

県民健康調査の甲状腺検査結果報告

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Future From Fukushima.

県民健康調査における甲状腺検査開始当初の背景

- チェルノブイリ原発事故後、被ばく時年齢が低い子供において、線量依存性に甲状腺癌の発症が増加することがこれまで報告されてきた。今回の事故で同様なことが起こる可能性について関心と不安が高まっていた。
- チェルノブイリ事故と比較すると福島では放射性ヨウ素による内部被ばくは小さいと想定されていたが、放射線と健康問題に対する科学的アプローチに加えて、調査への社会的な要請もあった。
- 一方、超音波スクリーニングによる甲状腺がん増加も懸念されたが、スクリーニングはもともと甲状腺では勧められていないため、その基準はなかった。本調査では、過剰診断の抑制を考慮した標準化したプロトコールが望まれた。

10年相対生存率

(国立がん研究センターHP)

部位		I	II	III	IV	全症例	手術症例	手術率(%)	病期不明率(%)	追跡率(%)	グラフ表示
食道 C15	症例数	312	335	402	269	1,440	598	41.5	91.5	99.2	グラフ表示
	生存率(%)	64.1	36.9	15.4	4.8	29.7	35.8				
胃	症例数	3,206	519	661	1,128	6,413	4,726				グラフ表示
	生存率(%)										

乳頭がん、濾胞がんの病期は、年齢によって異なります。45歳未満の場合には、がんの大きさ、広がり、リンパ節転移の有無には関係なく、遠くの臓器への転移があるかどうかでI期、II期に分類されます。45歳以上の場合は、大きさ、広がり、リンパ節や別の臓器へ転移の有無によって病期が決まります。

甲状腺分化がん45歳未満は、
I期 遠隔転移なし
II期 遠隔転移あり
予後がよいのでIII期IV期はない

C53	生存率(%)	59.5	20.8	8.5	2.9	19.7	32.2				グラフ表示		
	症例数	334	11.1	169	66.3	2,954	57.8					37.3	88.8
子宮体 C54	症例数	37.5	88.0	98.7	66.3	2,954	57.8	37.5	88.0	98.7	グラフ表示		
	生存率(%)	37.5	88.0	98.7	66.3	2,954	57.8						
卵巣 C56	症例数	48.4	96.5	98.9	66.3	2,954	57.8	48.4	96.5	98.9	グラフ表示		
	生存率(%)	48.4	96.5	98.9	66.3	2,954	57.8						
前立腺 C61	症例数	96.3	96.9	99.2	82.8	4,240	82.8	96.3	96.9	99.2	グラフ表示		
	生存率(%)	96.3	96.9	99.2	82.8	4,240	82.8						
腎・尿管 C64-66	症例数	70.3	96.1	98.4	78.5	785	78.5	70.3	96.1	98.4	グラフ表示		
	生存率(%)	70.3	96.1	98.4	78.5	785	78.5						
膀胱 C67	症例数	91.3	63.7	50.0	16.5	73.6	84.2	91.3	63.7	50.0	16.5	73.6	84.2
	生存率(%)	91.3	63.7	50.0	16.5	73.6	84.2						
甲状腺 C73	症例数	500	53	121	29	743	713	96.0	94.6	98.9	グラフ表示		
	生存率(%)	94.4	84.2	55.6	14.4	83.1	85.8						
胆膵 C67	症例数	134	43	118	57	372	328	88.2	94.6	99.1	グラフ表示		
	生存率(%)	84.6	63.2	25.2	19.5	51.7	56.8						
腎・尿管 C64-66	症例数	71	503	306	329	1,306	511	39.1	92.6	99.0	グラフ表示		
	生存率(%)	93.0	100.0	95.6	37.8	84.4	100.0						
腎・尿管 C64-66	症例数	269	88	86	175	650	532	81.8	95.1	99.8	グラフ表示		
	生存率(%)	91.3	76.4	51.8	13.8	62.8	73.0						
膀胱 C67	症例数	258	103	60	46	503	473	94.0	92.8	98.7	グラフ表示		
	生存率(%)	81.4	78.9	32.3	15.6	70.3	72.1						
甲状腺 C73	症例数	121	128	126	89	505	476	94.3	91.9	99.2	グラフ表示		
	生存率(%)	100.0	100.0	94.2	52.8	90.9	93.6						

胃がん 69%

I期 95%

II期 63%

III期 39%

IV期 8%

大腸がん 70%

I期 97%

II期 84%

III期 70%

IV期 8%

肺がん 33%

I期 69%

膵がん 5%

I期 30%

肝がん 15%

I期 29%

甲状腺がん 91%

I期 100%

II期 100%

III期 94%

IV期 53%

剖検例における潜在甲状腺乳頭がんの頻度

Study and Year of Publication	Location	Median Year When Autopsies Were Performed	Study Population	Median Age at Death (years)	Female (%)	Whole/Partial Examination of the Gland and No. of Slices Examined per Gland	No. of Autopsies Examined	No. of iDTCs	Prevalence of iDTC (%)
Lang et al, ³⁰ 1988	Hannover, Germany	1987	Autopsies in patients > 15 years of age with no clinically manifest carcinoma of the thyroid	61	44	Partial, NR	1,020	62	6.08
Martinez-Tello et al, ³¹ 1993 (1)	Madrid, Spain	1993	Autopsies performed at the Hospital Central de la Cruz Roja	68	45	Partial, 2*	625	31	4.96
Martinez-Tello et al, ³¹ 1993 (2)	Madrid, Barcelona, and Zaragoza, Spain	1993	Consecutive autopsies with no thyroid-related diseases	58	34	Whole, 35	100	22	22.00
Mitselou et al, ³² 2002	Epirus, Greece	1999	Forensic cases without any clinical thyroid disease history	56	26	Partial, 4-6*	160	12	7.50
Mortensen et al, ³³ 1955	Minnesota, United States	1952	Hospital routine consecutive postmortem examination; excluded patients with clinical evidence of thyroid disorder	> 60	32	Partial, 1*	821	13	1.58
Neuhold et al, ³⁴ 2001	Vienna, Austria	2001	Consecutive hospital autopsies with no clinical manifestation of thyroid carcinoma	66	52	Whole, NR	118	10	8.47
Nielsen and Zetterlund, ³⁵ 1985	Jonkoping, Sweden	1981	Consecutive hospital autopsies without prior surgery	72	42	Partial, 2*	498	27	5.42
Ottino et al, ³⁶ 1989	La Plata, Argentina	1986	Consecutive hospital autopsies	58	41	Whole, 24*	100	11	11.00
Pingitore, ³⁷ 1982	Tuscany and Liguria, Italy						111	4	3.60
Sampson et al, ³⁸ 1974	Minnesota, United States		residents				157	8	5.10
Seta and Takahashi, ³⁹ 1976	Iwate, Japan	1976	Unselected autopsies	40	52	Whole, 120-180	379	58	15.30
Siegal and Modan, ⁴⁰ 1981	Tel-Hashomer and Kfar Saba, Israel	1977	Consecutive hospital autopsies in adults	68	46	Partial, 6*	260	17	6.54
Silverberg and Vidone, ⁴¹ 1966	Connecticut, United States	1965	Unselected hospital autopsies in patients > 20 year of age	64	39	Partial, 5-6*	300	8	2.67
Sobrinho-Simoes et al, ⁴² 1979	Porto, Portugal	1975	Consecutive hospital autopsies in which entire thyroid gland was available	53	44	Partial, 2*	600	40	6.67
Solares et al, ⁴³ 2005	Guatemala City, Guatemala	2000	Consecutive autopsies with a cause of death not related to thyroid disease	41	23	Partial, 1*	150	3	2.00
Tanriover et al, ⁴⁴ 2011	Mamara, Turkey	2007	Forensic autopsies in people with no history of thyroid disease	45	14	Partial, 2*	108	4	3.70
Thorvaldsson et al, ⁴⁵ 1992	Reykjavik, Iceland	1985	Consecutive forensic autopsies in people without history of thyroid surgery or radiation treatment	52	20	Whole, 19	199	13	6.53
Yamamoto et al, ⁴⁷ 1990	Tokushima, Japan	1984	Hospital consecutive autopsies	61	39	Partial, 2*	408	46	11.27
Yatani et al, ⁴⁸ 1981 (1)	Mie, Japan	1981	Unselected autopsies; routine autopsy examination	50	40	Partial, NR	1,102	27	2.45
Yatani et al, ⁴⁸ 1981 (2)	Mie, Japan	1981	Unselected autopsies; exhaustive autopsy examination	50	44	Whole, NR	68	18	26.47

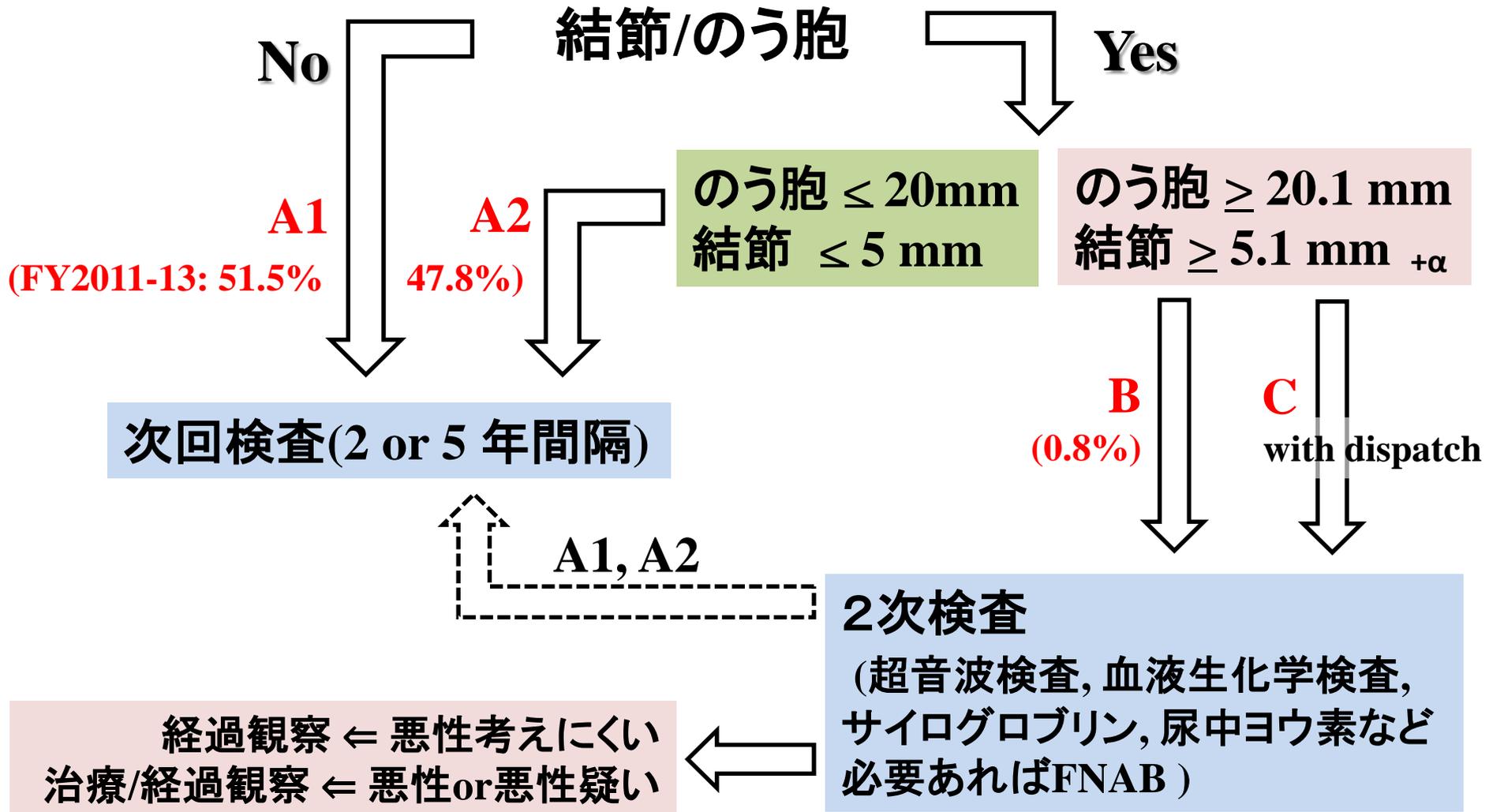
Whole examination average: 11.2%

Abbreviations: iDTC, incidental differentiated thyroid cancer; NR, not reported.

*Number of slices examined when no grossly macroscopic lesions were visible; additional slices were examined when macroscopic lesions were present.

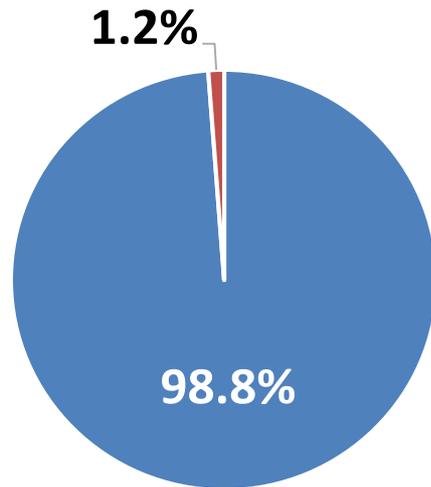
甲状腺検査のフローチャート

一次検査(超音波検査)



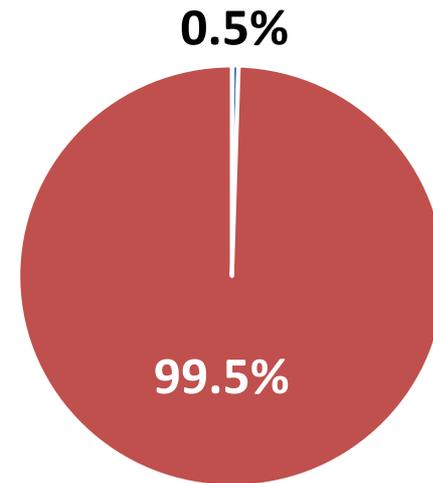
Percentage of Cyst and Nodule in two category

A2



■ Cyst ■ Nodule

B

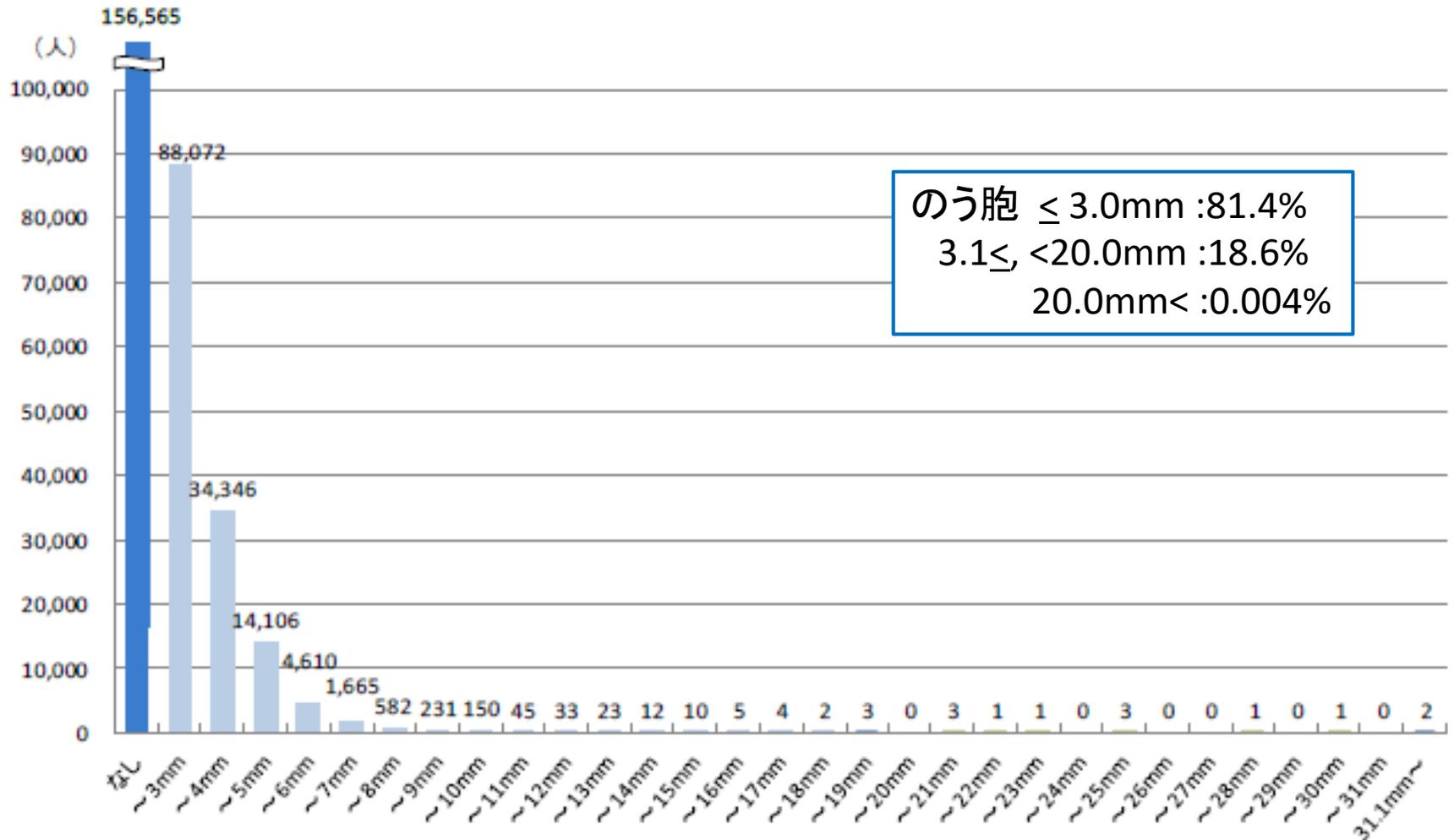


■ Cyst ■ Nodule

98.8% of A2 is Cyst, in contrast 99.5% of B is Nodule.

のう胞のサイズの分布 (FY2011-13, PBS)

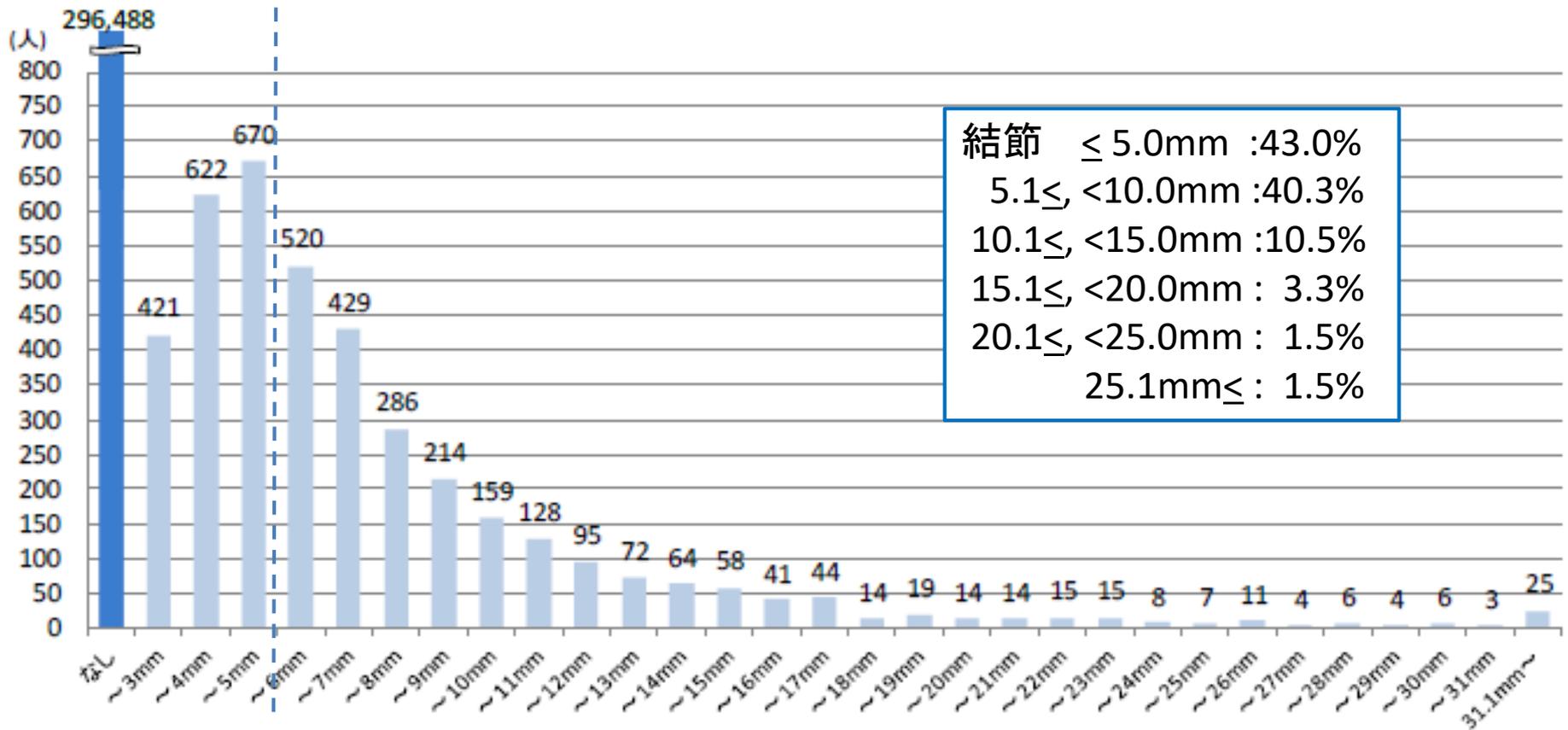
March 31, 2016



結節のサイズの分布 (FY2011-2013, PBS)

March 31, 2016

0.6% ← Over 5mm in size: 0.8% →



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

悪性または悪性疑い症例

先行検査(PBLS)と本格検査1回目(FFSS)の比較

	PBLS (FY2011-13)	FFSS (FY2014-15)
症例数	116	69
性別(男性:女性)	39:77	31:38
診断時年齢(±SD)	17.3 (±2.7) 歳	16.9 (±3.3) 歳
震災時年齢	6-18	5-18
平均腫瘍径(±SD) (最小-最大)	13.9 (±7.8) mm 5.1-45.0 mm	11.0 (±5.6) mm 5.3-35.6 mm
手術症例数	102	44
術後病理診断		
良性結節	1	0
乳頭がん	100	43
低分化がん	1	0
その他の腫瘍	0	1

Quantification of the increase in thyroid cancer prevalence in Fukushima after the nuclear disaster in 2011 – a potential overdiagnosis?

Katanoda K et al.
 Jpn J Clin Oncol 46: 284-86, 2016

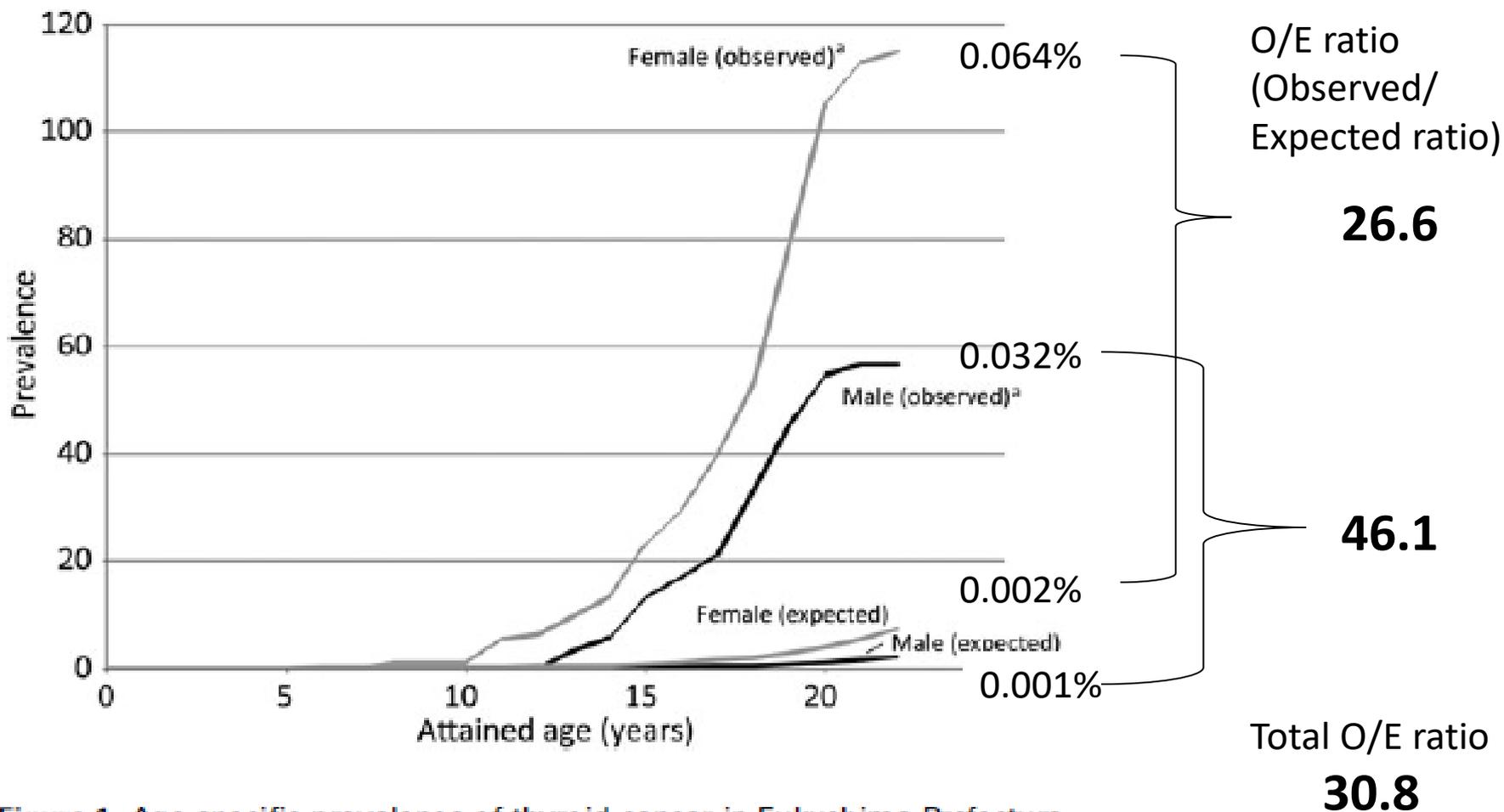
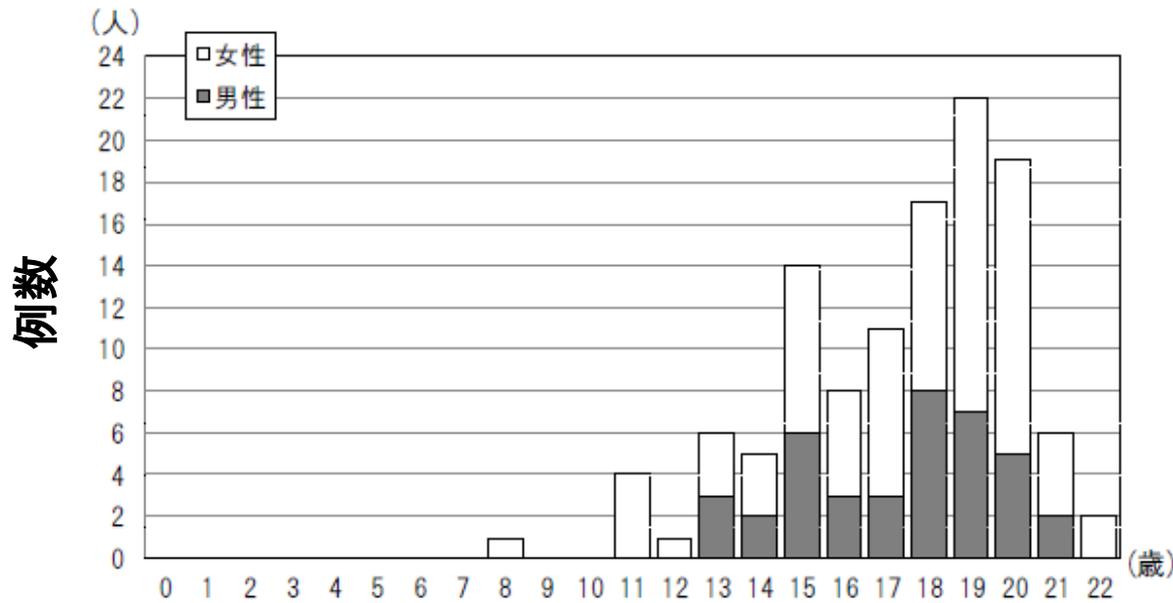


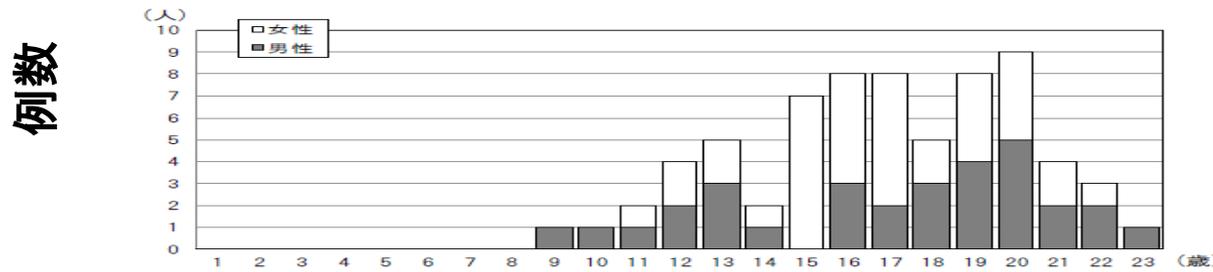
Figure 1. Age-specific prevalence of thyroid cancer in Fukushima Prefecture, expected in 2010 and observed as of the end of April 2015. ^aConfirmed by aspiration biopsy (including suspected malignancy). The detected number was corrected for screening rate.

悪性または悪性疑い症例の年齢・性別の分布 (診断時年齢)



PBLs (FY2011-13)

□ 女性
■ 男性



first FSS (FY2014-15)

Comparison of childhood thyroid cancer prevalence among 3 areas based on external radiation dose after the Fukushima Daiichi nuclear power plant accident

The Fukushima health management survey

Ohira T et.al. Medicine 2016; 95:35

初期4か月の外部被ばく実効線量推計に基づいた地域区分による甲状腺がんの有病率の性・年齢補正オッズ比

Table 2

Age- and sex-adjusted ORs and 95% CIs of thyroid cancer according to location group by first 4-month external radiation doses estimated by The Fukushima Health Management Survey.

	Group A [*]	Group B [†]	Group C [‡]
N	4,192	213,564	82,720
Women, %	50.5	49.4	49.8
Age at the time of the nuclear accident, y (SD)	9.4 (5.4)	9.0 (5.1)	8.6 (4.8)
Age at the time of screening, y (SD)	10.2 (5.4)	10.6 (5.1)	11.2 (4.9)
Duration from the time of the nuclear accident to the time of screening, y (SD)	0.8 (0.6)	1.7 (0.7)	2.6 (0.5)
No. of cases	2	76	34
Prevalence proportion per 100,000 people	47.7	35.6	41.1
Crude OR (95% CI)	1.16 (0.28–4.83)	0.87 (0.58–1.30)	Reference
Age- and sex-adjusted OR (95% CI) [§]	1.49 (0.36–6.23)	1.00 (0.67–1.50)	Reference
Multivariable-adjusted OR (95% CI) [¶]	1.01 (0.22–4.63)	0.82 (0.51–1.34)	Reference

Group A: of 5 mSv or more is more than or equal to 1.01%.

Group B: of 5 mSv or more is less than 1% and of 1 mSv or less is less than 99.5%.

Group C: of 1 mSv or less is more than 99.9%.

1.01

0.82

1.00

WHOによる甲状腺等価線量推計に基づいた地域区分における 甲状腺がん有病率の性・年齢補正オッズ比

from the nuclear accident
after the 2011 Great East Japan
Earthquake and Tsunami
based on a preliminary dose estimation



Group 1: WHO dose estimation, relatively highest thyroid organ dose area.
Group 2: WHO dose estimation, middle thyroid dose area.
Group 3: WHO dose estimation, relatively lowest dose area.

Table 3

Age- and sex-adjusted ORs and 95% CIs of thyroid cancer according to location group by first year thyroid doses estimated by WHO.

	Group 1 [*]	Group 2 [†]	Group 3 [‡]
N	4,192	147,830	148,454
Women, %	50.5	49.4	49.8
Age at the time of the nuclear accident, y (SD)	9.4 (5.4)	9.1 (5.2)	8.7 (4.9)
Age at the time of screening, y (SD)	10.2 (5.4)	10.6 (5.2)	11.0 (4.9)
Duration from the time of the nuclear accident to the time of screening, y (SD)	0.8 (0.6)	1.5 (0.6)	2.3 (0.7)
No. of cases	2	52	58
Prevalence proportion per 100,000 people	47.7	35.2	39.1
Crude OR (95% CI)	1.22 (0.30–5.00)	0.90 (0.62–1.31)	Reference
Age- and sex-adjusted OR (95% CI) [§]	1.50 (0.37–6.15)	1.01 (0.69–1.47)	Reference
Multivariable-adjusted OR (95% CI) [¶]	1.07 (0.24–4.71)	0.84 (0.54–1.32)	Reference

* Relatively highest dose area.

† Middle dose area.

‡ Relatively lowest dose area classified by WHO estimation.^[4]

§ Adjusted for age at the thyroid examination and sex.

¶ Adjusted for age at the thyroid examination, sex, and duration from the nuclear accident to the thyroid examination.

95% CI=95% confidence interval, OR=odds ratio, SD=standard deviation, WHO=World Health Organization.

1.07

0.84

1.00

Overdiagnosis in Cancer

J Natl Cancer Inst 2010;102:605–613

H. Gilbert Welch, William C. Black

Cancer	Population	% With cancer (disease reservoir) (a)	Lifetime risk of death or metastatic disease* (b), %	Probability of overdiagnosis where entire disease reservoir detected† (c = [a - b]/a), %
Prostate	Men older than 60 y	30–70	4	87–94
Thyroid	Adults aged 50–70 y	36–100	0.1	99.7–99.9
Breast	Women aged 40–70 y	7–39	4	43–90

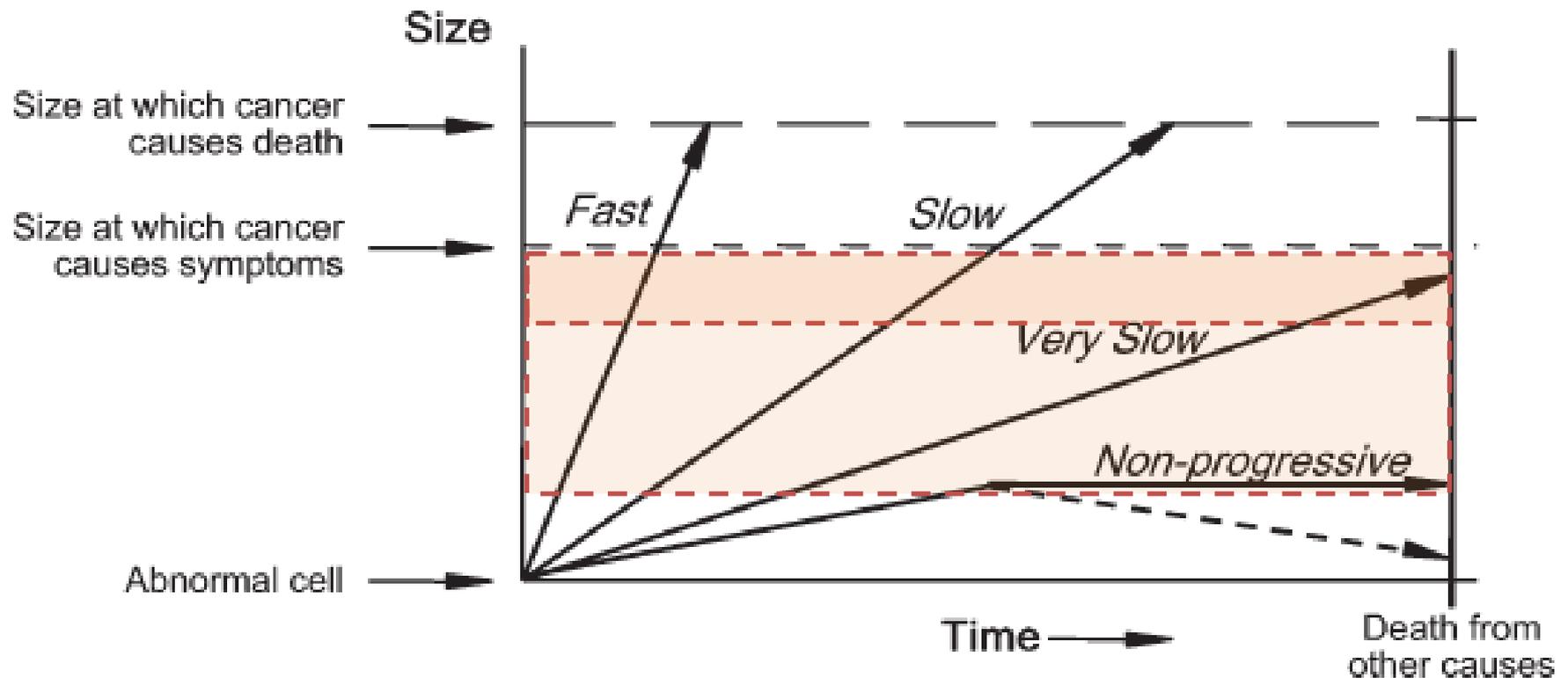


Figure 1. Heterogeneity of cancer progression. The arrow labeled “fast” represents a fast-growing cancer, one that quickly leads to symptoms

まとめ

- 近年の超音波画像診断技術の進歩により、甲状腺がんは世界的に増加傾向にあり、ラテントがん(潜在がん)が数多く発見され、過剰診断が問題となっている。
- 先行検査の甲状腺がん発見率は0.038%であり、年齢依存性の傾向であった。引き続き2巡目の検査でも同様の傾向である。
- これまで発見されている甲状腺がんは、線量の推計・年齢分布・地域分布・その他の所見より放射線の影響は考えにくいと思われる。しかし、疫学的な結論を得るには個別の甲状腺等価線量の精密な推計と長期の観察が必要とされる。
- 受診者のための長期調査としてゆくには、スクリーニング方法・基準・地域・対象者などの再考が必要であると思われる。