# Analysis of WHO report on Fukushima catastrophe

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On May 23rd, 2012, the World Health Organization (WHO) published what it called a „Preliminary dose estimation from the nuclear accident after the 2011 Great East Japan Earthquake and Tsunami". The report aims to provide timely and authoritative information on the anticipated scale of doses in members of the public for the first year after the accident" in order to "estimate at global level the potential health consequences of human exposure to radiation during the first year after the Fukushima Daiichi nuclear power plant accident."[1] The media response to the WHO publication echoed the reassuring messages of the report itself:

- "WHO: Post-Fukushima radiation levels in Japan 'low'" (BBC, May 24th, 2012)
- "WHO: Radiation exposure near Fukushima plant within safe limits (Asahi Shimbun, May 23rd, 2012)
- "Radiation danger through Fukushima nuclear disaster less than expected" (Spiegel, May 24th,2012)
- "Most Fukushima radiation doses within norms – WHO" (Reuters, May 23rd, 2012)
- "Fukushima Radiation mostly within accepted levels" (AFP, May 23rd, 2012)

Whether or not these optimistic headlines portray the true situation in Fukushima remains to be seen. This paper analyzes the WHO report by attempting to answer three simple questions:

- **What does the report say?**
  Which information is actually contained in the report, what are its main conclusions and how do the findings compare to the numbers published by other sources?
- **What does the report not say?**
  Which important information was left out of the report, which obvious conclusions were not drawn from the raw data and where does the report show bias
- **Who wrote the report?**
  Which organizations and individuals were responsible for putting together the report and what are their motives?

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## 1. What does the report say?

**Total effective dose**

The report states that people living in Fukushima prefecture can expect to receive effective radiation doses of 1-10 mSv within the first year of the catastrophe. Several "example locations" were identified, where the estimated radiation dose would exceed this range and reach levels between 10-50 mSv, two of which are cited by name: Namie and Iitate. In prefectures neighboring Fukushima, the estimated effective doses were calculated to be between 0.1–10 mSv, whereas the effective dose for people in all other prefectures in Japan was estimated to be between 0.1–1 mSv. The validity and reliability of these dose estimations is discussed further in the next chapter.

**Thyroid dose**

The WHO report further states that the average thyroid dose of people living in Fukushima prefecture would be between 10 and 100 mSv during the course of the first year, while in certain locations (the town of Namie is given as an example), thyroid doses as high as 200 mSv could be expected. In the rest of Japan, the estimated thyroid doses are estimated to be between 1–10 mSv.

**Radioactive contamination of foodstuffs**

The WHO report lists numerous types of food, which were radioactively contaminated by nuclear fallout. Vegetables, fruits, mushrooms, milk, meat, cereals and eggs were tested and were found to contain levels of radioactive isotopes above permissible safety levels. People who ate these foods ingested harmful radioactive isotopes and were consequently exposed to internal radiation.

**Total amounts of airborne radioactivity emissions:**

The WHO report contains data on the amount of radioactive isotopes released into the atmosphere between March 12$^{th}$ and April 6$^{th}$, 2011. According to the report, approximately 113 x $10^{17}$ Bq of the radioactive gas Xenon-133 were released during these first six days of the catastrophe. Xenon-133 has a physical half-life of 5.25 days, emits beta- and gamma-radiation and can cause harm to lung tissue upon inhalation. Conservative calculations by the Norwegian Institute for Air Research (NILU) determined a total emission of 167 x $10^{17}$ Bq of Xenon-133 between March 12$^{th}$ and April 20$^{th}$, 2011,[2] while TEPCO estimates, published in a report to the Japanese Nuclear and Industry Safety Agency (NISA) in March of 2011, were even higher: 223 x $10^{17}$ Bq of Xenon-133 emitted between March 12th and 15th.[3] NILU describes the release of Xenon-133 as the largest radioactive noble gas release in history not related to nuclear bomb testing – more than twice as high as the release of Xenon-133 during the Chernobyl nuclear meltdown.[4]

Regarding the estimated emissions of radioactive iodine-131, the WHO report claims total emissions of 1.24-1.59 x $10^{17}$ Bq between March 12$^{th}$ and April 6$^{th}$. Iodine-131 has a relatively short physical half-life of 8 days. Its beta- and gamma-radiation can cause thyroid cancer when ingested. Using data from radioactivity measuring posts set up under the Comprehensive Test Ban Treaty (CTBT), the Austrian Central Institute for Meteorology and Geodynamics (ZAMG) calculated the amount of iodine-131 released by the Fukushima meltdowns between March 12$^{th}$ and 14$^{th}$, 2011 to be between 3.6-3.9 x $10^{17}$ Bq, or roughly 20% of the total iodine-131 emissions from Chernobyl.[5] TEPCO estimated emissions of iodine-131 of a similar magnitude:

3.19 x $10^{17}$ Bq between March 12th and March 15th, 2011. The WHO report gives no reason why their estimations of iodine-131 emissions are about two-thirds lower than the TEPCO and ZAMG estimates.

Finally, the WHO report cites a total emission of cesium-137 of 0.97-1.53 x $10^{16}$ Bq between March 12th and April 6th, 2011, once more well below the estimates calculated by ZAMG (5 x $10^{16}$ Bq between March 12th and 14th, 2011)[6], NILU (3.58 x $10^{16}$ Bq between March 12th and April 20th, 2011)[7] and even TEPCO itself (3.03 x $10^{16}$ Bq between March 12th and 15th, 2011)[8]. According to NILU, cesium-137 emissions in Fukushima accounted for about 40-60% of the total release of cesium-137 during the Chernobyl catastrophe.[9] Again, no explanation is given as to why the WHO report's estimates are 50-80% lower than those of other institutions. Cesium-137 has a physical half live of 30 years and is mainly a beta-emitter, but its decay product barium-137m also produces gamma-radiation, both leading to the development of malignant tumors.

**Stable iodine protection**

The report clearly states several times that the intake of stable iodine prophylaxis was "not officially recommended" and that it can be assumed that "stable iodine tablets were not taken by members of the public, either in Japan or elsewhere. Therefore the estimated equivalent thyroid doses are higher than those expected in people who have undergone thyroid blocking to reduce the uptake of radioactive iodine."[10]

## 2. What is the report not saying?

**Misleading information about the cause of the nuclear catastrophe**

The WHO report states that "damage caused by the flooding of the site resulted in loss of cooling to the three reactor units", putting emphasis on the fact that it was the tsunami that caused the nuclear catastrophe and not the earthquake. As earthquakes occur relatively frequently and many nuclear power plants around the world (especially in Japan) were constructed near seismic fault lines, the nuclear industry has a great interest in diverting attention away from the earthquake as possible cause of the nuclear meltdowns and placing the blame on the much less frequent and more exotic "massive tsunami". However, a comprehensive German study showed that the structural damage, which led to the nuclear catastrophe at Fukushima Dai-ichi, was caused by the earthquake and not by the ensuing tsunami.[11] Atmospheric data collected by NILU also proved that radioactive emissions were first measured right after the earthquake had caused substantial damage to the reactors and before the tsunami struck the plant.[12] The Japanese parliament's Investigation Commission concluded:

> "TEPCO was too quick to cite the tsunami as the cause of the nuclear accident and deny that the earthquake caused any damage. We believe there is a possibility that the earthquake damaged equipment necessary for ensuring safety."[13]

**Radiation exposures disregarded by the expert panel**

Because people living within the 20 km zone around the Fukushima Dai-ichi complex were evacuated in the first days of the nuclear meltdowns, the expert panel disregarded radioactive exposure to this population.[14] The possibility that these people may have been exposed to radiation before or during evacuation was simply ignored, despite the fact that the parliamentary investigation commission found that

> "the central government was not only slow in informing municipal governments about the nuclear power plant accident, but also failed to convey the severity of the accident. (…) Specifically, only 20 percent of the residents of the town hosting the plant knew about the accident when evacuation from the 3km zone was ordered at 21:23 on the evening of March 11. Most residents within 10km of the plant learned about the accident when the evacuation order was issued at 5:44 on March 12, more than 12 hours after the Article 15 notification—but received no further explanation of the accident or evacuation directions. Many residents had to flee with only the barest necessities and were forced to move multiple times or to areas with high radiation levels. (…) Some people evacuated to areas with high levels of radiation and were then neglected, receiving no further evacuation orders until April."[15]

This omission is particularly critical, as evacuees were not handed out protective stable iodine tablets as described above. The doses to workers, who will undoubtedly have received the highest amounts of external radiation due to the catastrophe, were also not included in the report, citing the need for a different dosimetric approach.

**Lack of differentiation between adults, children and infants below the age of one**

The report creates three different age groups for which it attempts to calculate individual effective dose levels in the first year of the Fukushima nuclear catastrophe. Despite the use of age-dependent dose coefficients, the report states that the effective dose for all people living in Fukushima prefecture, regardless of their age, would be 1-10 mSv.[16] By not differentiating the measurements, the reprt is either disguising existing differences between adults, children and infants behind averaged broad estimates or ignoring the most basic aspects of pediatric radiobiology and childhood sociology: Children generally spend more time playing outside than adults. They play on the ground, in sand-boxes, on the beach or in the yard and are thus exposed to a much higher degree of inhalative pathogens. Infants have a habit of sticking everything in their mouth, sometimes even soil. In May of 2011, the Japanese Ministry of Science and Technology (MEXT) published a list of soil measurements taken in kindergardens, schools and day-care centers. None of the places surveyed had radioactive iodine-131 measurements below 1,200 Bq/kg. The highest measurement was found at an elementary school in Date city: 6,800 Bq/kg of iodine-131. Concerning cesium-137, the soil concentrations lay between 620 Bq/kg and 9,900 Bq/kg.[17]

Biologically, children are also more susceptible to radiation exposure than adults. Their skin has a greater relative surface area and permeability, so that larger amounts of radiation are absorbed. Higher respiratory minute volumes expose them to more airborne pathogens. Higher tissue-metabolism and high rates of mitosis increase the chance that mutations cause malignancies before they can be stopped by the body's self-regulatory mechanisms. As the children's immune systems and cell-repair mechanisms are not yet fully developed, these mechanisms cannot adequately prevent the development of cancer. In utero, the fetus can receive radioactive isotopes through the umbilical vein and can be irradiated radiation from isotopes collected in the maternal bladder. Additionally, radioactive isotopes like iodine-131 are transmitted via breast-milk. None of these numerous social and biological factors are mentioned in the report. The fact that is the children who suffer the most from radiation-induced effects, as can be seen from the results of the Chernobyl studies, is simply omitted in the report and adults, children and even infants pressed into a single estimated dose range.

**Uncritical view of the inadequate response to the nuclear catastrophe**

The report acknowledges certain protective actions taken by the Japanese authorities in order to decrease the exposure of the population to radioactivity. No mention is made, however, of the many concrete actions by the Japanese authorities that have led to higher exposure. Ignoring the data of the System for Predicting Environmental Emergency Dose Information (SPEEDI) system, which could have been readily available to the responsible authorities, people were evacuated from areas of lower risk to highly contaminated regions.[18] The fact that the authorities failed to protect the population from the adverse effect of iodine-131 despite better knowledge, by not distributing stable iodine tablets to the affected population, is not discussed in the report, nor is the important question being asked why such an easy and well-known method to reduce radiation exposure was not employed by the responsible authorities. The Japanese parliament's independent investigation commission states in its official report:

> "Although the positive effects of administering stable iodine and the proper timing were fully known, the government's nuclear emergency response headquarters and the prefectural government failed to give proper instructions to the public."[19]

Unbelievably, the Japanese government also raised the permissible level of radioactive exposure for children to 3.8 μSv per hour (approx. 20 mSv per year) on April 19th, 2011.[20] Only after protests by parent organizations, scientists and doctors did the government rescind the new guidelines on May 27th, and returned to the former permissible level of 1 mSv per year.[21] The Japanese parliament's Investigation Commission is more critical towards the government's crisis management than the WHO report:

> "The Commission concludes that the situation continued to deteriorate because the crisis management system of the Kantei [office of the Japanese prime minister], the regulators and other responsible agencies did not function correctly. (…) residents' confusion over the evacuation stemmed from the regulators' negligence and failure over the years to implement adequate measures against a nuclear disaster, as well as a lack of action by previous governments and regulators focused on crisis management. The crisis management system that existed for the Kantei and the regulators should protect the health and safety of the public, but it failed in this function. (…) the government and the regulators are not fully committed to protecting public health and safety; (…) they have not acted to protect the health of the residents and to restore their welfare."[22]

**Omission of the fact that there is no lower threshold for radioactivity-induced cancer**

The report suggests that estimated effective doses lie below certain reference levels, such as the reference level of external exposure from radon in dwellings (annual effective dose of about 10 mSv) or the planned residual dose in emergency exposure situations (acute or annual effective dose of about 20–100 mSv) and therefore do not pose a risk. This seems to suggest a certain safety, while omitting the important information that the risk of developing cancer and other radiation-induced diseases increases proportionally to the amount of radioactive exposure. Shunichi Yamashita, the radiation risk management adviser of Fukushima prefecture, even went so far as to declare 100 mSv per year a safe dose for children and adults, saying that "even a small additional radiation dose would cause a small increase in cancer incidence in an exposed population. Such an increase is theoretically measurable, but with the doses below 100 millisievert it is statistically insignificant and thus cannot be considered as an argument in support of excessive risk."[23] What is statistically insignificant to some may be existential to others. Unlike the WHO report, Mr Yamashita's comment at least acknowledges the internationally established linear no-threshold model, which shows statistical effects well below the dose limit of 100 mSv suggested above. This model is not mentioned in the report, nor are its consequences. In its internationally accepted BEIR VII report, the US National Academy of Sciences Advisory Committee on the Biological Effects of Ionizing Radiation has clearly shown that a lower threshold for radiation damage does not exist and that even the slightest amount of radioactivity can cause harmful tissue damage and genetic mutations. Therefore, low radiation exposure of a large population can cause the same amount of thyroid cancer cases as a high radiation exposure of a small population.[24] Using the standard international BEIR-VII dose-risk model, an exposure of a population with an average of 10 mSv would cause 1 person of 1,000 to develop cancer as a result. A radiation exposure of 100 mSv would cause cancer in 1 of 100 people.[25] It is clear that reference levels, however low or high, are always defined on the basis of "socially acceptable risks". Riding a bike in the street without a helmet may be considered a "socially acceptable risk" in some places or by some people, while others may view it differently. What is needed more than false assurances of a safety that does not exist is a public debate about which level of risk is socially acceptable. If the WHO report chooses to consider a risk of 1 in a 1.000 people contracting cancer a "socially acceptable risk", it should be stated so explicitly and not hidden behind false suggestions of safety like

comparisons with reference level for nuclear workers. A child is not a nuclear worker and has not chosen to risk its health by coming into contact with radioactive substances. Reference levels for nuclear workers have no place in a health report dealing with children and infants. Furthermore, no doctor would perform unnecessary radiological examinations on a patient and certainly not on a child or a pregnant woman, despite the dose of a single chest x-ray being "only" 0.02 mSv. Knowing the stochastic nature of radiation effects, every exposure less can help prevent the development of malignant disease. And 100 mSv would mean a total of 5000 chest x-rays within one year – a number no radiologist would dare to call insignificant to a person's health. In its „Official Report of The Fukushima Nuclear Accident", the Japanese parliament's Independent Investigation Commission writes:

> „There is no widely accepted threshold for long-term radiation damage caused by low doses. The international consensus, however, is that the risk does increase in proportion to the dose. The impact of radiation on health may vary from one person to another depending on age, sensitivity to radiation and other factors, some unknown. After the accident, the government unilaterally announced a benchmark on dosage without giving the specific information that residents needed, including answers to questions like: What is a tolerable level of exposure in light of long-term health effects? How do health implications differ for individuals? How can people protect themselves from radioactive substances?"[26]

**Selective food sampling**

A major proportion of the estimated total radiation exposure is made up by internal radiation incurred by the ingestion of radioactively contaminated food. The WHO report attempts to estimate the levels of internal radiation, but does not explain the inadequacy of its estimations. As can be expected, such a calculation of internal radiation dose is largely influenced by the method of choosing food samples and of determining sample size. Regarding the extent of sampling, it is startling to see, for example, only 17 eggs being tested in the entire Fukushima prefecture in the first month of the catastrophe, another 11 in the second month, none in the third and finally another 11 in the last month.[27] Measurements on only 39 eggs collected from Fukushima prefecture (and 18 more from the rest of Japan) in the course of four months are supposed to determine the amount of internal radioactive exposure through the ingestion of eggs for a population of 120 million people. Similarly low figures are given for fruits from Fukushima prefecture (40 samples in the first month, 16 samples in the second month and only 49 and 28 for the rest of Japan in those two months, respectively). Instead of commenting on this obvious factor of underestimating the actual radiation dose, the WHO report states that "the measured radioactivity concentrations are representative of the whole food market for Fukushima and neighboring prefectures." At the same time, the report admits to another factor of underestimation: "The total average food consumption considered in this assessment represents 800–900 grams, whereas the total average daily consumption is about 2000 grams."[28]

No comment is made regarding the places where the samples of the WHO report were collected, who collected them or for which purpose. As the nuclear industry and collaborating government institutions have a profound conflict of interest in the determination of health effects from the Fukushima catastrophe, samples published by TEPCO or the Japanese nuclear institutions must be questioned by independent scientists as there is a profound interest to withhold critical information from the public. The contamination levels of vegetables from Fukushima prefecture are a case in point. The highest level of radioactive contamination of vegetables included in the report are samples with 54,100 Bq/kg of iodine-131 and 41,000 Bq/kg of cesium-

137. Interestingly enough, the sample with the highest iodine-131 content was found outside of Fukushima prefecture.[29] MEXT, however, found contaminated vegetable samples with iodine-131 concentrations as high as 2,540,000 Bq/kg (more than 40 times higher than the most contaminated vegetable sample mentioned in the WHO report) and cesium-137 concentrations of up to 2,650,000 (more than 60 times higher than the most contaminated vegetable sample mentioned in the WHO report). One month after the meltdowns, maximum concentrations were still found to be above 100,000 Bq/kg for iodine-131 (almost twice as high as in the WHO report) and 900,000 Bq/kg for cesium-137 (more than 20 times higher as in the WHO report).[30] The report does not explain why these samples, readily available on the website of the ministry and cited by numerous publications, were omitted from the WHO analysis.

Because of these inadequacies of the choice and analysis of food samples, it is not permissible to extrapolate the contamination levels found in the limited number of samples cited in the WHO report in order to calculate internal radiation exposure for large populations.

**Omission of the effects of radioactively contaminated tap water**

Another concerning piece of information is found in a later section of the report: Because the expert panel thought that "doses from tap water were low in comparison with doses from other pathways", they simply did not include radioactive exposure from contaminated tap water in their dose calculations.[31] This seems odd, as the International Atomic Energy Agency (IAEA) itself had warned of high levels of radioactive iodine-131 in drinking water samples taken in the prefectures of Fukushima, Ibaraki, Tochigi, Gunma, Chiba and Saitamar between March 17th and 23rd.[32] Even in a northern district of Tokyo, tap water had been found to contain 210 Bq/l of iodine-131.[33] According to a publication by the German Society for Radiation Protection, FoodWatch and the German affiliate of the International Physicians for the Prevention of Nuclear War (IPPNW), there is no lower threshold for radioactive iodine-131 in water or food and levels that were measured in Japan in the days after the beginning of the nuclear catastrophe will certainly have contributed to the effective thyroid dose of those who drank contaminated water.[34] The omission of tap water in their calculations further discredits the report's questionable attempt of calculating internal radiation doses.

**Missing data on radioactive contamination of fish and sea-food**

Regarding the radioactive contamination of fish and sea-food, the WHO report contains data from only 41 singular fish samples caught in Fukushima prefecture in the first two months of the catastrophe. The maximum contamination found in one of these samples is said to have been 12,000 Bq/kg of iodine-131 and 7,100 Bq/kg of cesium-137. The authors of the report "considered that dilution of levels in seawater would result in the doses being of significance only close to the release point", and thereby ignored the effects of bioaccumulation. Through the trophic cascade, levels of radioactivity have a tendency to rise through the food chain, with larger fish, such as tuna, which are predominantly eaten by humans, accumulating the highest amounts of radioisotopes in the muscle tissue over time. Since the discharge of radioactive substances from Fukushima Dai-ichi continues to this day, the radioactive contamination of marine life can be expected to continue and increase with time. An example are the levels of radioactive cesium measured in sea bass, caught in the North Pacific, which continually rose from March until September for 2011, with a maximum contamination of 670 Bq/kg found on September 15th.[35] Even according to a TEPCO publication from May 2012, a total of 33 of 76 samples (43%) of fish still showed measurements of radioactive cesium

above the permissible level of 100 Bq/kg. Some samples, such as flatfish, caught 3km offshore from Odaka on May 9th, 2012, even reached more than ten times that value with 1,190 Bq/kg.[36] In July of 2012, Japan's Environment Ministry published findings that freshwater fish caught in rivers and lakes of Fukushima prefecture showed even higher amounts of radioactive cesium (in one case 2,600 Bq/kg) than salt-water fish caught in the open sea.[37] None of these findings are mentioned in the WHO-report, posing once more the question of how the samples for this report were chosen and why samples showing higher amounts of radiation were excluded.

**No mention of ongoing problems in the Fukushima reactors**

Using estimations which only cover the period of time from March 12th to April 6th, 2011, the WHO report ignores the fact that radiation leaks remain a problem at the Fukushima Dai-ichi reactors and that radioactive emissions continue be released into the environment to this day. There is no mention in the report of TEPCO's admission that between March 26th and September 30th, 1.1 x $10^{16}$ Bq of iodine-131, as well as about 7 x $10^{15}$ Bq of radioactive cesium continue to be released into the ocean.[38] Likewise, there is no mention of the ongoing need to cool reactors 1-3 with approximately 535,200 liters of waters per day – some of which evaporates as radioactively contaminated vapor or is leaked into the ground as radioactively contaminated effluent.[39]

The report states that "the contribution from iodine to the total exposure was considered to be zero from four months after the start of the release." This assumes that radioactive iodine was released only at the very beginning of the nuclear catastrophe and that no further emissions occurred, allowing iodine-131 levels to fall due to radioactive decay. However, in June of 2011, MEXT scientists still found iodine-131 concentrations of more than 200 Bq/kg in numerous municipalities of Fukushima prefecture, with maximum ranges found in Namie and Iitate of 1,300 and 1,100 Bq/kg, respectively.[40] As iodine-131 has a half-life of 8 days, measurements this high, 90 days after the initial fallout on March 15th, suggest additional contamination of the area with iodine-131 at a later time. Similarly, the WHO report found vegetable samples containing 2,200 Bq/kg of iodine-131 in month three of the catastrophe – further evidence for continued emissions of radioactive iodine after the initial explosions,[41] most probably due to spontaneous fission or recriticality in one or several of the reactors. Another fact not cited in the WHO report is the admission by TEPCO that, in January of 2012, atmospheric emissions of radioactive cesium were still measured with 60 MBq per hour or about 1,440 MBq each day.[42] No comment was made by TEPCO regarding continued iodine-131 emissions.

**Omission of critical thyroid studies**

Although the WHO report cites a thyroid study performed on 1,080 children from Fukushima prefecture, it fails to elaborate on the disconcerting results of this study or on the ensuing health consequences which these results may ultimately lead to. The results of the study were everything but reassuring: Monitoring, performed more than a week after initial fallout of radioactive iodine-131 occurred, showed radioactive emissions from the thyroid glands of 44.6% of the children examined, with readings going up to 35 mSv. While most of the children were found to have radiation readings of less than 10 mSv, the principle of radioactive decay was not taken into account. As iodine-131 has an effective half-life of 7.3 days, this decay is, in fact, highly significant: at the time of monitoring (March 24$^{th}$-30$^{th}$), less than 50% of the initial amount of radioactive iodine-131 will have been left to be detected by radiometry. The rest will already have disintegrated, causing damage to the surrounding tissue through radioactive decay. While this should be considered a given, no mention of this fact is made in the WHO report. Furthermore, no mention is found of the fact that there is no safe lower threshold for harmful radiation effects and that even a small amount of radiation exposure can lead to an increased chance of contracting malignant diseases. Again, the lay reader (and media) is spared the principle of "socially acceptable risks" and made to believe that no meaningful risk exists below a certain reference level. In the case of Chernobyl, the regions affected by radioactive fallout of iodine-131, such as the Gomel Oblast, showed a 58-fold increase in the incidence of thyroid cancer amongst children aged 0-18 between the years 1973-1985 (before Chernobyl) as opposed to 1986-1998 (after Chernobyl).[43] The Cardis-study published in the International Journal of Cancer in 2006 calculated about 16,000 additional thyroid cancer cases in Europe due to exposure to iodine-131 from Chernobyl. Rougly one-third of these in children received doses of iodine-131 below 25 mSv.[44]

Another large study on thyroid effects in Fukushima children is not mentioned at all in the WHO report. On April 26th, the Prefectural Government of Fukushima published first results of the "Resident Health Management Survey". Ultrasound examinations on the thyroid glands of 38,114 children aged 0-18 were conducted. In 184 children (0.5 %), thyroid nodules of more than 5mm and in 202 children (0.5%), thyroid nodules of less than 5 mm diameter were detected. Thyroid cysts were found in 13,398 of the children (35.1 %), a finding that is rather uncommon in pediatric populations.[45] Compared to an ultrasound study performed on a similar pediatric population from the Nagasaki prefecture in 2000, where only 2 of 250 children (0.8%) of the children showed thyroid cysts and none showed any kind of nodule,[46] the Fukushima numbers show a significant difference. Another ultrasound study, performed in the region of Gomel, Belarus, which had been affected by radioactive iodine fallout from Chernobyl, showed an increased rate of nodules similar to that of the Fukushima study: 342 of 19,660 children examined had nodules of varying size (1.74%).[47] Interestingly enough, the responsible scientist in each of these three studies (Fukushima, Nagasaki and Gomel) was the same individual: Shunichi Yamashita, who is now the Radiation Health Risk Management Advisor to Fukushima Prefecture. He is also the person who claimed that no serious health effects are to be expected below an exposure of 100 mSv per year. It has to be noted that a cyst or a nodule is not necessarily a precursor to cancer, but the accumulation of such anomalies in this pediatric population is at least noteworthy and beckons further investigation. Whether these anomalies in Gomel and Fukushima are the effect of radiation or may have a different cause needs to be examined. The authors of the prefectural health study came to exactly the opposite conclusion, advising that 99.5% of the examined subjects should not be reexamined in the following years.[48]

**Treatment of affected population as study subjects**

The WHO report applauds efforts by Japanese authorities to perform statistical and epidemiological research on the people affected by the nuclear catastrophe but fails to recognize the fact that none of these people were asked to be subjected to either radioactive fallout or extensive scientific research. Because the government is not providing adequate funding for people willing to leave the regions affected by the nuclear disaster, many are forced to stay in a radioactively contaminated environment and are subjected to scientific research trying to ascertain the health effects of life under such conditions: “Fukushima prefecture and Fukushima Medical University have begun a health management survey of some 2 million Fukushima residents, in cooperation with the National Institute of Radiological Sciences (NIRS). This survey includes questions on the actions of the residents for the period 11 March to 11 July 2011 (four months), including information about individuals' behaviors, movements, habits, and intakes of locally produced food and milk.”[49] The University of Fukushima also began with thyroid-examinations on 360,000 children. The affected children will have to undergo biannual check-ups until the age of 20 and every 5 years above that age for the rest of their lives. [50] Even if these tests serve the purpose to detect and treat possible radiation effects as early as possible, it has to be clearly stated that the nuclear catastrophe has caused millions of people to become study subjects against their will. Also, no mention is made regarding the psychological and social effects this will have on the affected populations.

## 3. Who wrote the report?

The report was compiled by a panel of 30 international experts, who, according to the report, have listed no competing interests. A closer look at the people who comprised this panel reveals a different story, altogether. Dr. Mikhail Balonov is working for the International Atomic Energy Agency (IAEA), as are Carl Blackburn, Gerhard Proehl, Volodymyr Berkovskyy, Jean-René Jourdain and Diego Telleria. David Byron is listed as a member of the UN Food and Agriculture Organization (FAO), while his position as head of the IAEA´s Food and Environmental Protection Section is omitted in the report. Likewise, Lionel Mabit, who is listed as working for the FAO, is in fact also working as a soil scientist for the IAEA. No mention is made as to why these IAEA-employees were not listed as such in the report. Most of the other panel members are working for national nuclear regulatory institutions, such as Florian Gering or Brigitte Gerich from the German Federal Office for Radiation Protection. Vladislav Golikov, Mikhail Balonov and Irina Zvonova are members of the Russian Institute of Radiation Hygiene. Jean-René Jourdain is a member of the French Institut de Radioprotection et de Sûreté Nucléaire (IRSN). Stephanie Haywood, Peter Bedwell, Jonathan Sherwood, Joseph Wellings, Tom Charnock and the panel's chair, Jane Simmonds, are all working for the Radiation Protection Division of the British Health Protection Agency (former National Radiological Protection Board). Shin Saigusa is a member of the Japanese National Institute of Radiological Sciences and the Japanese Nuclear Safety Commission (NSC). All of these institutions have been accused in the past of either colluding with the nuclear industry or of being influenced by pro-nuclear politicians. Most radiation regulatory agencies are affected in what they say by pro-nuclear governments and are careful not to say or report anything which would upset their government.[51] The Independent Investigation Commission of the Japanese Parliament even went so far as to name the Japanese nuclear regulatory bodies responsible parties in the Fukushima nuclear catastrophe.[52]

While some of the panel members are well-known spokespersons for nuclear energy and work for the IAEA, an organization which has declared the promotion of nuclear energy its core mission, not a single scientist who has published critical articles on the health effects of nuclear energy was included in the panel. Radiobiologists who have warned of the long-term effects of internal radiation were not included in the panel, nor oncologists specializing in the connection between radiation and cancer. The findings of the independent Japanese Citizen's Radioactivity Measuring Station were not taken into account or even given mention.

In order to understand why the WHO report was mainly written by members of nuclear regulatory institutions and the IAEA, it is important to realize that the WHO is subordinate in questions of nuclear safety to the IAEA. According to Articles 1.3. and 3.1. of the "Agreement between the IAEA and the WHO" from 1959, the WHO is bound by agreement not to publish anything concerning radiation without consent by the IAEA.[53] The IAEA, however, was founded with the specific mission to "promote safe, secure and peaceful nuclear technologies" and to "accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world." With these motives, the IAEA cannot be seen as an impartial voice on nuclear energy. Furthermore, its influence on the work of the WHO has rightly been criticized for obstructing independent research on the health effects of nuclear radiation. In the past, the WHO has often been shown to publish findings promoted by the IAEA while at the same time withholding publications that threw a more critical light on nuclear energy. The question arises, why a report on Fukushima that is published by the

WHO is written in large parts by members of the IAEA and other nuclear institutions. British radiobiologist Keith Baverstock, who ran the Radiation Protection Program at the WHO's European Regional Office from 1991 to 2003 has given a compelling reason for similar proceedings in the past, when WHO studies on Chernobyl were largely influenced by the IAEA: "The problem is that the top level of the IAEA is competent in regards to nuclear questions while the WHO is not. The WHO is subdued in discussions with IAEA and due to hierarchical reasons, the low-level [radiation] WHO-experts are not included in the relevant sessions. This leads to a situation, where, for example, water-experts led the radiological project of WHO."[54]

The Japanese parliament's Investigation Commission came to the conclusion that the Fukushima nuclear catastrophe was "the result of collusion between the government, the regulators and TEPCO, and the lack of governance by said parties. They effectively betrayed the nation's right to be safe from nuclear accidents. (…) the root causes were the organizational and regulatory systems that supported faulty rationales for decisions and actions, rather than issues relating to the competency of any specific individual."[55] The fact that members of the Japanese nuclear regulatory bodies played a role in drafting the WHO report does not raise confidence in its neutral and impartial character. Too crushing is the verdict of the Investigation Commission on the role these same regulatory bodies played in the cover-up of the Fukushima nuclear disaster:

> "The safety of nuclear energy in Japan and the public cannot be assured unless the regulators go through an essential transformation process. The entire organization needs to be transformed, not as a formality but in a substantial way. Japan's regulators need to shed the insular attitude of ignoring international safety standards (…) Their independence from the political arena, the ministries promoting nuclear energy, and the operators was a mockery. They were incapable, and lacked the expertise and the commitment to assure the safety of nuclear power."[56]

## Conclusion

It becomes clear that of all the evidence on radiation exposure, dose estimation and possible health effects of the Fukushima nuclear catastrophe, more is being omitted than is actually contained in the WHO report. A number of assumptions made by the expert panel are dubious, if not to say plain wrong. The quantity and selection of food samples have been shown to be inadequate and in stark contrast to samples published by the Japanese authorities. The estimates for radiation emission in the WHO report are significantly lower than those by independent research institutions and in some cases even TEPCO itself. The most important point of criticism when looking at the WHO report, however, is its apparent lack of neutrality. With an expert panel mainly comprised of IAEA staff and members of nuclear regulatory bodies accused of collusion with the nuclear industry, and with findings that differ so significantly from other, independent research publications, the report reads more like an effort to downplay the effects of the nuclear catastrophe than like a meaningful scientific approach to the issue of radiation exposure in Fukushima. It is unclear why a report written mainly by the IAEA and collaborating nuclear institutions would need to be published in the name of the WHO if not to provide an unsuspicious cover.

On a more human side, the report lacks a general acknowledgment of the hardships, which the residents of the affected regions have to endure. The apparent aim of the report, to dispel concerns of possible health effects of the nuclear catastrophe, stands in stark contrast to the statement by the Japanese's parliaments Investigation Commission:

> "The Commission recognizes that the residents in the affected area are still struggling from the effects of the accident. They continue to face grave concerns, including the health effects of radiation exposure, displacement, the dissolution of families, disruption of their lives and lifestyles and the contamination of vast areas of the environment. There is no foreseeable end to the decontamination and restoration activities that are essential for rebuilding communities."[57]

What is needed in Fukushima are independent scientific assessments, free of the suspicion of collusion and interference of the nuclear industry and the nuclear regulatory bodies, who were responsible for the multiple nuclear meltdowns of the Fukushima Dai-ichi power plant in the first place. What is needed are health- and community-based approaches rather than attempts by the industry to downplay the effects of the continued emission of radioactive isotopes in air, soil and water and the contamination of the North Pacific and more than 1,500 $km^2$ of mainland Japan. What is needed is for the WHO to regain its independence in assessing health risks related to radiation and reaffirm its claim to be guided solely by concerns for people's health and not by the interests of a specific industry. In the words of Kiyoshi Kurokawa, who chaired the Japanese parliament's Independent Investigation Commission on the Fukushima Nuclear Accident: "The people of Fukushima, the people of Japan and the global community deserve nothing less."

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