

Thyroid cancer under 19 in Fukushima: The fourth report from the second round screening

Toshihide Tsuda¹, Etsuji Suzuki², Akiko Tokinobu¹, Eiji Yamamoto³

¹Department of Human Ecology, Okayama University Graduate School of Environmental Life Science, Japan

²Department of Epidemiology, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Japan

³Department of Information Science, Faculty of Informatics, Okayama University of Science, Japan

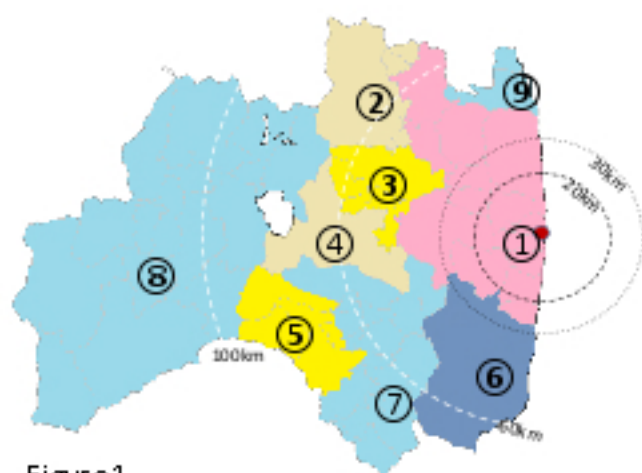


Figure 1
Examination year (FY)

1 st Round	2011	2012	2012	2013	2013
2 nd Round	2014	2014	2014	2015	2015

Background

After the 2011 nuclear power plant accident, Fukushima Prefecture implemented thyroid cancer screening for all children ages 18 years or younger (at the accident) starting from October 2011. The first round of the screening was completed in March 2014. The second round was conducted between April 2014 and March 2016 - Fiscal Year (FY) 2014-2016. The present report is based on the data up to March 31, 2016.

Methods

To clarify the effect of the accident to the screening result, we divided Fukushima Prefecture into the following nine areas/districts (Figure 1): ① Nearest area (i.e., the most contaminated area where the examination took place in FY 2011 for 1st round and FY 2014 for 2nd); ② North middle; ③ Central middle; ④ Koriyama City; and ⑤ South middle districts; ⑥ Iwaki City; ⑦ Southeastern least contaminated; ⑧ Western least contaminated (Aizu); and ⑨ Northeastern least contaminated (Soma) districts. Among the districts ② to ⑤, the examination took place in FY 2012 for 1st round and FY 2014 for 2nd. The districts ⑥ to ⑧ correspond to the "less affected" areas in the WHO report (2012). The district ⑨ was also less contaminated. Among the districts ⑥ to ⑨, the examination took place in FY 2013 for 1st round and FY 2015 for 2nd.

As an external comparison, we estimated 5-year-age standardized incidence rate ratios (SIRs) in each area/district and compared them with the mean annual incidence estimate of thyroid cancer (0-19 y.o. in 1st round and 0-24 y.o. in 2nd) based on highly precise data from the Japanese National Cancer Center 2001-2010. We assumed 4 years of duration on latency for 1st round, 2.5 years for district ① of 2nd round, and 2 years for districts ②-⑨ of 2nd.

Results

We showed the number of subjects, examinees, and thyroid cancer cases in each district; and estimates of PORs on both 1st (116 cases) and 2nd round in the table. In 2nd round, 57 cases (30 were operated; papillary carcinoma) were detected by FNA. Only four among them were eligible for the secondary examination in 1st round. Internal comparison indicated plume flow to the south.

Districts	Time of Screening	Population age ≤ 18	Participants in primary examination	Thyroid cancer cases by FNA ^a (No. operated)	External Comparison		Internal Comparison In the 1 st Round		Prevalence per 10 ⁶
					SIR ^b	(95% CI) ^c	cPOR ^d	(95% CI) ^e	
① Nearest Area	FY 2011	47,770	41,811 (87.5%)	15 ^e (15 ^e)	37.1	(20.2-62.3)	1.5	(0.7-3.3)	359
	FY 2014	49,459	34,480 (69.7%)	17 (?)	41.2	(24.0-65.9)			493
② North Middle District	FY 2012	57,211	50,618 (88.5%)	12 (?)	28.1	(14.5-49.0)	1		237
	FY 2014	59,498	45,522 (76.5%)	9 (?)	19.9	(9.1-37.7)			198
③ Central Middle District	FY 2012	21,051	18,193 (86.4%)	11 (?)	75.8	(37.9-135.7)	2.6	(1.1-5.9)	605
	FY 2014	21,808	16,313 (74.8%)	4 (?)	26.1	(7.1-66.9)			245
④ Koriyama City	FY 2012	64,378	54,063 (84.0%)	25 (?)	62.2	(40.2-91.8)	2.0	(0.99-4.0)	462
	FY 2014	66,762	47,773 (71.6%)	17 (?)	37.2	(21.6-59.5)			356
⑤ South Middle District	FY 2012	18,486	16,465 (89.1%)	8 (?)	62.6	(27.0-123.3)	2.1	(0.8-5.0)	486
	FY 2014	19,353	14,610 (75.5%)	1 (?)	7.5	(0.19-42.0)			68
⑥ Iwaki City	FY 2013	62,293	49,429 (79.3%)	24 (?)	67.2	(43.0-99.9)	2.1	(1.03-4.2)	486
	FY 2015	64,308	44,143 (68.6%)	4 (?)	8.0	(2.2-20.5)			91
⑦ SE Least Contaminated District	FY 2013	38,310	29,818 (77.8%)	9 (?)	48.3	(22.1-91.7)	1.3	(0.5-3.1)	302
	FY 2015	39,767	27,872 (70.1%)	3 (?)	11.3	(2.3-33.0)			108
⑧ Western Least Contaminated District	FY 2013	49,927	33,720 (67.5%)	12 (?)	62.9	(32.5-109.9)	1.5	(0.7-3.4)	355
	FY 2015	51,768	31,331 (60.5%)	1 (?)	3.3	(0.08-18.3)			32
⑨ NE Least Contaminated District	FY 2013	8,246	6,359 (77.1%)	0 (0)	0	(0.00-89.9)	0	(0-2.3)	0
	FY 2015	8,563	5,725 (66.9%)	1 (?)	19.1	(0.48-106.5)			175

^aFNA, fine needle aspiration; ^bSIR, standardized incidence rate ratio; ^c95% CI, 95% confidence interval; ^dcPOR, crude prevalence odds ratio; ^eIncluding one benign case

Conclusions

External comparison in both 1st and 2nd rounds showed remarkable excess thyroid cancer cases in Fukushima, 5 years and one month after the accident. Fukushima and neighboring prefectures need further investigations as well as countermeasures on potential adverse health effects, including malignancies other than thyroid cancer and other non-malignant diseases.

The related study was published in *Epidemiology* as an original article with 7 letters and one response to them, entitled "Thyroid Cancer Detection by Ultrasound among Residents Aged 18 Years and Younger in Fukushima, Japan: 2011 to 2014," by Tsuda T. et al. (2016; 27: 316-322; and 7 letters and one response to them are in 2016; 27: e17-e23. The authors have no conflict of interest. The