Survey of Prevalence of Nodular Thyroid Diseases and others)
[49] Sources and effects of ionizing radiation. Volume II: Scientific Annexes C, D and E. UNSCEAR 2008 Report. UNSCEAR (2011)
[50] Sources and effects of ionizing radiation. Volume II: Effects. UNSCEAR 2000 Report. United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2000 Report to the General Assembly., UNSCEAR (2000)
[51] Ethical Guidelines for Clinical Studies. Ministry of Health, Labour and Welfare

Supplement 1

Expert Meeting regarding to the Status of Health Management of Residents following the Accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station
(Rule of Procedure)

1. Purpose

(1) Regarding health management of residents due to the accident at Tokyo electric Power Company's Fukushima Daiichi Nuclear Power Station occurred in March 2011, the Fukushima Prefectural government has been conducting "Fukushima Health Management Survey" using the funding financed by the national government, but, We need to understand health status and issues in not only Fukushima prefecture but its surrounding prefectures, and examine its status from a medical perspectives in a professional way.

(2) According to the "Act on Promotion of Support Measures for the Lives of Disaster Victims to Protect and Support Children and Other Residents Suffering Damage due to Tokyo Electric Power Company's Nuclear Accident" (June 27, 2012, Law No. 48), the national government is to make necessary measures relative to surveys and others regarding health effects by the radiation exposures.

(3) Based on these situation, the "Expert Meeting Regarding to the Status of Health Management of Residents Following the Accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station" will be established in Environmental Health Department, Environmental Policy Bureau, Ministry of the Environment for the purpose of examining status and others regarding investigation and evaluation of radiation exposure dose, health management and medical care.

2. Title

This meeting is titled as "Expert Meeting regarding to the Status of Health Management of Residents following the Accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station" (thereafter refers to "Expert Meeting").

3. Contents for discussion

(1) Investigation and evaluation of radiation exposure dose
(2) Health Management
(3) Status of measures regarding medical care
(4) Other relevant issues

4. Members

Refer to the appendix

5. Administration

(1) Expert Meeting has a chairperson, and the Chairperson will be chosen by the members.
(2) Chairperson will convene and chair the Expert Meetings.
(3) Chairperson appoints an acting chairperson, who could take over the chairperson in case of emergency/absence of the chairperson.
(4) Chairperson as necessary could request attendance by professionals and others outside members.
(5) Expert Meetings will be open to public.

6. Secretariat

Secretariat of the Expert Meeting will be done at Radiation Health Management Office, Environmental Health Department, Environmental Policy Bureau, Ministry of the Environment.

(Appendix)

Members of "Expert Meeting regarding to the Status of Health Management of Residents following the Accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station"

○	Makoto Akashi	Board Member, National Institute of Radiological Science
	Masafumi Abe	Vice-President, Fukushima Medical University
	Yasuaki Arai	Director, National Cancer Center Hospital
	Hiromi Ishikawa	Board Member, Japan Medial Association
	Keigo Endo	President, Kyoto College of Medical Science
	Ichiro Okubo	Professor, Department of Health Care Policy and Management, Tsukuba University
	Fumiko Kasuga	Director of Safety Information on Drug and Food, National Institute of Health and Sciences
	Yasuhito Sasaki	Special adviser, Tumor Center, Hidaka Hospital
	Fumio Shishido	Professor, Department of Radiology, School of Medicine, Fukushima Medical University
	Kazuo Shimizu	Honorary Professor, Nippon Medical School
	Gen Suzuki	Director, International University of Health and Welfare Clinic
	Tomotaka Sobue	Professor, Department of Social and Environmental Medicine, Graduate School of Medicine, Osaka University
◎	Shigenobu Nagataki	Honorary Professor, Nagasaki University
	Takashi Nakamura	Honorary Professor, Tohoku University
	Ohtsura Niwa	Specially Appointed Professor, Fukushima Medical University
	Nobuhiko Ban	Professor, Graduate School of Nursing, Tokyo Healthcare University
	Toshimitsu Honma	Director General, Nuclear Safety Research Center, Japan Atomic Energy Agency

◎ : Chair, ○ : Vice-chair

Supplement 2

List of Records and Documents in the Meetings

○1st (November 11th, 2013)

Items

(1) Selection of Chair

(2) Investigation of Radiation Dose and Health Management following the Accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station

(3) Evaluation of Health Effect by radiation following the Accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station and others

(4) Others

Documents

Document 1-1: Rule of Procedure
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat01_1.pdf

Document 1-2: Major Measures related to Health Management in Basic direction of *Children' and other Victims' Support Act*
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat01_2.pdf

Document 2-1: Radiation Exposure Dose
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat02_1.pdf

Document 2-2: Health Management for Inhabitants in Fukushima Prefecture
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat02_2-1.pdf (1/2)
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat02_2-2.pdf (2/2)

Document 2-3: Examination by Prefectures Surrounding Fukushima and others
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat02_3.pdf

Document 2-3-1: Report on Health Effect by Radiation in Miyagi Prefecture
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat02_3_1.pdf

Document 2-3-2: Report of Health Effect by Radiation in Tochigi Prefecture
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat02_3_2.pdf

Document 2-3-3: Results of Expert Meeting of effect by Radiation to Health (Gunma Prefecture)
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat02_3_3.pdf

Document 2-3-4: Evaluation of Radiation Health Effect (Internal Exposure) Survey and others (Iwate Prefecture)
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat02_3_4.pdf

Document 3-1: Report of WHO Expert Meeting for Health risk assessment of the nuclear accident
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat03_1.pdf

Document 3-2: Scientific Findings in United Nations Science Committee Report
https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat03_2.pdf

Document 3-3: Reform of Health Management Related to the Accident at the Tokyo Electric

Power Company's Fukushima Daiichi Nuclear Power Station (Recommendation (Draft))

https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat03_3.pdf

Document 3-4: Nuclear Regulation Authority "Examination for Safety Procedure to Return Home" Document

https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat03_4.pdf

Document 3-5: Project for Investigating Individual Radiation Exposure Dose among Residents (New Project in the 2014 fiscal year)

https://www.env.go.jp/chemi/rhm/conf/conf01-01/mat03_5.pdf

(Document Submitted by Dr. Ishikawa)

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ext01.pdf

(References)

Reference 1: "Act on Promotion of Support Measures for the Lives of Disaster Victims to Protect and Support Children and Other Residents Suffering Damage due to Tokyo Electric Power Company's Nuclear Accident"

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ref01.pdf

Reference 2: Basic Direction for Implementing Victims' Life-Support Measures

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ref02.pdf

Reference 3: Nuclear Regulation Authority "Report by Committee of Health Management"

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ref03.pdf

Reference 4: "Working Group Report for Risk Management of Low Dose Radiation Exposure"

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ref04.pdf

Reference5: Documents of the 12th "Fukushima Health Management Survey" Advisory Committee

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ref05-1.pdf (1/2)

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ref05-2.pdf (2/2)

Reference 6: Map of Evacuation Settlement

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ref06.pdf

Reference 7: Result in Survey of Prevalence of Thyroid Diseases in Three Prefectures Outside Fukushima Prefecture

https://www.env.go.jp/chemi/rhm/conf/conf01-01/ref07.pdf

○2nd (December 25th, 2013)

Items

(1) Evaluation of Radiation Exposure Dose

(2) Others (Additional explanation for comments in the 1st meeting)

Documents

Document 1: Evaluation of Radiation Exposure Dose

https://www.env.go.jp/chemi/rhm/conf/conf01-02/mat01-1.pdf (1/4)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/mat01-2.pdf (2/4)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/mat01-3.pdf (3/4)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/mat01-4.pdf (4/4)

Document 2: Comprehensive Management of Data in Fukushima Health Management Survey

https://www.env.go.jp/chemi/rhm/conf/conf01-02/mat02.pdf

Document 3: Additional Document for the 1st Meeting: Fukushima Health Management Survey (Health check-ups)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/mat03.pdf

(Document Submitted by Dr. Ishikawa)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ext01.pdf

(Document Submitted by Dr. Kasuga)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ext02.pdf

(References)

Reference 1: Evaluation of Radiation Exposure Dose

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref01-1.pdf (1/7)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref01-2.pdf (2/7)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref01-3.pdf (3/7)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref01-4.pdf (4/7)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref01-5.pdf (5/7)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref01-6.pdf (6/7)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref01-7.pdf (7/7)

Reference 2: United Nations Scientific Committee (UNSCEAR) Annual Report (in English)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref02.pdf

Reference 3: Toward Acceleration of Fukushima's Reconstruction from Nuclear Disaster (December 20, 2013, Decision by NRA)

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref03.pdf

Reference 4: Rule of Procedure

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref04.pdf

Reference 5: Verbal Records of the 1st Meeting

https://www.env.go.jp/chemi/rhm/conf/conf01-02/ref05.pdf

○3rd (February 26th, 2014)

Proceedings

(1) Evaluation of Radiation Exposure Dose

1) Reply to Comments on the 2nd meeting

2) Future items related to evaluation and reconstruction of radiation dose

(2) Others

Documents

Document 1: Evaluation of Radiation Exposure Dose (Reply to Comments on the 2nd Meeting)

https://www.env.go.jp/chemi/rhm/conf/conf01-03/mat01-1.pdf (1/3)

https://www.env.go.jp/chemi/rhm/conf/conf01-03/mat01-2.pdf (2/3)

https://www.env.go.jp/chemi/rhm/conf/conf01-03/mat01-3.pdf (3/3)

Document 2: Evaluation of Radiation Exposure Dose (Items related to Future evaluation and reconstruction of Radiation Dose)

https://www.env.go.jp/chemi/rhm/conf/conf01-03/mat02.pdf

Document 3: Thyroid Survey in Kawabata Town Hall from March 28th to 30th

https://www.env.go.jp/chemi/rhm/conf/conf01-03/mat03.pdf

(Document Submitted by Dr. Endo)

https://www.env.go.jp/chemi/rhm/conf/conf01-03/ext01.pdf

(References)

Reference 1: Evaluation of Radiation Exposure Dose

https://www.env.go.jp/chemi/rhm/conf/conf01-03/ref01-1.pdf (1/2)

https://www.env.go.jp/chemi/rhm/conf/conf01-03/ref01-2.pdf (2/2)

Reference 2: Verbal Records of the 2nd Meeting

https://www.env.go.jp/chemi/rhm/conf/conf01-03/ref02.pdf

○4th (March 26th, 2014)

Items

(1) Future Schedule of Discussion

(2) Evaluation of Radiation Exposure Dose (part 3: conclusion)

(3) Hearing (part 1)

(4) Radiation Exposure and Health Effect (part 1)

(5) Others

Documents

Document 1: Future Schedule of Discussion

https://www.env.go.jp/chemi/rhm/conf/conf01-04/mat01.pdf

Document 2: Overview of Checked items from the 1st to the 3rd Meetings

https://www.env.go.jp/chemi/rhm/conf/conf01-04/mat02_1.pdf

Document 2-2: Future Investigation and Evaluation of Radiation Dose

https://www.env.go.jp/chemi/rhm/conf/conf01-04/mat02_2.pdf

Document 3-1: Document Submitted by Dr. Hisako Sakiyama

https://www.env.go.jp/chemi/rhm/conf/conf01-04/mat03_1.pdf

Document 3-2: Document Submitted by Dr. Suminori Akiba

https://www.env.go.jp/chemi/rhm/conf/conf01-04/mat03_2.pdf

Document 4: radiation Exposure and Health Effect

https://www.env.go.jp/chemi/rhm/conf/conf01-04/mat04.pdf

(Document Submitted by Dr. Ishikawa)

https://www.env.go.jp/chemi/rhm/conf/conf01-04/ext01.pdf

Note: UNSCEAR's Document was translated into Japanese by Japan Medical Association Research Institute.

http://www.unscear.org/docs/GAreports/A-68-46_e_V1385727.pdf

(References)

Reference 1: Rule of Procedure

https://www.env.go.jp/chemi/rhm/conf/conf01-04/ref01.pdf

Reference 2: Overview of Checked items from the 1st to the 3rd Meetings

https://www.env.go.jp/chemi/rhm/conf/conf01-04/ref02.pdf

Reference 3: Verbal Records of the 3rd Meeting

https://www.env.go.jp/chemi/rhm/conf/conf01-04/ref03.pdf

○5th (April 24th, 2014)

Proceedings

(1) Fukushima Nuclear Accident Report by United Nations Scientific Committee (UNSCEAR) Report on Effects of Nuclear Radiation

(2) Others

Documents

Document 1-1: UNSCEAR 2013 Report (Volume 1) (Abstract)

https://www.env.go.jp/chemi/rhm/conf/conf01-05/mat01_1-01.pdf (1/5)

https://www.env.go.jp/chemi/rhm/conf/conf01-05/mat01_1-02.pdf (2/5)

https://www.env.go.jp/chemi/rhm/conf/conf01-05/mat01_1-03.pdf (3/5)

https://www.env.go.jp/chemi/rhm/conf/conf01-05/mat01_1-04.pdf (4/5)

https://www.env.go.jp/chemi/rhm/conf/conf01-05/mat01_1-05.pdf (5/5)

Document 1-2: Press Release from UNSCEAR When Report was published

https://www.env.go.jp/chemi/rhm/conf/conf01-05/mat01_2.pdf

Document 2: Response to "Need for Future Scientific Research"

https://www.env.go.jp/chemi/rhm/conf/conf01-05/mat02.pdf

(Document Submitted by Dr. Kazuo Sakai)

https://www.env.go.jp/chemi/rhm/conf/conf01-05/ext01.pdf

(References)

Reference: Rule of Procedure

https://www.env.go.jp/chemi/rhm/conf/conf01-05/ref00.pdf

○6th (May 30th, 2014)

Items

(1) Evaluation of Radiation Exposure Dose (Part 4, Conclusion)

(2) Hearing (part 2)

(3) Radiation Exposure and Health Effect (part 2)

(4) Others

Documents

Document 1-1: Investigation and Evaluation of Radiation Exposure Dose in Residents (Conclusion) (Draft of Overview)

https://www.env.go.jp/chemi/rhm/conf/conf01-06/mat01_1.pdf

Document 1-2: Evaluation of Radiation Exposure Dose

http://www.env.go.jp/chemi/rhm/conf/conf01-06/mat01_2.pdf

Document 1-3: Overview of Checked items from 1st to 5th Meetings (Revised Draft of Document 2-1 in the 4th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-06/mat01_3.pdf

Document 2-1: WHO Health Effect Report (Radiation Exposure and Health Effect)

http://www.env.go.jp/chemi/rhm/conf/conf01-06/mat02_1.pdf

Document 2-2: WHO Health Effect Report (Method for Understand of Long-term Health Effect)

http://www.env.go.jp/chemi/rhm/conf/conf01-06/mat02_2.pdf

Document 2-3: Cancer Registrations

http://www.env.go.jp/chemi/rhm/conf/conf01-06/mat02_3.pdf

Document 3: "Concerns against Radioactive Substance Procedure Controls"

http://www.env.go.jp/chemi/rhm/conf/conf01-06/mat03_1.pdf

(Document Submitted by Dr. Michiaki Kai)

http://www.env.go.jp/chemi/rhm/conf/conf01-06/mat03_2.pdf

(Document Submitted by Dr. Kotaro Ozasa)

http://www.env.go.jp/chemi/rhm/conf/conf01-06/mat03_3.pdf

(References)

Reference 1: Document related to Thyroid Radiation Exposure in Ibaraki Prefecture
http://www.env.go.jp/chemi/rhm/conf/conf01-06/ref01.pdf

Reference 2: Document Related to Radiation Exposure Investigation Except Thyroid Radiation Exposure in Ibaraki Prefecture
http://www.env.go.jp/chemi/rhm/conf/conf01-06/ref02.pdf

Reference 3: UNSCEAR Report, "Levels and Effects of Radiation Exposure Due to the Nuclear Accident After the 2011 Great East-Japan Earthquake and Tsunami" (Overview)
http://www.env.go.jp/chemi/rhm/conf/conf01-06/ref03.pdf

Reference 4: WHO Expert Report of Health Risk Assessment for Fukushima Nuclear Accident (Overview)
http://www.env.go.jp/chemi/rhm/conf/conf01-06/ref04.pdf

Reference 5: Rule of Procedure
http://www.env.go.jp/chemi/rhm/conf/conf01-06/ref05.pdf

Reference 6: Verbal Records of the 4th Meeting
http://www.env.go.jp/chemi/rhm/conf/conf01-06/ref06.pdf

○7th (June 26th, 2014)

Items

(1) Evaluation of Radiation Exposure Dose (part 5, Conclusion 2)

(2) Radiation Exposure and Health Effect (part 3)

(3) Others

Documents

Document 1-1: Investigation and Evaluation of Radiation Exposure Dose in Residents (Conclusion) (Draft of Overview)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/mat01_1.pdf

Document 1-2: Comparison Table of Document 1-1 "Investigation and Evaluation of Radiation Exposure Dose in Residents (Conclusion) (Draft of Overview)"
http://www.env.go.jp/chemi/rhm/conf/conf01-07/mat01_2.pdf

Document 2-1: Overview of "Fukushima Health Management Survey" in Fukushima Prefecture
http://www.env.go.jp/chemi/rhm/conf/conf01-07/mat02_1.pdf

Document 2-2: Result of Research Project for Follow-up of Nodular Thyroid Diseases (Preliminary Report)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/mat02_2.pdf

Document 2-3: Discussion Point on Evaluation of Health Risk (Draft)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/mat02_3.pdf
(Document Submitted by Dr. Ishikawa)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/mat03.pdf
(Document Submitted by Dr. Sobue)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/mat04.pdf

(References)
Reference 1-1: List of Documents related to Radiation Exposure Dose
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref01_1.pdf
Reference 1-2: "Fault in Early-stage Protection of Thyroid Radiation Exposure shown in Surface Contamination Screening" (Iwanami Shoten Publishers)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref01_2.pdf
Reference 2-1: Document of the 15th "Fukushima Health Management Survey" Examination Committee
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_1.pdf
Reference 2-2-1: "Health Check-ups": Document of "Fukushima Health Management Survey," Examination Committee (the parts of 13th and 14th that are released)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_2_1.pdf
Reference 2-2-2: Report of "Mental Health and Lifestyle Survey" (2011 fiscal year and 2012 fiscal year): Document of "Fukushima Health Management Survey" Examination Committee
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_2_2.pdf
Reference 2-2-3: Report of "Pregnancy and Birth Survey" (2011 fiscal year): Document of "Fukushima Health Management Survey," Examination Committee
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_2_3.pdf
Reference 2-3: Overview of WHO Health Effect Report (Documents in 4th and 6th Meeting)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_3.pdf
Reference 2-4: Fukushima Nuclear Accident WHO Health Risk Evaluation Committee Report (Reference Document in 6th Meeting)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_4.pdf
Reference 2-5: UNSCEAR Report "Levels and Effects of Radiation Exposure Due to the Nuclear Accident After the 2011 Great East-Japan Earthquake and Tsunami" (Overview) (Revised reference Document in 6th Meeting)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_5.pdf
Reference 2-6: UNSCEAR Report "Need for Future Scientific Research" (Document in 5th Meeting)
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_6.pdf

Reference 2-7: Document Submitted by Dr. Hisako Sakiyama
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref02_7.pdf
Reference 3: Rule of Procedure
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref03.pdf
Reference 4: Verbal Records of the 6th Meeting
http://www.env.go.jp/chemi/rhm/conf/conf01-07/ref04.pdf

○8th (July 16th, 2014)

Items

(1) Hearing
(2) Radiation Exposure and Health Effect (part 4)
(3) Others

Documents

Document 1-1: Discussion Points on Evaluation of Health Risk (Overview of Comments for each Discussion Point)
http://www.env.go.jp/chemi/rhm/conf/conf01-08/mat01_1.pdf
Document 1-2: Discussion Points on Health Risk Evaluation (Draft) (7th Meeting Document)
http://www.env.go.jp/chemi/rhm/conf/conf01-08/mat01_2.pdf
Document 2: Investigation and Evaluation of Radiation Exposure Dose in Residents (Conclusion) (Draft of Overview)
http://www.env.go.jp/chemi/rhm/conf/conf01-08/mat02.pdf

(Document Submitted by Dr. Koichi Kida)
http://www.env.go.jp/chemi/rhm/conf/conf01-08/ext01.pdf
(Document Submitted by Dr. Shinzo Kimura)
http://www.env.go.jp/chemi/rhm/conf/conf01-08/ext02.pdf
(Document Submitted by Dr. Akira Sugenoya)
http://www.env.go.jp/chemi/rhm/conf/conf01-08/ext03.pdf
(Document Submitted by Dr. Toshihide Tsuda)
http://www.env.go.jp/chemi/rhm/conf/conf01-08/ext04.pdf
(Document Submitted by Dr. Yuichi Moriguchi)
http://www.env.go.jp/chemi/rhm/conf/conf01-08/ext05.pdf

(References)
Reference 1-1: WHO Health Risk Evaluation Committee Report of the Accident at Fukushima Nuclear Power Station (Overview) (Reference Document in 7th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-08/ref01_1.pdf

Reference 1-2: UNSCEAR Report "Levels and Effects of Radiation Exposure Due to the Nuclear Accident After the 2011 Great East-Japan Earthquake and Tsunami" (Overview) and Measures for "Need for Future Scientific Research" (Revised Reference Document in 6th Meeting and Document in 5th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-08/ref01_2.pdf

Reference 1-3: UNSCEAR's comment on WHO Health Risk Evaluation

http://www.env.go.jp/chemi/rhm/conf/conf01-08/ref01_3.pdf

Reference 1-4: Document Submitted by Dr. Hisako Sakiyama (Document in 7th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-08/ref01_4.pdf

Reference 2-1: Investigation and Evaluation of Radiation Exposure Dose in Residents (Conclusion) (Draft of Overview) (Revised Document in 7th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-08/ref02_1.pdf

Reference 2-2: "Evaluation of Radiation Exposure Dose among residents in Fukushima prefecture" (Document in debrief session of Nuclear Safety Research Center, JAEA in 2012 fiscal year)

http://www.env.go.jp/chemi/rhm/conf/conf01-08/ref02_2.pdf

Reference 3: Rule of Procedure

http://www.env.go.jp/chemi/rhm/conf/conf01-08/ref03.pdf

Reference 4: Verbal Records of the 7th Meeting

http://www.env.go.jp/chemi/rhm/conf/conf01-08/ref04.pdf

○9th (August 5th, 2014)

Items

(1) Evaluation of Radiation Exposure Dose

(2) Health Risk Assessment based on Evaluation of Radiation Exposure Dose

(3) Health Management based on Health Risk Assessment

<Hearing>

Dr. Akira Miyauchi (Clinical perspective of Childhood Thyroid Cancer)

Dr. Shoichiro Tsugane (Methodology of Epidemiological Survey)

Documents

Document 1: Summary of part of Radiation Exposure Dose for Interim Report (Draft)

http://www.env.go.jp/chemi/rhm/conf/conf01-09/mat01.pdf

Document 2: Previous Discussion related to Each Discussion Point for Health Risk Assessment

http://www.env.go.jp/chemi/rhm/conf/conf01-09/mat02.pdf

Document 3: Previous Comments related to Each Discussion Point on Reform of Health

Management (Overview)

https://www.env.go.jp/chemi/rhm/conf/conf01-09/mat03.pdf

(Document Submitted by Dr. Akira Miyauchi)

http://www.env.go.jp/chemi/rhm/conf/conf01-09/ext01.pdf

(Document Submitted by Dr. Shoichiro Tsugan)

http://www.env.go.jp/chemi/rhm/conf/conf01-09/ext02.pdf

(References)

Reference 1: Report of survey of Internal Radiation Exposure Using WBC within Fukushima Prefecture

http://www.env.go.jp/chemi/rhm/conf/conf01-09/ref01.pdf

Reference 2-1: WHO Health Risk Evaluation Committee Report of the Accident at Fukushima Nuclear Power Station (Overview) (Reference in 8th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-09/ref02_1.pdf

Reference 2-2: WHO Health Effect Report (Reference in 7th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-09/ref02_2.pdf

Reference 3-1: UNSCEAR Report "Levels and Effects of Radiation Exposure Due to the Nuclear Accident After the 2011 Great East-Japan Earthquake and Tsunami" (Overview) (Reference in 8th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-09/ref03_1.pdf

Reference 3-2: UNSCEAR's comment on WHO Health Risk Evaluation (Reference in 8th Meeting)

http://www.env.go.jp/chemi/rhm/conf/conf01-09/ref03_2.pdf

Reference 4: Rule of Procedure

http://www.env.go.jp/chemi/rhm/conf/conf01-09/ref04.pdf

○10th (August 27th, 2014)

Proceedings

(1) Reform of Health Management based on Health Risk Assessment

<Hearing>

Dr. Seiji Yasumura (Fukushima Health Management Survey)

Dr. Hokuto Hoshi (Fukushima Health Management Survey)

Documents

Document 1: Overview of Fukushima Health Management Survey and Current Measures of Health Check-ups and Health Screening in population

http://www.env.go.jp/chemi/rhm/conf/conf01-10/mat01.pdf

Document 2: Statistics in use to understand the frequency of diseases in population
http://www.env.go.jp/chemi/rhm/conf/conf01-10/mat02.pdf
Document 3: Main Discussion Points related to Reform of Health Management (Draft)
http://www.env.go.jp/chemi/rhm/conf/conf01-10/mat03.pdf

(Reference)
Reference 1: Overview of "Fukushima Health Management Survey"
http://www.env.go.jp/chemi/rhm/conf/conf01-10/ref01.pdf
Reference 2: Document of 16th "Fukushima Health Management Survey" Examination Committee
http://www.env.go.jp/chemi/rhm/conf/conf01-10/ref02.pdf
Reference 3: Report of Results in "Fukushima Health Management Survey" (Reference in 7th Meeting)
http://www.env.go.jp/chemi/rhm/conf/conf01-10/ref03.pdf
Reference 4: Overview of WHO Health Effect Report (Reference in 9th Meeting)
http://www.env.go.jp/chemi/rhm/conf/conf01-10/ref04.pdf
Reference 5: Rule of Procedure
http://www.env.go.jp/chemi/rhm/conf/conf01-10/ref05.pdf

○11th (September 22nd, 2014)

Proceedings

(1) Overview of Measures related to Health Anxiety in Ministry of the Environment
<Hearing>
Dr. Norita Kawakami (Research Report on Health Anxiety)
Dr. Junko Okubo (Control of Health Anxiety in terms of a Local Public Health Nurse)
(2) Reform of Health Management

Documents

Document 1: Overview of Measures related to Health Anxiety in Ministry of the Environment
https://www.env.go.jp/chemi/rhm/conf/conf01-11/mat01.pdf
Document 2: Discussion Points related to Health Effect of Radiation due to the Nuclear Accident, Reform of Health Management among Residents based on It and others (Draft)
https://www.env.go.jp/chemi/rhm/conf/conf01-11/mat02.pdf
(Document submitted by Dr. Norito Kawakami)
https://www.env.go.jp/chemi/rhm/conf/conf01-11/ext01.pdf

(Reference)

Reference: Rule of Procedure

https://www.env.go.jp/chemi/rhm/conf/conf01-11/ref01.pdf

○12th (October 20th, 2014)

Proceedings

(1) Social and Mental effect caused by Evacuation by the Nuclear Accident, Anxiety and others.

<Hearing>

-Reconstruction Agency (Measures related to Health and Living Support for Victims)

-Ministry of Health, Labour and Welfare (Measures related to Mental Care and Life-style related Disease of Victims)

(2) Interim Report

Documents

Document 1-1: "Basic Direction for Promotion of Measures of Living Support for Victims"

https://www.env.go.jp/chemi/rhm/conf/conf01-12/mat01_1.pdf

Document 1-2: Overview of effort by Authorities related to Health and Living Support for Victims

https://www.env.go.jp/chemi/rhm/conf/conf01-12/mat01_2.pdf

Document 2: Interim Report (Working Draft)

https://www.env.go.jp/chemi/rhm/conf/conf01-12/mat02.pdf

Document 3: Discussion Points toward Interim Report (Except a part of Evaluation of Radiation Dose)

https://www.env.go.jp/chemi/rhm/conf/conf01-12/mat03.pdf

Document 4: Summary of a part of Radiation Dose toward Interim Report

https://www.env.go.jp/chemi/rhm/conf/conf01-12/mat04.pdf

(Reference)

Reference 1: Additional Reference for Document 4 "Summary of a part of Radiation Dose toward Interim Report"

https://www.env.go.jp/chemi/rhm/conf/conf01-12/ref01.pdf

Reference 2: Rule of Procedure

https://www.env.go.jp/chemi/rhm/conf/conf01-12/ref02.pdf

○13th (November 26th, 2014)

Items

(1) Interim Report

Documents

Document 1: Interim Report (Draft)

https://www.env.go.jp/chemi/rhm/conf/conf01-13/mat01.pdf

(Reference)

Reference: Rule of Procedure

https://www.env.go.jp/chemi/rhm/conf/conf01-13/ref01.pdf

○14th (December 18th, 2014)

Items

(1) Interim Report

Document

Document 1: Interim Report (Draft)

https://www.env.go.jp/chemi/rhm/conf/conf01-14/mat01.pdf

(Reference)

Reference: Rule of Procedure

https://www.env.go.jp/chemi/rhm/conf/conf01-14/ref01.pdf

Supplement 3

List of Hearings Completed

※Affiliation and Title is from when the hearing took place

4th Meeting (March 26th, 2014)

Dr. Hisako Sakiyama

<Document> http://www.env.go.jp/chemi/rhm/conf/conf01-04/mat03_1.pdf

Dr. Suminori Akiba

Professor, Graduate School of Medical and Dental Sciences, Kagoshima University

<Document> Consideration of Health Risk of Low Dose of Radiation based on Epidemiological data among human being

http://www.env.go.jp/chemi/rhm/conf/conf01-04/mat03_2.pdf

5th Meeting (April 24th, 2014)

Dr. Kazuo Sakai

Director, Research Center for Radiation Protection, National Institute of Radiological Science

<Document> Report of United Nations Scientific Committee (UNSCEAR) on effect of Nuclear Radiation

"Levels and Effects of Radiation Exposure Due to the Nuclear Accident After the 2011 Great East-Japan Earthquake and Tsunami"

https://www.env.go.jp/chemi/rhm/conf/conf01-05/ext01.pdf

6th Meeting (May 20th, 2014)

Dr. Michiaki Kai

Professor, Environmental Health Science, Oita University of Nursing and Health Sciences (ICRP 4th Committee Member)

<Document> Attitude of ICRP related to action after the Accident

https://www.env.go.jp/chemi/rhm/conf/conf01-06/mat03_2.pdf

Dr. Kotaro Ozasa

Director, Department of Epidemiology, Radiation Effects Research Foundation

<Document> Research on Death Rate among the Atomic Bomb Survivors, the 14th Report 1950–2003: Effect among children of Atomic Bomb Survivor (the 2nd Generation)

https://www.env.go.jp/chemi/rhm/conf/conf01-06/mat03_3.pdf

8th Meeting (July 16th, 2014)

Dr. Koichi Kida

Vice-President, Fukushima Medical Association

<Document> Current Situation and Issues for Victim's Health Support after the Fukushima Nuclear Accident

https://www.env.go.jp/chemi/rhm/conf/conf01-08/ext01.pdf

Dr. Shinzo Kimura

Professor, International Research and Education Center, Dokkyo Medical University

<Document> https://www.env.go.jp/chemi/rhm/conf/conf01-08/ext02.pdf

Dr. Akira Sugenoya

Mayor, Matsumoto City

<Document> Need of Long-term Health Management and Research after the Accident at Fukushima Daiichi Nuclear Power Station: Based on the Status of Health Effects by the Chernobyl Accident and Efforts

https://www.env.go.jp/chemi/rhm/conf/conf01-08/ext03.pdf

Dr. Toshihide Tsuda

Professor, Graduate School of Environmental and Life Science, Okayama University

<Document> Health Effect of Low Dose of Radiation Exposure

https://www.env.go.jp/chemi/rhm/conf/conf01-08/ext04.pdf

Dr. Moriguchi Yuichi

Professor, Graduate School of Engineering, the University of Tokyo

<Document> Possibility of Using Environmental Monitoring Data and the Diffusion Model: Reconstruction of Radiation Exposure Dose in Early-Stage Caused by Short-lived Nuclides

https://www.env.go.jp/chemi/rhm/conf/conf01-08/ext05.pdf

9th Meeting (August 5th, 2014)

Dr. Akira Miyauchi

President, Kuma Hospital, Shinkokai Medical Corporation

<Document> Thyroid Microcarcinoma (Clinical Perspectives for Childhood Thyroid Cancer)

https://www.env.go.jp/chemi/rhm/conf/conf01-09/ext01.pdf

Dr. Shoichiro Tsugane

Director, Research Center for Cancer Prevention and Screening, National Cancer Center

<Document> Points of attention when conducting epidemiological research to prove a relationship between factors and diseases such as cancer

https://www.env.go.jp/chemi/rhm/conf/conf01-09/ext02.pdf

10th Meeting (August 27th, 2014)

Dr. Seiji Yasumura

Professor, School of Medicine, Fukushima Medical University

"Fukushima Health Survey"

Related Documents: Reference 1 https://www.env.go.jp/chemi/rhm/conf/conf01-10/ref01.pdf

Reference 2 https://www.env.go.jp/chemi/rhm/conf/conf01-10/ref02.pdf

Dr. Hokuto Hoshi

Chair, "Fukushima Health Management Survey" Examination Committee

"Fukushima Health Management Survey"

Related Document: Reference 2 https://www.env.go.jp/chemi/rhm/conf/conf01-10/ref02.pdf

11th Meeting (September 22nd, 2014)

Dr. Norito Kawakami

Professor, Graduate school of Medicine, the University of Tokyo

<Document> Research Project of Nuclear Disaster Effect 2013 Fiscal Year (Research Program of Health Effect of Radiation): Result of Research for Understanding of Health Anxiety by Radiation and Development of Methods of Effective actions

https://www.env.go.jp/chemi/rhm/conf/conf01-11/ext01.pdf

Dr. Junko Okubo
Deputy Director and Chief of Community Health, Manager of Health Promotion Division, Health and Welfare Center, Department of Health and Welfare, Fukushima City
"Control of Health Anxiety in Viewpoint of a Local Public Health Nurse"

12th Meeting (October 20th, 2014)

Victims Support Team, Reconstruction Agency

Mental Health and Disability Health Division, Department of Health and Welfare for Persons with Disabilities, Social Welfare and War Victims' Relief Bureau, Ministry of Health, Labour and Welfare

Community Health Office, Cancer Control and Health Promotion Division, Health Service Bureau, Ministry of Health, Labour and Welfare

<Document>Overview of effort by Authorities related to Health and Living Support for Victims
http://www.env.go.jp/chemi/rhm/conf/conf01-12/mat01_2.pdf