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Fifteen Years of the Thyroid Ultrasound Examination Program: Achievements and Future Directions

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for the Fukushima Health Management Survey, FMU

Introduction

It has been 15 years since the Thyroid Ultrasound Examination (TUE) began for children who were 18 years old or younger at the time of the nuclear power plant accident.

Today, I will first explain how this program has been carried out from the beginning up to now, and what has been learned so far.

I will also talk about efforts to support participants as they grow into adulthood, so they can easily access the information they need and make their own informed choices about whether to take part in the program.

Finally, I will share the key findings and lessons learned from these 15 years of TUE.

A dark blue arrow points to the right at the top left. Below it, several thin, curved lines in shades of blue and grey sweep across the left side of the slide.

Today's Topics

1. About the thyroid
2. Radiation and the thyroid
3. How the Thyroid Ultrasound Examination (TUE) began and what it has found
4. Thyroid Ultrasound Examination (TUE) initiative and the future ahead
5. What we know so far: Radiation-related
6. What we know so far: Non-radiation-related
7. Conclusion



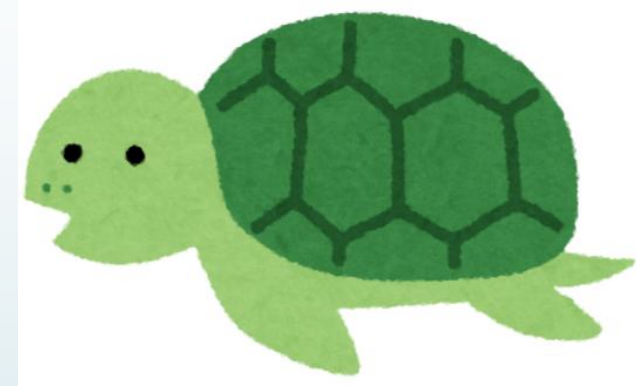
1. About the thyroid

About the thyroid



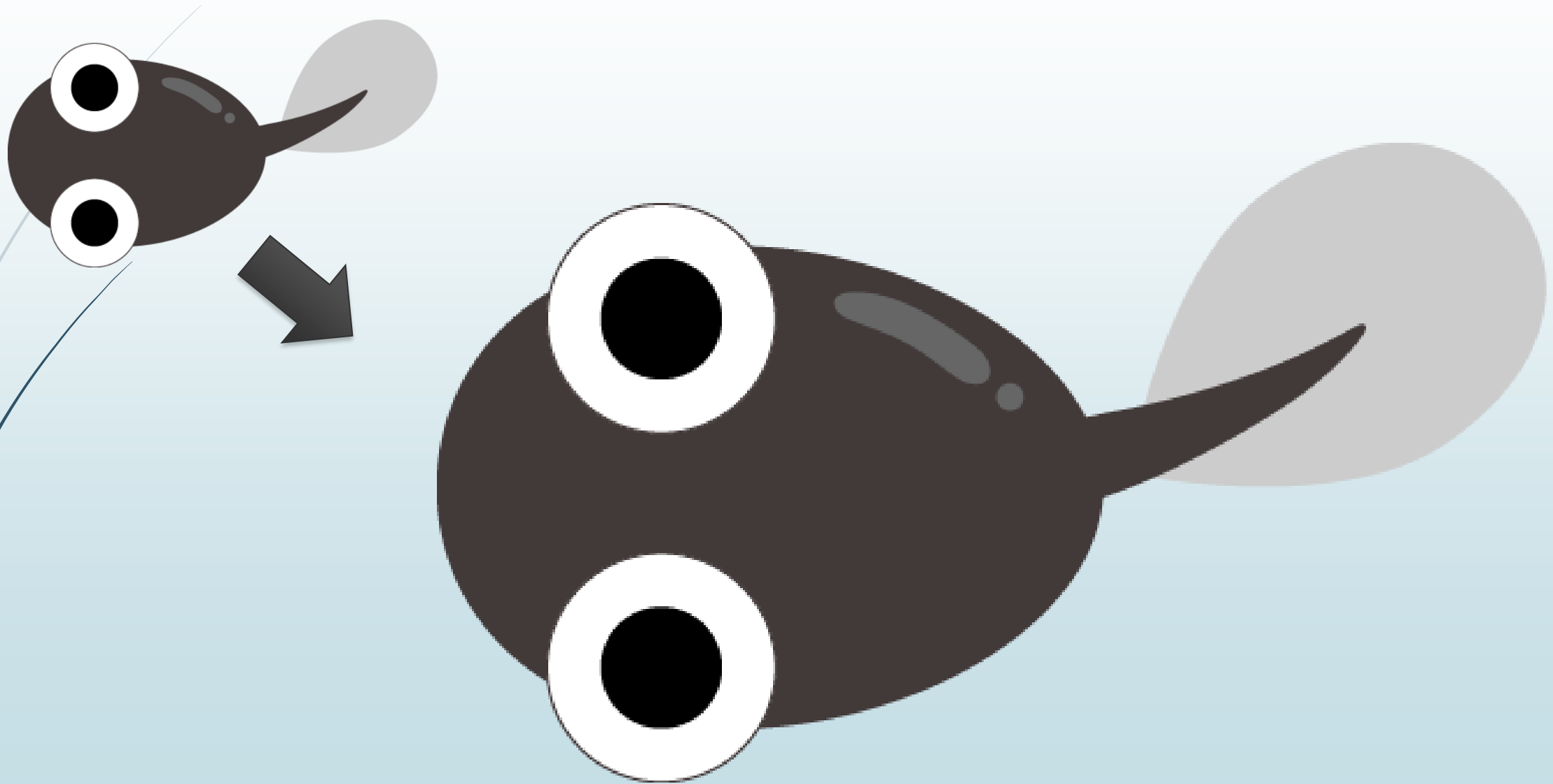
“Thyroid”

Thyr : shield, protector
oid : similar to



The thyroid is an important endocrine gland that makes and releases certain hormones that contain iodine.

Important roles of thyroid hormones



The role of the thyroid in the human body

► Before birth and during growth

Thyroid hormones are important for the development of the brain, organs (heart, liver, or kidneys), and bones, including the musculoskeletal system.

► In adulthood

Thyroid hormones help control energy use in the body.



2. Radiation and the thyroid

A high-magnification electron micrograph of a coronavirus particle. The particle is roughly spherical and covered in a dense layer of surface proteins, giving it a characteristic "crown" or "halo" appearance. The background is a light, grainy texture.

Inhalation

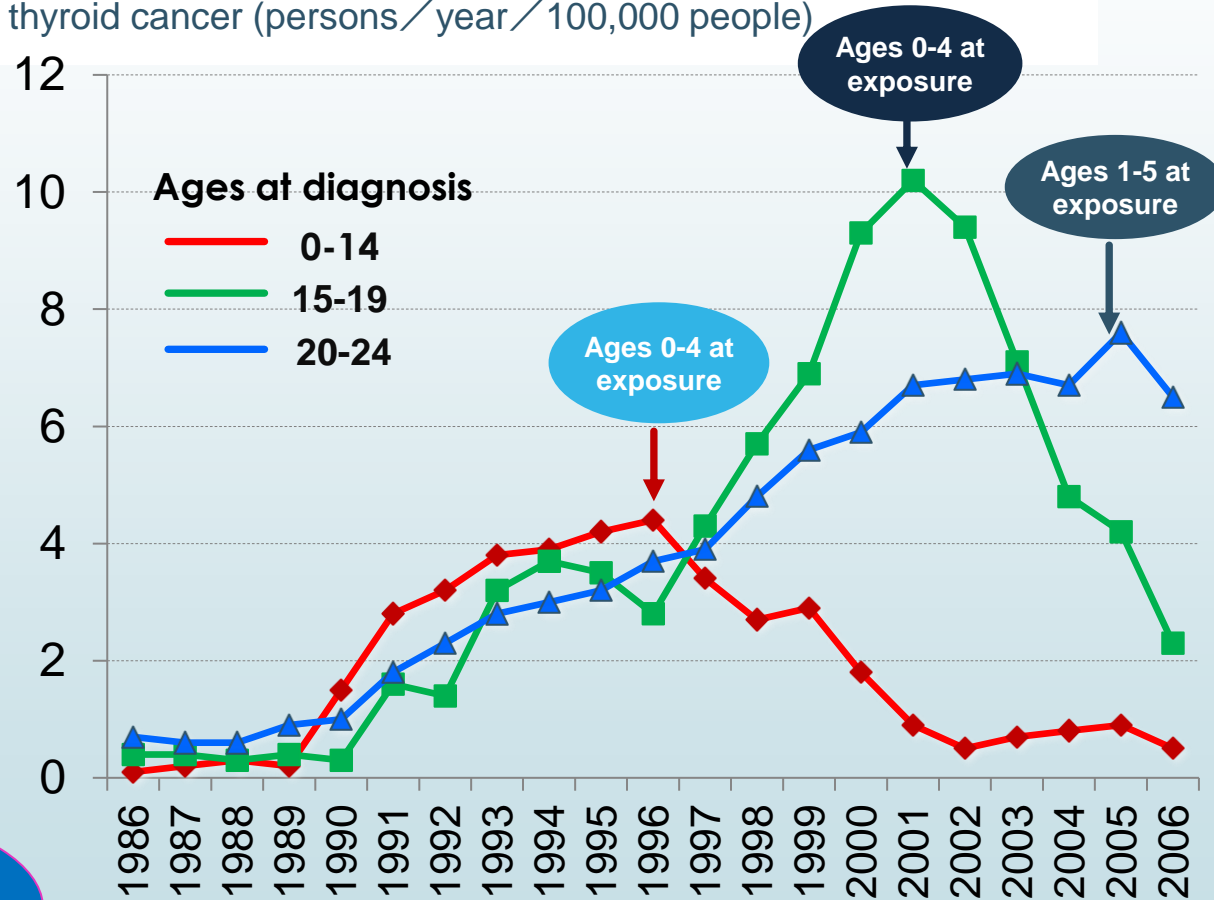
Daily Meals

From the textbook

Increase in pediatric thyroid cancer in Belarus

● Increase in pediatric thyroid cancer in Belarus


The incidence rate of thyroid cancer (persons/year/100,000 people)



How many years have passed since the Chernobyl accident?

(Demidchik Yu, Saenko V, Yamashita S. ABEM 2007 51:748-62)

0 2 4 6 8 10 12 14 16 18 20 years later



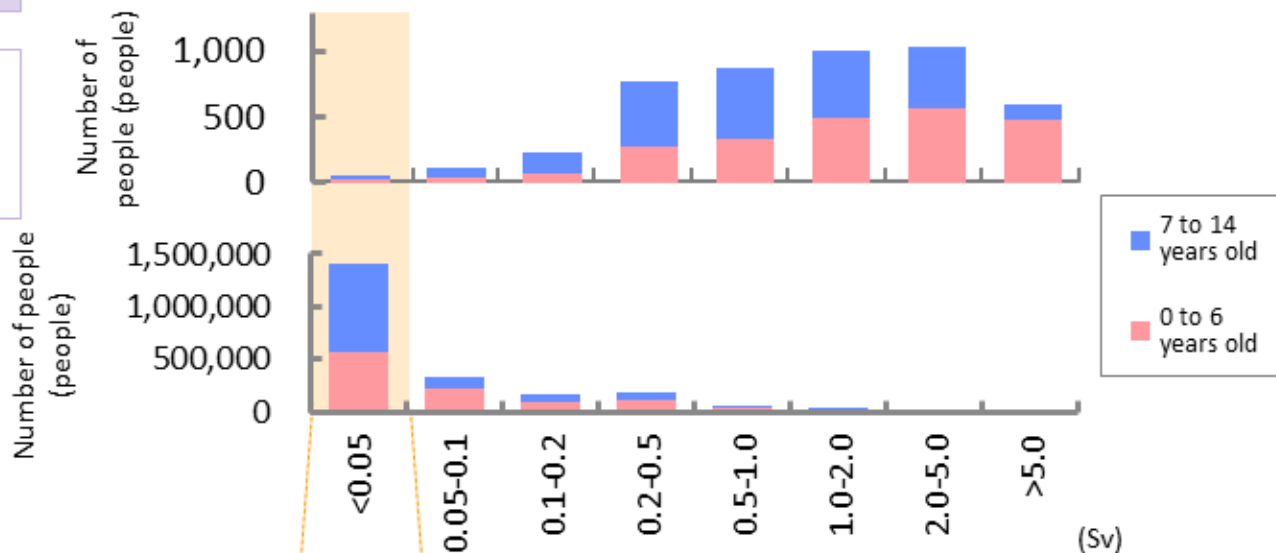
3. How the Thyroid Ultrasound Examination (TUE) began and what it has found

Children's thyroid exposure doses

Chernobyl NPS Accident

A group of people who evacuated in Belarus in 1986

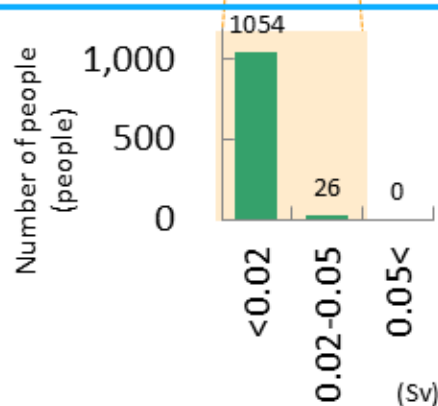
All people in Belarus (excluding evacuees)



Source: United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2008 Report

Accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS

* This data is based on a survey targeting a limited group of residents and does not reflect the overall circumstances.



Calculation method

For comparison, the "Results of the Simple Thyroid Screening for Children" contained in the "Outline of Children's Simple Measurement Test Results" (August 17, 2011; Team in Charge of Assisting the Lives of Disaster Victims (Medical Team)) is rearranged using "screening level of 0.2 μSv/h (equivalent to 100 mSv of thyroid dose equivalent for 1-year-old children)" (May 12, 2011; Nuclear Safety Commission of Japan) (Gy = Sv)

Source: "Safety of Fukushima-produced Foods," Nuclear Disaster Expert Group

Judging from the measurement method and ambient dose rates at the relevant locations, the detection limit is set at around 0.02 Sv.

“Thyroid Ultrasound Examination” The Fukushima Health Management Survey



TUE Flow Chart

Fukushima residents who were aged 1 to 18 at the time of the disaster.

Voluntary participation

Primary examination (Portable ultrasound devices are mainly used)

Schools or other facilities and venues in Fukushima prefecture



Domestic medical institutions and facilities outside Fukushima

Ultrasound image evaluation (At Fukushima Medical University)

Others

Nodules ≥ 5.1 mm or cysts ≥ 20.1 mm



Voluntary participation

Confirmatory examination

(More detailed ultrasonography of the thyroid, plus blood, and urine tests)



Informed consent



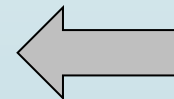
Determination for cytology

Confirmatory examination
Cytology-* FNAC (as necessary)



Next round of primary examination

For those 19 years old or younger: every 2 years
For those 20 years old and older: every 5 years



Surgical treatment and/or medical follow-up

*FNAC: Fine Needle Aspiration Cytology

TUE at schools and general examination venues



Mobile Examination Bus



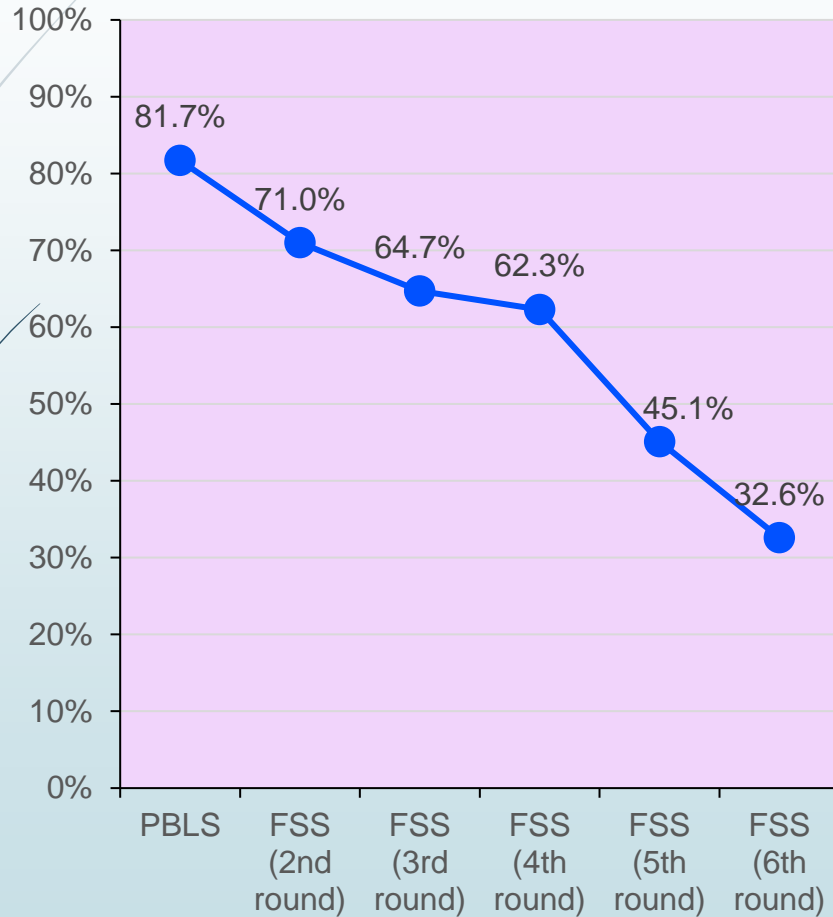
TUE result summary

		Preliminary Baseline Survey	Full-scale Survey	Full-scale Survey	Full-scale Survey	Full-scale Survey	Full-scale Survey	Age 25 Survey	Age 30 Survey
		(1st round)	(2nd round)	(3rd round)	(4th round)	(5th round)	(6th round)	****	****
		*	**	**	***	****	*****		
Fiscal Year		2011- 2013	2014- 2015	2016- 2017	2018- 2019	2020- 2022	2023- 2024	2017-	2022-
Eligible participants		367,637	381,237	336,667	294,228	252,936	211,928	169,956	66,542
Participation rate		81.7%	71.0%	64.7%	62.3%	45.1%	32.6%	8.1%	6.3%
Results	A1	51.5%	40.2%	35.1%	33.6%	28.8%	26.8%	42.3%	43.4%
	A2	47.8%	59.0%	64.2%	65.6%	70.0%	71.8%	52.1%	47.8%
	B	0.8%	0.8%	0.7%	0.8%	1.2%	1.4%	5.6%	8.8%
	C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Participants eligible for the confirmatory examination		2,293	2,230	1,502	1,394	1,346	988	719	271
Confirmatory examination participation rate		92.9%	84.2%	73.5%	74.3%	82.9%	73.4%	84.0%	84.5%
Malignant or suspected for malignancy (FNAC)		116	71	31	39	50	19	26	9
Treatment / surgery cases		102	56	29	34	46	13	19	4
Pathological diagnoses	Papillary carcinoma	100	55	29	34	45	13	18	4
	Poorly differentiated	1							
	Other	1(benign)	1(other)			1(other)		1 (follicular)	

*As of 2018/3/31, **As of 2021/03/31, ***As of 2022/06/30, ****As of 2024/12/31, *****As of 2025/3/31, *****As of 2025/6/30

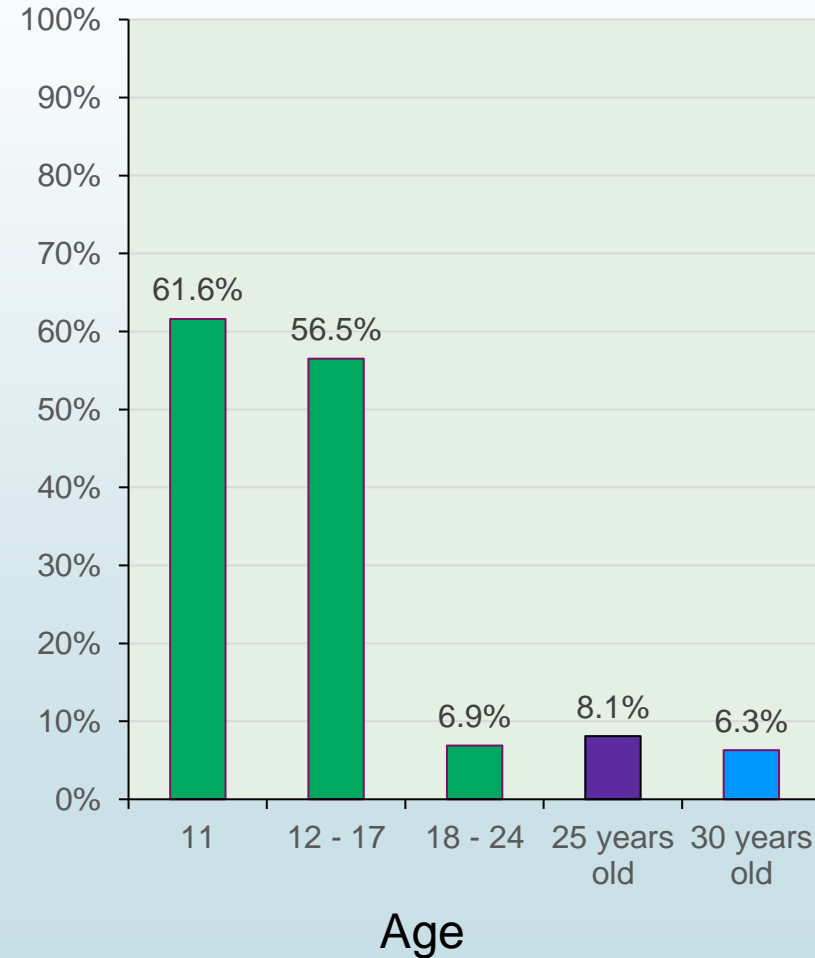
Changes in participation rate

Changes in the participation rate by survey round



PBLS: Preliminary Baseline Survey
FSS: Full-scale Survey

Participation rate by age group of FSS 6th round
Participation rate of Age 25 and Age 30





4. Thyroid Ultrasound Examination (TUE) initiative and the future ahead

Relationship Between Cancer Screening and TUE

Cancer Screening

- Cancer screening programs are established when a **reduction in cancer mortality** has been scientifically demonstrated.
- Participation is not mandatory, but **screening is recommended**.
- Recommended cancer screening programs by the Japanese government.
 - Gastric cancer screening
 - Cervical cancer screening
 - Lung cancer screening
 - Breast cancer screening
 - Colorectal cancer screening

Thyroid Ultrasound Examination (TUE)

- TUE is **conducted to monitor the health** of Fukushima residents exposed to radiation following the nuclear power plant accident.
- These examinations have not been shown to reduce cancer mortality and are therefore not considered cancer screening.
- TUE **participation is voluntary** and offered to **individuals after receiving information on both advantages and disadvantages**.

Advantages of the examination

- If the examination shows no irregularities in the thyroid gland, this may bring **peace of mind and an improved quality of life** for those who might otherwise be concerned about health effects from radiation exposure.



- **Early diagnosis and early treatment** may **reduce the risk** of complications from surgery, side effects from treatment, and cancer recurrence.



- Analysis of Thyroid Ultrasound Examination data can provide information on **the presence or absence of radiation effects**, not only to participants and their families, **but also to residents of the prefecture and people everywhere.**



Disadvantages of the Examination

- Finding small cancers may **lead to the treatment of cases that would otherwise never cause symptoms** or shorten a person's natural lifespan.
- Early diagnosis of cancer or suspected cancer may lead to prolonged treatment or follow-up that **may increase psychological burdens** and **impose socioeconomic disadvantages**.
- Nodules (lumps) and cysts that do not require treatment may also be found, and even if these are benign, a confirmatory examination or cytological diagnosis may be recommended, which could be inconvenient and **may add emotional distress** to participants and their families.



Supporting children and families in making informed decisions about participation

On-location sessions

Simplified Examination Information

県民健康調査 甲状腺検査について

福島第一原子力発電所の事故の影響で甲状腺がんが増えるのではないかと、心配する人も多かったが、福島県と福島県立医科大学が中心となって甲状腺検査がはじまりました。甲状腺検査は、甲状腺を超音波（きこえない音）で調べる検査です。しかし、甲状腺検査を受けることにもメリット（よい点）だけでなく、デメリット（わるい点）があることも考えられています。甲状腺検査は、希望する人が受ける検査です。このお話を甲状腺検査を受けるかどうかを決めるために役立ててください。

「甲状腺がん」ってどんな病気？

はじめは自分で気づく症状はありません。甲状腺がんが大きくなると、のどがはれたり、飲み込みにくくなったりすることがあります。この病気は進み方がゆっくりで命にかかわる場合はとても少ないと言われています。超音波を使って検査すると、症状のない甲状腺がんも見つかります。甲状腺がんの多くは手術をして治しますが、まずは手術をしないで様子を見る場合もあります。手術したの多くは手術前と同じ生活を送っています。

甲状腺検査を受けることには、メリット（よい点）とデメリット（わるい点）があります。検査を受けるかどうかをおうちのひとと相談してください。

メリット（よい点）

- 甲状腺がんを心配している人にとって、検査を受けて大丈夫だったら安心できるかもしれません。
- 隠れていた病気が早く見つかり、治療を早く始めることができます。
- 福島県で甲状腺がんが増えるのかわかると、みなさんにお知らせすることができます。

デメリット（わるい点）

- 一生自分で気づく症状がなく、体に問題のない甲状腺がんを見つけてしまうことがあるかもしれません。
- 甲状腺がんが見つかったときや疑われたときには、定期的に病院に通わなければならないことがあります。
- 検査結果が本当は心配ない場合でも実は病気ではないかと心配になることがあります。

この検査ではデメリット（わるい点）を減らすために次のような取り組みを行っています。

- 甲状腺検査では治療の必要のない病気は、なるべく診断されないようにしています。
- 検査でわからないことや不安や心配なことは、検査の時や電話などで相談できます。

中学生向け

県民健康調査 甲状腺検査について

福島第一原子力発電所の事故の影響で甲状腺がんが増えるのではないかと、心配する人も多かったので、福島県と福島県立医科大学が中心となって甲状腺検査がはじまりました。甲状腺検査は、甲状腺を超音波（きこえない音）で調べる検査です。しかし、甲状腺検査を受けることにもメリット（よい点）だけでなく、デメリット（わるい点）があることも考えられています。甲状腺検査は、希望する人が受ける検査です。このお知らせ文を甲状腺検査を受けるかどうかを決めるための参考にしてください。

甲状腺がんの特徴

甲状腺がんは、最初、自覚症状はありません。しかし、病変が大きくなると、のどがはれたり、飲み込みにくくなったりすることがあります。普通は進行が遅く、死亡率は低いと言われています。超音波検査では、症状のない甲状腺がんも見つかります。甲状腺がんの多くは手術により治療を行います。まずは経過観察をしてすぐに手術をしないでも様子を見る場合もあります。手術しても多くの人は手術前と同じ生活を送っています。



甲状腺検査を受けることには、メリット（よい点）とデメリット（わるい点）があります。検査を受けるかどうか、ご家族と相談してください。

メリット

- 検査で異常のないことがわかれば、放射線による健康への影響を心配している人にとっては、安心できる可能性があります。
- 早めの診断・治療により、合併症や副作用、再発の可能性などを低くすることができます。
- 甲状腺検査を行うことで、放射線の影響の有無に関する情報を本人、家族はもとより、県内外の人たちにもお伝えすることができます。

デメリット

- 将来、日常生活や命に影響を及ぼすことのないがんを発見し、治療の可能性がります。
- がん、がんの疑いが早期にわかった場合、治療や診断期間の長期化により、普通の生活に支障をきたす可能性があります。
- 検査では、治療の必要のない結節やう胞が発見されることがあります。また、二次検査等を勧められることにより本人や家族に対し、心配をかけてしまうことがあります。

この検査ではデメリットを減らすために次のような取り組みを行っています。

- 甲状腺検査では、治療の必要のない病変ができるだけ診断されないよう対策をしています。
- 二次検査を受けた方の不安や心配には、必要に応じて心のケア・サポートチームの職員が、感じている不安などに寄り添う対応をしています。また、電話による相談も応じています。

Examination Information for Junior High Students



第3話 甲状腺検査のメリットとデメリットって何？




An explanatory animation video

Mental health care for TUE participants

- ✓ Worries about the examination and its results
- ✓ Worries about treatment and ongoing follow-up care



1. Establishment of a **call center**
2. Publication of the **Thyroid Newsletter** twice a year, providing regular information on examinations and FAQs
3. **Information booths** at examination venues, offering explanations of preliminary results and consultations with medical doctors
4. Establishment of the **dedicated medical hotline** for medical questions related to examination results
5. Support for participants and their families by the **mental health care support team**
6. Support for thyroid cancer patients and those under medical follow-up, as well as their families, including **peer support**

A decorative graphic on the left side of the slide. It features a dark blue vertical bar on the far left. A black arrow points to the right from the top of this bar. Several thin, light blue lines curve downwards and to the right from the bottom of the arrow, extending across the left side of the slide.

Future examinations and efforts to improve accessibility

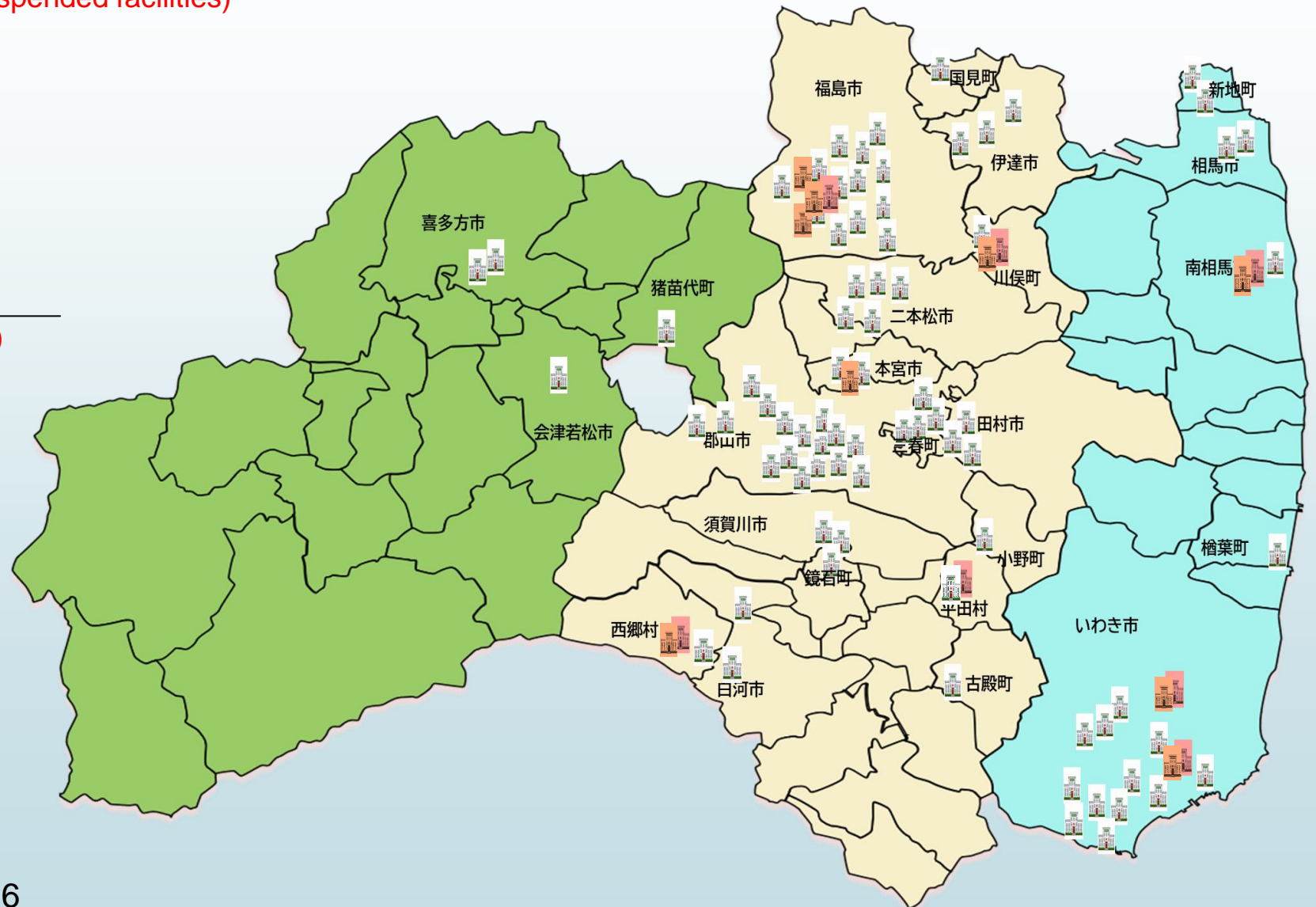
- Ensuring the availability of medical institutions for TUE
- Primary examinations through a shared-use framework
- Online Reservation System

Implementing Institutions in Fukushima Prefecture

(number of medical institutions with agreements for the TUE implementation)

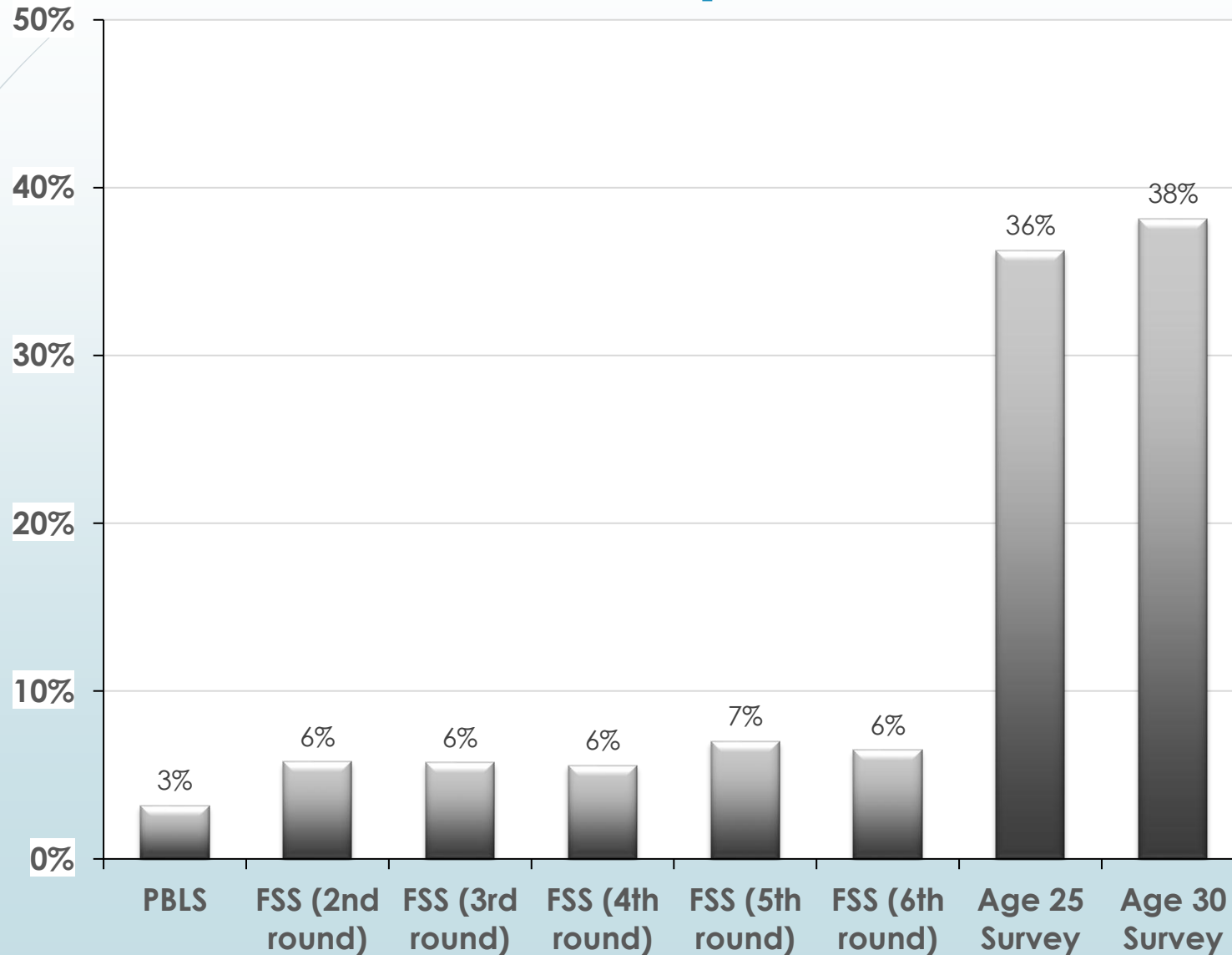
Cooperative Facilities (suspended facilities)

KENPOKU	27	(5)
KENCHU	29	(0)
KENNAN	3	(1)
AIZU	4	(0)
MINAMIAIZU	0	(0)
SOSO	7	(1)
IWAKI	14	(2)
Total	84	(9)



As of January 1, 2026

Proportion of participants undergoing primary examination outside the prefecture

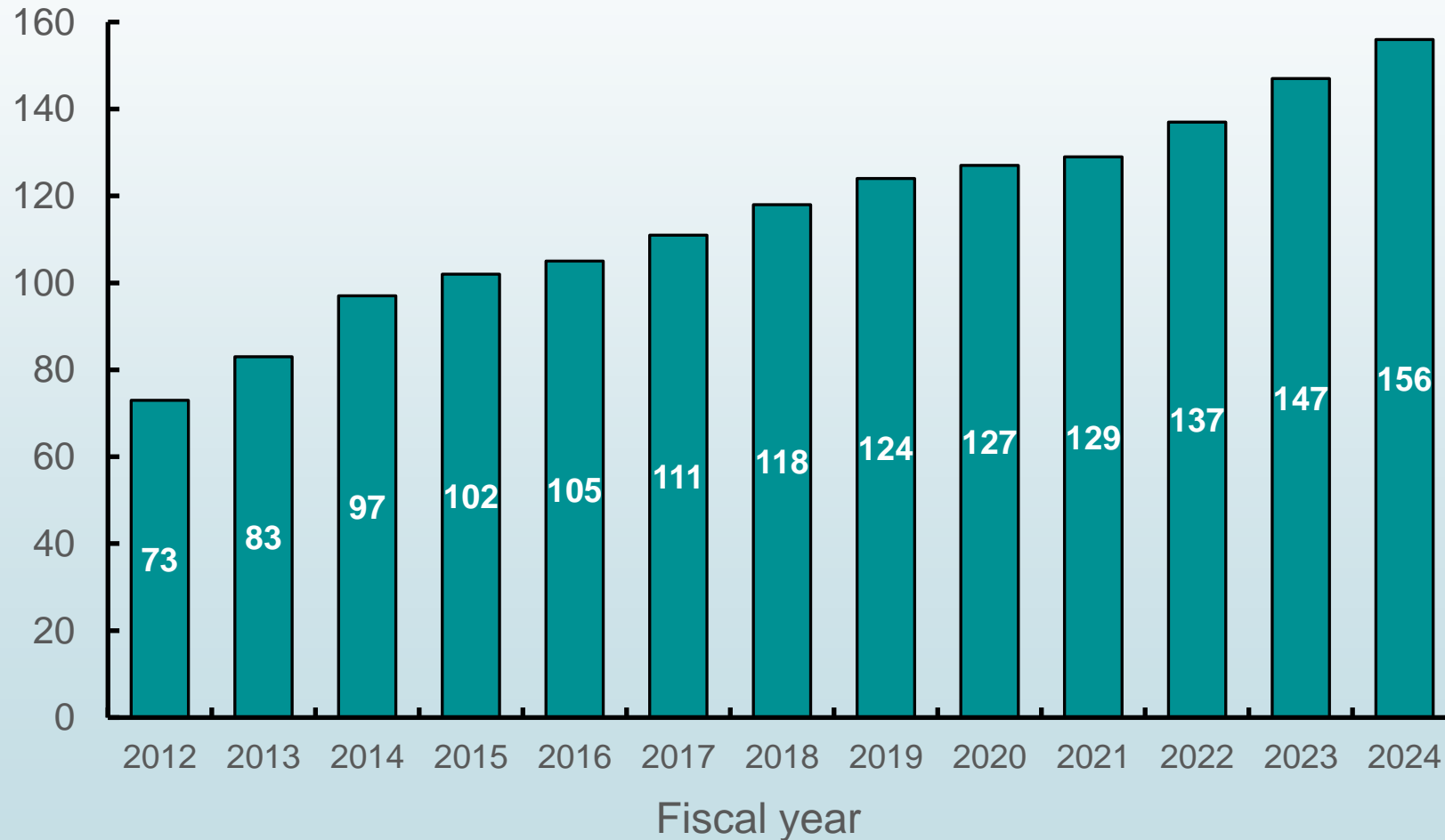


PBLs:
Preliminary Baseline Survey
FSS:
Full-scale Survey

As of March 31, 2025

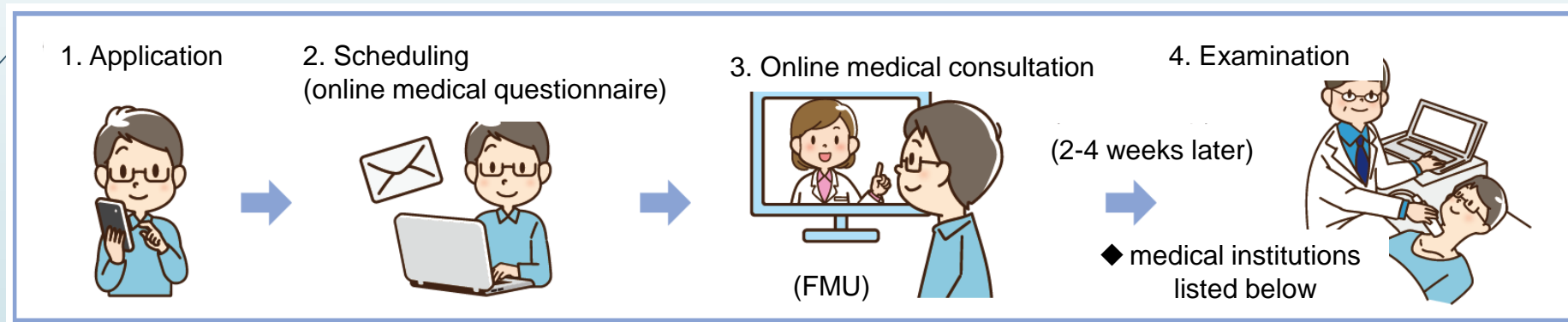
Yearly changes in the number of contracted TUE medical institutions outside the prefecture

Number of medical institutions



Open hospital system for TUE and imaging

Although all participating medical institutions have certified ultrasound technologists, they do not have certified thyroid specialist doctors on staff. However, primary examination is made available by conducting an online medical consultation with certified doctors from Fukushima Medical University. Primary screening has currently been initiated at the following five hospitals.



- ◆ Kasumigaura Medical Center (Tsuchiura City, Ibaraki)
- ◆ National Hospital Organization, Saitama Hospital (Wako City, Saitama)
- ◆ Kanto Rosai Hospital (Kawasaki City, Kanagawa)
- ◆ Yokohama Rosai Hospital (Yokohama City, Kanagawa)
- ◆ Miyagawa Hospital (Kawasaki City, Kanagawa)

The online reservation system for TUE has launched

甲状腺検査WEB予約システム

様 通知 設定 ログアウト

🔔 新着情報

未読の新着情報はありません

2025年度1次検査を予約する

2025年度2次検査を予約する

同意確認書兼問診票

予約

受診票

お知らせ

よくある質問

設定

トップページ 同意確認書兼問診票 予約 受診票 お知らせ よくある質問 設定

© 2025 Fukushima Medical University.



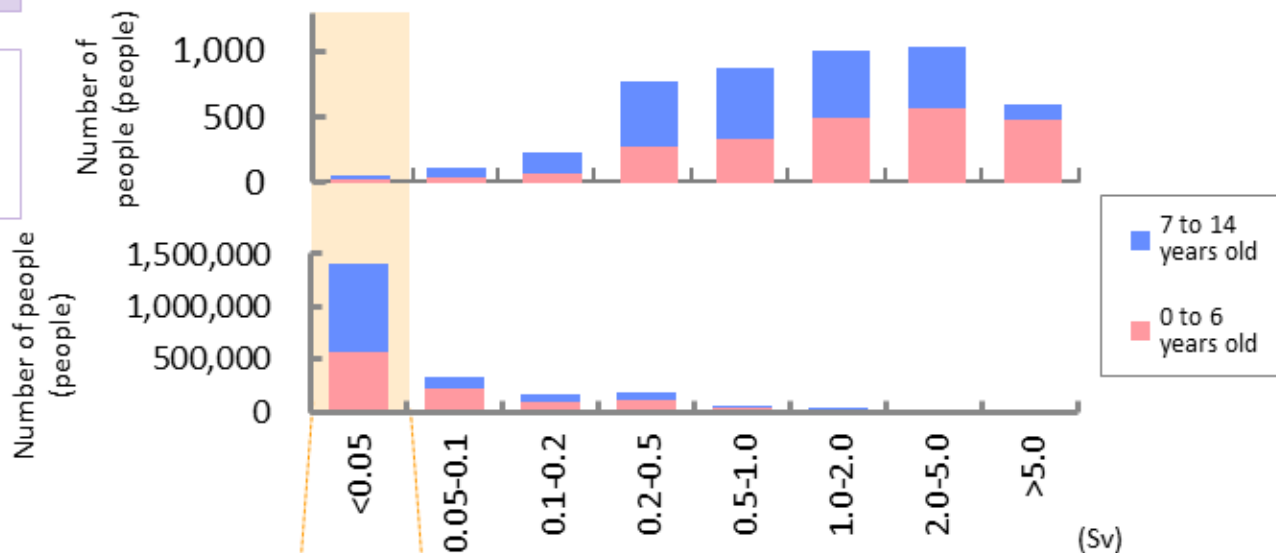
5. What we know so far: Radiation-related

Children's thyroid exposure doses

Chernobyl NPS Accident

A group of people who evacuated in Belarus in 1986

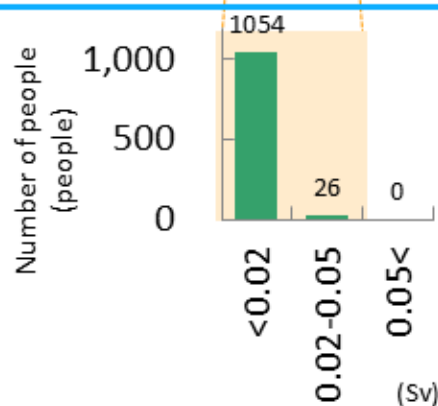
All people in Belarus (excluding evacuees)



Source: United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2008 Report

Accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS

* This data is based on a survey targeting a limited group of residents and does not reflect the overall circumstances.



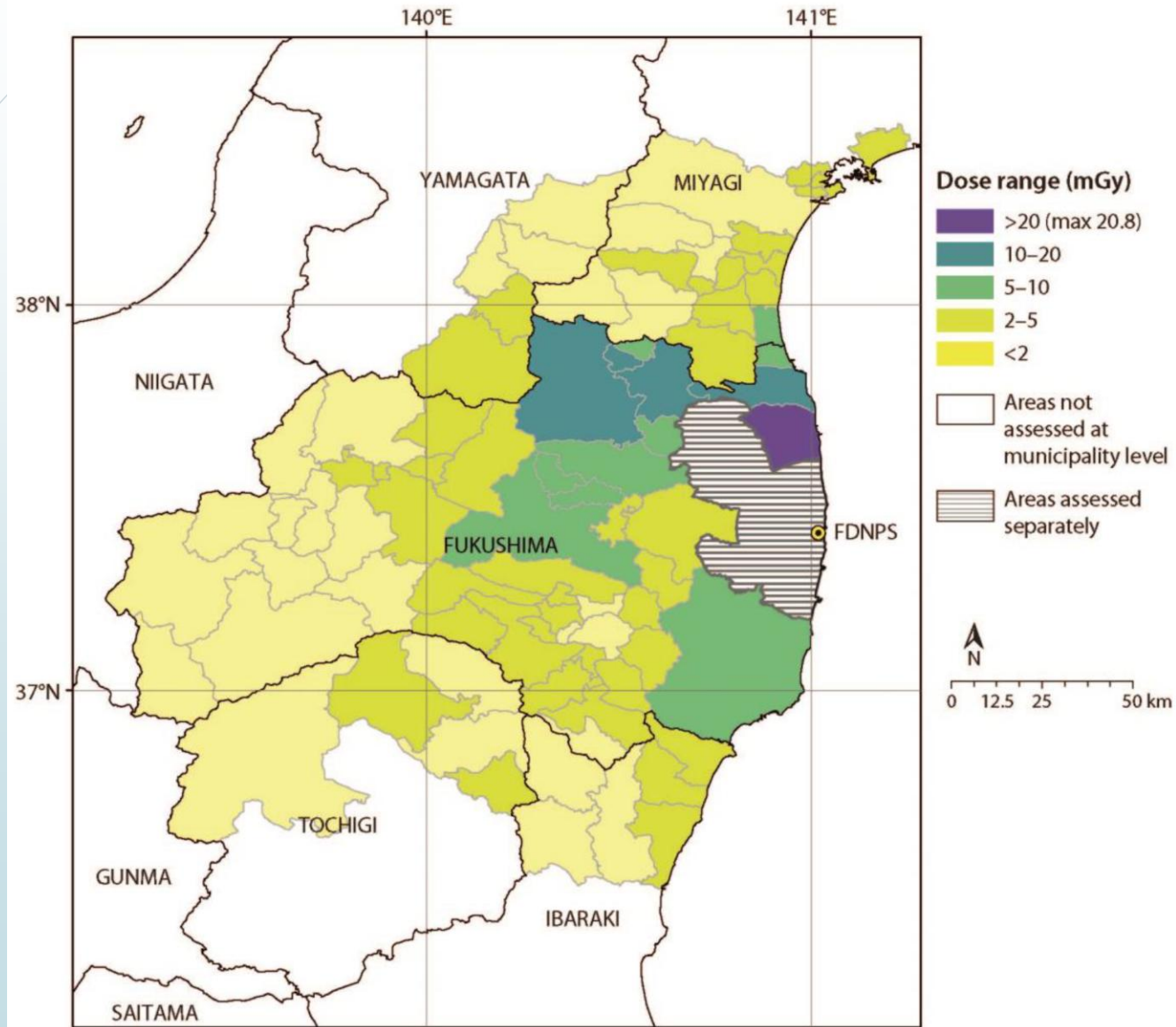
Calculation method

For comparison, the "Results of the Simple Thyroid Screening for Children" contained in the "Outline of Children's Simple Measurement Test Results" (August 17, 2011; Team in Charge of Assisting the Lives of Disaster Victims (Medical Team)) is rearranged using "screening level of 0.2 μSv/h (equivalent to 100 mSv of thyroid dose equivalent for 1-year-old children)" (May 12, 2011; Nuclear Safety Commission of Japan) (Gy = Sv)

Source: "Safety of Fukushima-produced Foods," Nuclear Disaster Expert Group

Judging from the measurement method and ambient dose rates at the relevant locations, the detection limit is set at around 0.02 Sv.

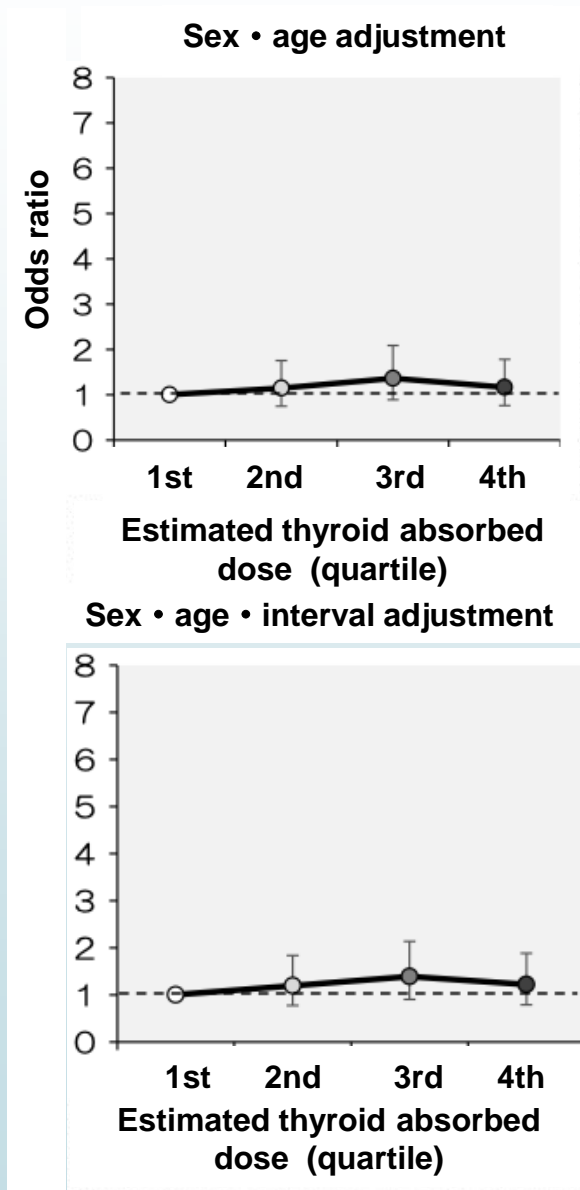
Estimated absorbed doses to adult thyroids in the first year after the accident, by municipalities (UNSCEAR 2020/2021 Report, excluding evacuation areas)



UNSCEAR 2020 Thyroid dose and malignant/suspected malignant detection rate (Full-scale Survey, Rounds 2–5, Cumulative)

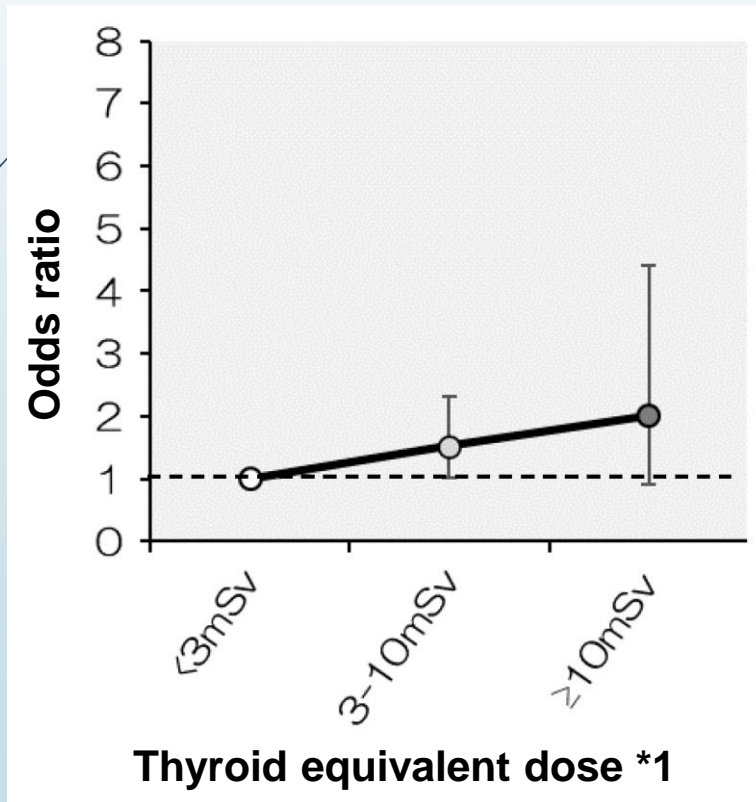
	1st 0.5-2.6 mGy	2nd 2.7-4.3 mGy	3rd 4.5-7.0 mGy	4th 7.0-15 mGy
Female (%)	50.5	50.2	49.2	49.7
Age at the time of primary examination (mean)	8.4	9.3	6.7	7.8
Examination interval (%)				
< 4 years	33.2	26.4	18.1	17.8
4 ≤, < 5 years	5.7	13.8	8.4	12.3
5 ≤, < 6 years	24.3	7.9	11.8	5.0
6 ≤, < 7 years	4.8	19.2	13.0	19.4
≥ 7 years	32	32.7	48.7	45.5
Malignant or suspicious for malignancy (persons)	34	58	58	57
Detection rate (/ 100,000 people)	71.3	88.8	81.5	78.3

Summarized based on the meeting material of the 56th Oversight Committee

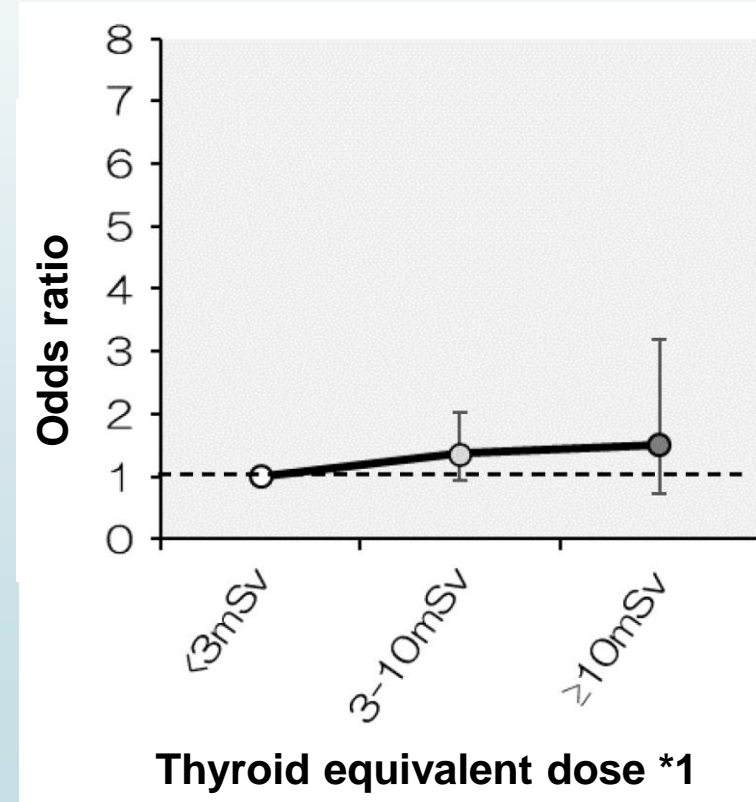


Odds ratios of malignant/suspected malignant detection by thyroid equivalent dose group

Cases detected through the TUE



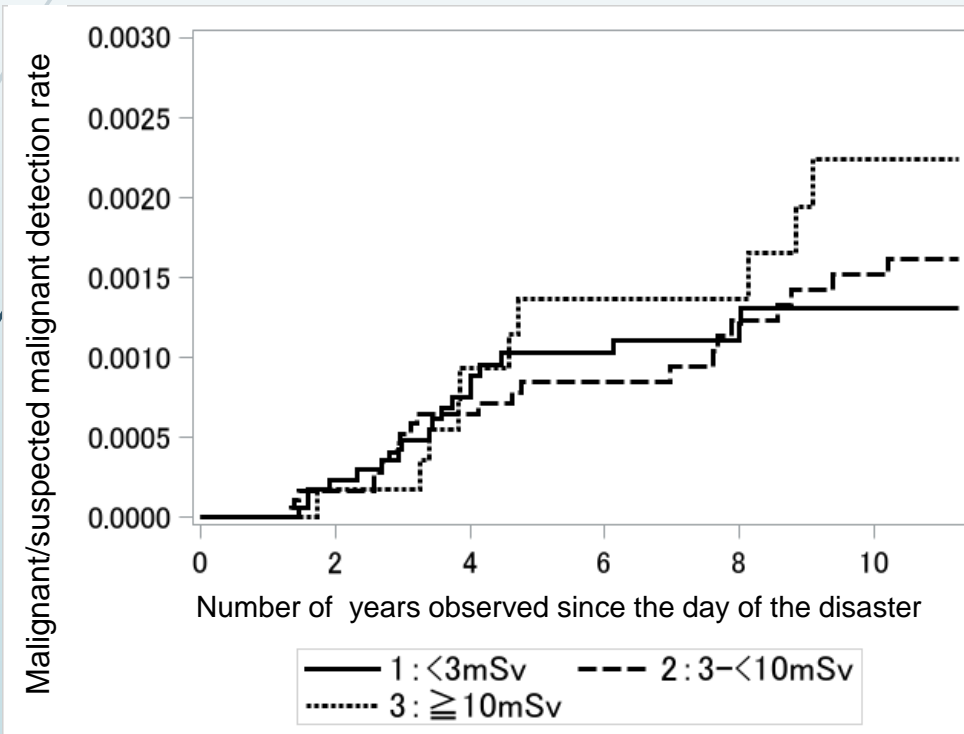
Cases detected through the TUE + Cancer Registry data



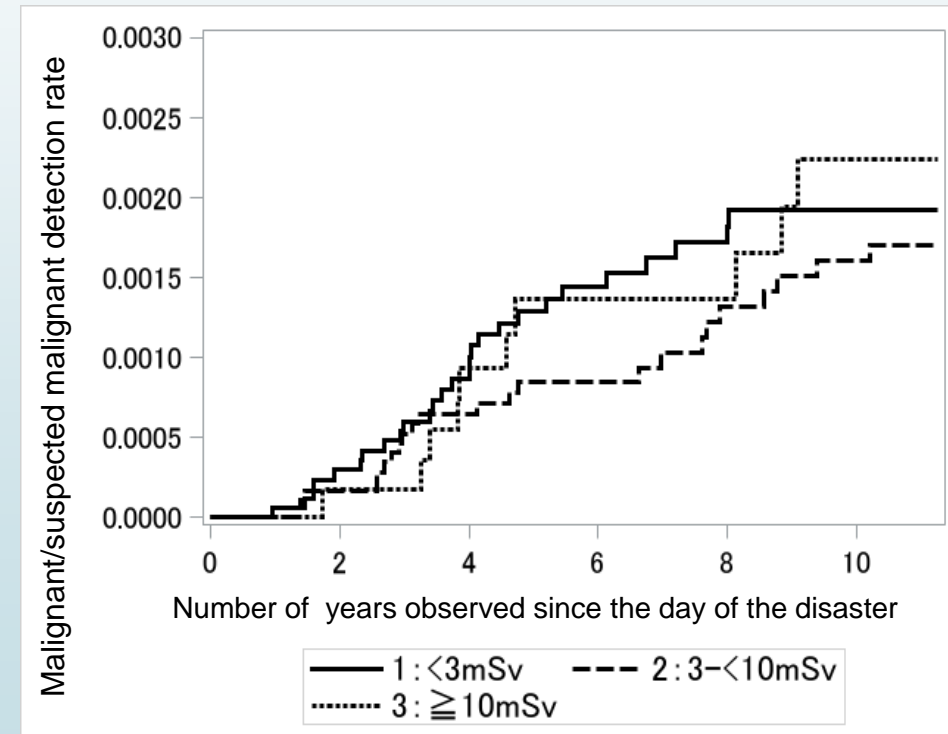
Cumulative detection rates of malignant/suspected malignant cases by thyroid equivalent dose group

(Kaplan-Meier analysis by three estimated radiation dose categories in coastal Hama-dori and the evacuation areas)

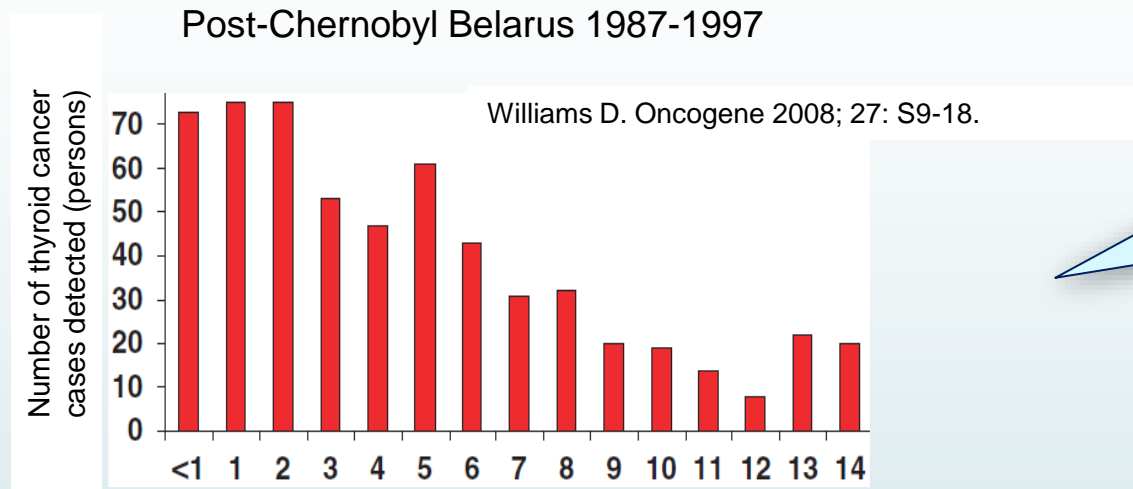
Cases of TUE participation (excluding the cases registered only in the Cancer Registry)



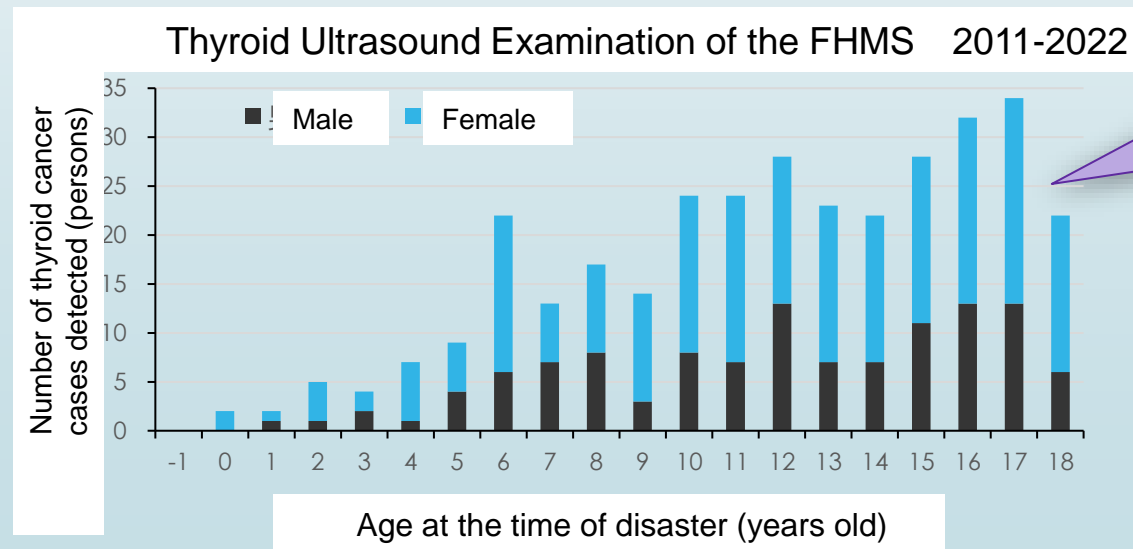
Cases of both TUE participation and registration in the Cancer Registry



Number of thyroid cancer cases detected by age at the time of the nuclear accident



1-11 years after the Chernobyl nuclear accident



0-12 years after the Fukushima Daiichi accident

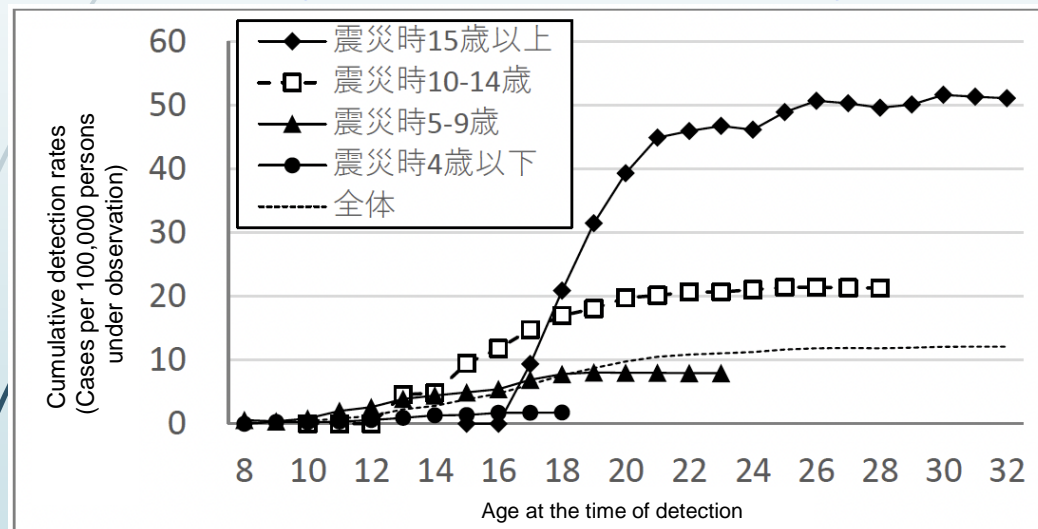
Figure: 5th round Full-scale Survey and Age 25 survey (as of March 2025)

<https://www.pref.fukushima.lg.jp/site/portai/kenkocyoa-kentoiinkai.html>

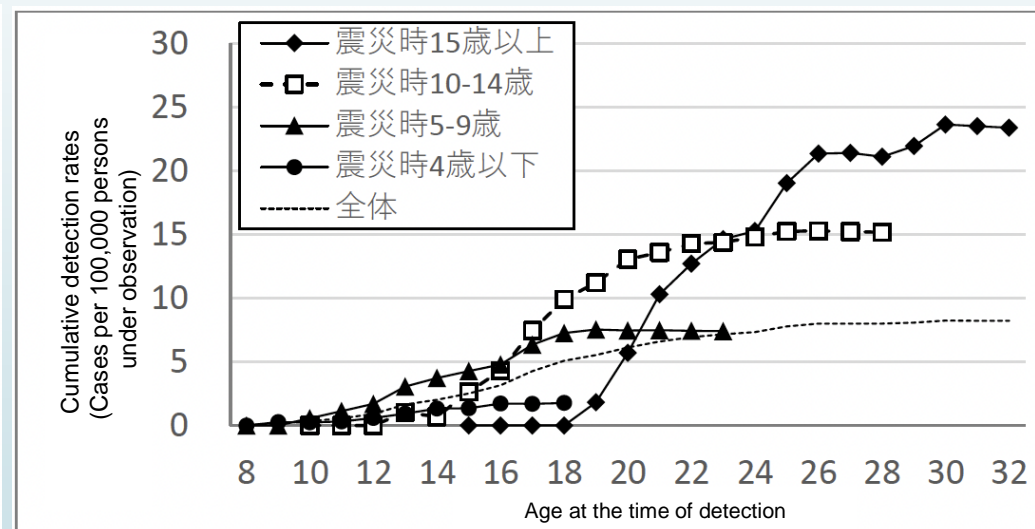
Cumulative detection rates by age at the time of detection (by age at the time of the disaster)

Cases detected among the TUE participants, and only in the cancer registry data

Cases detected in the Preliminary Baseline Survey and the Full-Scale Surveys



Cases detected only in the Full-Scale Surveys



- ◆ 15 years old and older at the time of the earthquake
- 10 to 14 at the time of the earthquake
- ▲ 5 to 9 at the time of the earthquake
- 4 years old and younger at the time of the earthquake
- Overall

Excerpt from the Thyroid Examination Evaluation Subcommittee summary for the TUE Preliminary Baseline Survey through the Fifth-round Full-scale Survey

1. From the Preliminary Baseline Survey (PBLs) through the 5th round Full-scale Survey, no association between thyroid cancer and radiation exposure has been recognized... It can be said that this conclusion is clearer than at the stage of the summary up to the 4th round Full-scale Survey. Regarding the region-restricted analysis in the case-control study, the results have not been consistent, possibly due to the small number of covered populations included in the analysis. **Therefore, it remains important to make judgments based on the results of continued follow-up analyses.**
2. In the summary through the 4th Round Survey, it was stated that "the results of the detailed ultrasound examinations conducted on a broad population of asymptomatic individuals may reflect either an overdiagnosis of cancers that do not threaten life expectancy or cause symptoms, or the early detection of cancers that may cause symptoms in the future, or both," and, "At present, it is impossible to determine the relative proportions of these effects, and further retrospective verification by specialized academic societies is necessary." **This assessment remains unchanged at this time.**
3. The TUE program has been conducted with the aim of long-term monitoring of children's health, based on the intention of residents who seek to undergo the examination... **The program should be implemented in a manner that enables residents to make informed decisions based on sufficient information.**



6. What We Know So Far: Non-radiation-related



(1) Thyroid volume

- a. Measurement of width, thickness, and longitudinal diameter, and related issues
- b. Simplified methods for volume assessment and reference values

(2) Variations in Thyroid Hemiagenesis (Absence of One Lobe)

(3) Ectopic thyroidal Thymus

(4) Ultrasonographic Nodule Findings and Their Relationship to Pediatric Thyroid Function

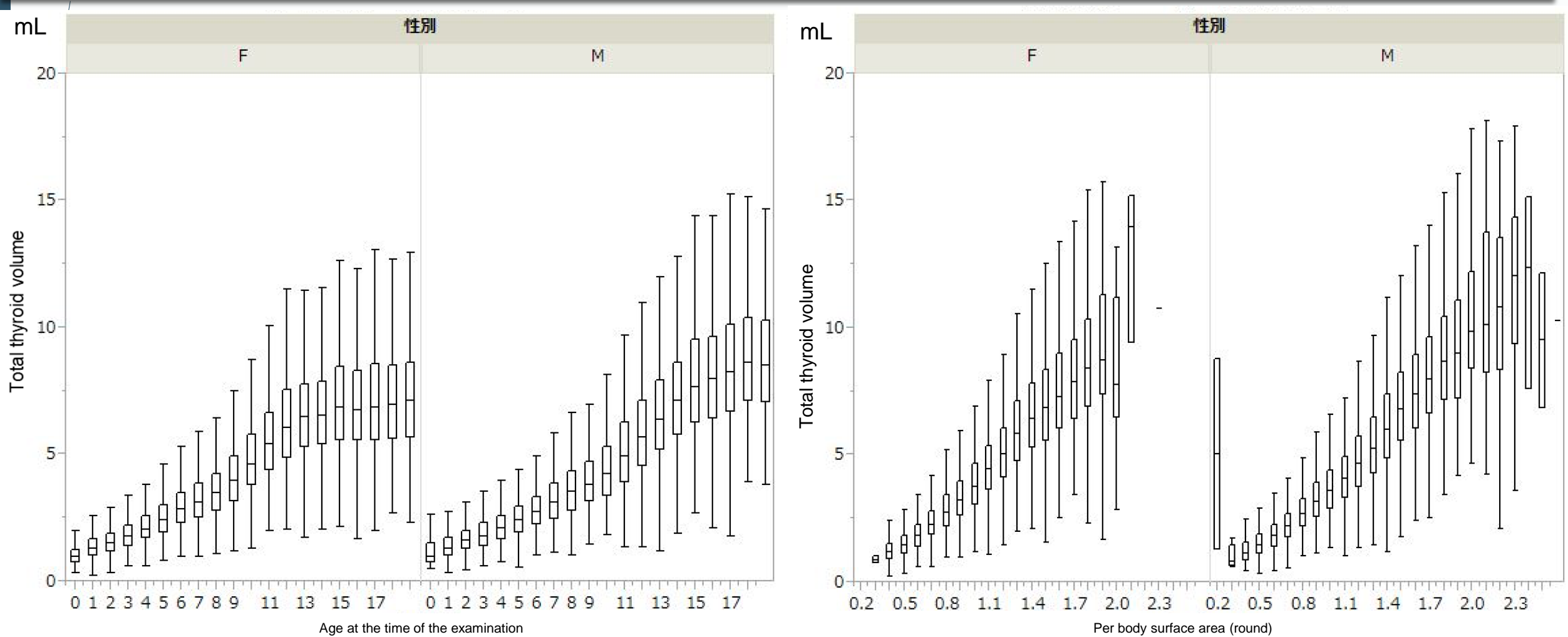
- a. Physiological regulation of thyroid hormones in childhood
- b. Relationship with ultrasonographic nodule findings

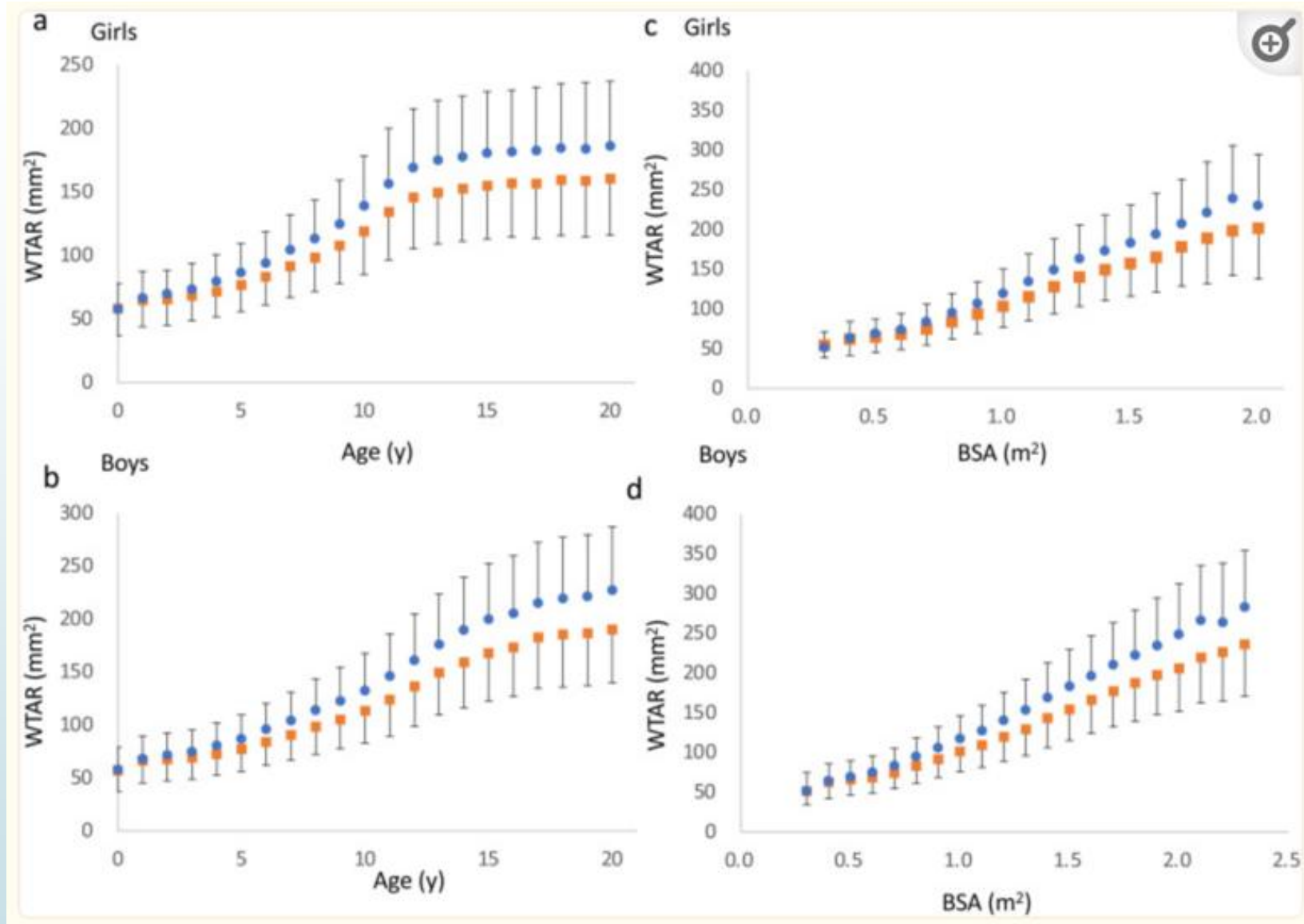
(5) Diffuse Thyroid Goiter and Thyroid Auto-antibodies



(1) Thyroid volume

Distribution of thyroid volume percentiles (2.5th, 25th, 50th, 75th, and 97.5th) per age (left panel) and per 0.1 m² body surface area (right panel), calculated using the current method based on ultrasonographically measured thyroid width, thickness, and longitudinal diameter.

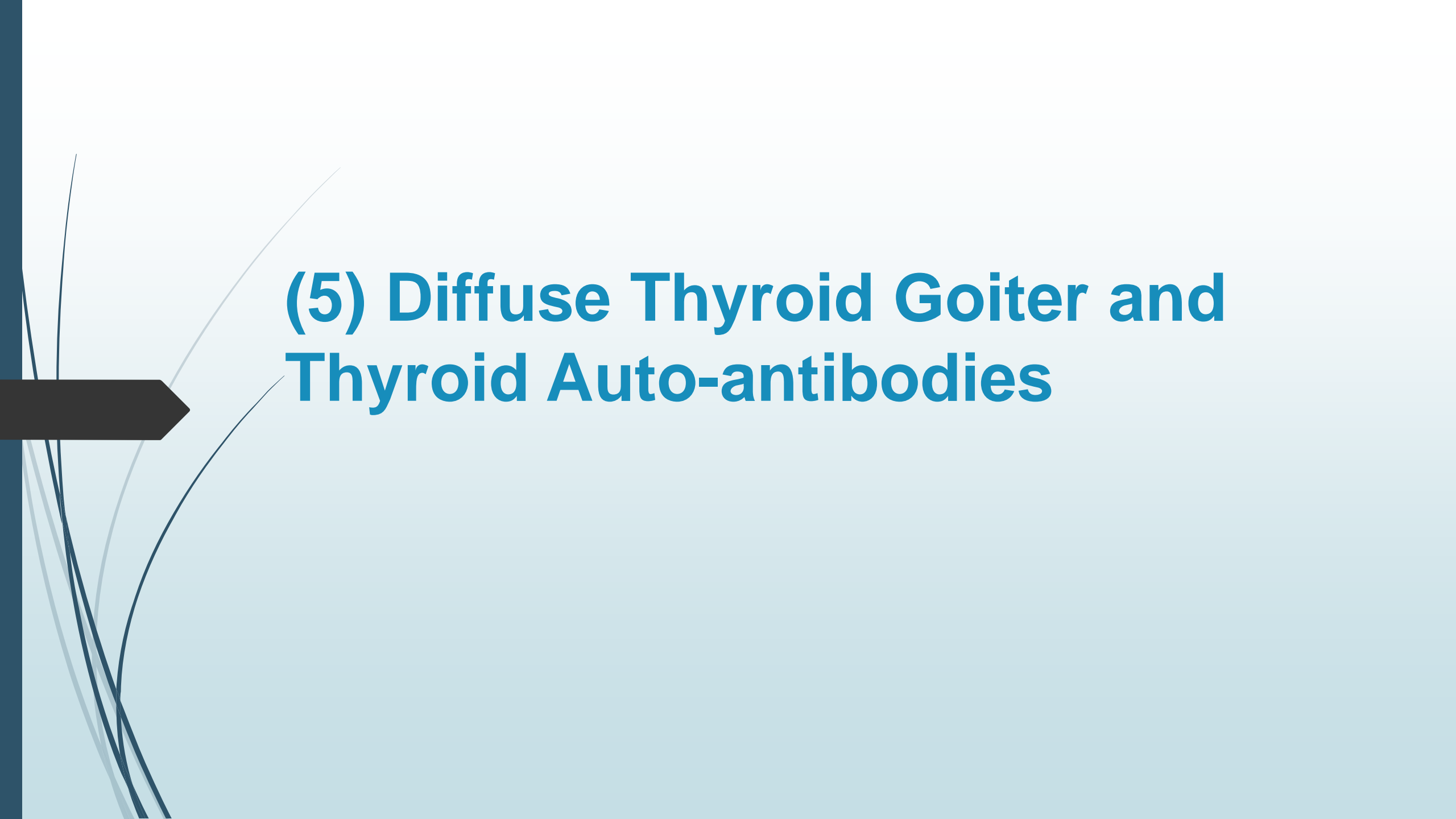




Blue represents the right lobe, and orange represents the left lobe

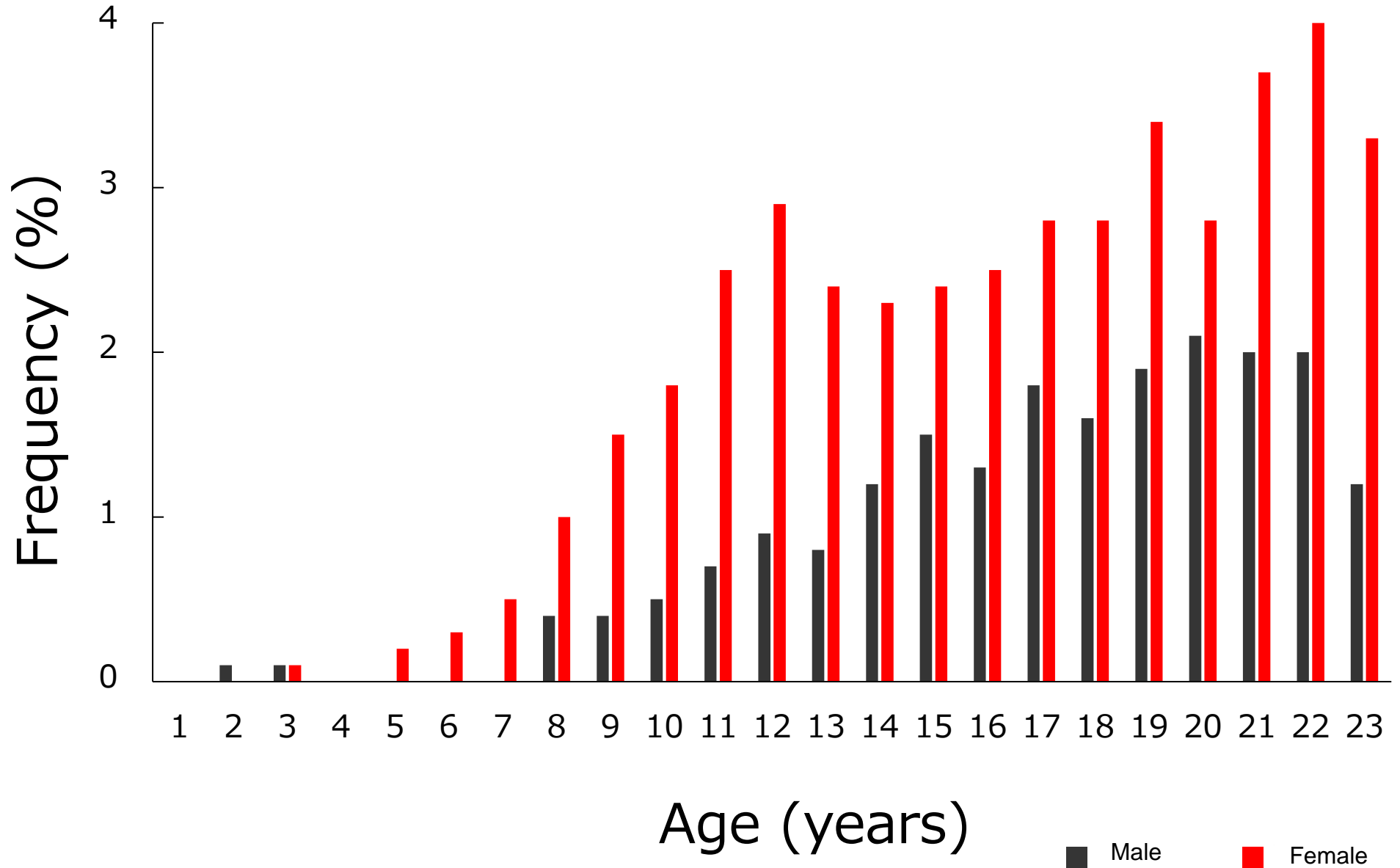
Clinical significance

A novel method for evaluating thyroid volume based on age and body surface area was established using measurements of thyroid size in a Japanese population. Standardization of thyroid volume can be achieved through the calculation of the standard deviation score (SDS).



(5) Diffuse Thyroid Goiter and Thyroid Auto-antibodies

Diffuse thyroid enlargement, by age and sex



Summary of current findings (non-radiation-related)

- Findings from these additional observations help us better understand how the thyroid normally grows and changes from childhood to young adulthood, and how to distinguish these normal changes from disease-related conditions, such as thyroid antibodies and papillary thyroid cancer.

Conclusion

1. We have looked back together over the past 15 years on the role of the thyroid as a hormone-producing organ, discussed radiation, and reviewed the purpose, activities, and key findings of the Fukushima Health Management Survey's Thyroid Ultrasound Examination.
2. This examination program is unlike anything ever conducted. With the support and feedback of many people, it has continued to this day.
3. We will continue to respect each person's choice about whether to participate, provide clear information so that people can decide with confidence, and ensure that anyone who wishes to have the examination can do so smoothly and comfortably.

We would like to express sincere gratitude to everyone involved. Thank you very much for your kind attention.

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