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**Medical consequences of Fukushima NPP accident
-Nuclear Disaster and Health-
Nagasaki University/Fukushima Medical University
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From Hiroshima and Nagasaki to Fukushima through Chernobyl and Semey

“Two lessons from Fukushima are that seemingly fail-safe mechanisms can fail, and that when they do, health professionals will be expected to provide timely, accurate, and unambiguous advice, despite scarce evidence.”

See [Editorial](#) page 403

August 1, 2015

From Hiroshima and Nagasaki to Fukushima 1

Long-term effects of radiation exposure on health

Kenji Kamiya, Kotaro Ozasa, Suminori Akiba, Ohtsura Niwa, Kazunori Kodama, Noboru Takamura, Elena K Zaharieva, Yuko Kimura, Richard Wakeford

Late-onset effects of exposure to ionising radiation are the focus of large scale epidemiological studies. The cohort studies of atomic bomb survivors in Nagasaki (the Life Span Study) is thought to be the most comprehensive because of the size of the cohort, the exposure range of individually assessed doses. For assessment in the radiation protection system, the role of other authorities. Radiation exposure in survivors is essential. Overall, survivors and their children have a higher risk of radiation-induced diseases. Hereditary effects in the children of survivors are not shown definitively. This is a potential health effects of nuclear accidents, occupational and medical exposure. There is a need to be established.

Introduction

Adverse health effects of exposure to ionising radiation were identified soon after the discovery of x-rays. Epilation was reported as early as 1896, and was described soon after.^{1,2} With the invention of high-voltage x-ray tubes in around 1930s, implementation in medical procedures, amounts of radiation started to penetrate the body, such as bone marrow. Injuries to exposed tissues, known as tissue reactions, as deterministic effects because they will

Search strategy and selection criteria

Results of studies of Japanese atomic bomb survivors and their children, based on well defined cohorts with satisfactorily validated individual radiation doses, done by the Atomic Bomb Casualty Commission Radiation Effects Research Foundation (RERF), so representative articles reporting findings of these published in peer-reviewed international journals, monographs or ABCC and RERF reports when appropriate papers were not available.

For studies of Chernobyl, we searched PubMed, Cochrane Medline, and Google Scholar with the keywords "Chernobyl nuclear accident", "Chernobyl nuclear accident risk", and "Chernobyl accident, psychological consequences". We selected papers published in peer-reviewed international journals, and used some authoritative reviews of literature published by the UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and WHO.

From Hiroshima and Nagasaki to Fukushima 2

Health effects of radiation and other health problems in the aftermath of nuclear accidents, with an emphasis on Fukushima

Arifumi Hasegawa, Koichi Tanigawa, Akira Ohtsuna, Hiroaki Yabe, Masaharu Maeda, Jun Shigemura, Tetsuya Ohira, Takako Tominaga, Makoto Akashi, Nobuyuki Hirohashi, Tetsuo Ishikawa, Kenji Kamiya, Kenji Shibuya, Shunichi Yamashita, Rethy K Chhem

437 nuclear power plants are in operation at present. Unfortunately, five major nuclear accidents have occurred: Windscale Piles (UK, 1957), Three Mile Island (USA, 1979), Fukushima Daiichi (Japan, 2011). The effects of these accidents on the environment and public health are still under investigation. Evidence about radiation health effects on atomic bomb survivors provides the basis for national and international regulations on radiation protection. Common issues were not necessarily physical health effects, but psychological and social effects. Additionally, evidence about health problems for the most vulnerable people, such as

Introduction

Since the atomic bombings of Hiroshima and Nagasaki, some of the most tragic events in human history, accumulated evidence about effects of radiation on atomic bomb survivors and other radiation-exposed people has formed the basis for national and international regulations for radiation protection.¹ Peaceful use of nuclear energy has been pursued since December 1954 when US President Eisenhower gave his Atoms for Peace speech,² and many nuclear power plants (NPPs) have been built around the world to meet increasing

Key messages

- 437 nuclear power plants (NPPs) are in operation around the world; at least one-third are located in areas more densely populated than the area of the Fukushima Daiichi NPP, suggesting that a major nuclear accident would affect a large number of people
- Although severe nuclear accidents are uncommon, five have taken place in the past, resulting not only in health effects attributable to radiation exposure, but also in other serious health issues
- In addition to health effects of radiation exposure (ie, acute radiation syndrome and increased incidence of cancer), adverse effects on mental health were reported after the Fukushima Daiichi and Chernobyl NPP accidents
- The Fukushima Daiichi NPP accident showed the health risks of unplanned evacuation and relocation for vulnerable people such as hospital inpatients and elderly people needing nursing care, and failure to respond to emergency medical needs at the NPP
- Displacement of a large number of people has created a wide range of public health-care and social issues

From Hiroshima and Nagasaki to Fukushima 3

Nuclear disasters and health: lessons learned, challenges, and proposals

Akira Ohtsuna, Koichi Tanigawa, Atsushi Kumagai, Ohtsura Niwa, Noboru Takamura, Sanae Midorikawa, Kenneth Nallet, Shunichi Yamashita, Hitoshi Ohta, Rethy K Chhem, Mike Clarke

Past nuclear disasters, such as the atomic bombings in 1945 and major accidents at nuclear power plants, have highlighted similarities in potential public health effects of radiation in both circumstances, including health effects unrelated to radiation exposure. Although the rarity of nuclear disasters limits opportunities to undertake research of evidence-based interventions and strategies, identification of lessons learned and development of an effective plan to protect the public, minimise negative effects, and protect emergency workers from exposure to high-dose radiation is important. Additionally, research is needed to help decision makers to avoid premature evacuation among patients already in hospitals and other vulnerable groups during evacuation. Since nuclear disasters affect hundreds of thousands of people, a substantial number of people are at risk of physical and mental health problems. During the recovery period after a nuclear disaster, physicians might need to screen for psychological burdens and provide general physical and mental health care for many affected residents who might experience long-term displacement. Reliable communication of personalised risks has emerged as a challenge for health professionals beyond the need to explain radiation protection. To overcome difficulties of risk communication, provide decision aids to protect workers, vulnerable people, and residents after a nuclear disaster, physicians receive training in nuclear disaster response. This training should include evidence-based interventions, strategies to balance potential harms and benefits, and take account of scientific uncertainty in providing community health care. An open and joint learning process is essential to prepare for, and minimise the effects of, future nuclear disasters.

Introduction

The effects of nuclear disasters on individuals and society can be diverse and long lasting. The atomic bombings of Hiroshima and Nagasaki in 1945, and the Chernobyl nuclear power plant (NPP) accident in 1986, showed that radiation can pose substantial health risks for many people.^{1,2} Additionally, many other serious issues not directly related to the health effects of radiation can arise.³ Among these negative effects are mental illness, poor perceptions of health, stigma, lifestyle-related health problems, and discord within families and society.⁴

The rarity of nuclear disasters limits opportunities to undertake rigorous research, such as randomised trials, to provide an evidence base for effective interventions and strategies; however, priorities have been identified.⁵ Nuclear disasters might occur in the context of a wider disaster that has placed strain on emergency responders, health-care practitioners, and public health decision makers, further limiting the likelihood of empirical research. Despite these challenges to development of a robust evidence base, questions need to be answered about how to protect people who are, or who might be, exposed to radiation, and how to minimise other potential harms to their physical and mental health after a nuclear disaster. Emergency workers responding to a nuclear disaster are the highest risk group for radiation injuries, and an effective plan is needed to mitigate their radiation exposure. Additionally, strategies are needed to minimise effects of evacuation on people for whom this

Key messages

- Individual exposure doses of emergency personnel of skilled personnel from a sufficiently large pool of specialised technical expertise
- Medical facilities for provision of emergency physical care for injured or sick people who might have been exposed outside the planned evacuation area
- Residents in areas surrounding a nuclear power plant about the spread of the radioactive plume and should countermeasures including indoor sheltering, property restrictions; if ordered, evacuation should be implemented
- Adequate medical support is needed during evacuation; if such support is not available, sheltering is needed to avoid the health risks of evacuation
- Various medical needs arise and should be anticipated in disaster can be diverse and long lasting, and can include social issues; community physicians need to respond to necessary skills and knowledge
- Health-care professionals are expected to enable residents to make well informed decisions about their health risks of radiation and other health risks associated with evacuation; community leaders, physicians have a particularly important role in public health
- Opportunities to assess interventions, actions, and the subsequent recovery stage should be taken; medical education should be planned in advance to respond during an ongoing crisis, and prepare for a



Towards long-term responses in Fukushima

Michael R Reich, Ayo Goto

Lancet 2015; 386: 498-500

See Series page 495, 474, and 489

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4 years have passed since the nuclear power plant accident at Fukushima, Japan, moving the problems there from an acute nuclear disaster to a chronic environmental disaster, with multiple social, psychological, economic, and political consequences. As described by Ohtsuna and colleagues,¹ many people continue to experience multiple losses, both tangible and intangible, at the individual, family, and community levels. Planning Hiroshima and Nagasaki side by side with Fukushima, as done in this issue of *The Lancet*, seems inappropriate in major respects. Hiroshima and Nagasaki were intentional governmental acts of war, whereas Fukushima was accidental and negligent industrial behaviour in time of peace. They share exposure to radiation—but at vastly different levels and in different forms.² In Fukushima, no one has died from radiation exposure, and the UN Scientific Committee on the Effects of Atomic Radiation report³ in 2013 stated that substantial changes in future cancer statistics attributed to radiation exposure are not expected to be observed, although the committee also noted “a theoretical increased risk of thyroid cancer among most exposed children” and recommended they be “closely followed.”⁴

However, putting these disasters together does reveal some shared characteristics. In Hiroshima and Nagasaki, people were “exposed to explosion” (*ibaku* in Japanese); while those in Fukushima are “exposed to radiation” (also *ibaku* in Japanese).⁵ These words share the same pronunciation, but use different Japanese characters. Both groups are living with the social and psychological uncertainties and implications of possible radiation exposure. Both groups also became *ibakusha* or victims. The apocalyptic disruptions of their lives did not arise from their own choices, but from social and political decisions taken by others. This reaction is common in radiation disasters worldwide.⁶

The survivors of a chronic environmental disaster typically seek redress around questions of care, compensation, and clean-up.⁷ Although chronic environmental disasters have important medical dimensions, the human losses go far beyond the medical sphere. Below we briefly explore these three questions for Fukushima, examine the role of community engagement, and highlight changes needed to prevent another nuclear power plant disaster.

Long-term responses in Fukushima need to provide effective care for the complex problems that people confront, including physical and mental health risks as well as community health, as noted by Hasegawa and colleagues⁸ and Ohtsuna and colleagues.¹ Different populations in Fukushima need different kinds of care—for example, to address parental concerns about cancer risks for children, young women's concerns about their

marriage prospects, and evacuees' profound challenges of social adjustment in relocated places.⁹ Many of these problems are multidimensional (involving radiation risks, social stigma, family conflicts), in ways that physicians are not trained to address.

Questions of compensation frequently become sources of conflict in cases of environmental contamination, as affected people seek monetary redress for their economic, health (both physical and mental), marital, and social losses. Conflicts often arise around who should be compensated, what should be compensated, how values should be determined, and how long compensation should continue.¹⁰ These issues have led to a flood of lawsuits in Fukushima, against both the Tokyo Electric Power Company and Japan's central Government. According to one review of the litigation for nuclear damages related to Fukushima, the financial magnitude was calculated as approximately ¥10 trillion (US\$110 billion) and involving more than 1.5 million claimants. This makes it “the largest civil liability case in the legal history of not only Japan, but probably the world.”¹¹ The lawsuits raise major legal, financial, and political implications.

The scale of clean-up needed in Fukushima Prefecture is enormous within the grounds of the destroyed Fukushima power plant¹² and in the surrounding areas. The total amount of contaminated soil and materials from Fukushima Prefecture alone is estimated to reach 22 million cubic metres, “equal to filling the Tokyo Dome (a baseball stadium) 18 times.”¹³ The shortage of adequate storage sites contributes to delays in decontamination work and to indecision by some former residents who wonder whether to return home or relocate elsewhere permanently.¹⁴ The decontamination effort is expected to last until at least 2027 and cost an estimated ¥1300 billion.¹⁵ These ongoing clean-up activities, near areas where people are living, create profound social unease, in part because of the invisible nature of radiation. A coalition of technical experts in Japan and other countries examined the decontamination activities and raised crucial questions about whether the clean-up will “contribute to the restoration and rebuilding of the lives of those affected.”¹⁶

The International Commission on Radiological Protection (ICRP), in its report on people “living in long-term contaminated areas,”¹⁷ concluded that those people need to be involved in the management of the “existing exposure situation”. Additionally, the ICRP stated, “The responsibility of authorities at both national and local levels [is] to create the conditions and provide the means favouring the involvement and empowerment of the population.”¹⁸ In short, living with long-term contamination needs community engagement—especially to address the related problems of care, compensation, and clean-up.



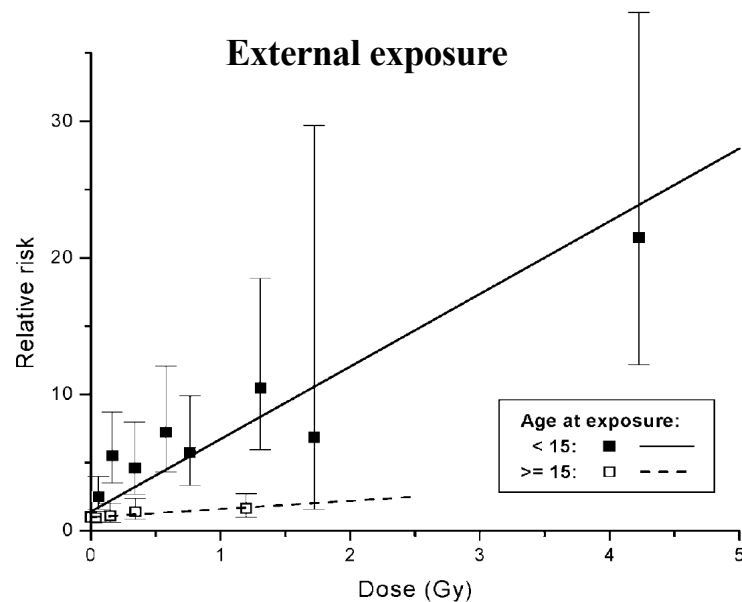
Radiation epidemiology

Radiation exposure of the thyroid at young age is the most clearly defined environmental factor associated with thyroid cancer

External radiation exposure

- A-bomb survivors
- Marshall Islanders (fall-out)
- Children exposed to EBT

ERR/Gy~7.7 [1.1 – 32]

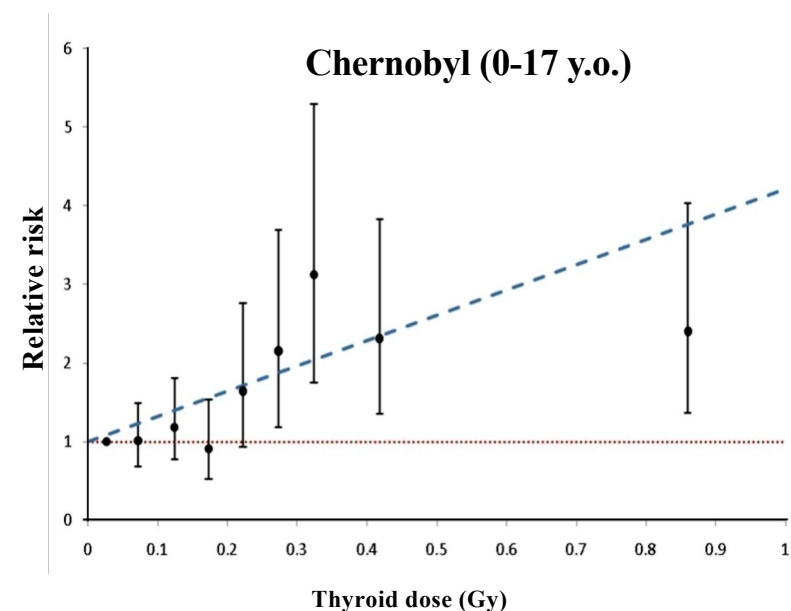


E.Ron 2002

Internal radiation exposure

- Therapeutic radioiodine
- Hanford (fall-out)
- Chernobyl

OR at 1 Gy~5.5 – 8.4 [ERR/Gy 1.9 – 19]



V.Ivanov 2010

ISSUES to be newly discussed and changed after FUKUSHIMA

Issue 1: Emergency Planning Zones and Protective Action and Guidelines

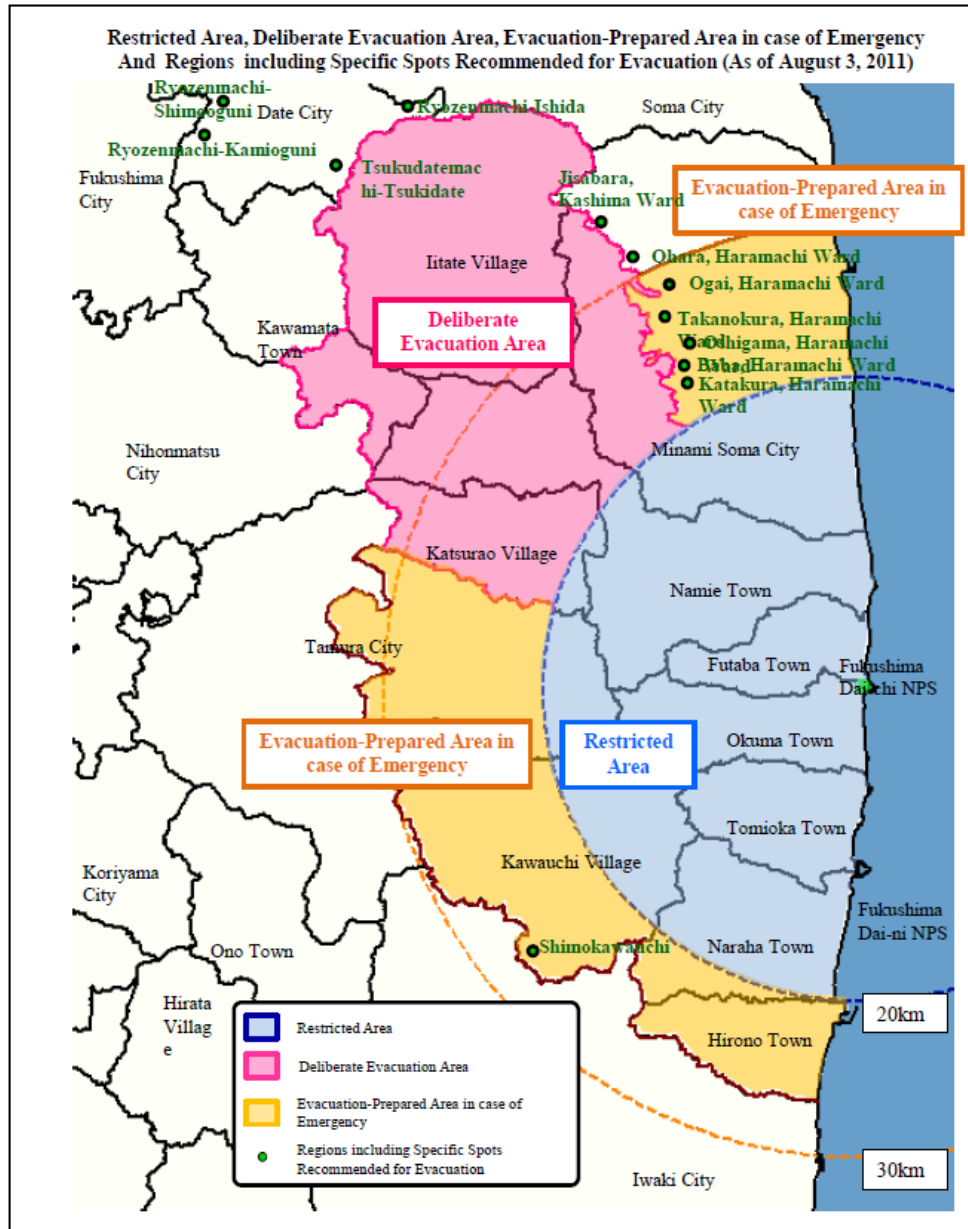
Issue 2: Potassium Iodine (KI) Policy

Issue 3: Communications and Public Health Education (Countermeasures against *radiophobia*)

Issue 4: Reentry and Recovery Policy

*In order to improve Global Radiation Protection Culture, Fukushima is now responsible as a focal point and world-leader to work together with international related organizations and research/education university/institutes; radiation risk analysis, risk communication, risk management, health care, risk education/training.....**FMU is now the core research center for nuclear disaster.***

Evacuation Status of Residents in Fukushima



Number of evacuees from designated evacuation areas:

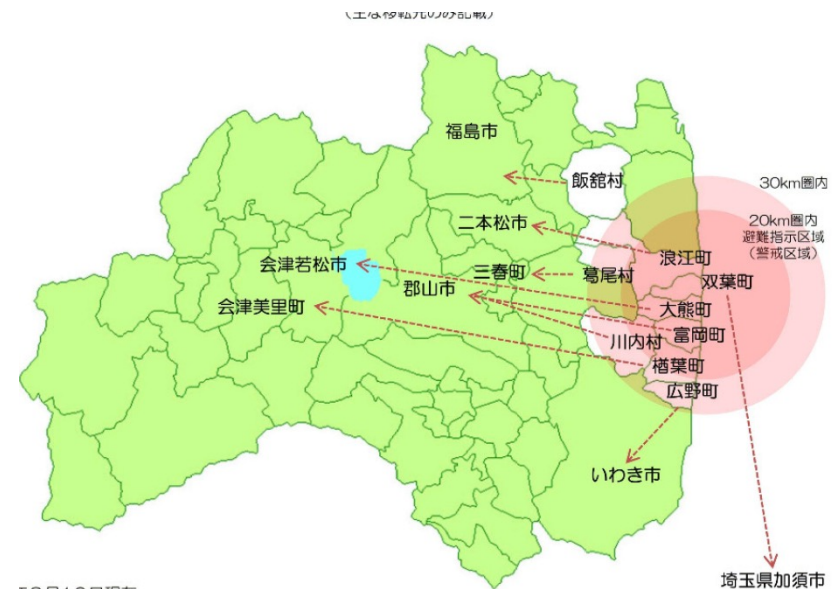
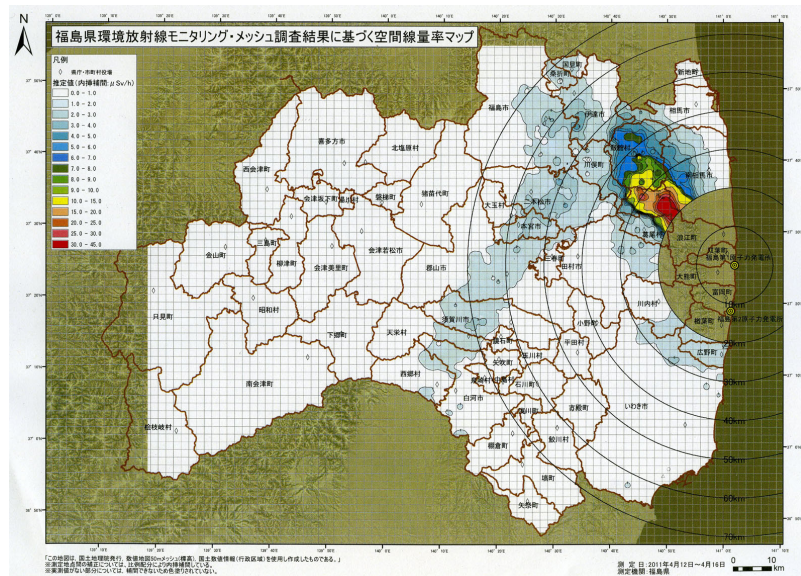
- **Restricted Area:**
about 77,000
- **Deliberate Evacuation Area:**
about 10,000
- **Evacuation-Prepared Area:**
about 26,000

Total: about 113,000

(Source: Cabinet Office, Feb 2012)

Fukushima Health Management Survey

- The design of the health management was planned in May, 2011, which was divided into two categories: **a basic survey** of dose estimates for all the residents and **further examination** of target populations.
- The objectives are to watch over a long-term health condition of residents in Fukushima and to promote their health and welfare.
- If exists, it is also aimed to investigate whether a long-term low-dose rate radiation exposure has an effect on their health or not.



Fukushima Health Management Survey May 2011

Objectives:

- To monitor long-term health condition of resident in Fukushima and to promote their health
- To investigate whether a long-term low-dose radiation exposure has an effect on their health

Contents:

1. Basic survey (subjects: 2 million all resident in Fukushima)
2. Detailed survey
 - **Thyroid examination by ultrasonography (370,000; 0-18 y/o)**
 - Comprehensive medical checkups (210,000 ; Evacuees)
 - Mental health and lifestyle survey (210,000 ; Evacuees)
 - Survey on pregnant women and nursing mothers (16,000)

Fukushima's Big Concern from Chernobyl and Thyroid Cancer

- The most important point learned from Chernobyl NPP accident is how to protect the public from unnecessary exposure of internal as well as external radiation, especially from the fear/anxiety of increased risk of radiation-induced thyroid cancer.
- How to overcome the difficulty of LNT model understanding depends on logical thinking way at the individual level but emotional reaction cannot be avoided.

How to analyze radiation dose

Questionnaire

2 3月中に滞在した場所と期間についてお聞きします。記入例に比べて、3月11日から15日までの行動について記入してください。

記入例

- ・滞在した場所を矢印で記載してください。自宅、勤務先、通学先以外の地名は、〇〇市〇〇丁目〇〇番地、〇〇町(村)〇〇丁目〇〇番地まで記入してください。
- ・学校や会社などの場合は、所属だけかまいません。
- ・野外、移動および野外に滞在する場合は、その場所の種類が不明の場合は(○)、コンクリート造の場合は(□)と書き添えてください。
- ・ただし、自宅、勤務先については、本図またはコンクリート造の記載は不要です。
- ・野外にいた時間をおおむねの順に記載し、その場所について右欄に記載してください。
- ・海外での滞在期間は「滞在場所：海外」に、移動、居住もまとめて記載ください。

滞在場所	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	地名・施設名			
3/11 (日)																																			
3/12 (月)																																			
3/13 (火)																																			
3/14 (水)																																			

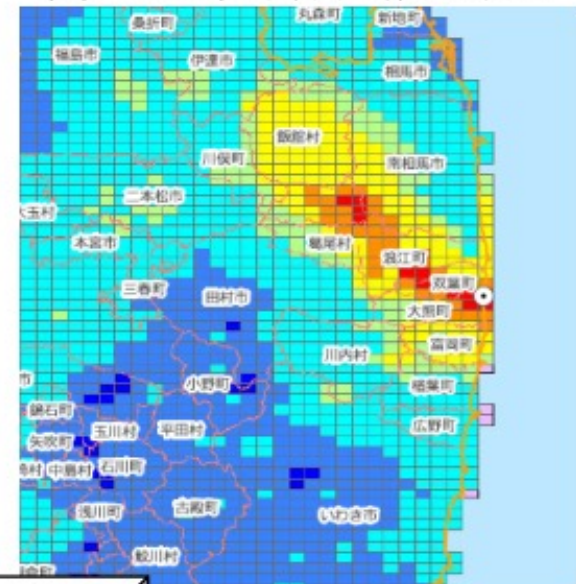
実際の行動を記入してください。

滞在場所	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	地名・施設名			
3/11 (日)																																			
3/12 (月)																																			
3/13 (火)																																			
3/14 (水)																																			

Movement & behavior 調査



Time-course of air dose map



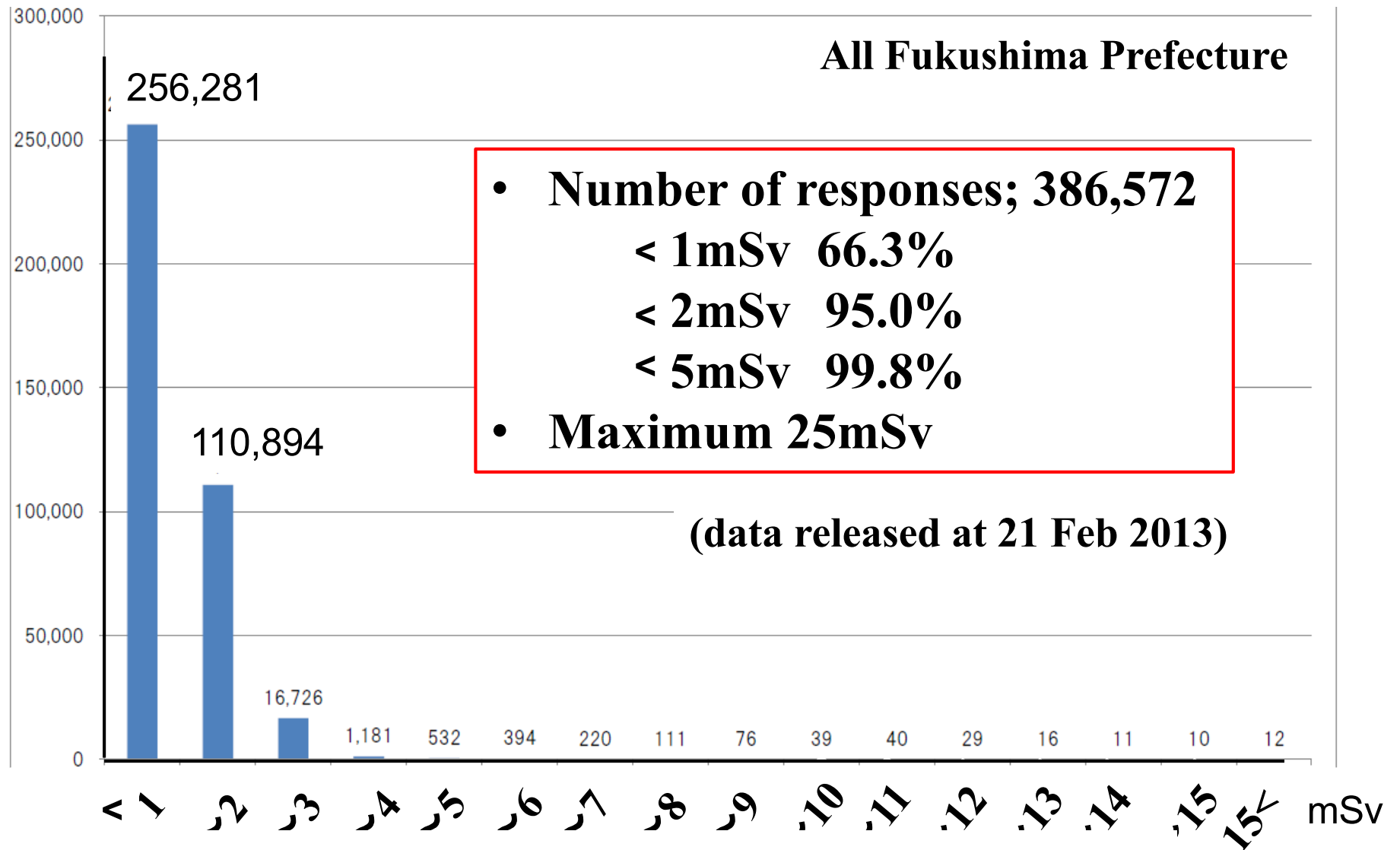
Estimation dose
calculating combined
above two information
by NIRS

To help understanding
of individual first 4M dose

To help understanding
of radiation-related health risk

To establish database for long-term health management

Distribution of External Exposure Dose (mSv) (Estimated Cumulative effective dose from March 11 to July 11)



Estimated from location and time course on questionnaire

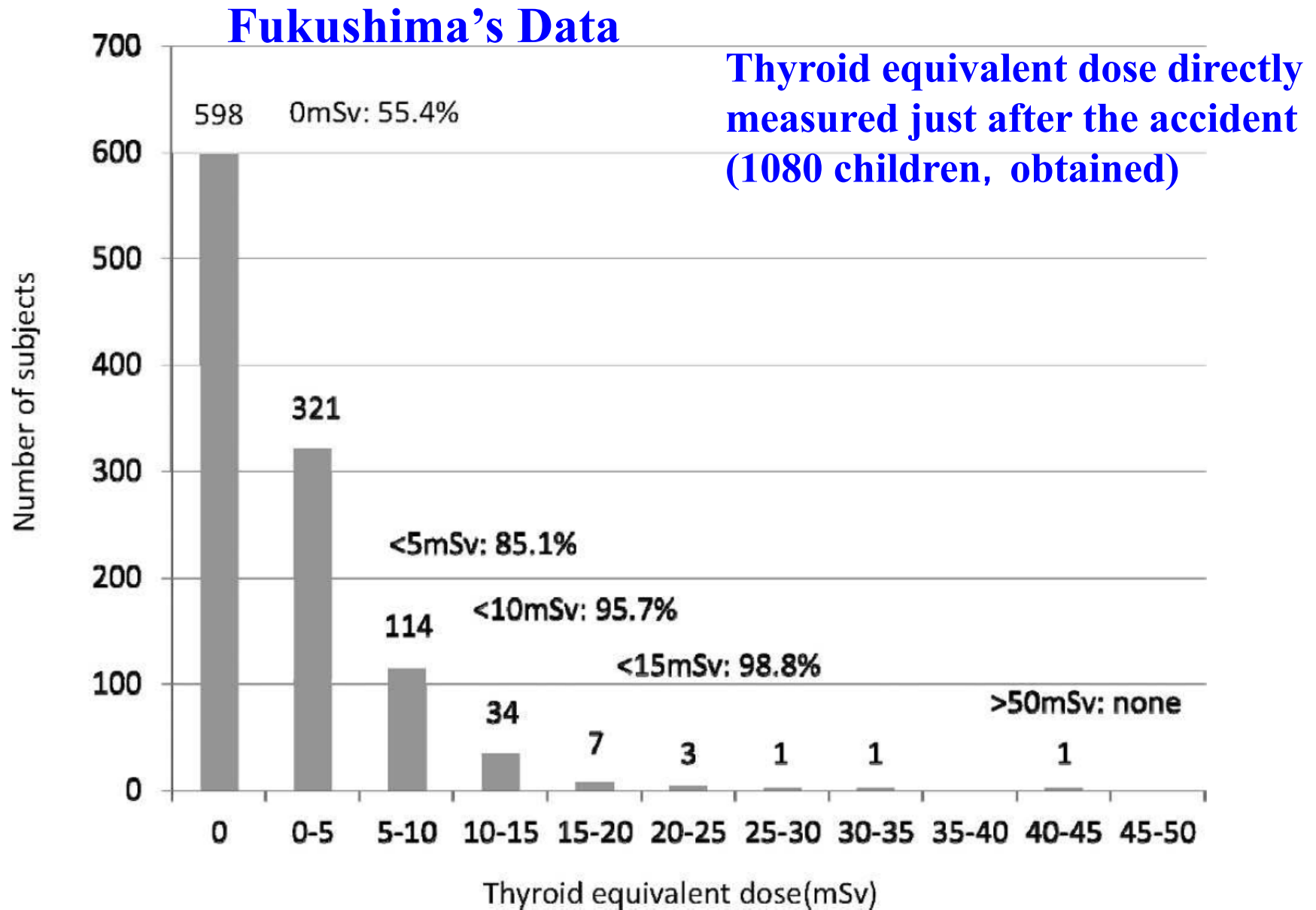
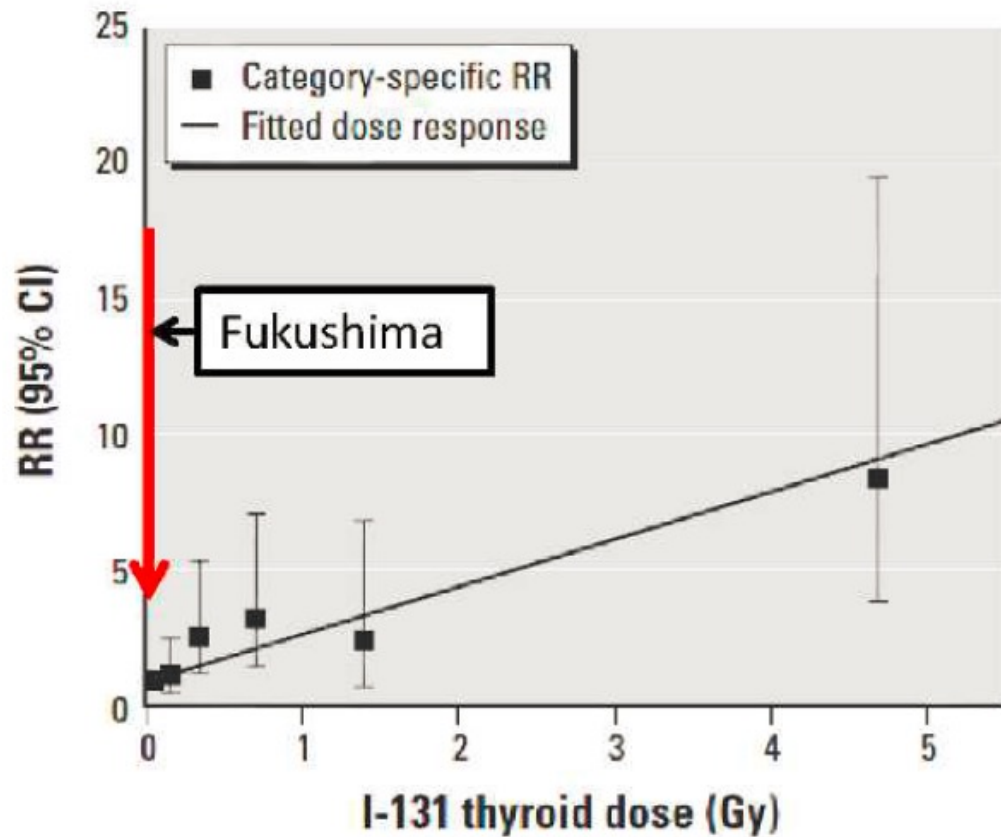


Fig.5 Distribution of thyroid equivalent doses estimated by the results of the screening survey and the intake scenario from March 12, 2011 to the day before measurements.

(a) Different thyroid dose between Ukraine and Fukushima



(b) Different thyroid dose between Belarus and Fukushima

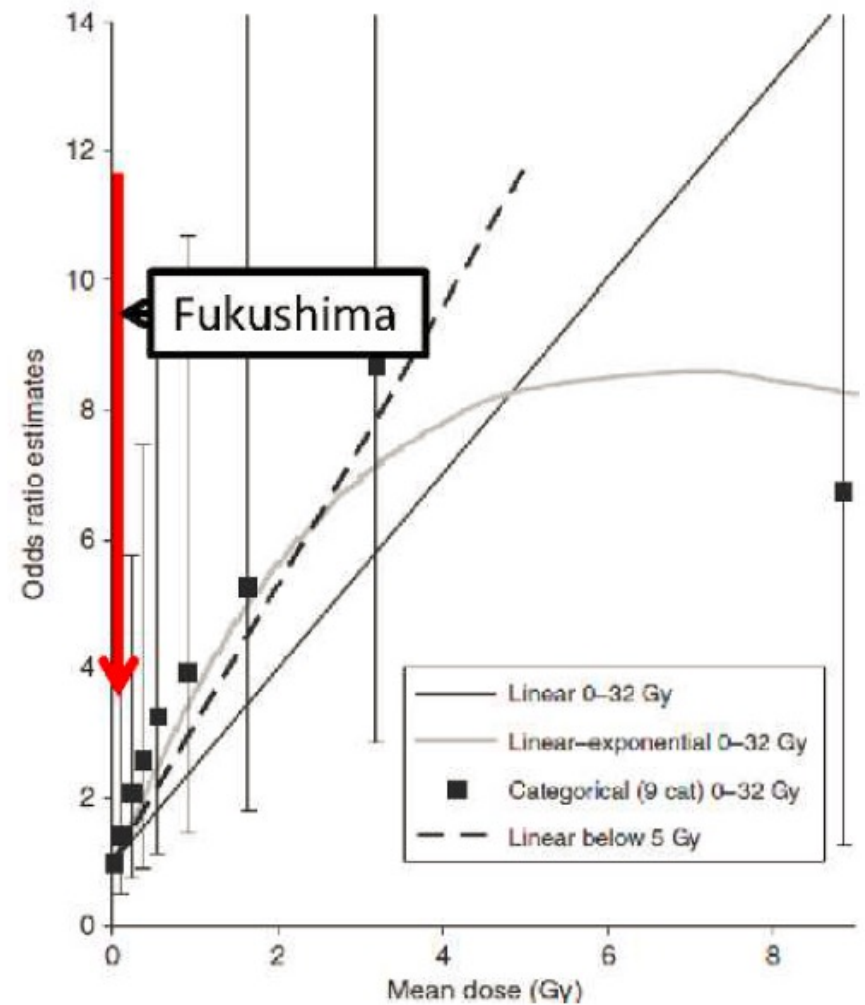
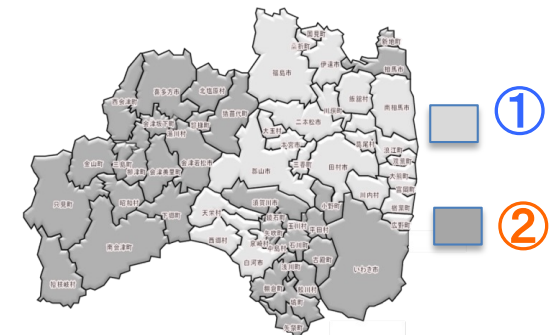
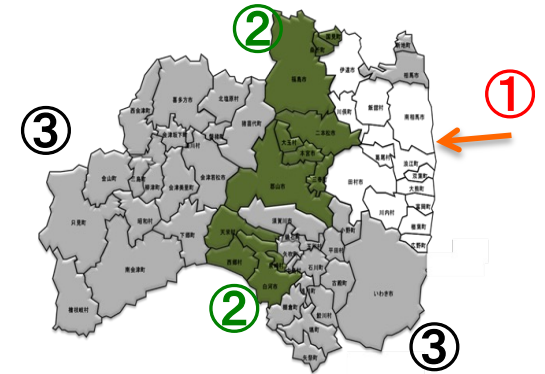


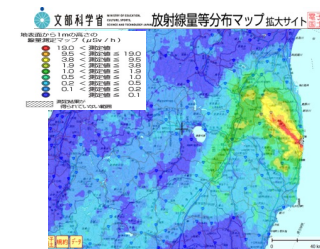
Fig.6. Panel a: Thyroid radiation doses in Fukushima, Ukraine and Belarus in dose-response relationship between thyroid cancer and ^{131}I . Panel b: Dose-response relationship for the incidence of thyroid cancers. Both figures were modified from two articles (republished with permission, Brenner AV, et al. *Environ Health Perspect* 2011; 119: 933-9 and Zablotska LB, et al. *Br J Cancer* 2011; 104: 181-7).

Thyroid Ultrasound Examination (TUE) Schedule

- **Preliminary Baseline Survey (PBLS) subjects: 368,000**
 - ① *1st survey: FY2011, from October 2011 to March 2012*
 - ② *2nd survey: FY2012, from April 2012 to March 2013*
 - ③ *3rd Survey: FY2013, from April 2013 to March 2014*
- **Full scale survey (FSS) subjects: 380,000**
 - ① *1st survey: FY2014, from April 2014 to March 2015*
 - ② *2nd survey: FY2015, from April 2015 to March 2016*



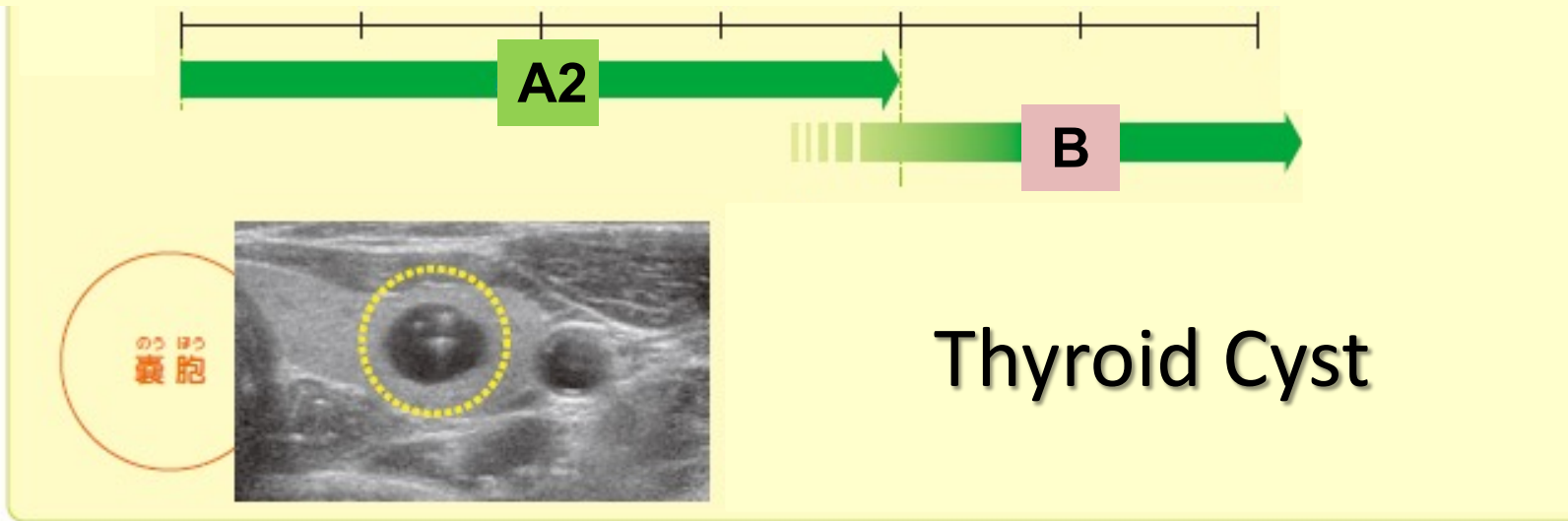
TUE was performed firstly on those who were living in high-exposure areas at the time of the accident.



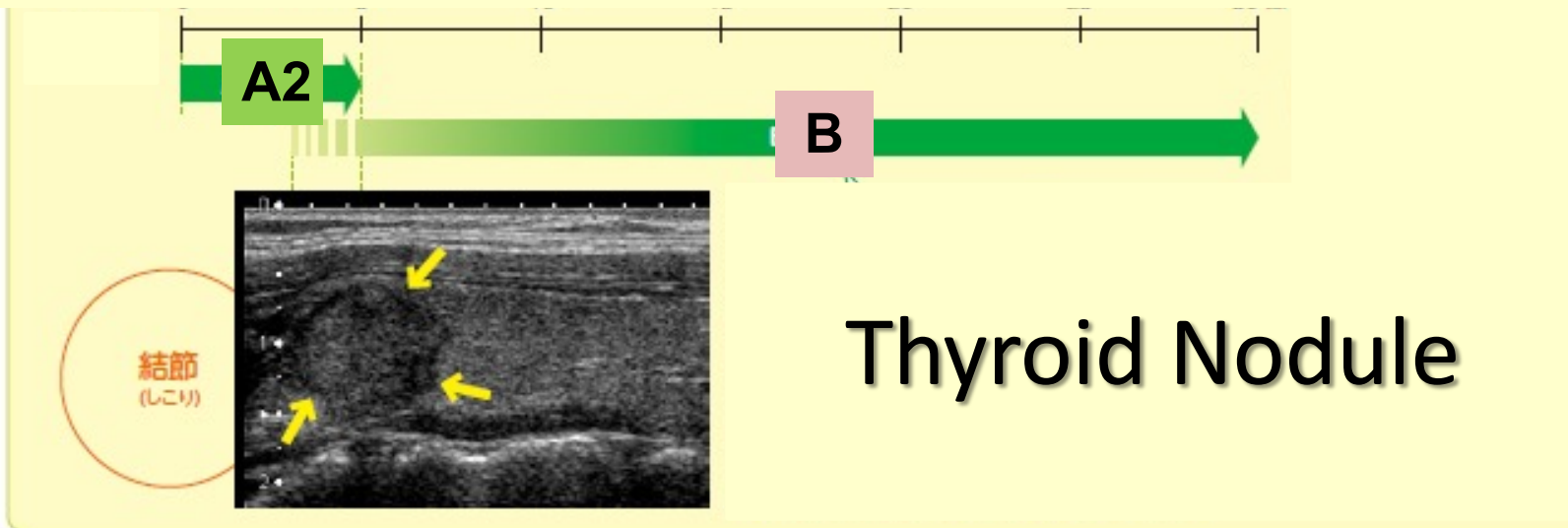
The full-scale survey will then continue every two years until the age of 20, and every five years thereafter for the remainder of the subject's life.

Thyroid Ultrasonography Screening Criteria

Diameter 0 5 10 15 20 25 30 mm



Diameter 0 5 10 15 20 25 30 mm



Preliminary Baseline Survey (PBLIS)

- PBLIS examined 298,577 persons.
- Participation rate was 81.2%.
- Among 297,046 examinees,

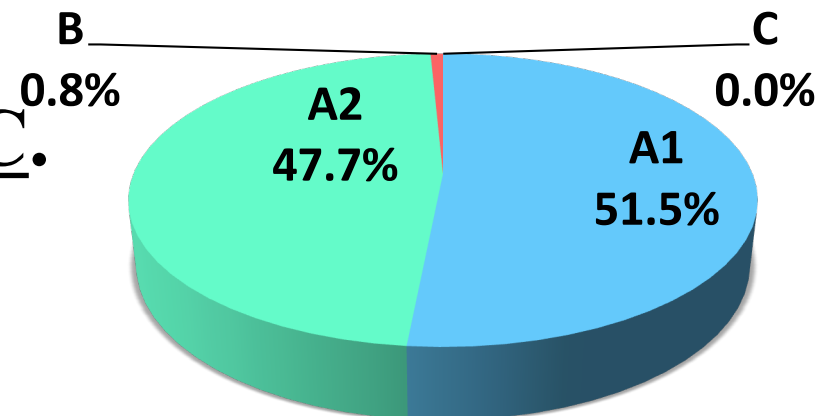
PBLIS diagnostic results included

153,017 A1 (51.5%),

141,788 A2 (47.7%),

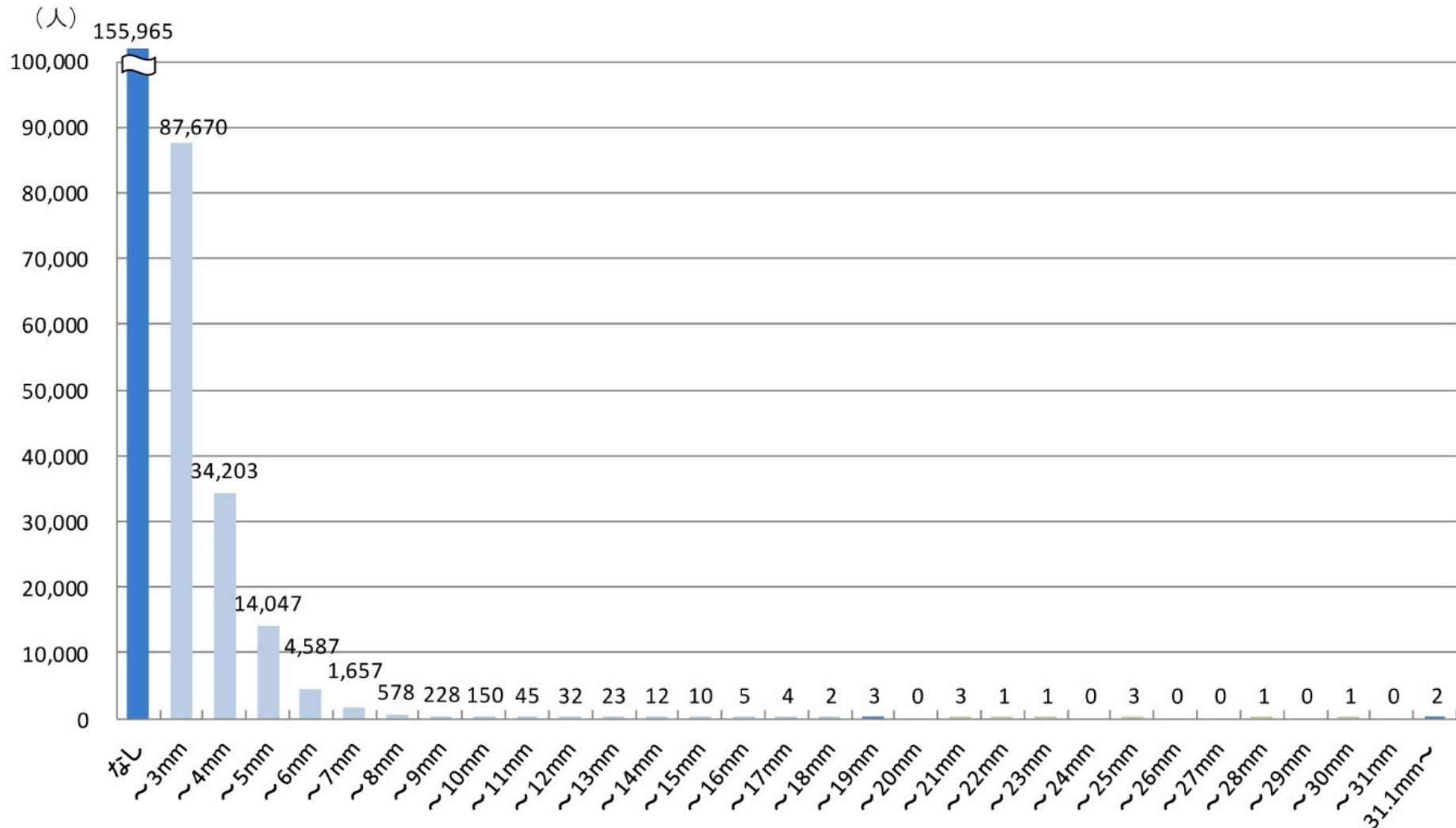
2,250 B (0.8%), and one C.

↓
Confirmatory examination



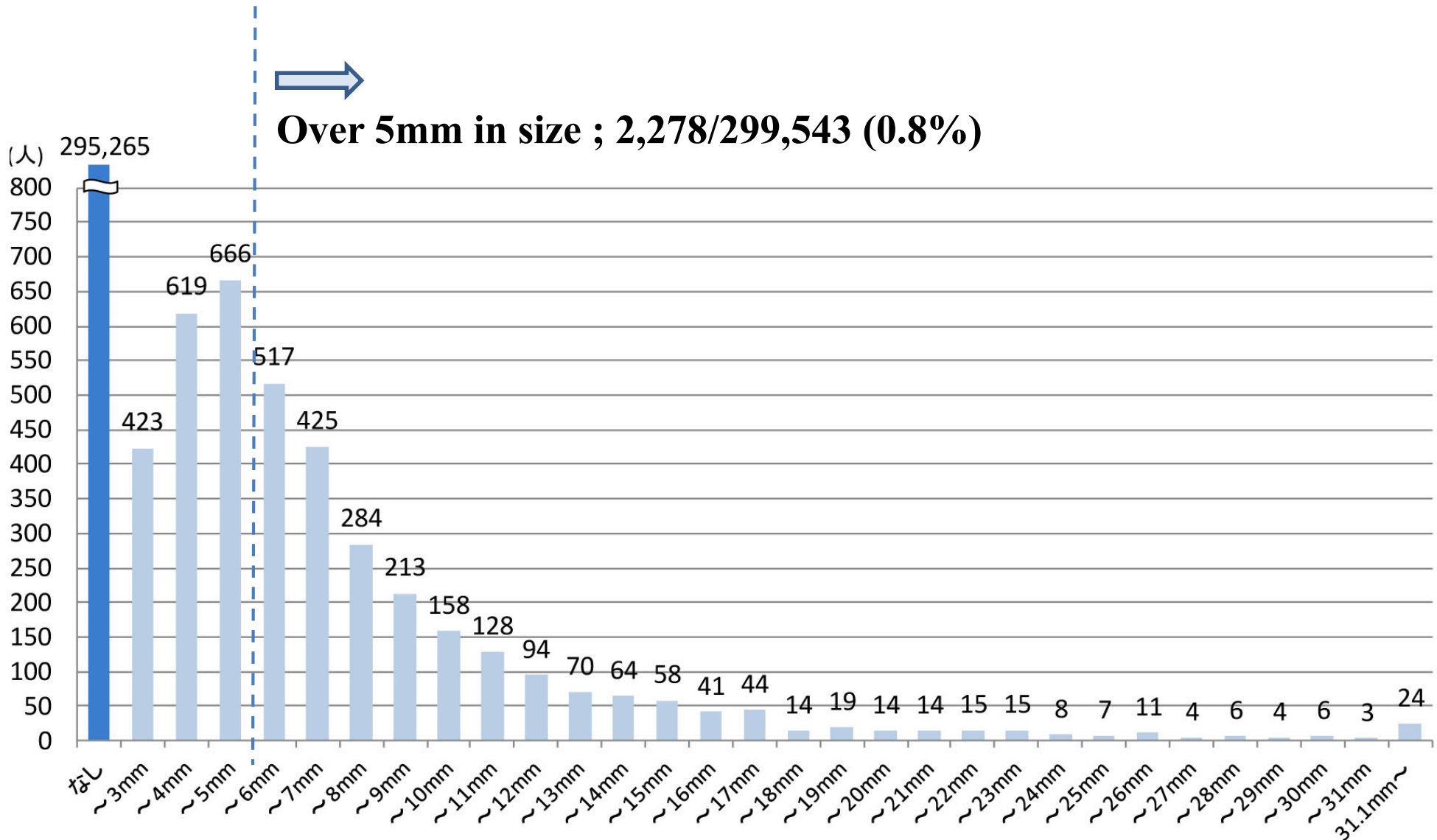
Size distribution of thyroid cysts detected by US among 299,543 children

March 31, 2015



Size distribution of thyroid nodules detected by US among 299,543 children

March 31, 2015



Results of thyroid US examination; October 2011 – March 2015

(Preliminary baseline survey)

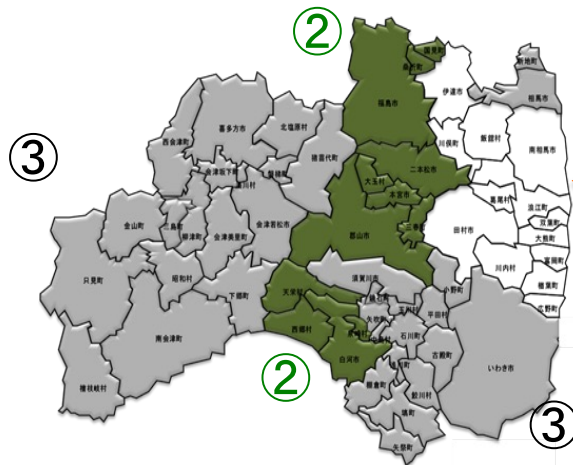
Judgment		Interpretation	N	(%)
A subtotal		Within normal range	296,954	99.2%
A	(A1)	No specific finding	154,018	51.5%
	(A2)	Nodule with ≤ 5.0mm or/and Cyst with ≤ 20.1mm	142,936	47.8%
B		Nodule with ≥ 5.0mm or/and Cyst with ≥ 20.1mm Recommended 2nd Screening	2,278	0.8%
C		Needed further examination	1	0.0%
Total			299,543	100%

(Data are available at <http://wwwcms.pref.fukushima.jp/>)

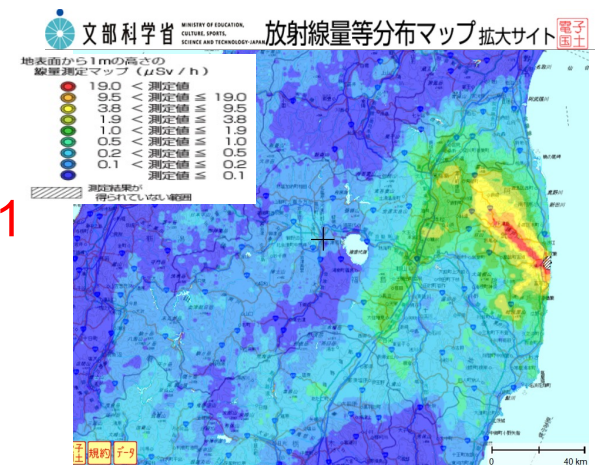
The frequency of suspicious or malignant cases diagnosed by FNAC, according to area

		No. of children screened	Suspicious or malignant cases*	Proportion of suspicious or malignant cases (%)
①	FY2011	41,810	14	0.033
②	FY2012	139,339	56	0.040
③	FY2013	117,428	39	0.033
Total		298,577	109	0.037

* Excluding one suspected case found benign after surgery

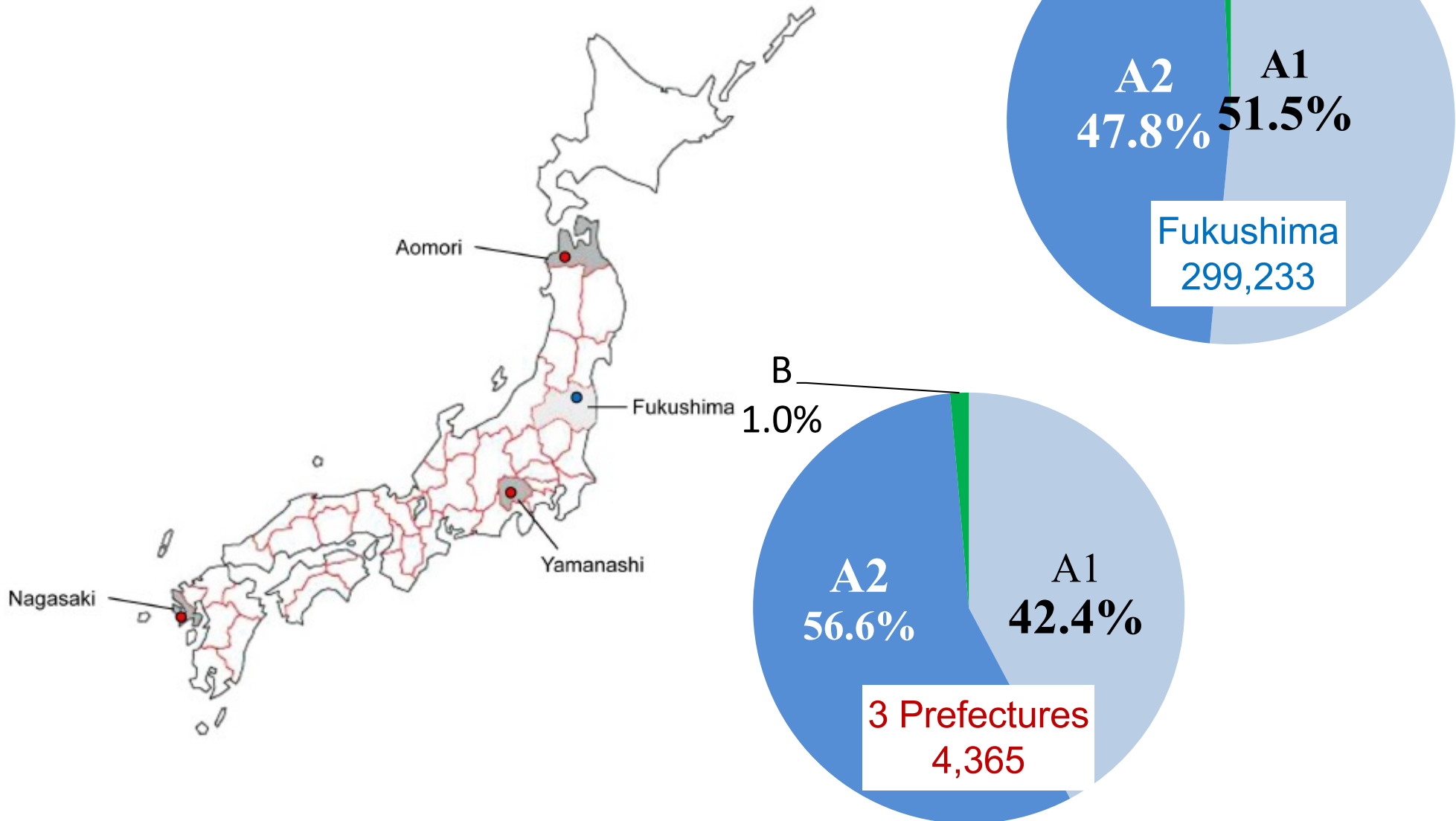


Since Oct.9, 2011



Thyroid Ultrasound Findings in Children from Three Japanese Prefectures: Aomori, Yamanashi and Nagasaki

PLOS ONE Hayashida N de.al. December 2013 | Volume 8 | Issue 12 | e83220

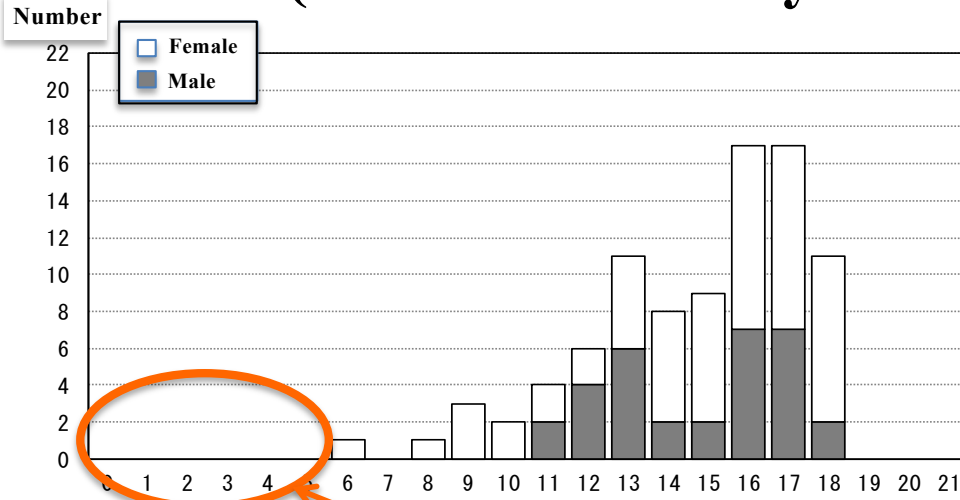


Malignant or suspicious cases detected by US-FNAB in Fukushima

March 31, 2015

Number of cases (FY 2011-2013)	Total 112
Gender	Male: 38 Female: 74
Mean age (SD, min-max)	17.2 years (± 2.7, 8-22) <i>at the time of diagnosis</i> 14.8 years (± 2.6, 6-18) <i>at the time of the disaster</i>
Mean tumor size (SD, min-max)	14.2 mm (± 7.8, 5.1-45.0)
Pathological diagnosis of 99 surgical cases	1 benign nodule 95 papillary thyroid carcinomas 3 poorly differentiated thyroid carcinoma

Age and gender distribution of 110 cases diagnosed with malignant or suspected of malignancy by FNAC (First round of thyroid examination in Fukushima)



Suspicious or malignant cases by age at the time of disaster

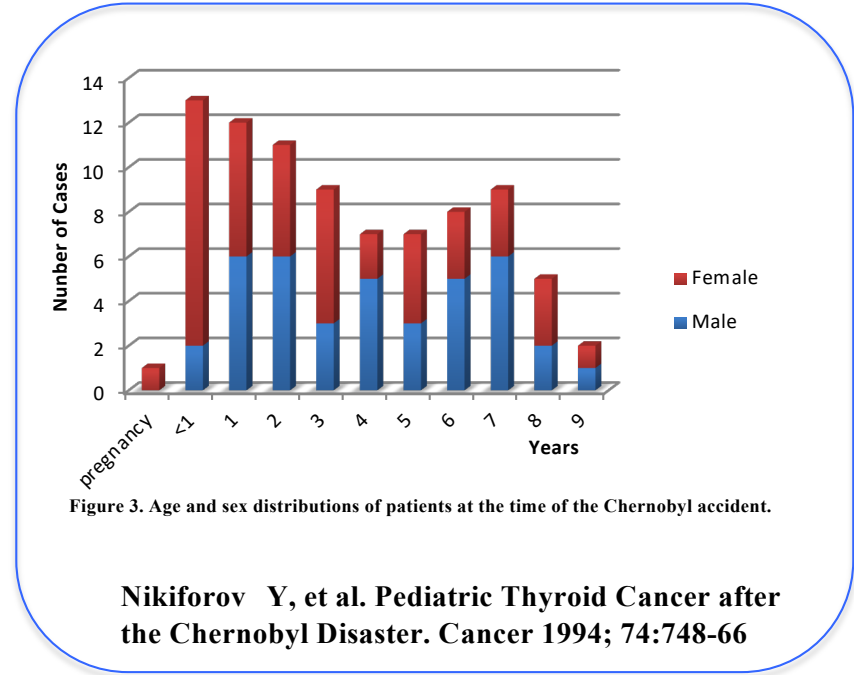
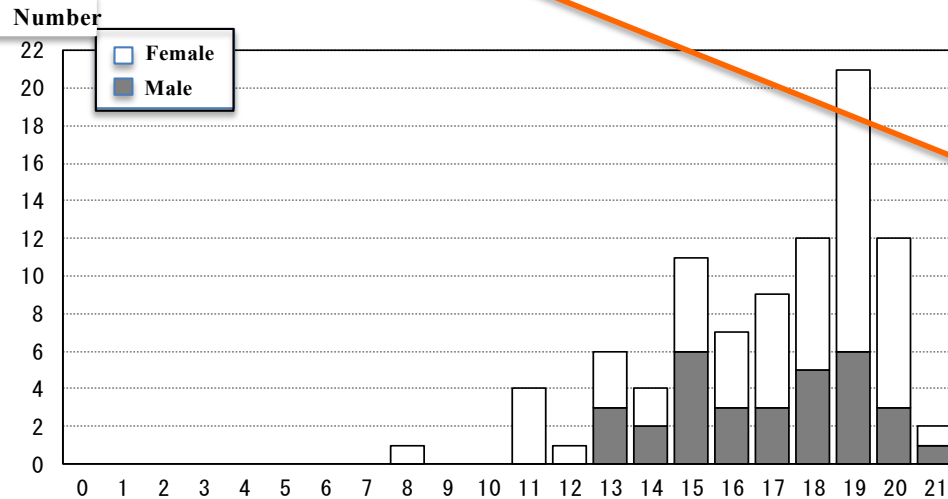


Figure 3. Age and sex distributions of patients at the time of the Chernobyl accident.

Nikiforov Y, et al. Pediatric Thyroid Cancer after the Chernobyl Disaster. *Cancer* 1994; 74:748-66

Following the accident, no cases of thyroid cancer was found in children aged 0-5 years, unlike Chernobyl.



Suspicious or malignant cases by age as of the date of confirmatory examination

68 Operated Thyroid Cancer Cases -clinico-pathological and genetic findings-

- Age and sex at operation; 17.3 ± 2.8 (M22, F 46)
- Tumor size; 14.7 ± 9.2 mm
- Histology; CP61, FV2, CMV4, PD1
- TNM classification; pT1/2 37, pT3 31; pN0 15, pN1a or 1b 52; M0 65, M1 2; pEx0 36, pEx1 32
- Genetic mutation;
Braf^{V600E} 43 (63.2%), H-Ras 0, K-Ras 0, N-Ras 0, Ret/PTC1 6 (8.8%), Ret/PTC3 1 (1.5%), ETV6(ex4)/NTRK 4 (5.9%), ETV6(ex5)/NTRK 0, AKAP9/Braf 0, TERT C250T 0, TERT C228T 0

Thyroid Cancer in Fukushima

-about 300,000 children screened by US for the first 3 years-

- Due to recent advances in US technology, diagnostic image quality has dramatically improved. In addition to worldwide tendency of increased incidence of thyroid cysts/nodules and cancers, average detection rate of childhood thyroid cancer in Fukushima is around 0.03~0.04% by US screening, which needs to be further analyzed and both *the overdiagnosis and overtreatment* needs to be recognized, despite of low or undetectable thyroid dose.
- Carefully analysis of thyroid US data that takes into account not only potential screening effect and exaggerated incidence rates of thyroid diseases, but also the treatment strategies for overdiagnosis and its outcomes in children is required, especially for a long time for those who are detected thyroid abnormalities

Sensational News by Media

- **Over a third of Fukushima children at risk of developing cancer (June 2012)**
- **Fukushima kids have skyrocketing number of thyroid abnormalities (February 2013)**



Sophisticated mass screening activities in Fukushima has lead to an increase in the incidence of thyroid nodules/cysts, and cancer due to earlier detection of non-symptomatic cases. It is therefore not be possible to compare the future observed thyroid cancer incidence with the figures of any previous report, as the baseline risk changes due to the screening activities.

Interim Results of Health Checkup for the Evacuees in Fukushima in 2011

- The 2011 Comprehensive Health Check clarified the general health conditions of evacuees from the government-designated evacuation zone after the Great East Japan Disaster. Obesity and hyperlipidemia exist even at young ages and increase in both male and female adults. Liver dysfunction and hyperuricemia increase at relatively young ages in male. Furthermore, hypertension, glucose dysmetabolism, and renal dysfunction increase in adulthood and are most common at older ages.
- We compared the comprehensive health check results after the disaster with the results of health examinations performed before the disaster in children and adults. The results suggested that the rates of obesity, glucose metabolic dysfunction, hyperlipidemia, and liver dysfunction after the disaster were high, at least in part, compared with those before the disaster. Regarding the factors that contributed to these results, changes of lifestyle, diet, exercise, and other personal habits caused by forced evacuation are suggested, although there were interfering factors such as the difference of health check period, age distribution, region distribution and participation rate.
- Based on the results of the health check carried out in 2011, we are continuing the comprehensive health check long term and maintaining the system to prevent various diseases, including life-style related disease of participants.

Interim Results of Mental Health and Life-style Survey for the Evacuees in Fukushima in 2011-2012

In children

- The most remarkable issues are physical symptoms, *influences at school performance, irritation, anxiety & depression, and sensitivity to earthquakes & radiation* taken from the category of “Reactions amongst Children due to 3.11 Disaster”.

In adults

- The most remarkable issues are *sleep issues, physical problems, depression, fear of future, and agitation, discount of evacuation life*, taken from the category of “Reaction to Self from the 3.11 Disaster”.

Interim Results of Survey of Expectant and Pregnant Mothers in the entire Fukushima in 2011-2012

- *There are neither any increase of miscarriage nor artificial abortion* owing to the extensive efforts of the Japanese Medical Association, especially Obstetricians and Gynecologists.
- Furthermore by the Japan Association of Obstetricians and Gynecologists (JAOG), the congenital malformations were evaluated in babies delivered in Fukushima prefecture.
- There is *no obvious increased prevalence rate of congenital malformations* at the present time compared with the rate of Birth Defects Monitoring of JAOG. However, it is necessary to gather more cases to draw a conclusion.

As a hub medical institution for recovery and revitalization of Fukushima

～Fukushima Global Medical Science Center～

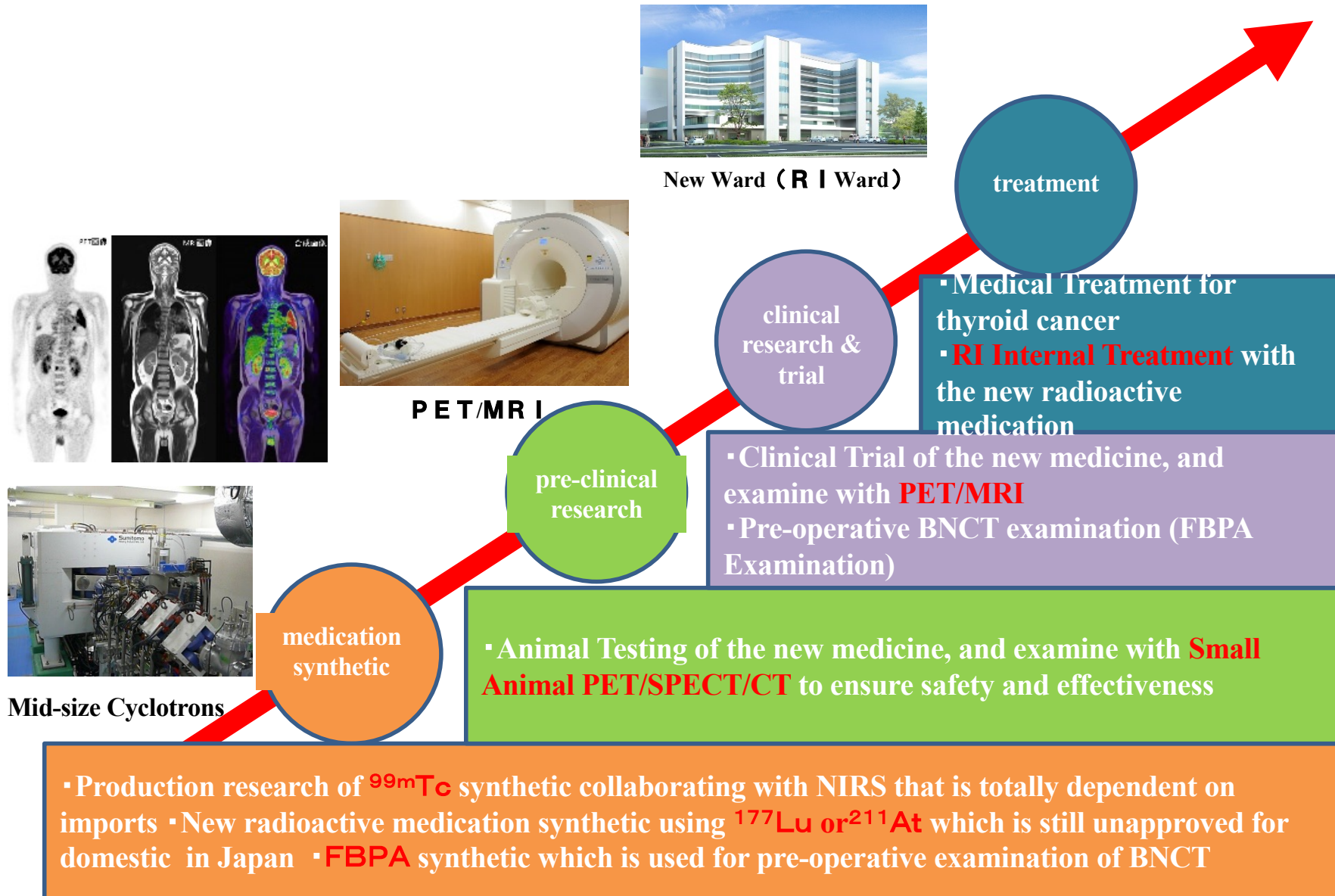


Fukushima Medical University

Advanced Clinical Research Center in Fukushima Medical University Hospital

- New challenge will start 2016 with the Japanese Nuclear Medicine Experts-

One Location and One Stretch – From medication synthetic, pre-clinical research, clinical research and trial, and treatment for the patients from the entire Japan





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- >> [Senior Administrative Personnel](#) (2014.05.01)
- >> [Number of Students \(as of April 2014\)](#) (2014.04.22)

[Selected Papers on Disaster and Radiation](#) **new!!!**

[Fukushima Radiation and Health](#)
Radiation Medical Science Center for the Fukushima Health Management Survey,
Fukushima Medical University

To avoid any misunderstanding and mislead of the results of Fukushima Health Management Survey, please access the Fukushima Radiation and Health homepage.

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Senior Administrative Personnel
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[School of Medicine](#)
The School of Medicine was established as a prefectural college with a mission to lead the medical community in Fukushima Prefecture.
[Organization](#)

[School of Nursing](#)
The School of Nursing was established in 1998 with the develop professional nurses can play an active role in diverse medical settings.
[Organization](#)

[School of Graduate Education](#)
The School of Graduate Education offer postgraduate students opportunities to not only acquire profound academic knowledge but also experience various medical settings...

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

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What's New

News

- 29 Jun-1 Jul 2015 [Training Meeting on Radiation, Health, and Society: Radiation Leading Education Change after Fukushima](#) **NEW!**
- 22-26 Jun 2015 [Train the Trainers Workshop on Medical Physics Support for Nuclear or Radiological Emergencies](#) **NEW!**
- 2-3 Jun 2015 [Second Asian Workshop on the Ethical Dimensions of the System of Radiological Protection](#) **NEW!**
- 1-2 Jun 2015 [FMU experts dispatched to United Nations \(UNSCEAR and IAEA\) in Vienna, Austria.](#)
- 1 Jun 2015 [5th ICRP Seminar Convened.](#)
- 26-27 May 2015 [15th International Congress of Radiation Research](#) **NEW!**
- 18 May 2015 [Proceedings of the 19th Prefectural Oversight Committee Meeting for Fukushima Health Management Survey](#)
- 11-12 May 2015 [Prof. Elisabeth Cardis of CREAL visited FMU](#)

<http://fukushima-mimamori.jp/>

<http://www.fmu.ac.jp/radiationhealth/>

[World Health Summit Satellite Symposium convenes at FMU: and Resilient Health Systems to Meet Emerging Challenges](#)

- 16 Mar 2015 [ICRP Seminar Convened.](#)