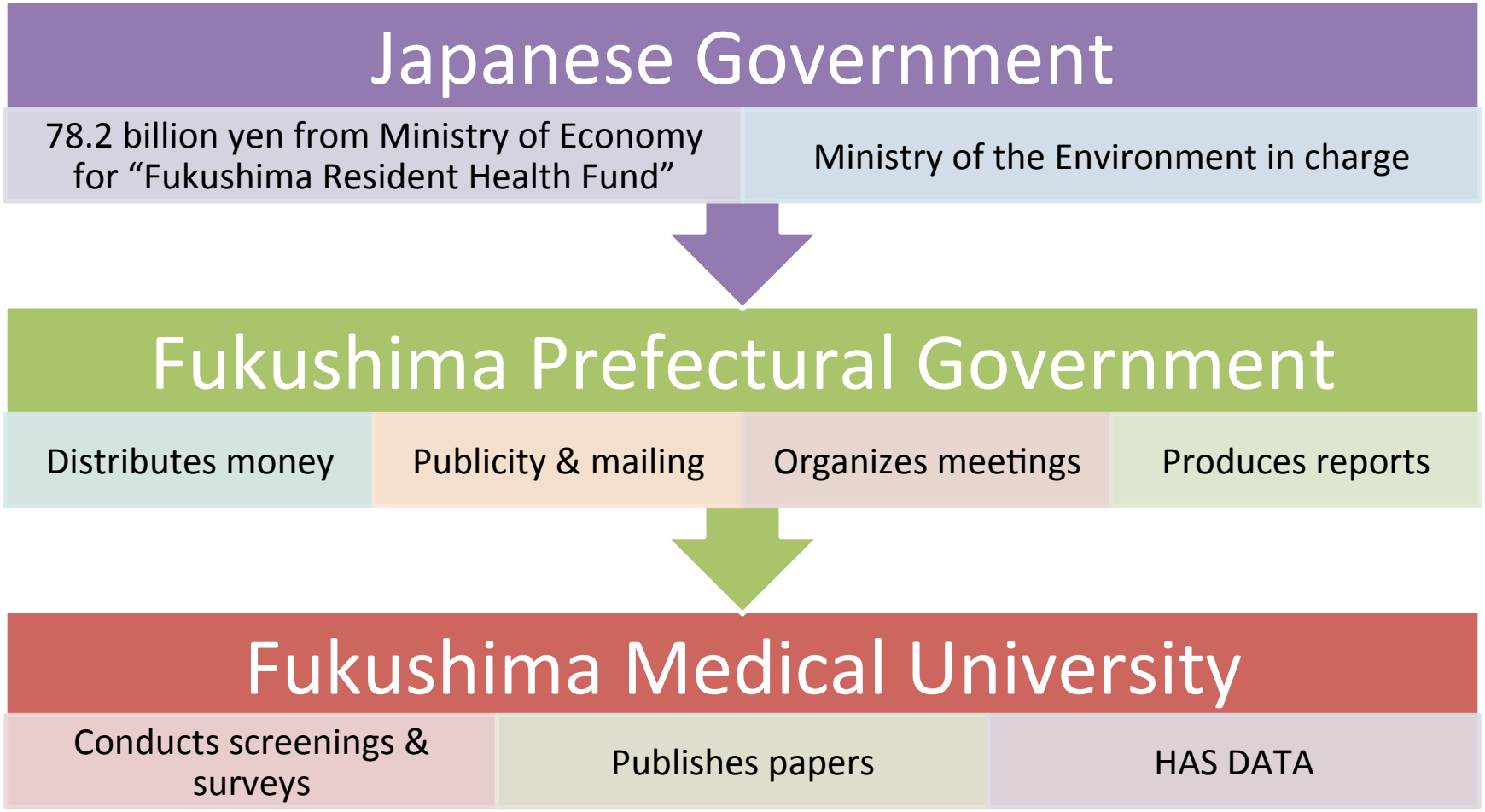
May 3, 2016, Washington DC
A Fukushima +5/Chernobyl +30 anniversary event
by Beyond Nuclear:
Lessons from Chernobyl and Fukushima - The Risks of "Normalizing" Radiation

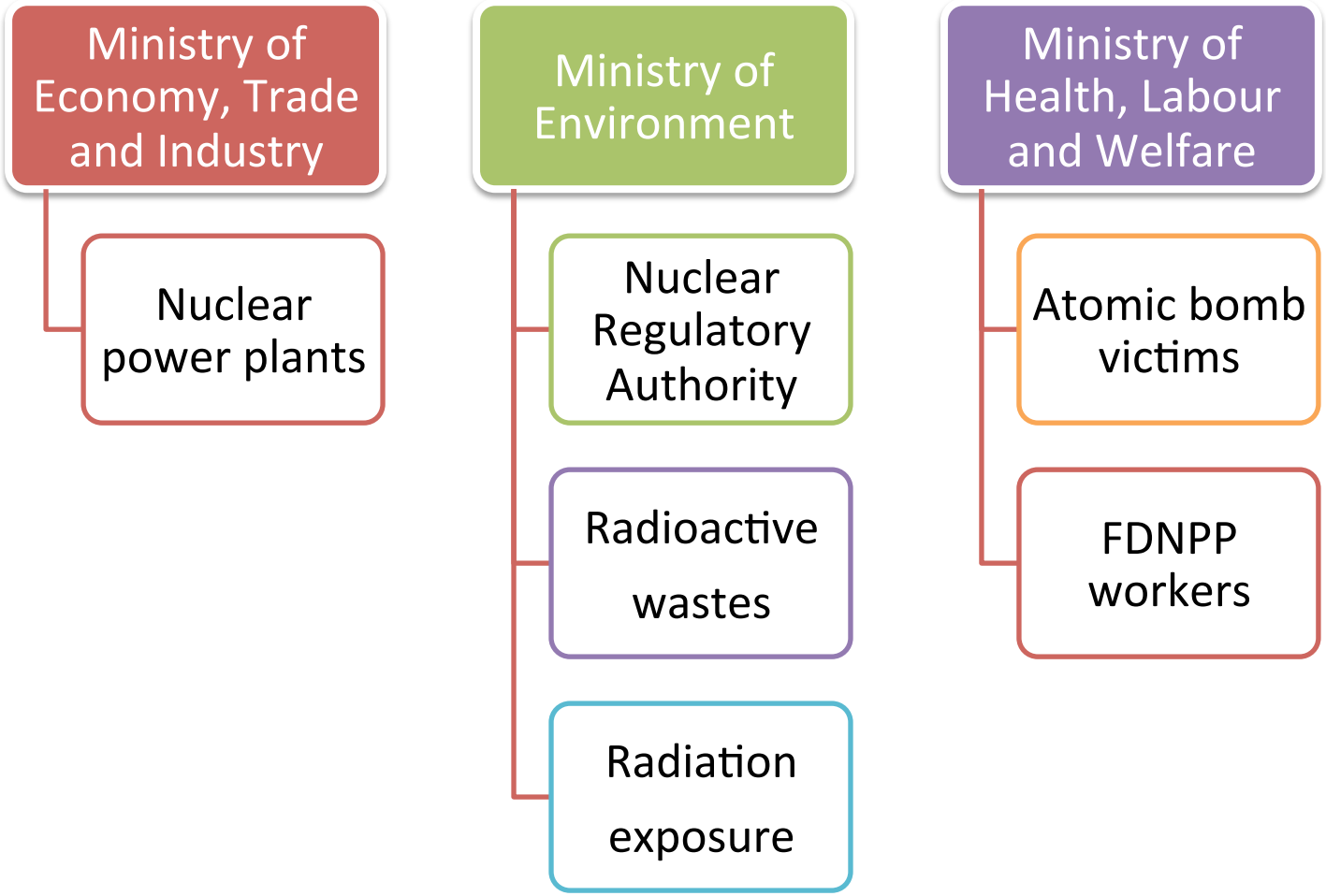
Fukushima Aftermath and the Health of Children: Thyroid Cancer Issues

Yuri Hiranuma, D.O.

Who conducts Fukushima Health Management Survey?



“Nuclear” role divisions



Who are screened for thyroid cancer?

First round screening (Oct 2011-March 2014)

Fukushima residents born between April 2, 1992 and April 1, 2011

- ages 0 to 18 at the time of the March 11, 2011 accident
- 367,685 eligible; 300,476 participated

Japanese fiscal year:
April 1 to March 31 next year

(Missing those born between March 12, 1992 and April 1, 1992)

Second round screening (April 2014-March 2016)

Fukushima residents born between April 2, 1992 and April 1, 2012

- includes children exposed in utero (& conceived after iodine gone)
- 381,261 eligible; 236,595 participated as of 12/31/15

How thyroid cancer is diagnosed

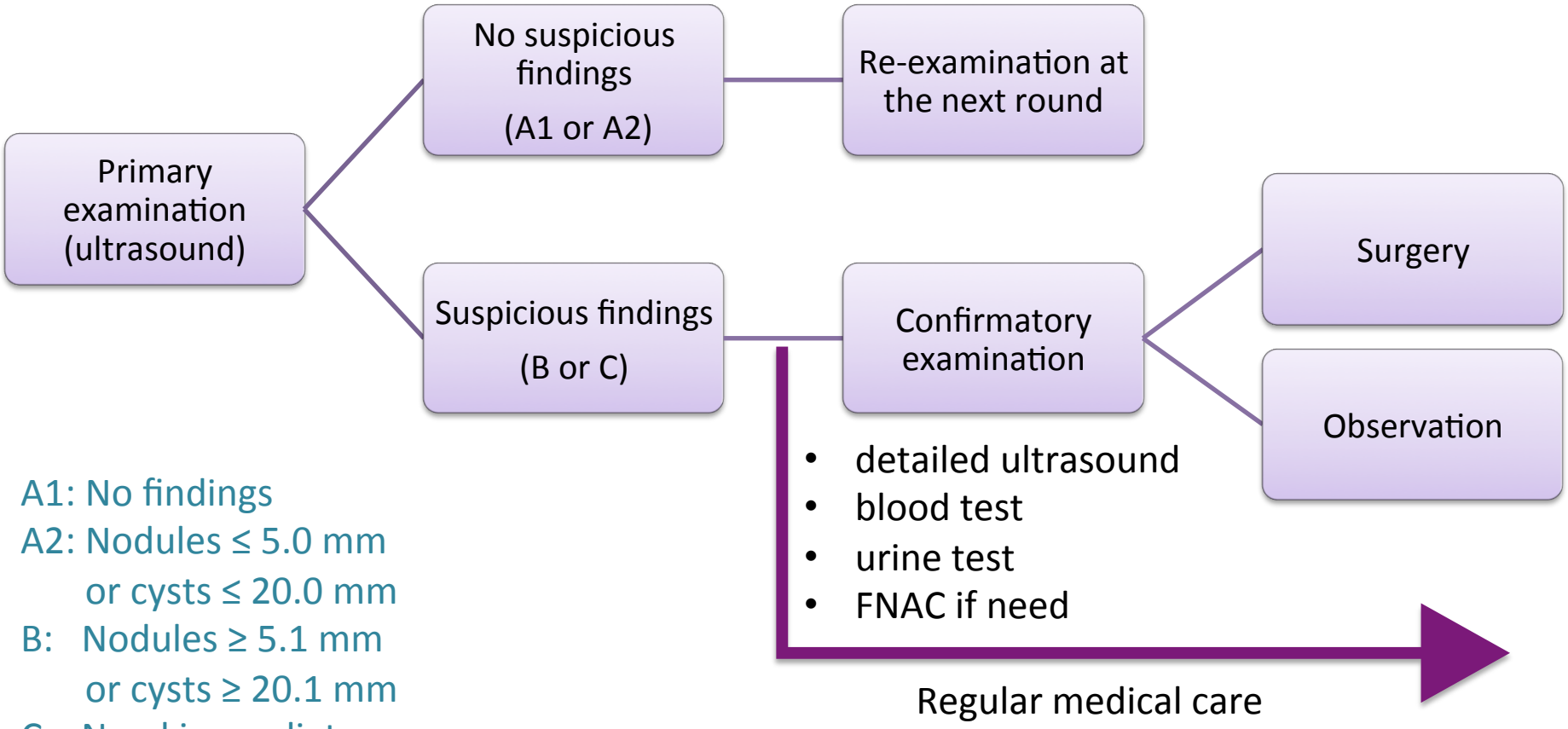
Thyroid ultrasound examination

Suspicious lump: Fine needle aspiration biopsy/cytology to examine cells

Cancer suspected: final diagnosis by tissue examination requires surgical removal of the thyroid gland

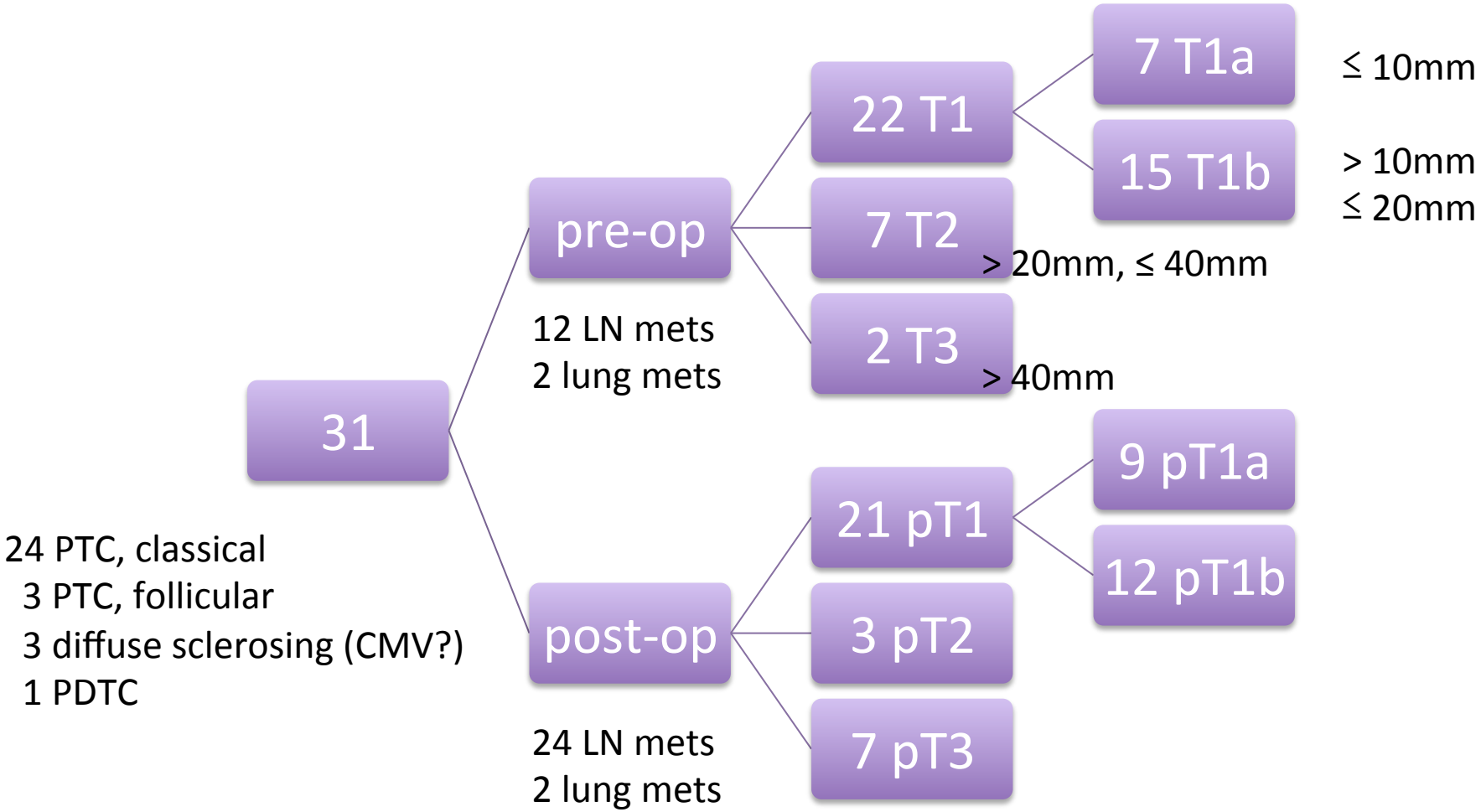
In Fukushima, cancer cases are reported as "suspected" or "confirmed"

Primary and confirmatory exams

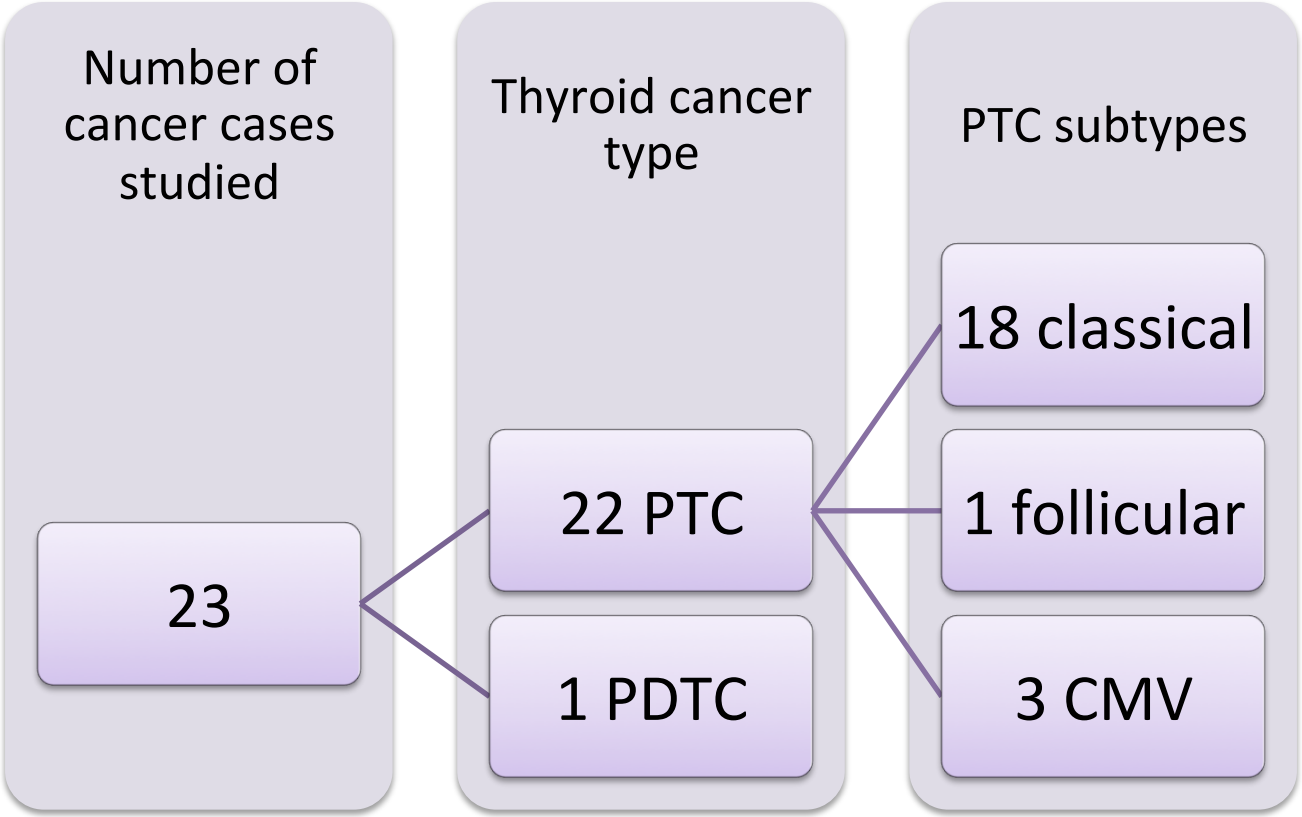


A1: No findings
A2: Nodules ≤ 5.0 mm
or cysts ≤ 20.0 mm
B: Nodules ≥ 5.1 mm
or cysts ≥ 20.1 mm
C: Need immediate re-exam

Japan Society of Clinical Oncology
August 28, 2014



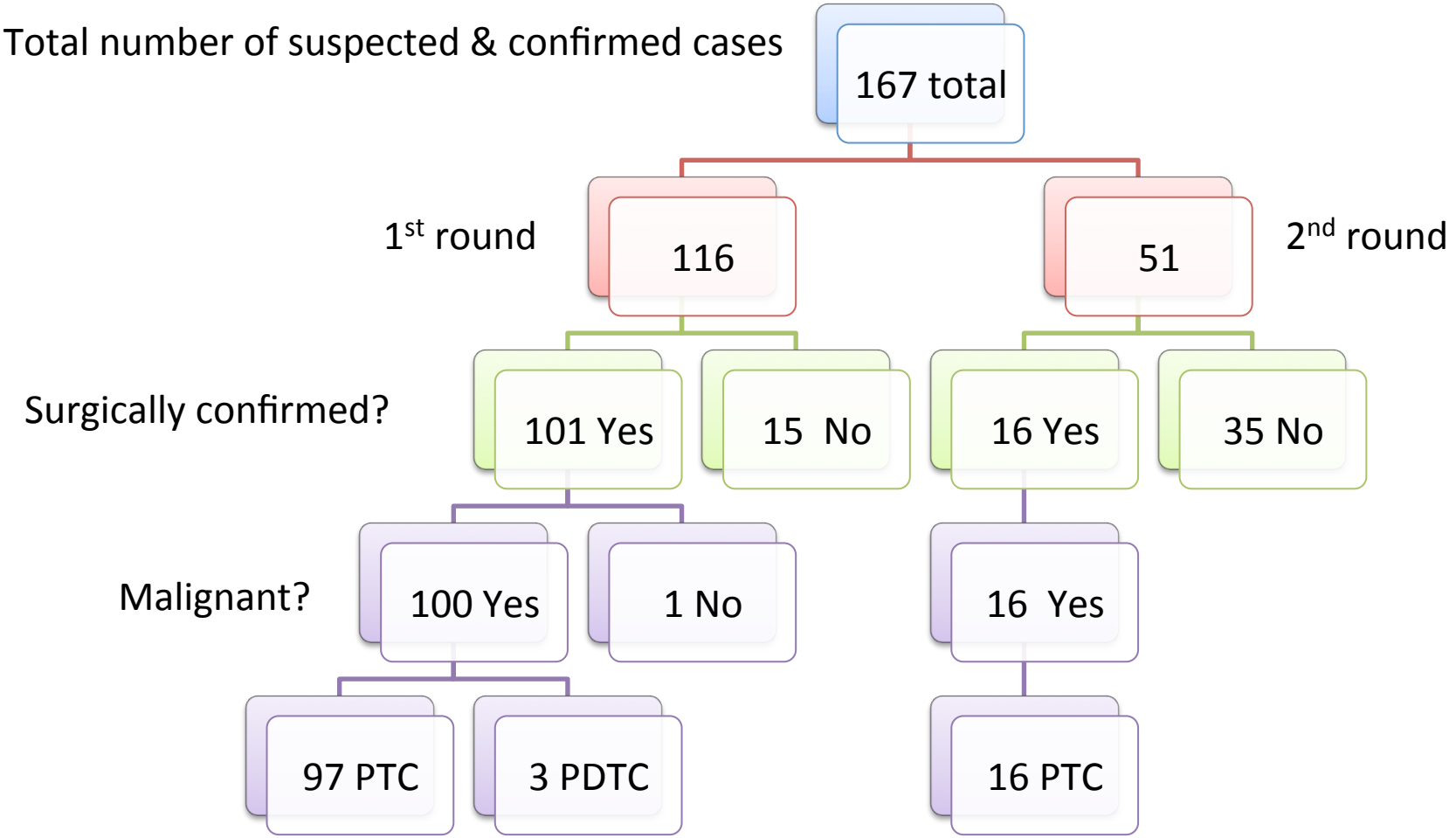
Japan Thyroid Association meeting November 14, 2014



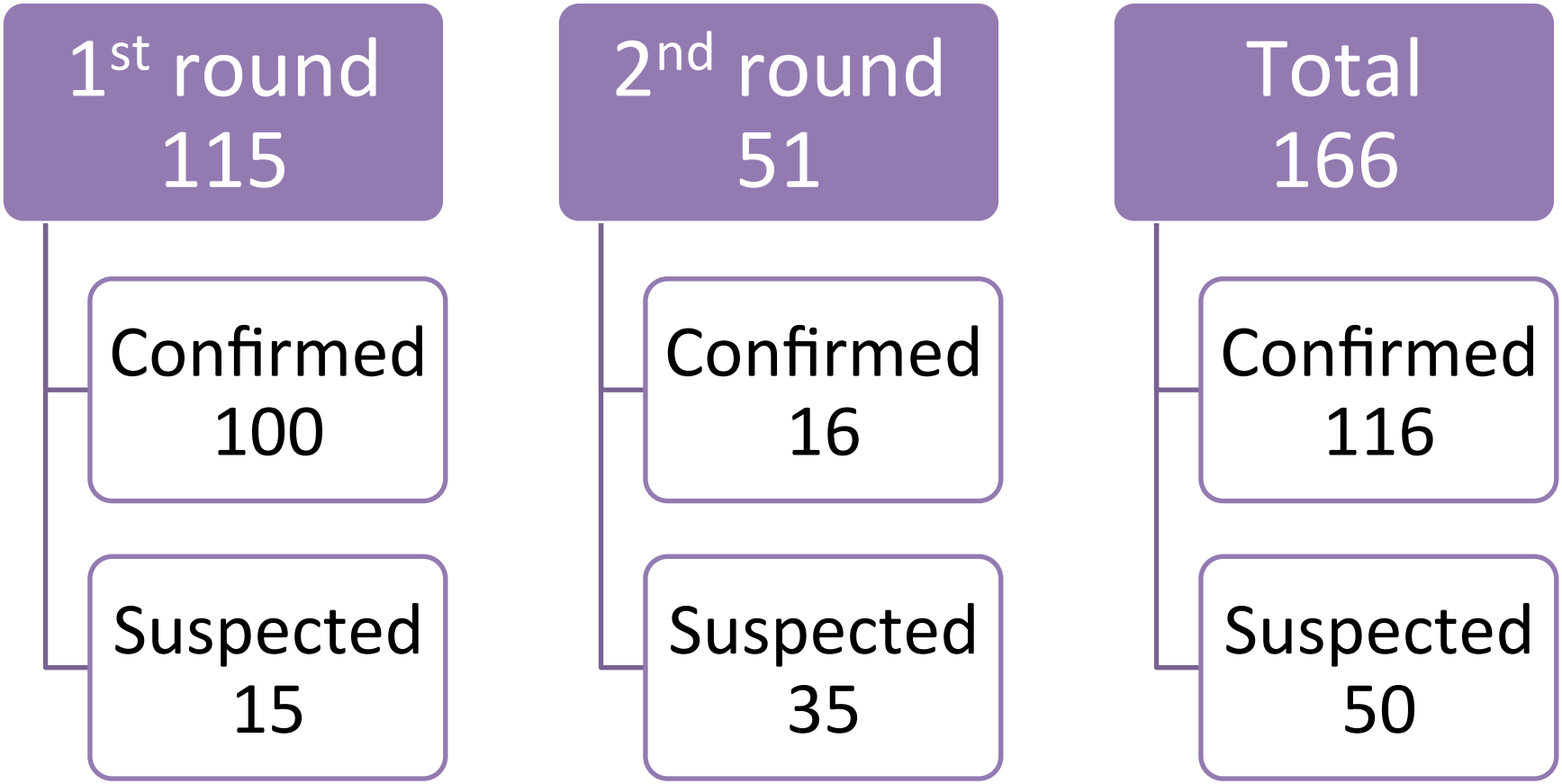
5 cases had total thyroidectomy due to large tumor sizes:

- 1 PTC, follicular variant
- 3 PTC, cribriform-morular variant (CMV)
- 1 PDTC (poorly-differentiated thyroid cancer)

How many thyroid cancer cases?



Summary: How many thyroid cancer cases?



First round: Are 115 cases a lot?

Completed first round data with **115** cancer cases considered here, assuming all suspicious cases would be confirmed to be cancerous.

First round screening → prevalence

115 cases found in 300,478 participants

Prevalence = 383 per million

2010 National incidence ≈ 3.3 per million (ages 0-19)

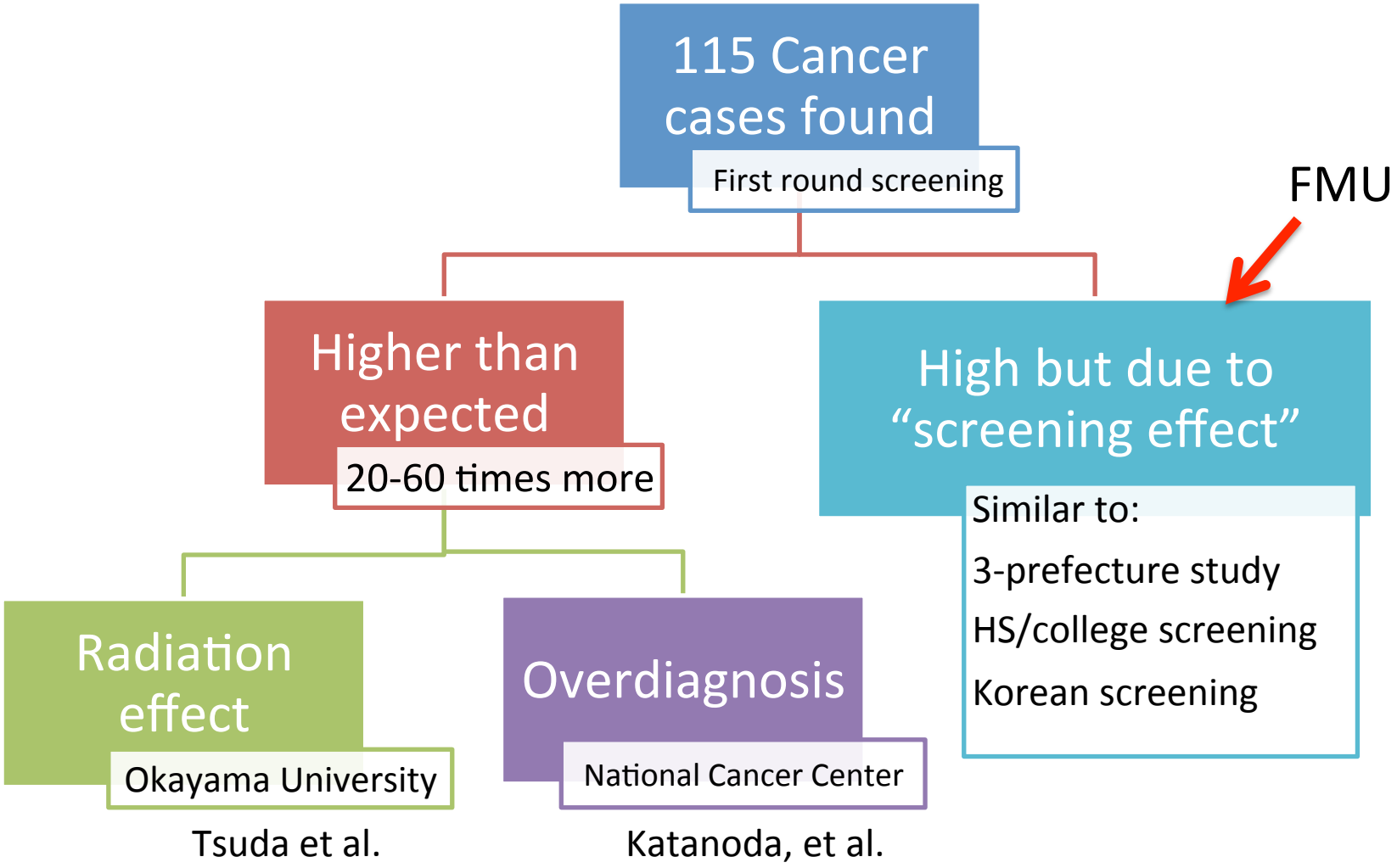
Problem: Prevalence ≠ incidence

Not directly comparable

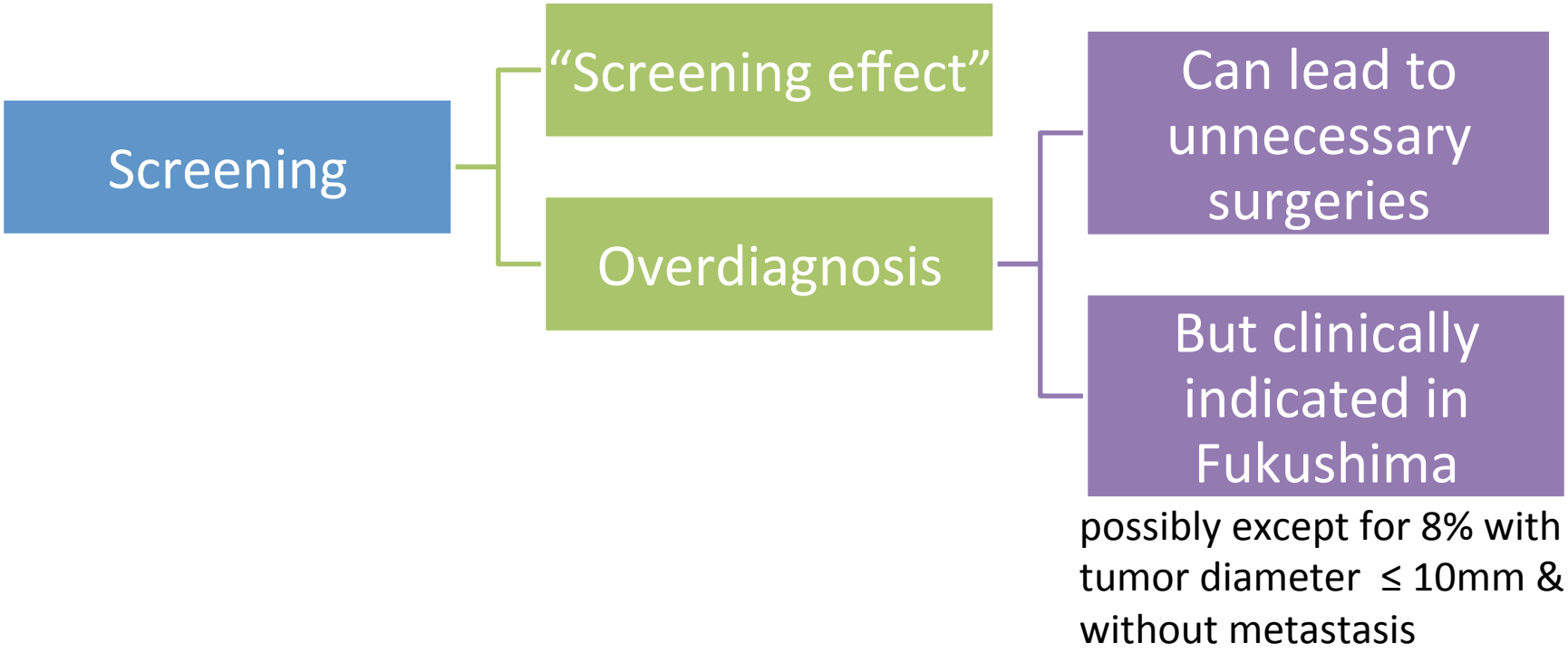
Calculations by 2 groups of researchers → both show increased occurrence

2000 US incidence: 6.83 per million (ages 0-19)

First round: Different opinions

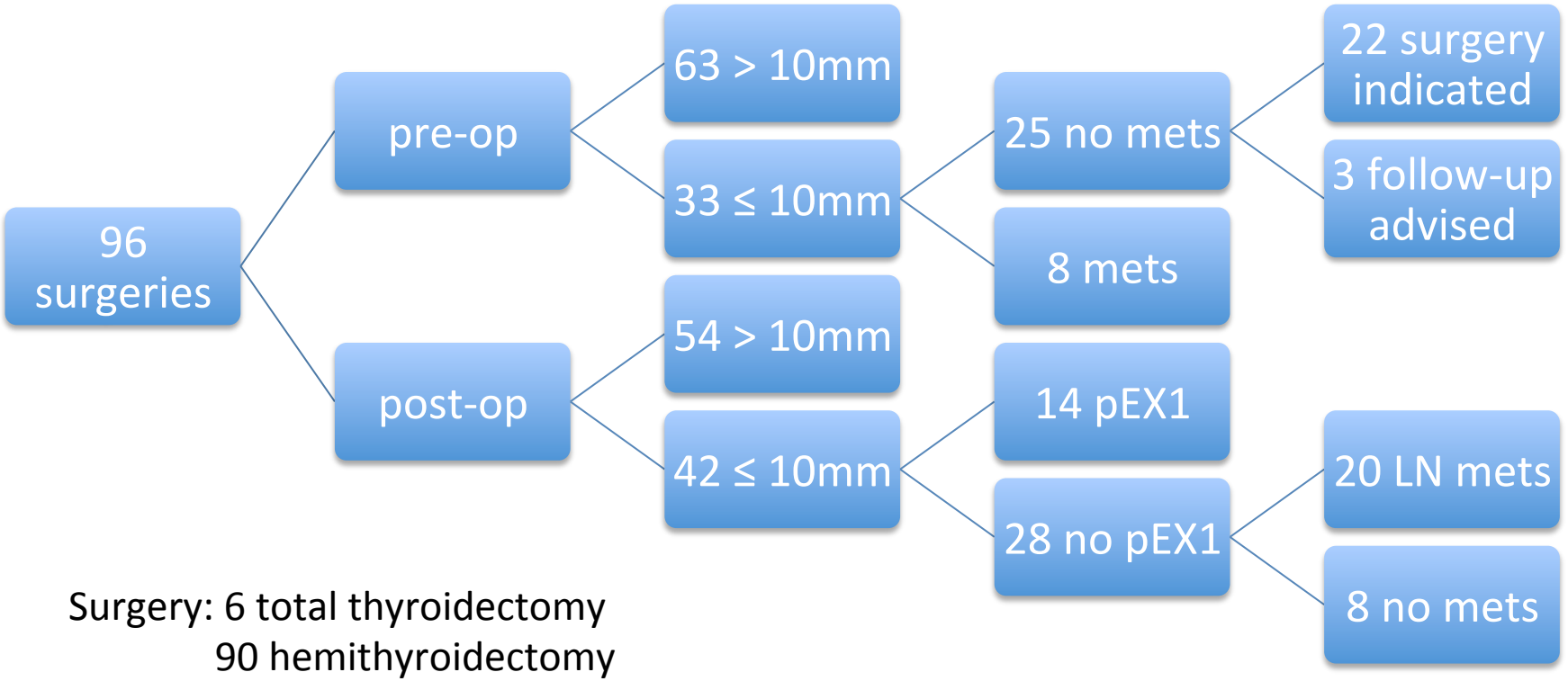


- **“Screening effect”** = early detection of disease due to screening
- **Overdiagnosis** is the diagnosis of "disease" that will never cause symptoms or death during a patient's lifetime. **Overdiagnosis** is a side effect of screening for early forms of disease.



Clinical/Pathological information

(as of March 2015)



Surgery: 6 total thyroidectomy
90 hemithyroidectomy

Overall: pre-op 23 LN mets, 2 lung mets
post-op 38 pEX1, 72 LN mets

No post-surgical complications

FMU “The high prevalence of childhood thyroid cancer detected in this 4-year study in Fukushima can be attributed to mass screening. ”

Thyroid. 2016 Apr 20. [Epub ahead of print]

Comprehensive survey results of childhood thyroid ultrasound examinations in Fukushima in the first four years after the Fukushima Daiichi Nuclear Power Plant accident.

Suzuki S[1], Suzuki S[2], Fukushima T[3], Midorikawa S[4], Shimura H[5], Matsuzuka T[6], Ishikawa T[7], Takahashi H[8], Ohtsuru A[9], Sakai A[10], Hosoya M[11], Yasumura S[12], Nollet KE[13], Ohira T[14], Ohto H[15], Abe M[16], Kamiya K[17], Yamashita S[18].

⊕ **Author information**

Abstract

BACKGROUND: Thyroid nodules and cancers are rare in children as compared to adults. However, after the 1986 Chernobyl Nuclear Power Plant accident, a rapid increase of childhood thyroid cancer was observed. To avoid any confusion and misunderstanding of data obtained in Fukushima after the 2011 nuclear accident, baseline prevalence of thyroid nodules and cancers should be carefully assessed with standardized criteria systematically, and comprehensively applied to the population perceived to be at risk.

AIMS: Under the official framework of the Fukushima Health Management Survey, we examined the thyroids of children in Fukushima using ultrasound, and analyzed the results collected in the first 4 years after the nuclear accident in order to establish a baseline prevalence of childhood thyroid abnormalities, especially cancer.

SUBJECTS AND METHODS: Of 367,685 people aged 18 years or younger as of April 1, 2011 who were living in Fukushima Prefecture at the time of the accident, 300,476 underwent thyroid ultrasound screening. Of those, the 2108 subjects with thyroid nodules were further examined using an advanced ultrasound instrument, with standardized criteria applied to determine the need for fine needle aspiration cytology (FNAC). FNAC results determined the need for surgery and histological confirmation of the cytological diagnosis.

RESULTS: Of the 2108 re-screened subjects, 543 underwent FNAC, of whom 113 were diagnosed with malignancy or suspected malignancy. Subsequently, 99 patients underwent surgical resection, revealing 95 cases of papillary thyroid cancer, three poorly differentiated cancers, and one benign nodule. The overall prevalence of childhood thyroid cancer in Fukushima was determined to be 37.3 per 100,000 with no significant differences between evacuated and non-evacuated areas. Thyroid cancer patients had external exposure estimates of < 2.2 mSv during the first 4 months.

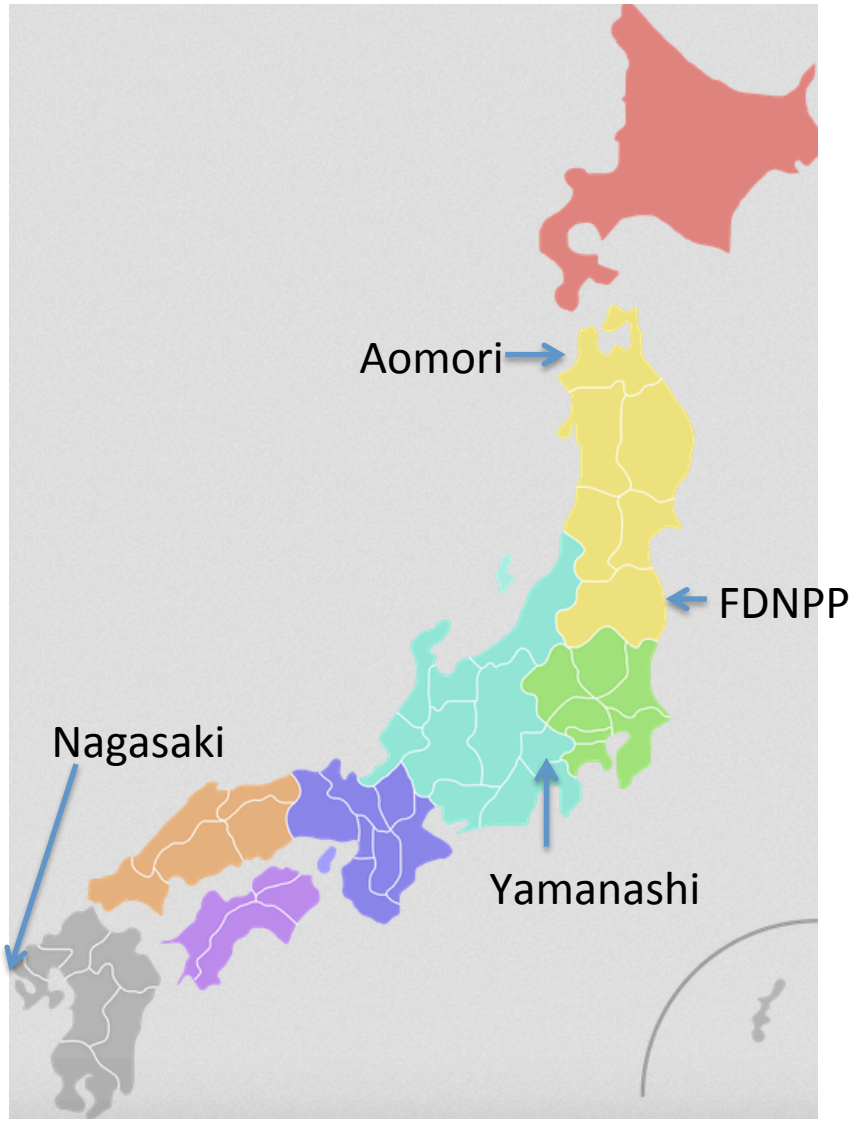
CONCLUSIONS: The high prevalence of childhood thyroid cancer detected in this 4-year study in Fukushima can be attributed to mass screening. It clearly exceeds what is found incidentally anywhere else. Direct comparisons with any other results, even those from cancer registries, are not meaningful, owing to differences in methodology.

Three-prefecture study

- Aomori, Yamanashi, and Nagasaki
- 4365 children, ages 3-18
- Not age- or sex-matched (no age 0-2)
- Sampling bias? One school/prefecture

- % cysts and nodules similar to Fukushima
- 1 cancer case found
- Non-cancer thyroid diseases identified
  - Grave's disease
  - Hashimoto's thyroiditis
  - Adenomatous goiter

Commissioned by Nuclear Facilities Development and Nuclear Fuel Cycle Industry Division, Electricity and Gas Industry Department, Agency for Natural Resources and Energy, METI (Ministry of Economy, Trade and Industry)



Radiation effects denied because:

- Doses not as high as Chernobyl
  - But Fukushima doses are uncertain.
  - Individual variations in behavior and intake.
  - Thyroid cancer can occur at lower doses?
- No dose response by the official report
  - FMU doing proper analysis? → Tsuda et al. reports dose response tendency.
  - Maybe actual doses were higher in some areas.
- Thyroid cancer not found in ages < 5
  - Based on the Chernobyl finding 4 years after the accident.

But, what about the second round?

- 51 cases of thyroid cancer so far.
  - 80% had no findings in the first round that could have become cancerous → newly developed.
  - Screening effect should no longer be an issue.
    - "Harvest effect"
- 20-38 times higher than expected so far.
- New results for the last 3 months to be released in mid-May.
- Supposedly finished by March 2016, but the final results won't be available until later.

What else to look out for?

Non-Fukushima cases

- 3 cancer cases in Kitaibaraki City

Non-screened Fukushima cases

- 67,000+ non-participants
- Non-participants who had surgery outside Fukushima

Non-cancerous thyroid diseases

- Hashimoto's thyroiditis (hypothyroidism)
- Grave's disease (hyperthyroidism)

Non-Fukushima screening

- Ibaraki Prefecture
  - Kitaibaraki City (3)
  - Takahagi City
  - Tokaimura
  - Ushiku City
- Chiba Prefecture
  - Kashiwa City
- Tochigi Prefecture
  - Nikko City

Empowerment through knowledge!

Thank you for your attention.