

## Basic Survey (Radiation Dose Estimates)

Reported on 15 February 2016

### 1. Response Rates and Radiation Dose Estimates

#### 1.1 Response Rates of Residents

The overall effective response rate to the Basic Survey (radiation dose estimates), for the entire population of Fukushima Prefecture, was 27.4% (564,083 of 2,055,326) as of 31 December 2015. Among the respondents, 71,020 answered through the simplified questionnaire. (See Table 1.)

In addition to sending out the simplified questionnaire, giving instructions at thyroid ultrasound examination venues for filling out the survey form, started in FY 2013, helped increase response rates among younger age groups. Instructions have also been provided at venues for check-ups and health exams organized by municipalities in FY 2015. As a result, we received responses mainly from middle-aged individuals. (See Table 2.)

Survey population		2,055,326	/
Responses	Original questionnaire	493,063	24.0%
	Simplified questionnaire*	71,020	3.5%
	Total	564,083	27.4%

\*Preliminary figures  
Fractions have been rounded.

Age group (years)	0-9	10-19	20-29	30-39	40-49	50-59	60-	Total
As of 31 October 2012 (A)	28.4%	19.4%	16.6%	21.9%	19.9%	21.6%	27.0%	23.0%
As of 31 December 2015 (B)	46.3%	35.5%	18.0%	24.5%	22.3%	22.9%	27.9%	27.4%
Point change (B) - (A)	17.9	16.1	1.4	2.6	2.4	1.3	0.9	4.4

Tables 3 and 4 below show the results of the original and simplified questionnaires combined.

## 1.2 Radiation Dose Estimates

Doses have been estimated for 547,380 of 564,083 respondents (97.0%) as of 31 December 2015, and results have been returned to 544,607 respondents. (See Table 3.)

Area	Survey population a	Responses b	Response rate c=b/a	Completed dose estimates d	Proportion e=d/b	Returned results f	Proportion g=f/b
Kempoku	504,042	151,754	30.1%	148,241	97.7%	147,983	97.5%
Kenchu	557,237	135,878	24.4%	132,307	97.4%	131,491	96.8%
Kennan	152,225	34,954	23.0%	33,695	96.4%	33,174	94.9%
Aizu	267,203	57,137	21.4%	54,303	95.0%	54,061	94.6%
Minami-aizu	30,789	6,358	20.7%	5,960	93.7%	5,950	93.6%
Soso	195,604	89,914	46.0%	87,227	97.0%	86,720	96.4%
Iwaki	348,226	88,088	25.3%	85,647	97.2%	85,228	96.8%
Total	2,055,326	564,083	27.4%	547,380	97.0%	544,607	96.5%

Including areas covered by the initial survey of 29,044 people in Yamakiya, Namie and Iitate.

We have been estimating doses for non-residents who were visiting or staying in Fukushima Prefecture at the time of the accident. (See Table 4.)

Number of requests a	Responses b	Response rate c=b/a	Completed dose estimates d	Proportion e=d/b	Returned results f	Proportion g=f/b
3,959	2,205	55.7%	1,957	88.8%	1,943	88.1%

\* Table 3, 4, and Appendix 1 include the data in the estimation period less than four months.

## 2. Results of Radiation Dose Estimates

Table 5 shows a breakdown of completed dose estimates (from Table 3), excluding cases of data covering less than four months.

Radiation doses for a total of 468,748 residents have been estimated to date. The results for 459,620 respondents (excluding radiation workers) suggest that the doses for about 87% of the respondents in Kempoku area and about 92% in Kenchu area were <2 mSv. The doses for approximately 88% of the respondents in Kennan area and more than 99% of those in Aizu and Minami-aizu areas were <1 mSv. Doses for about 77 % of respondents in the Soso area and more than 99% of respondents in Iwaki were also <1 mSv.

Effective Dose (mSv)	Total	Excluding radiation workers				By area (excluding radiation workers)												
		Total	Excluding radiation workers	Percentage	Percentage	Kempoku *		Kenchu		Kennan		Aizu		Minami-aizu		Soso **		Iwaki
<1	291,093	285,418	62.1%	93.8%	24,853	20.1%	57,643	51.5%	25,460	88.2%	44,456	99.3%	4,837	99.3%	55,661	77.3%	72,508	99.1%
1-2	148,178	145,845	31.7%	99.8%	83,056	67.0%	45,780	40.9%	3,386	11.7%	300	0.7%	34	0.7%	12,658	17.6%	631	0.9%
2-3	25,769	25,396	5.5%		15,499	12.5%	8,138	7.3%	17	0.1%	25	0.1%	0	-	1,687	2.3%	30	0.0%
3-4	1,571	1,491	0.3%	5.8%	468	0.4%	423	0.4%	0	-	1	0.0%	0	-	595	0.8%	4	0.0%
4-5	550	504	0.1%		40	0.0%	5	0.0%	0	-	0	-	0	-	458	0.6%	1	0.0%
5-6	441	389	0.1%	0.2%	19	0.0%	3	0.0%	0	-	0	-	0	-	366	0.5%	1	0.0%
6-7	268	230	0.1%		10	0.0%	1	0.0%	0	-	1	0.0%	0	-	218	0.3%	0	-
7-8	155	116	0.0%	0.1%	1	0.0%	0	-	0	-	0	-	0	-	115	0.2%	0	-
8-9	118	78	0.0%		1	0.0%	0	-	0	-	0	-	0	-	77	0.1%	0	-
9-10	72	41	0.0%	0.0%	0	-	0	-	0	-	0	-	0	-	41	0.1%	0	-
10-11	69	36	0.0%		0	-	0	-	0	-	0	-	0	-	36	0.1%	0	-
11-12	52	30	0.0%	0.0%	1	0.0%	0	-	0	-	0	-	0	-	29	0.0%	0	-
12-13	37	13	0.0%		0	-	0	-	0	-	0	-	0	-	13	0.0%	0	-
13-14	34	12	0.0%	0.0%	0	-	0	-	0	-	0	-	0	-	12	0.0%	0	-
14-15	27	6	0.0%		0	-	0	-	0	-	0	-	0	-	6	0.0%	0	-
≥15	314	15	0.0%	0.0%	0	-	0	-	0	-	0	-	0	-	15	0.0%	0	-
Total	468,748	459,620	100.0%	100.0%	123,948	100%	111,993	100%	28,863	100%	44,783	100%	4,871	100%	71,987	100%	73,175	100%
Max	66 mSv	25 mSv			11 mSv		6.3 mSv		2.6 mSv		6.0 mSv		1.9 mSv		25 mSv		5.9 mSv	
Mean value	0.9 mSv	0.8 mSv			1.4 mSv		1.0 mSv		0.6 mSv		0.2 mSv		0.1 mSv		0.8 mSv		0.3 mSv	
Median	0.6 mSv	0.6 mSv			1.4 mSv		0.9 mSv		0.5 mSv		0.2 mSv		0.1 mSv		0.5 mSv		0.3 mSv	

\* Including Yamakiya.  
 \*\* Including Namie and Iitate.

Percentages have been rounded and may not total to 100%.  
 Excluding those with estimation period less than four months.

## 3. Evaluation of the results

The latest effective radiation dose estimates showed similar trends to those observed so far.

Since previous epidemiological studies<sup>1</sup> indicate no significant health effects at doses ≤100 mSv, we concluded that radiation doses estimated so far are unlikely to cause adverse effects on health, although this conclusion is based on external radiation doses estimated only for the first four months following the accident.

### References

- 1) Sources and effects of ionizing radiation, United Nations Scientific Committee on the Effects of Atomic Radiation, UNSCEAR 2008 Report to the General Assembly, with scientific annexes.

## 4. Survey on the representativeness of dose distribution shown in the Basic Survey

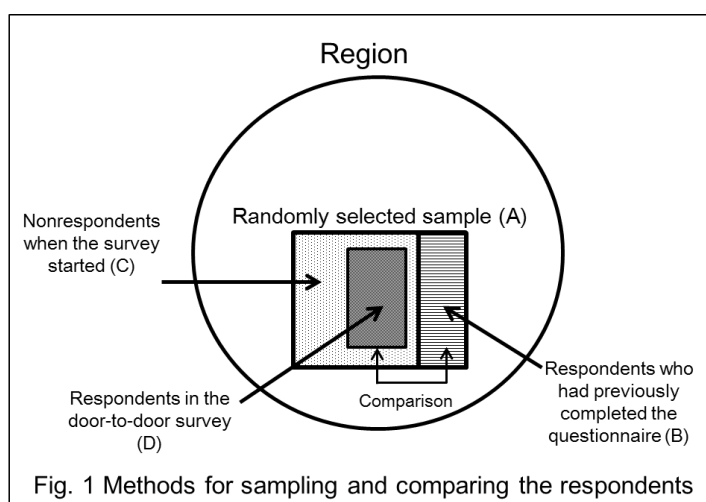
### 4.1 Purpose

The purpose of this study is to investigate whether people who have responded to the Basic Survey represent the whole population in regard to external dose estimates and dose distribution.

### 4.2 Methods

We randomly select a sample from each region (Fig. 1 A), visit nonrespondents of the group (Fig. 1 C), and encourage their cooperation. We compare by region the dose distribution of the respondents in the door-to-door survey (Fig. 1 D) to that of individuals who responded previously by mail (Fig. 1 B). In the Soso area, where the residents experienced a wide range of exposure levels, more samples are selected (Fig. 1 A).

In order to find out if the doses of the population (B) and (D) are equivalent, we use an equivalence test comparing mean values of effective doses.



### 4.3 Results

#### 4.3-1 Results of the door-to-door survey

There were 2,645 people to be interviewed in this survey, and 990 of them responded. Excluding three participants who lived outside the prefecture during the estimation period, two who were born after 11 March 2011, and 24 radiation workers, we compared estimated doses of 961 respondents to those of individuals who had previously completed the questionnaire.

#### 4.3-2 Comparing mean values of effective doses

The difference between the mean effective doses of respondents in the door-to-door survey and those of respondents who had previously completed the questionnaire in each of seven areas ranged from -0.09 mSv to +0.12 mSv. (See next page for details.)

The results show that the difference falls within the equivalence interval (0.25 mSv or less) and the means for radiation doses of two groups are equivalent with 95% confidence (significance level: 5%). Therefore, what has already been reported is considered to be an accurate and unbiased assessment of dose distribution for the whole population of each area.

Estimation period : Four months (from 11 March through 11 July 2011)  
 Radiation workers : Excluded

Comparison of respondents who had completed the questionnaire with those in the door-to-door survey of the selected sample

Area	Items	Respondents who had completed the questionnaire (Fig. 1 B)	Respondents in the door-to-door survey (Fig. 1 D)	Difference in mean effective dose (D-B) (mSv)
Kempoku	Mean effective dose (mSv)	1.41	1.53	0.12
	Survey population	168	171	
Kenchu	Mean effective dose (mSv)	1.04	0.95	-0.09
	Survey population	190	224	
Kennan	Mean effective dose (mSv)	0.73	0.68	-0.05
	Survey population	41	71	
Aizu	Mean effective dose (mSv)	0.19	0.24	0.05
	Survey population	11	34	
Minami-aizu	Mean effective dose (mSv)	0.19	0.19	0.00
	Survey population	15	49	
Soso	Mean effective dose (mSv)	0.73	0.81	0.08
	Survey population	1,138	388	
Iwaki	Mean effective dose (mSv)	0.32	0.40	0.08
	Survey population	25	24	

