Report of the Fukushima Health Management Survey
(FY 2011-2013)

revised version (June 12, 2015)

FUKUSHIMA MEDICAL UNIVERSITY
Message from the Director

Thank you for taking time to think about the Fukushima Health Management Survey.

Fukushima Prefecture has been conducting this comprehensive and scientific survey since June 2011 in response to the Fukushima Daiichi Nuclear Power Plant accident following the Great East Japan Earthquake of 11 March 2011. We aim to monitor and promote the long-term health of Fukushima residents.

Commissioned by Fukushima Prefecture, Fukushima Medical University, which is the only medical university in Fukushima Prefecture, set up the Radiation Medical Science Center to carry out this survey. The center and the prefecture have been advancing the survey by seeking expert advice from the Prefectural Oversight Committee Meeting for the Fukushima Health Management Survey.

Based on the survey results for three years, from fiscal (FY) 2011 through FY 2013 (provisional figures included), we made this booklet to provide the results as of 31 December 2014. It summarizes the Basic Survey, which estimates the external radiation exposure when the air dose rate was highest, and detailed surveys (Comprehensive Health Check, Thyroid Ultrasound Examination, Mental Health and Lifestyle Survey, and Pregnancy and Birth Survey) submitted to the Prefectural Oversight Committee Meeting.

Our center is committed to help the people of Fukushima achieve better health by teaming up with specialists in the university and around the world, and by working in partnership with various institutions. We would appreciate your continued support.

Masafumi Abe
Executive Director,
Radiation Medical Science Center
Fukushima Medical University
The Fukushima Health Management Survey is a project conducted by Fukushima Medical University (FMU) under the initiative of Fukushima Prefecture. Following the release of radioactive materials and evacuation of residents caused by the Fukushima Daiichi nuclear accident, the survey was launched to estimate external exposure of the people in Fukushima Prefecture, which is essential for prevention, early detection and treatment of diseases. The goal is to protect and promote the long-term health of Fukushima residents.

Outline of the Fukushima Health Management Survey

**Estimating the Radiation Dose (Basic data)**

**Basic Survey**
- Group: Residents and visitors of Fukushima Prefecture as of 11 March 2011
- Method: Self-administered questionnaire
- Content: Recorded movements from 11 March 2011 onward (Radiation dose estimates)

**Long-term Health Management**

**Health Management File**
- Keeping the health checkup records by participants
- Providing information on radiation

**Database System**
- Promoting long-term health of the residents
- Informing and guiding future generations

**Fukushima Health Management Survey (For all Fukushima residents)**

**Monitoring the Health of the Residents**

**Detailed Surveys**

**Thyroid Ultrasound Examination**
- Group: Residents aged 18 years or younger as of 11 March 2011
- Content: Thyroid ultrasound examination

**Comprehensive Health Check (Including conventional health exams)**
- Group: Residents of evacuation zones
- Content: General health checkup items with differential white blood count and others
  - Regular health exams and cancer screening organized by employer or municipality can help detect and treat diseases.

**Comprehensive Health Check (For the residents ineligible for conventional health exams)**

**Mental Health and Lifestyle Survey** (For residents of evacuation zones using survey questionnaire)

**Pregnancy and Birth Survey** (For residents who were issued Maternal and Child Health Handbook using survey questionnaire)

Japan’s fiscal and academic year begins April 1.
Purpose

The purpose of the survey is to enable the residents to understand their individual radiation dose as basic data, and to help manage their long-term health.

Those Surveyed

- Officially registered residents of Fukushima Prefecture between 11 March and 1 July 2011
- Residents of other prefectures who stayed, worked or studied in Fukushima between 11 March and 1 July 2011 (upon request)
- Visitors to the prefecture between 11 and 25 March 2011 (upon request)

Outline

The participants are asked about their whereabouts from 11 March through 11 July 2011, in order to estimate the individual external exposure when atmospheric radiation dose was highest.

After the Survey

The survey result is mailed to participants.

Results

Response Rates

The overall effective response rate to the Basic Survey is 27.0% as of 31 December 2014. A simplified questionnaire was distributed to people who stayed in place or moved only once after 11 March 2011. Since it was introduced in November 2013, the number of responses increased more than 60,000 especially in the Aizu area.

Results of Radiation Dose Estimates

Doses have been estimated for about 449,000 respondents excluding radiation workers. The results suggest that 99.8% of respondents received <5 mSv and the maximum value was 25 mSv. (See the table below.)

Evaluation of the Results

Since previous epidemiological studies indicate no significant health effects at doses <100 mSv, we concluded that radiation doses estimated so far are unlikely to cause adverse effects on health, although this conclusion is based on effective doses estimated only for the first four months following the accident.


### Estimated external radiation doses (preceding and full-scale surveys)

<table>
<thead>
<tr>
<th>Effective Dose (mSv)</th>
<th>Total</th>
<th>Excluding radiation workers</th>
<th>Kempoku*</th>
<th>Kenchu</th>
<th>Kessen</th>
<th>Aiiz</th>
<th>Minami-aiiz</th>
<th>Soso**</th>
<th>Iwaki</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>284,668</td>
<td>279,118</td>
<td>24,590</td>
<td>20.2%</td>
<td>55,961</td>
<td>51.6%</td>
<td>24,353</td>
<td>88.4%</td>
<td>43,496</td>
</tr>
<tr>
<td>1-2</td>
<td>144,618</td>
<td>142,344</td>
<td>81,671</td>
<td>67.0%</td>
<td>44,184</td>
<td>40.8%</td>
<td>3,182</td>
<td>11.5%</td>
<td>279</td>
</tr>
<tr>
<td>2-3</td>
<td>24,954</td>
<td>24,597</td>
<td>15,057</td>
<td>12.4%</td>
<td>7,827</td>
<td>7.2%</td>
<td>17</td>
<td>0.1%</td>
<td>21</td>
</tr>
<tr>
<td>3-4</td>
<td>1,532</td>
<td>1,457</td>
<td>457</td>
<td>0.4%</td>
<td>413</td>
<td>0.4%</td>
<td>0</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>4-5</td>
<td>537</td>
<td>495</td>
<td>39</td>
<td>0.0%</td>
<td>5</td>
<td>0.0%</td>
<td>0</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>5-6</td>
<td>429</td>
<td>376</td>
<td>18</td>
<td>0.0%</td>
<td>3</td>
<td>0.0%</td>
<td>0</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>6-7</td>
<td>265</td>
<td>227</td>
<td>10</td>
<td>0.0%</td>
<td>1</td>
<td>0.0%</td>
<td>0</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>7-8</td>
<td>151</td>
<td>114</td>
<td>1</td>
<td>0.0%</td>
<td>0</td>
<td>–</td>
<td>0</td>
<td>–</td>
<td>1</td>
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<tr>
<td>8-9</td>
<td>113</td>
<td>73</td>
<td>1</td>
<td>0.0%</td>
<td>0</td>
<td>–</td>
<td>0</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>9-10</td>
<td>69</td>
<td>39</td>
<td>0</td>
<td>–</td>
<td>0</td>
<td>–</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>10-11</td>
<td>66</td>
<td>34</td>
<td>0</td>
<td>–</td>
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<td>–</td>
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<tr>
<td>11-12</td>
<td>52</td>
<td>31</td>
<td>0</td>
<td>–</td>
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<td>–</td>
<td>0</td>
<td>–</td>
<td>0</td>
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<td>12-13</td>
<td>36</td>
<td>13</td>
<td>0</td>
<td>–</td>
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<td>0</td>
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<td>13-14</td>
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<td>12</td>
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<td>–</td>
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<td>–</td>
<td>0</td>
<td>–</td>
<td>0</td>
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<tr>
<td>14-15</td>
<td>27</td>
<td>6</td>
<td>0</td>
<td>–</td>
<td>0</td>
<td>–</td>
<td>0</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>≥15</td>
<td>108</td>
<td>12</td>
<td>0</td>
<td>–</td>
<td>0</td>
<td>–</td>
<td>0</td>
<td>–</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>457,859</td>
<td>448,948</td>
<td>27,552</td>
<td>100.0%</td>
<td>43,798</td>
<td>100.0%</td>
<td>4,706</td>
<td>100.0%</td>
<td>71,101</td>
</tr>
</tbody>
</table>

**Excluding those with estimation period less than four months.**

*percentages have been rounded and may not total to 100%.

### Mean Value

- Max: 66 mSv
- Mean Value: 0.9 mSv

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As of 31 December 2014

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*Including Yamakiya of Kawamata.
**Including Namie and Iitate.

The table provides the distribution of estimated radiation doses by area, with Kempoku* and Kenchu being the largest contributors to radiation exposure. The data is useful for understanding the radiation exposure levels experienced by residents in different areas of Fukushima Prefecture.
Purpose
One of the health problems caused by the Chernobyl nuclear power plant accident was thyroid cancer in childhood caused by internal exposure to radioactive iodine. Since the exposure level in Fukushima Prefecture caused by the nuclear accident in 2011 was lower than in Chernobyl, it is unlikely to cause adverse effects on health. However, we launched a Thyroid Ultrasound Examination Program to address long-term health concerns by understanding the condition of their thyroid glands. Started from October 2011, the examination will continue regularly.

Those Surveyed
Residents of Fukushima Prefecture born between 2 April 1992 and 1 April 2012

Outline
Following the Initial Screening, which was finished in March 2014, Full-scale Thyroid Screening was started in April 2014 and it will continue every two years until the age of 20 and every 5 years thereafter.

The time between the exams is subject to review at the Prefectural Oversight Committee Meeting.

Procedure
Primary examination started as a baseline survey aiming to check for people who require detailed examination.

As a confirmatory examination, we conduct advanced ultrasonography, urine test, blood test, and fine-needle aspiration cytology (FNAC) if needed. Participants who were recommended for watchful waiting or treatment are referred to their doctors for diagnosis covered by health insurance.

Diagnostic Criteria of Primary Examination

Thyroid Ultrasound Examination 1 (Number of Participants: About 385,000)

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Expansion of responsible organizations in Fukushima Prefecture

Sessions in the Past

Expansion of responsible organizations outside the prefecture

Content

A cyst is a sac-like structure filled with liquid in the thyroid gland, which is benign and often found in healthy individuals. It contains no cells inside and does not lead to cancer. Many people have cysts which may change in size and number frequently. Previous surveys found that cysts are prevalent among teenagers and not in early childhood.

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A nodule is a growth of thyroid cells. While some can be cancerous, most nodules are benign. Participants with nodules ≤ 5.0 mm may be classified as B when clinically indicated.

Most thyroid nodules have been known to be harmless over a lifetime. They are ≤ 5.0 mm in size and not generally recommended for advanced examination like FNAC, since it is not beneficial for patients. Based on that, we have decided for the survey that children with nodules ≤ 5.0 mm nodules should not receive the confirmatory examination but are recommended for watchful waiting until they undergo the next ultrasonography (Primary Examination) in two to five years.

Children thyroid cancer cases found in Fukushima Prefecture are unlikely to be the result of the radiation exposure after 11 March 2011 considering the following factors:

1. Few thyroid cancer cases are found among younger children who are at high risk of suffering damage from radiation exposure.
2. There is no difference in the proportion of thyroid cancer cases among Hamadori, Nakadori, and Aizu area at this point.
3. The exposure level in Fukushima Prefecture turned out to be low. However, it is important for the residents to regularly undergo the thyroid ultrasound examination in the long run to ensure the low-dose radiation exposure does not affect their health.

Thyroid Ultrasound Examination Services

▶ Expansion of responsible organizations in Fukushima Prefecture

▶ Expansion of responsible organizations outside the prefecture

Summary of the Results of Initial Screening

Briefing Session for the Residents

Thyroid Ultrasound Examination Services

You can choose the venue

Public Facilities

Medical Institutions inside the prefecture

You can choose the venue

Public Facilities

Medical Institutions inside the prefecture

There are more than 95 medical institutions that conduct the examination outside the prefecture as of 28 February 2015.

You can choose the venue

Public Facilities

Medical Institutions inside the prefecture

You can choose the venue

Public Facilities

Medical Institutions inside the prefecture

There are more than 95 medical institutions that conduct the examination outside the prefecture as of 28 February 2015.

Undergoing the examination within or outside the prefecture requires reservation beforehand with the Radiation Medical Science Center.

*Further expansion is planned.

Group

The briefing session is for the children, parents and teachers of nursery schools, elementary schools, middle schools and high schools in the prefecture. Class time can be spent for the session at elementary schools (for seniors), middle schools and high schools.

▶ Content

A 90-minute session including questions and answers is provided by physicians explaining the details of the survey and the effects of radiation.

▶ Sessions in the Past

In FY 2013, there were 88 sessions with 3,993 participants. In FY 2014, 2,586 residents participated in 49 sessions as of 28 February 2015. In total, 6,579 people have participated in 137 sessions so far.
After the Exams

System

Children aged 15 and younger and people living outside the prefecture aged 16 and older undergo individual health exams every year at medical institutions. For residents within the prefecture aged 16 and older, health checkups are performed by either of the following methods:

1. Additional checkup items are included in Special Health Checkups and health exams organized by municipalities.
2. Group physical examinations organized by FMU.
3. Individual health exams conducted at medical institutions within the prefecture.

Those Surveyed

Residents of nationally designated evacuation zones as of 2011 and those who were recommended to have follow-up based on the results of the Basic Survey.

Outline

Examination Items

Examination items differ according to age. In addition to the general checkup items, differential white blood count is used to help diagnose various illnesses such as infectious disease, allergies, leukemia and cancer.

Blood tests are conducted for participants aged 15 and younger. Biochemistry tests are available to those of primary school age and older on request.

Purpose

The nuclear accident in 2011 led to a large-scale evacuation of residents in surrounding areas, especially the nationally designated evacuation zones. Many evacuees have since been concerned about their health due primarily to the sudden and notable changes in their lifestyle, diet and exercise habits, in addition to the loss of opportunity to undergo conventional health checkups.

We started Comprehensive Health Check to promote the health of all residents of the evacuation zones by ensuring that they understand their current health status, which is essential not only for prevention of lifestyle diseases, but also for early detection and early treatment of various illnesses.

Results

Comparing results with data of Special Health Checkups organized by municipalities and Health Checks for the Elderly² collected before 11 March 2011, proportion of people with obesity, impaired glucose tolerance, hepatic dysfunction, and hypertension increased. (See the table below.)

2) The group of the data and the Comprehensive Health Check are not the same.

Changes in the Results of Comprehensive Health Check

<table>
<thead>
<tr>
<th>Year</th>
<th>Obesity* (BMI &gt; 25 kg/m²)</th>
<th>Impaired glucose tolerance** (HbA1c &gt; 6.5%) Male</th>
<th>Hypertension (Systolic pressure of 140 mmHg) Male</th>
<th>Hypertension (Diastolic pressure of 90 mmHg) Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2008</td>
<td>30%</td>
<td>41%</td>
<td>4.3%</td>
<td>16.4%</td>
</tr>
<tr>
<td>FY 2009</td>
<td>30%</td>
<td>45%</td>
<td>4.0%</td>
<td>15.4%</td>
</tr>
<tr>
<td>FY 2010</td>
<td>30%</td>
<td>44%</td>
<td>3.8%</td>
<td>15.7%</td>
</tr>
<tr>
<td>FY 2011</td>
<td>42%</td>
<td>7.0%</td>
<td>11.0%</td>
<td>19.7%</td>
</tr>
<tr>
<td>FY 2012</td>
<td>38%</td>
<td>5.1%</td>
<td>7.7%</td>
<td>15.8%</td>
</tr>
</tbody>
</table>

(Comparing results with data of Special Health Checkups organized by the municipalities of nationally designated evacuation zones and Health Checks for the Elderly. The group of the data and the Comprehensive Health Check are not the same.)

*Body mass index (BMI) is a measure of body fat based on height and weight used to predict metabolic syndrome.

**HbA1c refers to glycated hemoglobin used for diagnosing diabetes. Measuring HbA1c shows what the average blood sugar levels have been over a period of months.

HbA1c 6.5 % and above is the criteria established by Japan Diabetes Society (JDS) before March 2012.

***An arterial amino transferase (ALT) is an enzyme found in the liver. ALT is measured to see if the liver is damaged or diseased.
Mental Health and Lifestyle Survey (Number of Participants: About 210,000)

**Purpose**

Since the Great East Japan Earthquake and the Fukushima Daiichi nuclear accident in 2011, many people in Fukushima Prefecture seem to feel anxious and stressed by the experience and evacuation. Our goal is to comprehend physical and mental health and lifestyle of the residents so that we can provide them with mental health care and lifestyle services. The survey also aims to establish better mental health care for future generations especially in disaster and emergency situations.

**Those Surveyed**

Residents of nationally designated evacuation zones as of 2011.

- [Evacuation zones](#) All parts of Tamura city, Minami-soma city, Kawauchi town, Hida town, Naraha town, Tomioka town, Kawasaki village, Okuma town, Futaba town, Namie town, Kata no village, Istia village and parts of Date city (belonging to designated evacuation areas)

**Outline**

Survey forms are mailed to participants according to their age. There are five different age groups:

- 0 to 3 years
- 4 to 6 years
- Primary school age
- Middle school age
- Adult

**Support after the Survey**

The Mental Health Support Team, consisting of clinical psychiatrists, public health nurses and other professionals, will provide phone support to respondents determined to require counseling or support for mental health or lifestyle problems. (See the figure below.)

Participants requiring continued support are connected to their municipal government or registered physicians.

**Flowchart**

Continuous Support for Participants

- Participants who require lifestyle support
- Participants who require or wish for examination by a doctor
- Participants determined to require further professional mental health care

**Results**

(Data of FY 2013 are preliminary figures as of 28 February 2014.)

### 1. Lifestyle of people aged 16 and older

After the disaster in 2011, the survey showed an increase in residents with +3 kg weight gain, less physical activity, and less satisfactory sleep. However, until FY 2013, people who made better lifestyle choices—whether smoking less, exercising more or sleeping better—have slowly been increasing. Some participants who drank more alcohol or slept less after the disaster may still be dealing with post-traumatic stress.

### 2. Mental health of people aged 16 and older

The proportion of respondents who required mental health support has been decreasing over the years. However, compared with the national average of about 3% at normal times, there are more than three times as many people who showed signs of mood disorder or anxiety disorder. Nearly 2% of participants possibly continue to have post-traumatic reaction caused by the nuclear disaster.

### 3. Mental health of children

Compared with the survey for FY 2011, the proportion of children who required support has decreased except for the males of middle school age. Compared with the survey results of children living in less affected areas, however, figures of children of all ages were still higher. When providing mental health care to children, it is important to talk to them frequently, give them a message of care and support, recognize the changes in their health and behavior, and take into account the family and school situations.
Pregnancy and Birth Survey

The purpose of the survey is to address the anxiety women and mothers in Fukushima Prefecture have, and provide necessary support through assessing their physical and mental health. The survey also aims to improve perinatal care in the prefecture by listening to their needs and expectations.

Those Surveyed

These who receive Maternal and Child Health Handbooks from municipal offices in Fukushima Prefecture, and those who had the handbooks issued during the same period in other prefectures but received antenatal care or delivered babies in Fukushima.

Outline

Survey forms are mailed to participants.

Survey Items
- Mental health of mothers
- Living environment (evacuation or family living apart)
- Pregnancy outcome or health status of pregnant women
- Confidence in child rearing
- Family planning

Support after the Survey

In order to address the anxiety of the respondents, midwives and public health nurses provided counseling via telephone or email to respondents who were screened to be in need of support.

Changes in Births and Natality

Number of people who became pregnant or gave birth in the prefecture decreased temporarily, but increased in FY 2013 from a year earlier.

Preterm deliveries, Low birth weight infants, Congenital anomalies

While preterm deliveries, low birth weight infants, congenital anomalies are some of the concerns the residents have over radiation, results from the surveys for FY 2011-2013 showed the similar trend to national survey and generally reported incidence.

Changes in Sources of Nourishment

Number of people who feed their children breast milk before weaning has been increasing compared with FY 2011.

Changes in the Numbers of Mothers with Depressive Symptoms

Number of participants who checked YES to both or either of the following questions has gradually been decreasing:
- Have you often been feeling down or depressed for the past month?
- Have you lost interest in activities or found things unpleasurable for the past month?

Telephone Counseling

We provide telephone support to over 1,000 participants every fiscal year. The concern over radiation was the most common issue raised among them after 11 March 2011, but the content of consultation has changed over the years.

<table>
<thead>
<tr>
<th>(%)</th>
<th>FY 2011</th>
<th>FY 2012</th>
<th>FY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety over radiation or effects of radiation</td>
<td>29.2%</td>
<td>33.4%</td>
<td>42.5%</td>
</tr>
<tr>
<td>Mental or physical health of mothers</td>
<td>20.2%</td>
<td>26.7%</td>
<td>38.7%</td>
</tr>
<tr>
<td>Child rearing (baby food, nighttime crying, constipation, vaccination)</td>
<td>14.0%</td>
<td>23.7%</td>
<td>20.3%</td>
</tr>
<tr>
<td>Mental or physical health of children</td>
<td>27.1%</td>
<td>25.5%</td>
<td>24.5%</td>
</tr>
</tbody>
</table>

Figures in the brackets are the proportion of preterm deliveries and incidence of low birth weight infants reported in the Vital Statistics conducted by Ministry of Health, Labour and Welfare for the same fiscal year.

*Figures in the brackets are the generally reported incidence of congenital anomalies.
With over 1,000 visits per month, our homepage is a key way of finding out data published by Fukushima Medical University, directing you quickly to the information you need. Progress of the Fukushima Health Management Survey is reported quarterly by the Fukushima Prefectural Government. English summaries follow within about a month. The What's New section on the main page keeps you up-to-date with news from Fukushima, including international conference and workshop announcements and proceedings.