

Health consequences of the Fukushima accident
Summary of the epidemiological studies conducted on
the inhabitants of the Fukushima Prefecture
Report on the situation in March 2016

Principle of the studies in place

Starting at the end of June 2011, the Japanese health authorities designed and set up epidemiological studies to assess the health of persons who were or had been exposed to radioactive releases and to monitor them over time. Depending on the group concerned, the studies are based on a questionnaire, which in certain cases is backed up by medical check-ups. The results of these epidemiological studies will provide information on the basic incidence of certain pathologies within the Japanese population (cancers, leukaemia, psychological, thyroid, liver and kidney disorders, diabetes, etc.) and, based on changes observed over time, make it possible to assess how exposure to radioactive fallout may affect the health of the population concerned. Planned for a period of approximately 30 years, the management of these studies has been entrusted to the Medical University of Fukushima, in collaboration with other Japanese medical centres.

The studies include:

- A basic survey targeting all residents of the Fukushima Prefecture. The purpose of this survey is to collect information on residents' behaviour (where they were, at what time, for how long, etc.) in order to estimate the external dose that they may have received, and thus identify individuals requiring in-depth medical monitoring. The survey concerns a population of 2 055 326 individuals (taking into account the very slight change in the population of the Fukushima Prefecture since the accident).
- A thyroid assessment for all children under 18 years of age who were in the Fukushima Prefecture during the fallout phase. The main purpose of this study is to detect a possible increase of thyroid cancers in the upcoming years and decades, as was observed in children exposed to radioactive fallout resulting from the Chernobyl accident. It concerns approximately 360 000 children born before 1 March 2012.
- Specific medical assessments in residents who were evacuated from the areas most exposed to radioactive fallout. This study, which concerns approximately 210 000 people, serves to collect information related to their lifestyle (such as tobacco consumption or alcoholism, for example) and psychological conditions, using a questionnaire, and to the baseline incidence of pathologies such as cancers, leukaemia, diabetes, liver and kidney disorders based on clinical and biological examinations.
- A campaign to monitor women in the Fukushima Prefecture who declared a pregnancy as of 1 August 2010, and a study to track any genetic and congenital abnormalities diagnosed in the children born of these women. This study concerns approximately 20 000 women.

State of progress of the on-going studies

Basic Survey

General data

- According to the latest assessment conducted on 31 December 2015, 564 083 of the 2 055 326 residents of the Fukushima Prefecture had responded to the questionnaire since it was first distributed, i.e. **a response rate of 27.4%** (a slight increase compared to the assessment of 31 December 2014, for which the response rate was 27.0%), according to a Medical University of Fukushima report dated 15 February 2016. It should be noted that the Japanese authorities decided to simplify the questionnaire by removing certain questions as of 2014, as almost three years had elapsed since the tsunami in March 2011. Although no detailed information is available on this point, it is very likely that the questions removed are essentially those calling upon respondents' immediate memory, as very little credit can be given to responses to questions referring to the days immediately following the accident. For information, of the 564 083 questionnaires completed as at 31 December 2015, 71 020 were simplified questionnaires.
- Of the 564 083 completed questionnaires, the external doses received during the first four months following the accident were estimated for 547 380 respondents using a software tool that was specially developed by the NIRS (Japanese National Institute for Radiological Sciences). A further 2 205 people (of the 3 959 people contacted, i.e. a participation rate of 55.7%) who were passing through ("non-residential visitors") the Fukushima Prefecture when the tsunami struck also responded to the questionnaire.
- In its report dated 15 February 2016, the Medical University of Fukushima specified that the dose estimates were made by the NIRS only for the residents who were in the Fukushima Prefecture for at least the first four months after the accident (*however, this distinction seems curious insofar as even those people who stayed in the area for just a few days could have received significant doses if they were in the Fukushima Prefecture during the initial weeks following the accident*).

Estimated doses for residents of the Fukushima Prefecture not employed at the Fukushima nuclear power plant

- The report dated 15 February 2016 presents only the dose estimates for 468 748 people who were in the area concerned for at least the first four months following the accident, of whom 9 128 were workers at the power plant living in the Fukushima Prefecture, and who responded to the questionnaire. However, it does not provide **any information regarding the 78 632 residents who were in the Fukushima Prefecture for less than four months following the accident**.
- Of the 459 620 residents of the Fukushima Prefecture not employed at the power plant and for whom an external dose was estimated, **285 418 people (i.e. 62.1% of the residents assessed) received, over the course of the first four months following the accident, external doses less than 1 mSv and 15 people (i.e. less than 0.003% of the people assessed) received doses greater than 15 mSv (Figure 1). The maximum external dose received is estimated to be 25 mSv**. This assessment, conducted on residents who were not employed at the Fukushima power plant, **does not show any significant change in these statistics over time** (according to the report dated 31 December 2014, 12 people in all had received an external dose higher than 15 mSv).
- Of the 15 most exposed people (who were among the 459 620 residents not employed at the Fukushima power plant, and for whom an external dose was estimated as indicated above), three were between the ages of 40 and 49 (age at the time of the accident), three were in the 50-59 range, six in the 60-69 range, one person was in the 70-79 range and two people were over 80 years of age. The distribution of people by region shows that **the 15 most exposed people are all residents of the Soso region: eight live in Namie, four in Iitate, one in Okuma and two in Futaba**. Finally, Figure 2 shows that **it is in the region of Kempoku (which includes, in particular, the cities of Fukushima, Date and Kawamata) that the average external dose received by the population is the highest (1.4 mSv; i.e. a stable value compared to the average as at 31 December 2014)**.

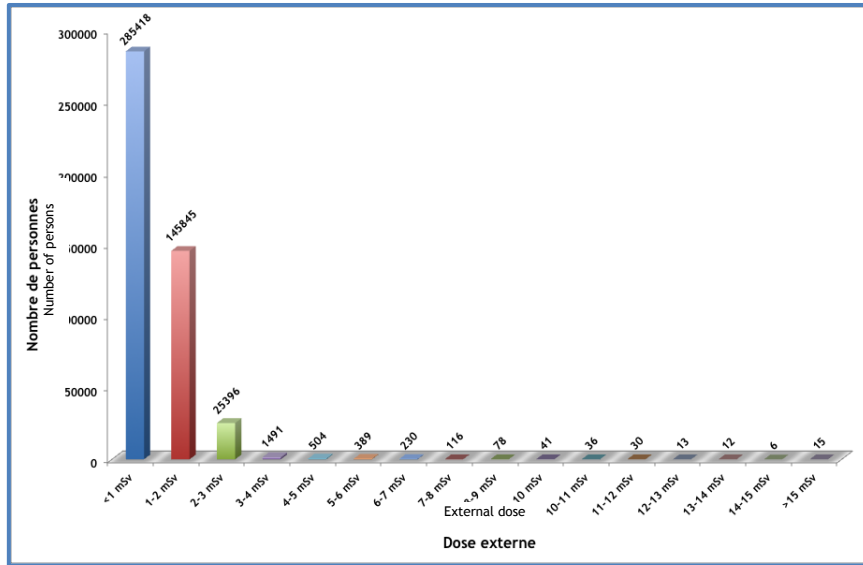


Figure 1: Distribution of the external doses received during the first four months after the accident by the population residing in the Fukushima Prefecture (excluding workers and non-residential visitors) according to the results of the survey conducted by the Medical University of Fukushima (report dated 31 December 2015).

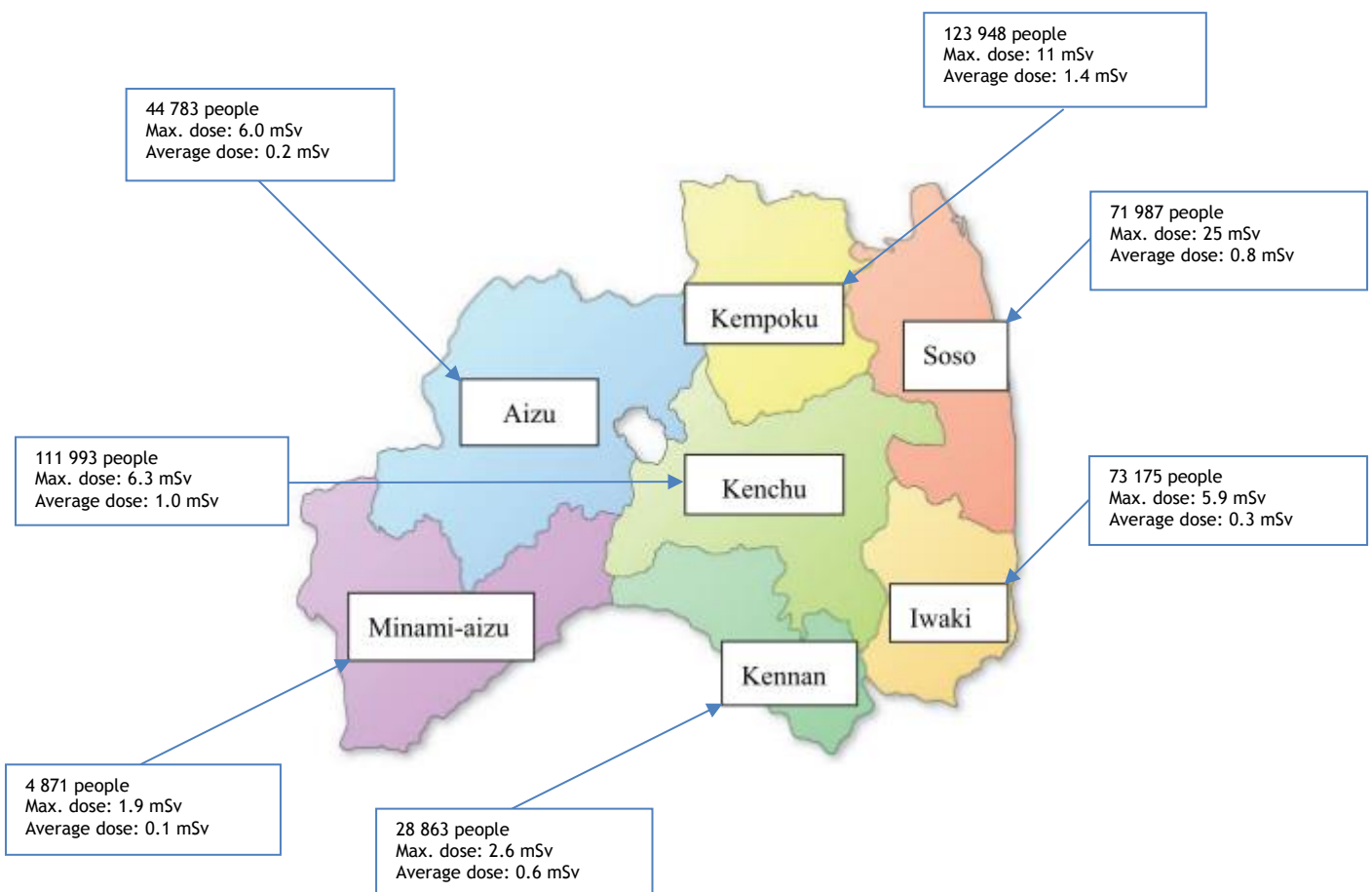


Figure 2: Distribution of the maximum external doses received during the first four months after the accident by the population residing in the Fukushima Prefecture (excluding workers and non-residential visitors) according to the results of the survey conducted by the Medical University of Fukushima (report dated 31 December 2015). The numbers of people indicate those for whom an assessment was carried out).

- The results of the estimated external doses received by the residents of the Fukushima Prefecture show values less than 2 mSv for 87% of the population of the Kempoku region (which includes, in particular, the cities of Fukushima, Date and Kawamata) and for 92% of the Kenchu region (which includes the city of Koriyama), as well as values less than 1 mSv for 88% of the residents of the Kennan region and for more than 99% of the regions of Aizu, Minami-aizu and Iwaki. For the Soso region (which includes, in particular, the areas of Namie, Iitate and Minami-soma), the estimated external dose is less than 1 mSv for 77% of the residents.

Estimated doses for non-residential visitors to the Fukushima Prefecture

- Regarding the 2 205 “non-residential visitors” who responded to the questionnaire, the report dated 15 February 2016 indicates that the external dose received was assessed for 1 957 of them. However, it provides detailed dosimetry information only for 1 688 non-residential visitors. Of the latter, more than 83% had received an external dose of less than 1 mSv and two a maximum external dose between 3 and 4 mSv (maximum dose estimated for non-residential visitors).

Estimated doses for the residents of the Fukushima Prefecture employed at the Fukushima power plant

- Of the 9 128 residents of the Fukushima Prefecture employed at the power plant and for whom an external dose was estimated on the basis of responses to the questionnaire, **5 675 people (i.e. 62.2% of assessed workers) received, over the course of the first four months following the accident, external doses less than 1 mSv and 299 people (i.e. 3.3% of assessed workers) received doses higher than 15 mSv (Figure 1). The maximum external dose received is estimated to be 66 mSv.**
- It must nevertheless be specified that ***these estimates of external doses in these residents employed at the Fukushima power plant cannot replace the values recorded by TEPCO and its subcontractors.*** Actually, the values shown above were calculated on the basis of the responses to the questionnaire given by these workers, whereas the values presented by TEPCO correspond to the external doses recorded by the dosimeters carried by the workers in question. ***For more detailed information regarding the doses received by workers at the Fukushima power plant, please refer to another IRSN’s note dedicated to this subject.***

Monitoring the thyroid function in children exposed to radioactive releases

Methodology

- In order to evaluate the thyroid function of children exposed to radioactive releases, the Medical University of Fukushima started a large-scale campaign in April 2011, comprising ultrasound examinations of the thyroid gland, aimed at approximately 360 000 children under 18 years of age (or born between 2 April 1992 and 1 April 2011), who were present in the Fukushima Prefecture at the time of the accident. In the event of a thyroid disorder being detected, the assessment was backed up by biological analyses or even biopsies (fine needle aspiration) of the thyroid.
- The goal for the Japanese authorities was for all the children concerned to undergo an initial ultrasound examination of the thyroid by April 2014 (first screening campaign to assess the baseline incidence of thyroid cancers in children in the Fukushima Prefecture). Plans were then made to carry out a second screening campaign as from April 2014 in the same children to count the number of new cases of thyroid cancer and check whether or not the number is increasing over time. The second campaign should end in April 2016, after which the children will undergo follow-up thyroid assessments once every two years until they reach the age of 20 years, and then once every five years beyond the age of 20 years (Figure 3).

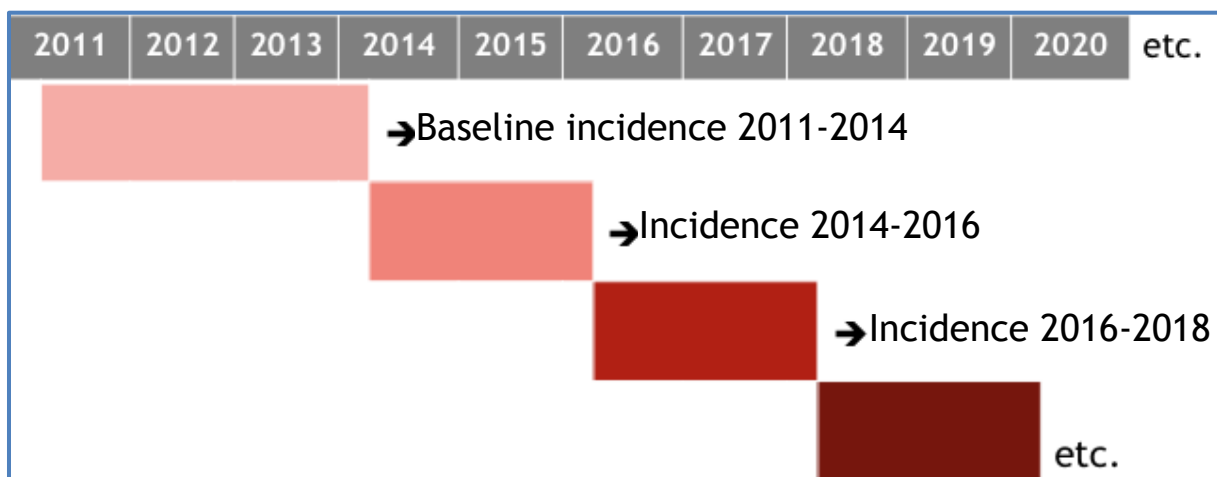


Figure 3: Schedule of the systematic screening campaign for disorders in the thyroid function in children in the Fukushima Prefecture

First screening campaign for thyroid cancers (April 2011 - April 2014: “Preliminary Baseline Screening”)

- According to the Medical University of Fukushima report dated 31 August 2015, of the 367 685 children included in the first screening campaign, **300 476 showed up for a thyroid assessment between April 2011 and April 2014 (i.e. a participation rate of 81.7%)**. In these 300 476 children, ultrasound examination of the thyroid gland revealed:
 - o The absence of cysts or nodules in 152 573 children (i.e. 50.8% of the examined population).
 - o The presence of nodules with diameters of less than 5 mm in 1 715 children (i.e. 0.6% of the examined population).
 - o The presence of nodules with diameters of more than 5 mm in 2 275 children (i.e. 0.8% of the examined population).
 - o The presence of cysts with diameters of less than 20 mm in 143 901 children (i.e. 47.9% of the examined population).
 - o The presence of cysts with diameters of more than 20 mm in 12 children (i.e. 0.004% of the examined population).

- Of the 300 476 children who had an ultrasound examination of the thyroid between April 2011 and April 2014, **2 294 were identified as requiring additional examinations**: a second ultrasound examination of the thyroid and/or dosing of thyroid hormones and anti-thyroid antibodies and/or biopsies of the nodules or cysts considered suspicious during the first examination. As of 30 June 2015, additional examinations had been conducted on 2 056 children (in the absence of any clear indication in the Medical University of Fukushima report, it is assumed that the other 238 children who ought to have undergone additional examinations did not show up, or that the results of the additional examinations were not available when the report was drafted, or that in some cases the additional examinations were finally considered unnecessary by the physicians).
- Of the 2 056 children who underwent additional examinations, the fine-needle aspiration biopsy of the contents of the nodules or cysts confirmed their potentially malignant nature in 113 cases (38 boys and 75 girls aged between 6 and 18 years at the time of the accident, with an average age at the time of the accident of 14.8 years) and surgical ablation of the thyroid was deemed necessary in 99 of these cases.
- Of the 113 children whose thyroid biopsies were considered suspicious, 65 also responded to the dosimetry questionnaire. Analysis of their responses showed that the external dose received was estimated to be less than 1 mSv in 45 children and that the highest external dose was 2.2 mSv.
- Analysis of the 99 thyroids removed by surgical ablation confirmed the presence of **a thyroid cancer of papillary adenocarcinoma type** (note that this histological type of thyroid cancer is the only one that can be observed after exposure to ionising radiation) in 95 children, a non-differentiated thyroid cancer in three children and a benign tumour in one child. The other 14 children whose thyroid biopsies were considered suspicious are subject to special monitoring. Depending on the results of further examinations, the physicians will decide whether or not these children require surgery.
- According to this data, **the annual incidence of thyroid cancer in children under 18 years of age is 11 out of 100 000 in the Fukushima Prefecture for the period of 2011-2014**. According to data corresponding to the period 2003-2007 in the thyroid cancer registries of eight other Japanese prefectures not concerned by fallout from the Fukushima accident (Prefectures of Aichi, Fukui, Hiroshima, Miyagi, Nagasaki, Nigata, Osaka and Saga), the average annual incidence of thyroid cancer in children between 5 and 24 years of age (i.e. the 2016 age group corresponding to children born in 2011) is 0.75 out of 100 000. **According to initial analyses, the annual incidence of thyroid cancers is 15 times greater in children from the Fukushima Prefecture than in those from the rest of Japan**.
- However, contrary to the approach adopted by some authors (especially T. Tsuda in his article published in 2015 in the journal *Epidemiology*: Tsuda T, Tokinobu A, Yamamoto E, Suzuki E. *Thyroid Cancer Detection by Ultrasound Among Residents Ages 18 Years and Younger in Fukushima, Japan: 2011 to 2014*. *Epidemiology* 2015, doi: 10.1097/EDE.0000000000000385), **the annual incidence of thyroid cancers in children, estimated on the basis of a systematic screening campaign, cannot be compared to that estimated on the basis of data recorded without such a campaign**.
- When a pathology is systematically screened within a population, its incidence will be statistically increased automatically owing to the “screening factor”, which is the factor related to the systematic nature of the screening. For example, South Korea introduced systematic screening for thyroid cancers in children in 1999. Comparison of figures before 1999 with those after 1999 show that the annual incidence of thyroid cancer in Korean children has been multiplied by a factor of 15 due to the implementation of systematic screening.
- In order for data comparison to be relevant, **the annual incidence of thyroid cancers in children from the Fukushima Prefecture for the period 2011-2014 must be compared with incidence values estimated as part of systematic screening campaigns carried out during the same period and in similar conditions, in Japanese prefectures that were not affected by fallout from the Fukushima accident**.

- Thus, during the period 2011-2014, four systematic screening campaigns for thyroid cancer were carried out in children under 18 years of age in prefectures not affected by the Fukushima accident, including the prefectures of Aomori, Hiroshima and Yamanashi. The data from these studies shows that the annual incidence estimated on the basis of systematic screening of thyroid cancer in children is between 23 and 130 out of 100 000 in these prefectures that were not affected by fallout from the Fukushima accident. ***This data therefore shows that there is no significant difference between the annual incidence of thyroid cancer in children from the Fukushima Prefecture and the incidence values estimated on the basis of systematic screening carried out between 2011 and 2014 in prefectures not affected by fallout from the Fukushima accident.***
- In conclusion, during the first screening campaign for thyroid cancer in all children from the Fukushima Prefecture who turned up for a thyroid ultrasound examination, 98 cases of thyroid cancer were diagnosed and 14 children are subject to special monitoring to keep track of changes in the results of additional examinations that were considered suspicious. ***This figure of 98 cases of thyroid cancer, diagnosed between 2011 and 2014 in children from the Fukushima Prefecture, i.e. an annual incidence of 11 out of 100 000, will serve as a reference for any subsequent campaigns, which will be aimed at counting new cases of thyroid cancer, i.e. thyroid cancers that were not yet developed during the first screening campaign.***

Second screening campaign for thyroid cancers (April 2014 - April 2016)

- According to the Medical University of Fukushima report dated 12 February 2016, of the 381 261 children included in the second screening campaign, ***236 595 came for a thyroid check-up between April 2014 and December 2015.*** The available results as of 31 December 2015 show that of the 220 088 children whose thyroid check-up was analysed, the ultrasound examination of the thyroid gland revealed:
 - o The absence of cysts or nodules in 87 643 children (i.e. 39.8% of the examined population).
 - o The presence of nodules with diameters of less than 5 mm in 1 302 children (i.e. 0.6% of the examined population).
 - o The presence of nodules with diameters of more than 5 mm in 1 811 children (i.e. 0.8% of the examined population).
 - o The presence of cysts with diameters of less than 20 mm in 129 326 children (i.e. 58.8% of the examined population).
 - o The presence of cysts with diameters of more than 20 mm in six children (i.e. 0.003% of the examined population).
- Of these 220 088 children whose thyroid check-up had been interpreted as of 31 December 2015, ***1 819 were identified as requiring additional examinations:*** a new ultrasound examination of the thyroid and/or dosing of thyroid hormones and anti-thyroid antibodies and/or biopsies of the nodules or cysts considered suspicious during the first examination. As of 31 June 2015, these additional examinations had been conducted on 1 087 children (in the absence of any clear indication in the report of the Medical University of Fukushima, it is assumed that the other 732 children had not yet been called in for the additional examinations, or that the results of these examinations were not yet available when the report was drafted).
- Of the 1 087 children on whom the additional examinations were conducted, the fine-needle aspiration biopsy of the contents of the nodules or cysts confirmed their potentially malignant nature in 51 cases (21 boys and 30 girls - aged between 6 and 18 years at the time of the accident, with an average age at the time of the accident of 12.9 years), and surgical ablation of the thyroid was deemed necessary in 16 of these cases.
- Of the 51 children whose thyroid biopsies were considered suspicious, 29 also responded to the dosimetry questionnaire. Analysis of their responses showed that the external dose received was estimated to be less than 1 mSv in 10 children and that the highest external dose was 2.1 mSv.

- Analysis of the 16 thyroids removed by surgical ablation between April 2014 and December 2015 confirmed ***the presence of a thyroid cancer of papillary adenocarcinoma type in the 16 operated children***. The other 35 children whose biopsy was considered suspicious are subject to special monitoring (or have not yet been operated on at the time of publishing of the report). Depending on the results of further examinations, the physicians will decide whether or not these children require a surgical operation.
- According to this provisional data, ***the annual incidence of thyroid cancer in children under 18 years of age is between 4 (considering the 16 cases of cancer confirmed by surgery) and 14 (considering the total 51 suspicious cases) out of 100 000 in the Fukushima Prefecture for the period of April 2014 - December 2015***.
- In the current state of progress of the second systematic screening campaign, the comparison of the incidence data for the period April 2011-April 2014 with the incidence data for the period April 2014-December 2015 ***does not yet show any significant increase in new cases of thyroid cancer in children who were under 18 years of age at the time of the accident***.
- However, it is too early at this stage to make a judgment as to whether there is an increase in thyroid cancer in children following the accident. ***It is impossible to determine at present whether or not an increase will be observed in thyroid cancer in children from the Fukushima Prefecture***. These screening campaigns must be continued to obtain a trend from which well-founded conclusions can be drawn. In other words, ***a connection with the Fukushima accident may only be made if the annual incidence of thyroid cancer in children increases starting from the period 2016-2018 (or during subsequent periods)***.

Monitoring evacuees

Impact on general state of health

- The 210 000 or so people who were evacuated in the weeks following the accident are required to come in for an in-depth medical check-up once a year.
- According to a report by the Medical University of Fukushima dated 31 December 2015, which was partially updated on 15 February 2016, a health assessment was conducted on:
 - o 84 218 people (including 17 934 children under 15 years of age) of the 210 189 called in between January 2012 and March 2012 (i.e. 40.1% of those who showed up for the assessment, with a participation rate of 64.5% in children under 15 years of age).
 - o 58 789 people (including 11 780 children under 15 years of age) of the 211 987 called in between July 2012 and December 2012 (i.e. 27.7% of those who showed up for the assessment, with a participation rate of 43.5% in children under 15 years of age).
 - o 53 288 people (including 10 248 children under 15 years of age) of the 213 444 called in between July 2013 and December 2013 (i.e. 25.0% of those who showed up for the assessment, with a participation rate of 38.7% in children under 15 years of age).
 - o 51 090 people (including 9 216 children under 15 years of age) of the 214 211 called in between July 2014 and December 2014 (i.e. 23.9% of those who showed up for the assessment, with a participation rate of 35.6% in children under 15 years of age).
 - o 33 943 people (including 7 038 children under 15 years of age) of the 215 315 called in between July 2015 and December 2015 (i.e. 15.8% of those who showed up for the assessment, with a participation rate of 27.8% in children under 15 years of age).
- The above figures show that fewer and fewer people are showing up for the medical check-up as the time since the accident increases. Deeper analysis of the data reveals the same trend in children under 15 years of age, even if the percentage of children who showed up for the medical check-up is higher than for adults. ***The figures seem to imply that evacuees are less and less worried by the possible health consequences of their possible exposure at the time of the accident.***
- The data collected (this does not concern the information collected in 2015, which is still being analysed) during the health assessments conducted since 2012 shows:
 - o ***An increase in weight observed during the campaign conducted between January and March 2012***, with a greater prevalence in men compared to women: 22.3% of people between 16 and 39 years of age and 37.1% of people over 65 year of age were overweight according to the data collected during this first campaign. These figures remained stable till December 2013, after which ***a reduction in the prevalence of obesity was observed during the campaign conducted between July and December 2014***: 21.8% of people between 16 and 39 years of age and 34.3% of people over 65 years of age were overweight according to the data collected during this fourth campaign.
 - o ***An above normal quantity of abdominal fat was observed during the campaign conducted between January and March 2012***: this excess abdominal fat was found in 37.3% of men aged between 16 and 39 years, 56.0% of men aged between 40 and 64 years, 58.2% of men over 65 years of age, 9.5% of women aged between 16 and 39 years, 19.5% of women aged between 40 and 64 years and 26.7% of women over 65 years of age. ***The data collected during the campaign conducted between July and December 2014 show a decrease in these trends in all men aged from 16 years to more than 65 years*** (respectively, 32.0%, 55.3% and 56.2%); ***this decrease was also observed in women aged between 16 and 34 years (8.5%) and those over 65 years of age (26.4%), whereas an increase was observed in women aged between 40 and 64 years (20.7%).***

- ***A reduction in the prevalence of hypertension was observed during the campaigns conducted between July 2012 and December 2014***, compared to the campaign conducted between January and March 2012. This reduction could be observed in all age groups, in men as well as in women, even though the prevalence of hypertension remained greater in men than in women.
- ***The number of people suffering from diabetes aged between 16 and 64 years remained stable between January 2012 and December 2014***, whereas the number of diabetics over 64 years of age fell as from the campaign conducted between July and December 2014.
- ***An increase was observed between July 2012 and December 2014 in the number of people suffering from renal failure among men and women over 40 years of age***, compared to the data collected during the campaign conducted between January and March 2012.
- An increase in the number of people between 7 and 15 years of age with high cholesterol or triglyceride levels was observed between January and March 2012. ***The increased prevalence of high triglyceride levels was confirmed during the campaign conducted between July and December 2014 on children between 7 and 15 years of age.***
- ***An increase was observed between July and December 2012 in the number of people suffering from liver disorders that could be attributed to excessive alcohol consumption***, compared to the campaign conducted between January and March 2012. ***A reduced prevalence of liver disorders was subsequently observed during the campaigns conducted between July and December 2013, and then between July and December 2014.***
- ***Except for those concerning renal failure in people over 65 years of age and triglyceride levels in children aged between 7 and 15 years, the above figures reveal an overall improvement in evacuees' physical state of health, most likely related to a gradual improvement in living conditions, which had fallen in the first months following the accident.***

Impact on mental health

- In order to assess the impact of the accident on evacuees' mental health, a questionnaire was mailed to them in 2012, 2013 and 2014. According to a Medical University of Fukushima report dated May 2015:
 - 92 314 people (including 18 745 children) of the 210 189 contacted (including 29 585 children) responded to the questionnaire in 2012 (i.e. a participation rate of 43.9%).
 - 66 279 people (including 11 203 children) of the 211 615 contacted (including 27 108 children) responded to the questionnaire in 2013 (i.e. a participation rate of 31.3%).
 - 55 883 people (including 9 495 children) of the 212 372 contacted (including 26 513 children) responded to the questionnaire in 2014 (i.e. a participation rate of 26.3%).
 - 46 646 people (including 6 072 children) of the 212 747 contacted (including 25 872 children) responded to the questionnaire in 2015 (i.e. a participation rate of 21.9%, according to the provisional data available as of 31 March 2015).
- As observed in the general health assessments, ***a steady decrease was observed in the participation rate of the survey, the aim of which was to assess the impact of the accident on evacuees' mental health.***

- The main lessons drawn from the survey conducted between 5 February and 31 October 2014 are as follows (the results of the survey conducted in 2015 were still being analysed at the time this document was being drafted):
 - o 12 763 people (including 1 256 children) expressed a desire to receive help, either by telephone consultations or through information documents.
 - o ***In all, 4 386 people (473 children and 3 913 adults) received support over the telephone*** (the others either did not reply to the calls, eventually decided they did not desire such support, could not be reached, or had died in the meantime, which was the case for 20 adults).
- ***The problems mentioned (stable in type as well as in proportion compared to the results of the previous year) by the 473 children*** who were contacted by telephone were mainly:
 - o ***Excessive emotions (38.0%).***
 - o ***Irritability (34.4%).***
 - o ***Relationship problems with their friends (32.6%).***
 - o ***Rebellious behaviour (31.4%).***
- After the telephone consultations, 78 children showed up for a consultation with a health-care provider (37 of whom went to a psychiatrist or psychologist).
- ***The problems mentioned (of the same type, but lower in proportion compared to the results of the previous year) by the 3 913 adults*** who were contacted by telephone were mainly:
 - o ***Depressive syndrome in 35.4% of them, compared to 44.2% found during the survey of the previous year.***
 - o A deterioration in physical condition in 15.3% of them, compared to 16.1% during the survey of the previous year.
 - o The use of psychotropic drugs in 13.0% of them, compared to 15.4% during the survey of the previous year.
 - o Increased fear of earthquakes in 4.1% of them, compared to 7.0% during the survey of the previous year.
 - o Increasing sleeping disorders in 6.8% of them, compared to 8.0% during the survey of the previous year.
- After these telephone consultations, 2 907 adults showed up for a consultation with a health-care provider (510 of whom went to a psychiatrist or psychologist).

Monitoring women who were pregnant at the time of the accident and their children

- According to a Medical University of Fukushima report dated 12 February 2015 (including an update to the report dated 25 December 2014), the conducted surveys compare information obtained in connection with monitoring campaigns on women who came for a check-up at a medical centre in the Fukushima Prefecture when the pregnancy was declared (the baby may have been born elsewhere in some cases):
 - o For pregnancies that began between 1 August 2010 and 31 July 2011: 9 316 responses (received between 20 January 2012 and 31 March 2013) out of the 16 001 questionnaires distributed, i.e. a return rate of 58.2%.
 - o For pregnancies that began between 1 August 2011 and 31 July 2012: 7 181 responses (received between 14 December 2012 and 30 November 2013) out of the 14 516 questionnaires distributed, i.e. a return rate of 49.5%.
 - o For pregnancies that began between 1 August 2012 and 31 July 2013: 7 260 responses (received between 24 December 2013 and 26 December 2014) out of the 15 218 questionnaires distributed, i.e. a return rate of 47.7%.

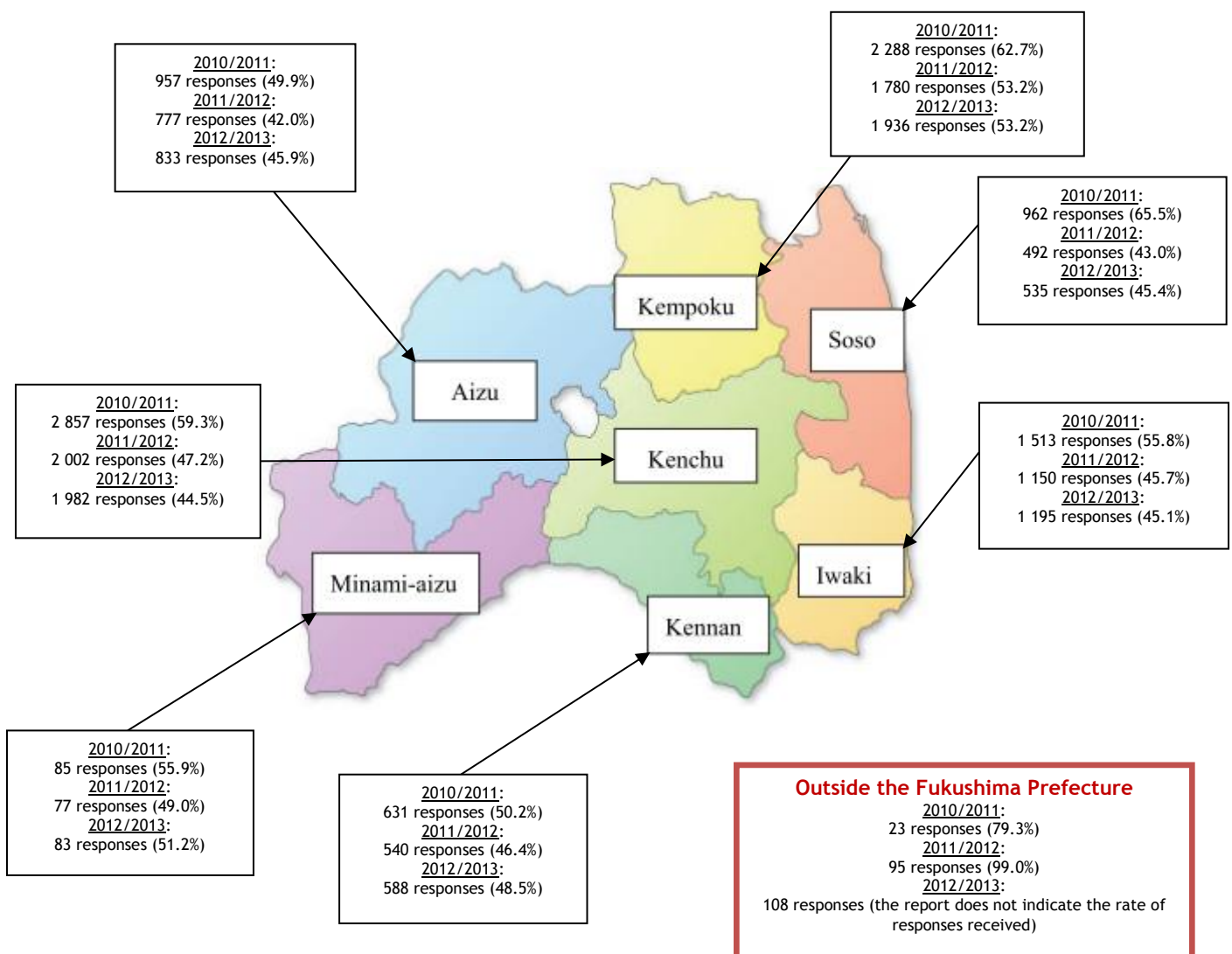


Figure 4: Breakdown of responses to the questionnaire submitted to pregnant women who came for check-ups for a pregnancy declared between 1 August 2010 and 31 July 2013 (report dated 12 February 2015, the years correspond to the time at which the pregnancy was declared)

- The main lessons drawn from this survey are as follows:
 - o After a slight increase in the *abortion rate* between 2011 and 2012 (0.06% for pregnancies declared between August 2010 and July 2011, compared to 0.08% for those declared between August 2011 and July 2012), **a downward trend was observed in 2013** (0.04% for pregnancies declared between August 2012 and July 2013).
 - o **No significant change is observed in the rate of miscarriages**, which was 0.77% for pregnancies declared between August 2010 and July 2011; 0.81% for those declared between August 2011 and July 2012; and 0.78% for those declared between August 2012 and July 2013.
 - o After an increase in the *rate of premature births* between 2011 and 2012 (4.75% for pregnancies declared between August 2010 and July 2011, compared to 5.74% for those declared between August 2011 and July 2012), **a downward trend was observed in 2013** (5.40% for pregnancies declared between August 2012 and July 2013) **and was not significantly different from the premature birth rate observed in Japan as a whole in 2013 (5.8%)**.
 - o **Regarding congenital malformations, the rate saw a slight downturn**: 2.85% for births from pregnancies declared between August 2010 and July 2011; 2.39% for births from pregnancies declared between August 2011 and July 2012; 2.35% for births from pregnancies declared between August 2012 and July 2013: **these figures are comparable to the Japanese national average, which is between 3 and 5%**. In one-third of cases, the malformations or abnormalities observed in children were heart-related (0.91% for births resulting from pregnancies declared between August 2012 and July 2013).
- Infant feeding method:
 - o 36.6% of women only breastfed their child in 2013/2014; this figure fell to 35.2% in 2012/2013 and 30.4% in 2011/2012.
 - o **Among the reasons mentioned by women who fed their child only with reconstituted milk, the fear of radioactive contamination of their breast milk was mentioned by 1.8% in 2013/2014, increasing to 6.2% in 2012/2013 and 19.8% in 2011/2012.**
- The following questions were asked concerning the mothers' mental health:
 - o "Have you felt sad or depressed over the past month?"
 - o "Have you lost interest in your surroundings or been unable to enjoy yourself over the past month?"

24.5% of women who were pregnant in 2013/2014 replied positively to one or both questions, compared to 25.5% in 2012/2013 and 27.1% in 2011/2012. The region of Minami-Aizu had the highest proportion of positive replies in 2013 (32.5%), whereas the region of Soso was most affected in 2011 (32.1%) and 2012 (32.9%).

However, the number of women suffering from postpartum depression remained significantly higher in 2013 in the Fukushima Prefecture (13%) compared to the Japanese national average (9%).

Moreover, of the 7 260 women who responded to the questionnaire in 2013/2014, **1 101 expressed a desire for psychological support by telephone or an appointment with a psychiatrist or psychologist (i.e. 15.2% compared to 15.0% in 2011/2012 and 15.4% in 2012/2013)**. The reason mentioned was related to depressive symptoms in **67.6% of cases (a sharp drop compared to 87.4% in 2011/2012 and 68.0% in 2012/2013)** and to the fear of the impact of radioactivity on their pregnancy in **17.1% of cases (a sharp drop compared to 29.2% in 2011/2012 and 23.7% in 2012/2013)**.

- Finally, when asked "Why do you not wish to attempt another pregnancy?" only 5.6% of the women questioned in 2013/2014 mentioned a fear related to the consequences of radioactive exposure, whereas this reason was mentioned by 14.8% of women in 2012/2013.