

# Report of the Fukushima Health Management Survey



revised version (February 17, 2016)



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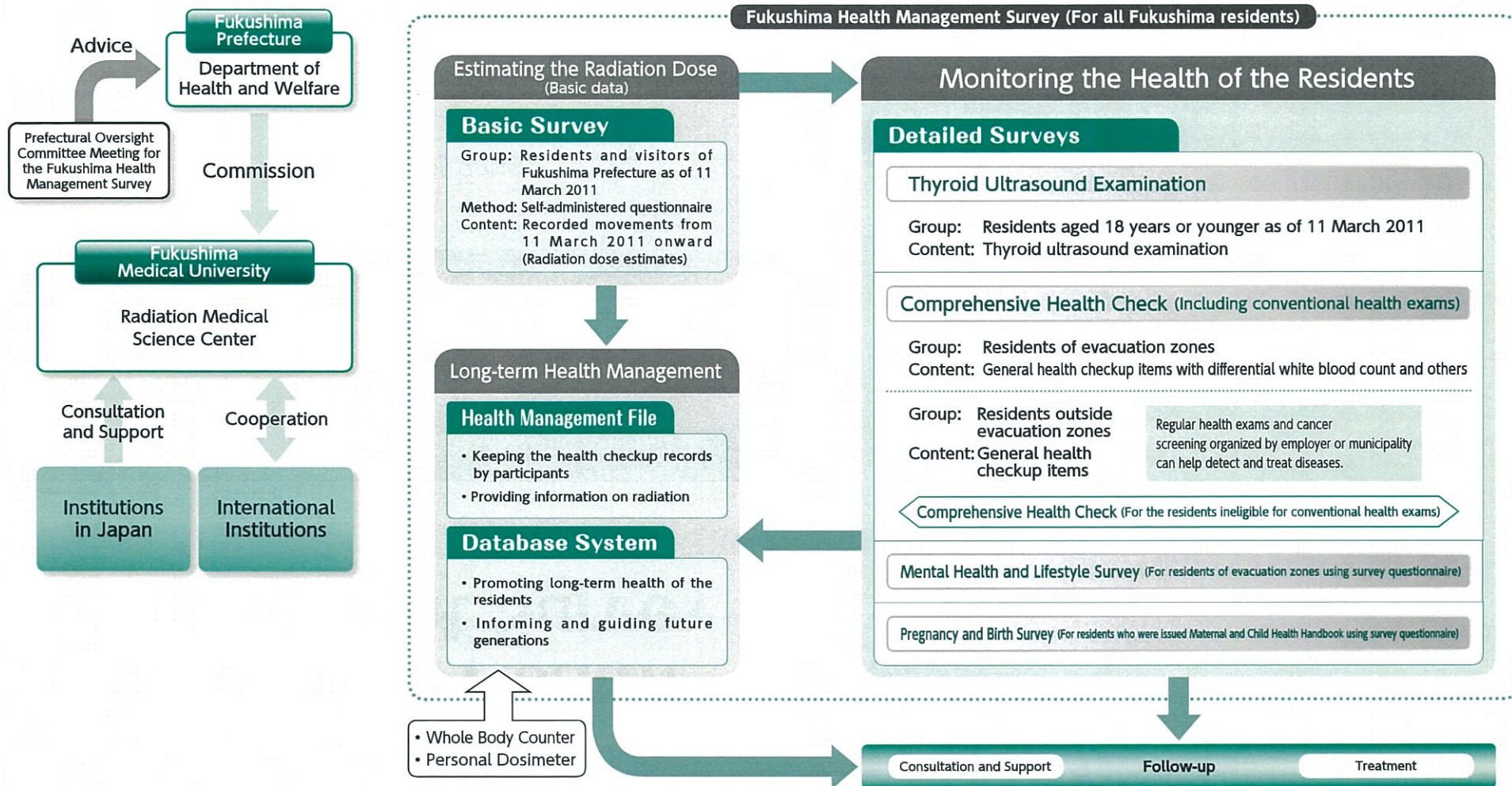
# Fukushima

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# Outline of the Fukushima Health Management Survey

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.



# Basic Survey (Number of Participants: About 2,060,000)

## 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 27.4% as of 31 December 2015. 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 70,000 especially in the Aizu area.

### ► Results of Radiation Dose Estimates

Doses have been estimated for about 460,000 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<sup>1</sup> 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.

1) Sources and effects of ionizing radiation, United Nations Scientific Committee on the Effects of Atomic Radiation, UNSCEAR 2008 Report to the General Assembly, with scientific annexes

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

As of 31 December 2015

Effective Dose (mSv)	Total	Excluding radiation workers				By area (excluding radiation workers)													
						Kempoku*		Kenchu		Kennan		Aizu		Minami-aizu		Soso**		Iwaki	
		<1	291,093	285,418	62.1%	93.8%	99.8%	24,853	20.1%	57,643	51.5%	25,460	88.2%	44,456	99.3%	4,837	99.3%	55,661	77.3%
1-2	148,178	145,845	31.7%			83,056	67.0%	45,780	40.9%	3,386	11.7%	300	0.7%	34	0.7%	12,658	17.6%	631	0.9%
2-3	25,769	25,396	5.5%			15,499	12.5%	8,138	7.3%	17	0.1%	25	0.1%	0	—	1,687	2.3%	30	0.0%
3-4	1,571	1,491	0.3%	5.8%		468	0.4%	423	0.4%	0	—	1	0.0%	0	—	595	0.8%	4	0.0%
4-5	550	504	0.1%			40	0.0%	5	0.0%	0	—	0	—	0	—	458	0.6%	1	0.0%
5-6	441	389	0.1%	0.2%		19	0.0%	3	0.0%	0	—	0	—	0	—	366	0.5%	1	0.0%
6-7	268	230	0.1%			10	0.0%	1	0.0%	0	—	1	0.0%	0	—	218	0.3%	0	—
7-8	155	116	0.0%	0.1%	0.2%	1	0.0%	0	—	0	—	0	—	0	—	115	0.2%	0	—
8-9	118	78	0.0%			1	0.0%	0	—	0	—	0	—	0	—	77	0.1%	0	—
9-10	72	41	0.0%			0	—	0	—	0	—	0	—	0	—	41	0.1%	0	—
10-11	69	36	0.0%			0	—	0	—	0	—	0	—	0	—	36	0.1%	0	—
11-12	52	30	0.0%	0.0%		1	0.0%	0	—	0	—	0	—	0	—	29	0.0%	0	—
12-13	37	13	0.0%		0.0%	0	—	0	—	0	—	0	—	0	—	13	0.0%	0	—
13-14	34	12	0.0%			0	—	0	—	0	—	0	—	0	—	12	0.0%	0	—
14-15	27	6	0.0%			0	—	0	—	0	—	0	—	0	—	6	0.0%	0	—
≥15	314	15	0.0%	0.0%	0.0%	0	—	0	—	0	—	0	—	0	—	15	0.0%	0	—
Total	468,748	459,620	100.0%	100.0%	100.0%	123,948	100%	111,993	100%	28,863	100%	44,783	100%	4,871	100%	71,987	100%	73,175	100%
Max	66 mSv	25 mSv				11 mSv		6.3 mSv		2.6 mSv		6.0 mSv		1.9 mSv		25 mSv		5.9 mSv	
Mean Value	0.9 mSv	0.8 mSv				1.4 mSv		1.0 mSv		0.6 mSv		0.2 mSv		0.1 mSv		0.8 mSv		0.3 mSv	

\*Including Yamakiya of Kawamata.

\*\*Including Namie and Iitate.

Percentages have been rounded and may not total to 100%.  
Excluding those with estimation period less than four months.

# Thyroid Ultrasound Examination 1 (Number of Participants: About 382,000)

## 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

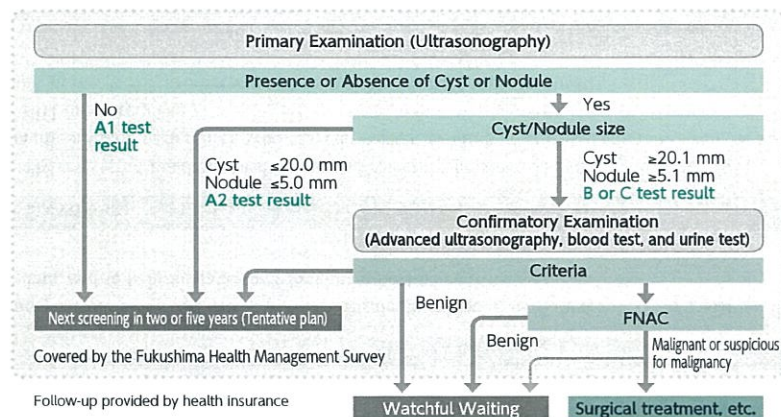
### Schedule

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 at 5 year milestones thereafter. We will endeavor to make sure that no more than 5 years pass between examinations.

### 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

Ultrasound images captured at the primary examination are reviewed by a committee consisting of specialists, physicians responsible for the exam, and radiological technologists. Some A2 test results were classified as B, with advice to take the confirmatory examination if they were considered suspicious of malignancy based on the image regardless of the size.

Mixed cystic-solid nodule is classified as "nodule" in the survey.

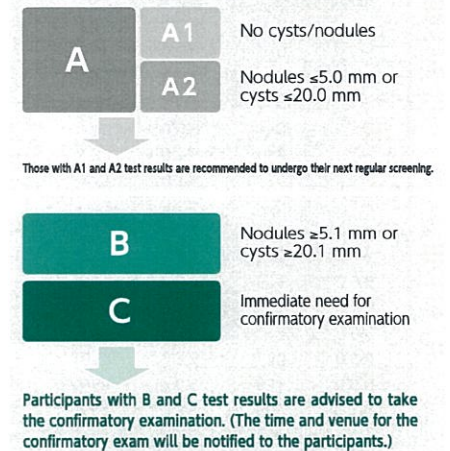
In this case, the size of the cyst is recorded instead of the nodule inside. So if a nodule of 3 mm was found in a 7 mm cyst, the participant is categorized as B with nodule ≤5.1 mm.

We have a wider range of diagnostic criteria of suspicious for malignancy in order not to miss a tiny size.

## After the Survey

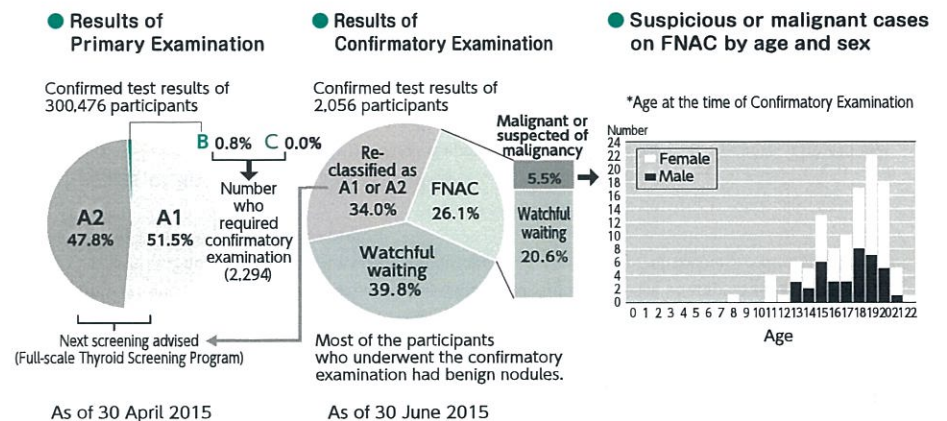
The survey result is mailed to participants informing them about whether they had cysts or nodules and the approximate size if they had any.

## Definition of Diagnostic Criteria



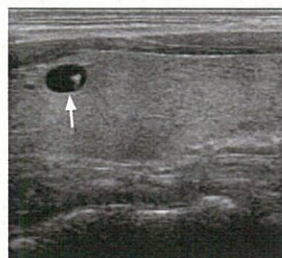
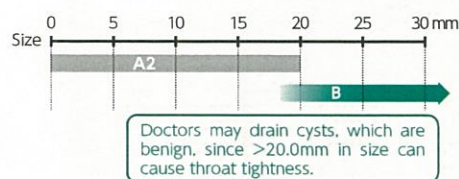
## Results

### Results of Initial Screening

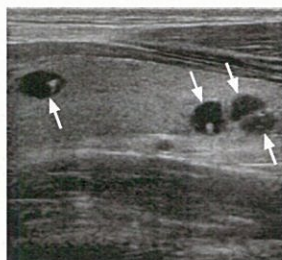


## Cyst

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.



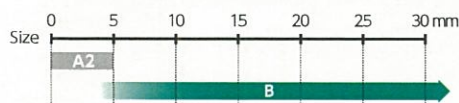
Cyst (Single)



Cysts (Multiple)

## Nodule

A nodule is a growth of thyroid cells. While some can be cancerous, most nodules are benign. Participants with nodules  $\leq 5.0$  mm may be classified as A2 when clinically indicated.



Nodule

Most thyroid nodules have been known to be harmless over a lifetime. They are  $\leq 5.0$  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  $\leq 5.0$  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.

## Summary of the Results of Initial Screening

Childhood 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

- In case you missed the ultrasound exam at schools-
- In case you missed the scheduled date of the exam-
- In case you are living outside the prefecture but want to undergo the exam in Fukushima-

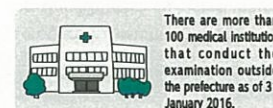
#### You can choose the venue



### ► Briefing on the result of primary examination

Since July 2015, when examinations are held at public facilities, we've had a booth to offer personal explanations to participants about their examination results. When requested, a physician explains the ultrasound image and its preliminary interpretation. Where a booth cannot be set up, alternatives, including telephone counseling, are offered.

### ► Expansion of responsible organizations outside the prefecture



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

## Visiting Lectures for Students and Briefing Sessions for Residents

### ► Target Groups

Visiting Lectures: Grade 5 elementary school students through high school (ages 11 to 18) in Fukushima Prefecture. Visiting Briefing Sessions: Parents and teachers of students in nursery/kindergarten, elementary, junior and senior high schools in Fukushima Prefecture.

### ► Content

A physician explains the thyroid examination and effects of radiation to the thyroid.

A 45- to 60-minute lecture, or a 90-minute session including questions and answers, is provided.

### ► Previous Activity

As of February 17, 2016, we have conducted 63 lectures and sessions (33 and 30 respectively) in FY 2015 (from April 2015 to March 2016). In the period from April 2013 to February 2016, we had 203 lectures and sessions with 10,048 participants.



Briefing Session

# Comprehensive Health Check (Number of Participants: About 210,000)

## 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.

## 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.

[Evacuation zones]

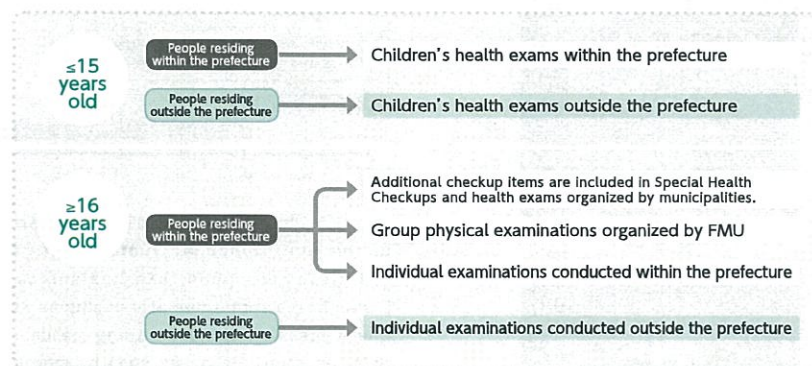
All parts of Tamura city, Minami-soma city, Kawamata town, Hirono town, Naraha town, Tomioka town, Kawauchi village, Okuma town, Futaba town, Namie town, Katsurao village, Iitate village and parts of Date city (belonging to designated evacuation areas)

## Outline

### ► 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.



### ► Examination Items

Examination items differ according to age. In addition to the general checkup items, differential white bloodcount 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.

Age	Examination Item
0-6 years old (Preschool children and infants)	Height, weight, CBC (Number of red blood cells, hematocrit, hemoglobin, platelet count, number of white blood cells, differential white blood count.)
7-15 years old (From 1st to 9th grade)	Height, weight, blood pressure, CBC (Number of red blood cells, hematocrit, hemoglobin, platelet count, number of white blood cells, differential white blood count.) [Additional items on request] Blood biochemistry (AST, ALT, $\gamma$ GT, TG, HDL-C, LDL-C, HbA1c, plasma glucose, serum creatinine, uric acid)
16 years old and older	Height, weight, BMI (abdominal circumference), blood pressure, CBC (Number of red blood cells, hematocrit, hemoglobin, platelet count, number of white blood cells, differential white blood count.), Urinary test (urinary sugar, urine protein, urine occult blood), Blood biochemistry (AST, ALT, $\gamma$ GT, TG, HDL-C, LDL-C, HbA1c, plasma glucose, serum creatinine, estimated glomerular filtration rate [eGFR], uric acid) The underlined values are not routinely measured during regular health exams.

### ► After the Exams

The result of the health exam is mailed to participants. Participants aged 15 years and younger can have a briefing from physicians at medical institutions.

## Results

Comparing results with data of Special Health Checkups organized by municipalities and Health Checks for the Elderly<sup>2</sup> collected before 11 March 2011, proportion of people with obesity, impaired glucose tolerance, hepatic dysfunction, and hypertension increased. (See the table below.)

<sup>2</sup> The group of the data and the Comprehensive Health Check are not the same.

### ● Changes in the Results of Comprehensive Health Check

Drawn from the 12th Prefectural Oversight Committee Meeting for the Fukushima Health Management Survey.

	Obesity* (BMI $\geq 25$ kg/m <sup>2</sup> )		Impaired glucose tolerance** (HbA1c $\geq 6.5\%$ )		Hepatic dysfunction*** (ALT of $\geq 51$ U/L)		Hypertension (Diastolic pressure of $\geq 90$ mmHg)	
	Male	Female	Male	Female	Male	Female	Male	Female
FY 2008	30%	31%	4.1%	2.9%	4.3%	1.8%	16.4%	11.6%
FY 2009	30%	30%	4.5%	2.8%	4.0%	1.8%	15.4%	9.6%
FY 2010	30%	28%	4.4%	2.7%	3.8%	1.7%	15.7%	10.3%
FY 2011	42%	34%	7.0%	3.4%	11.0%	4.4%	19.7%	11.6%
FY 2012	38%	33%	5.1%	2.7%	7.7%	3.9%	15.8%	10.1%

(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 alanine aminotransferase (ALT) is an enzyme found in the liver. ALT is measured to see if the liver is damaged or diseased.

## 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 medical care, health care and welfare 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, Kawamata town, Hirono town, Naraha town, Tomioka town, Kawauchi village, Okuma town, Futaba town, Namie town, Katsurao village, Iitate village and parts of Date city (belonging to designated evacuation areas)

## Outline

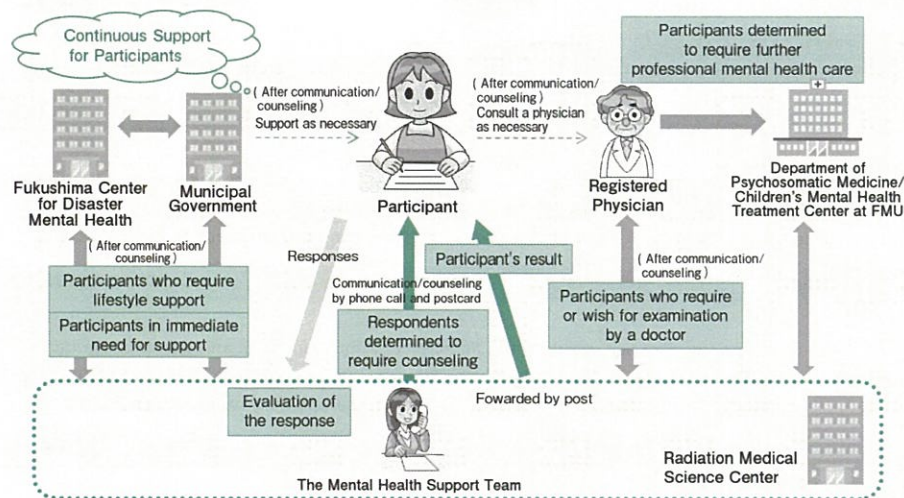
Survey forms are mailed to participants according to their age. There are five different age groups (0 to 3 years, 4 to 6 years, primary school age, middle school age, and adults).

## ► 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



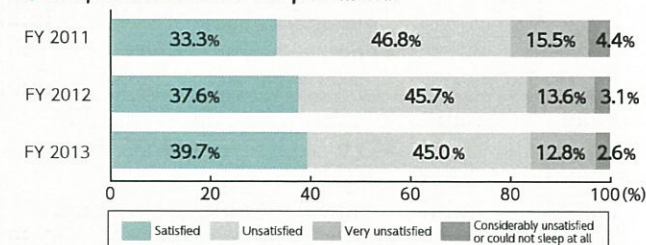
## Results

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

After the disaster in 2011, the survey showed an increase in residents with  $\geq 3$  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.

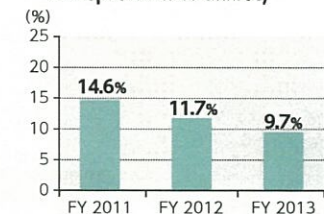
### ● Sleep satisfaction for the past month



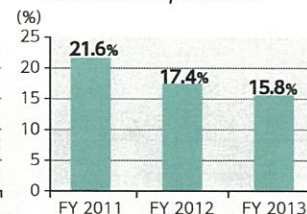
### 2. Mental health of people aged 16 and older

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.

### ● Proportion of participants who required support in regard to depression or anxiety



### ● Proportion of participants who required support in regard to post-traumatic reaction caused by the disaster

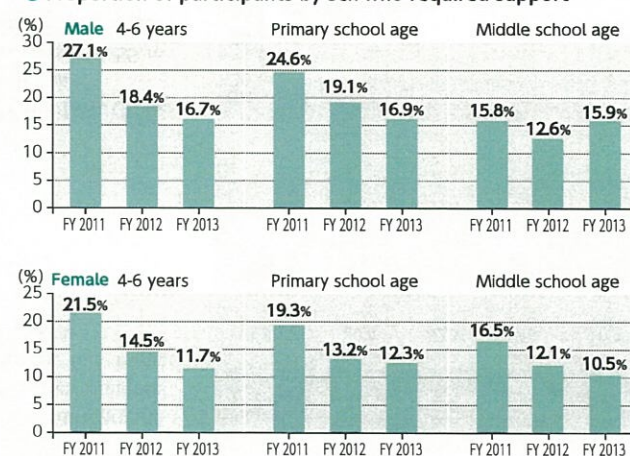


### 3. Mental health of children

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.

### ● Proportion of participants by sex who required support



# Pregnancy and Birth Survey

## Purpose

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

Those who received 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 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, public health nurses and etc 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.

### Rate of preterm deliveries, Rate of low birth weight infants, Rate of 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.

#### Participants

Radiation Medical Science Center for the  
Fukushima Health Management Survey,  
Fukushima Medical University



Number of participants in FY 2011	16,001	Response rates: 58.2%
Number of participants in FY 2012	14,516	Response rates: 49.5%
Number of participants in FY 2013	15,218	Response rates: 47.7%
Number of participants in FY 2014	15,125	Response rates: 47.2%

	Rate of preterm deliveries	Rate of low birth weight infants	Rate of congenital anomalies
FY 2011	4.75 (5.7)	8.9 (9.6)	2.85
FY 2012	5.74 (5.7)	9.6 (9.6)	2.39
FY 2013	5.40 (5.8)	9.9 (9.6)	2.35
FY 2014	5.43 (5.7)	10.1 (9.5)	2.30

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.

## Changes in Sources of Nourishment

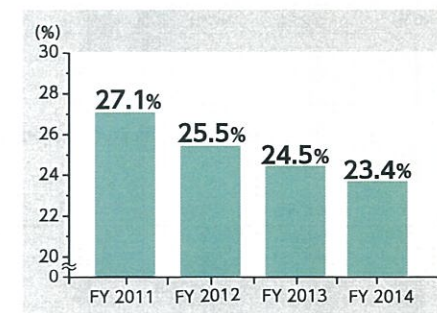
Number of people who feed their children breast milk before weaning has been increasing compared with FY 2011.

	Breastfeeding only	Breast and bottle feeding combined	Bottle feeding only	None - Invalid answer
FY 2011	30.4	62.3	7.0	0.3
FY 2012	35.2	54.6	9.7	0.6
FY 2013	36.6	54.4	8.7	0.4

## 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.

FY 2011	FY 2012	FY 2013	FY 2014
Anxiety over radiation or effects of radiation 29.2%	Mental or physical health of mothers 33.4%	Mental or physical health of mothers 42.5%	Mental or physical health of mothers 49.5%
Mental or physical health of mothers 20.2%	Child rearing (baby food, nighttime crying, constipation, vaccination) 26.7%	Child rearing (baby food, nighttime crying, constipation, vaccination) 38.7%	Child rearing (baby food, nighttime crying, constipation, vaccination) 36.1%
Child rearing (baby food, nighttime crying, constipation, vaccination) 14.0%	Anxiety over radiation or effects of radiation 23.7%	Mental or physical health of children 20.3%	Related to family life 20.5%