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2022 Fukushima Medical University International Symposium on the Fukushima Health Management Survey
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Fukushima Medical University
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The UNSCEAR 2020 Report on Fukushima: Implications of Information Published Since the UNSCEAR 2013 Report

Gillian Hirth, Chair of UNSCEAR
5 March 2022

4th International Symposium on the Fukushima Health Management Survey
Science for Society: Advancing Fukushima's Well-Being



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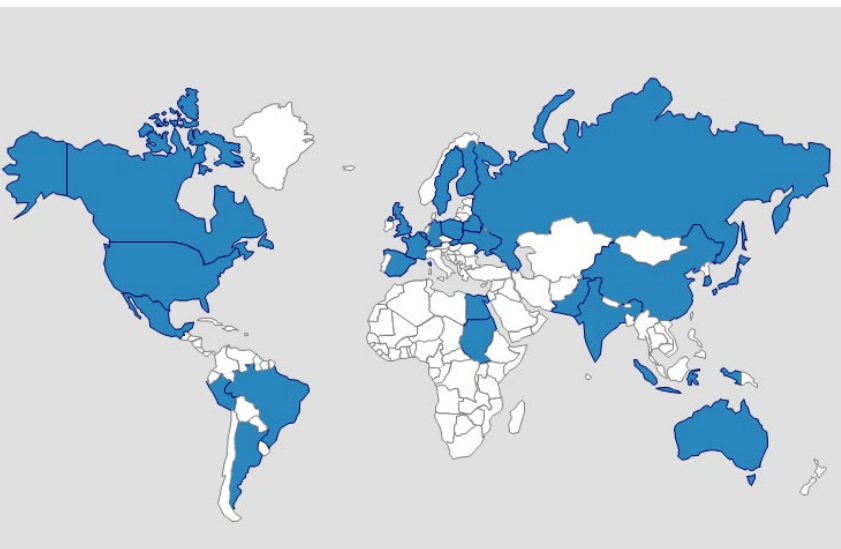
- Established by UN General Assembly (GA) resolution in 1955
- **Assess levels**, effects & risks of ionizing radiation
 - identify emerging issues
 - improve knowledge
 - identify areas for future research
- Disseminate findings to the UN GA Member States, scientific community & public



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Composition of the Committee



- Until 2021 - 27 States Members of Committee
- From 2022 – 31 States Members of Committee
- Algeria, Iran (Islamic Republic of), Norway, United Arab Emirates

- UNSCEAR 2020/2021 Report to the General Assembly
- Secretary General Report to the General Assembly
- Resolution A/RES/76/75

https://www.unscear.org/docs/GAreports/2021/A_RES_76_75_E.pdf



2019 - Vienna

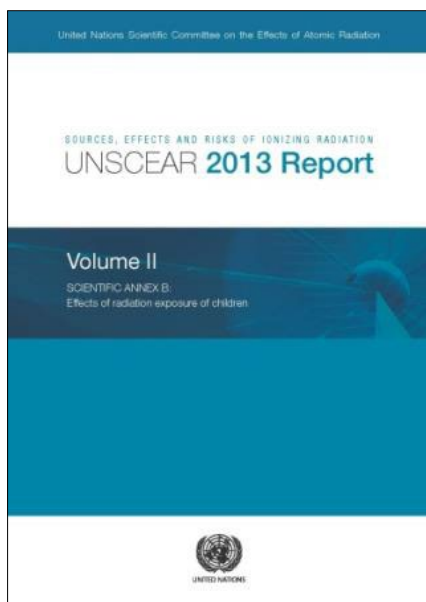


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UNSCEAR's work on the Fukushima accident

- UNSCEAR 2013 Report
 - Outreach events in Koriyama and Fukushima city
 - Press briefings in Tokyo





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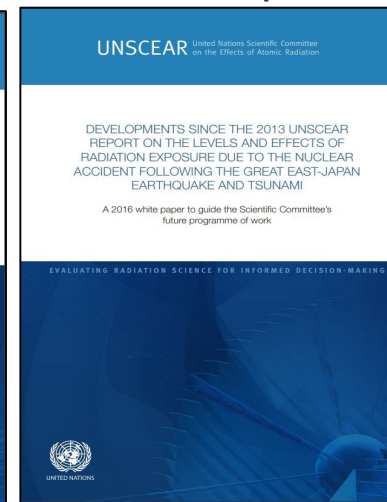
UNSCEAR Follow-up work 2015-2017

- UNSCEAR 2015, 2016 and 2017 White Papers
 - Outreach events in Iwaki, Minamisoma and Aizusakamatsu city
- Available in English and Japanese from the UNSCEAR Website

UNSCEAR 2015 White Paper



UNSCEAR 2016 White Paper



UNSCEAR 2017 White Paper



- <https://www.unscear.org/unscear/en/fukushima-japanese.html>
- <https://www.unscear.org/unscear/en/fukushima.html>



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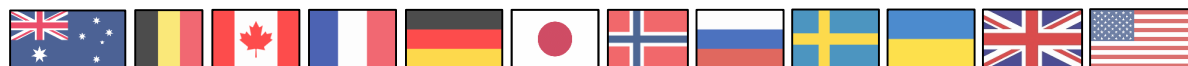
Update to the UNSCEAR 2013 Report

2018 – 2020

“Levels and Effects of Radiation Exposure due to the Fukushima Daiichi Nuclear Power Plant”

Aim: To provide a summary of all the information available relating to the levels and effects of radiation exposure due to the accident and an appraisal of the implications of this information for the 2013 report in time for the tenth anniversary of the accident.

Contributing Countries and Organizations





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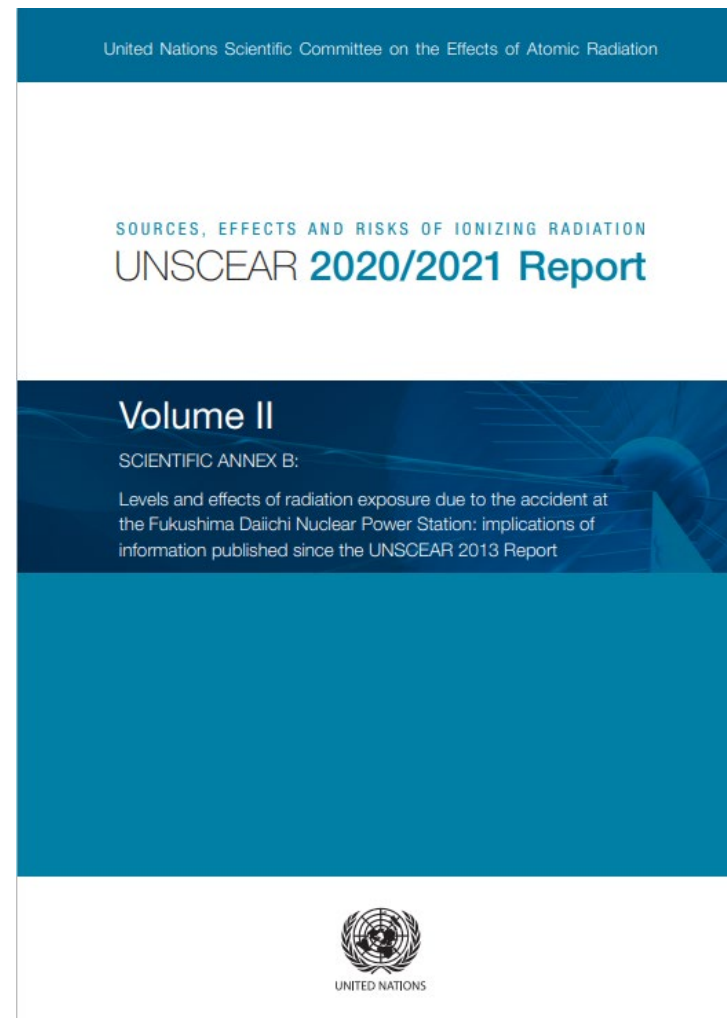
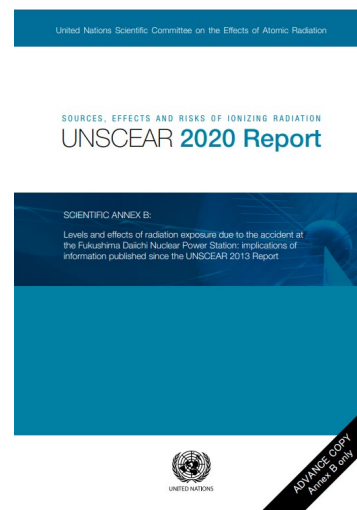
UNSCLEAR 2020 Report

Advanced copy (in English) published
online 9 March 2021

UNSCLEAR 2020/2021 Report Volume II - Annex B

Published 11 February 2022

https://www.unsclar.org/unsclar/en/publications/2020_2021_2.html





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UNSCEAR 2020/2021 Report Volume II - Annex B

To be published in Japanese in March 2022

UNSCEAR website (in Japanese)

<https://www.unscear.org/unscear/en/fukushima-japanese.html>

Including the supplementary 23 electronic
attachments

原子放射線の影響に関する国連科学委員会

電離放射線の線源、影響およびリスク

UNSCEAR 2020年/2021年報告書

第II巻

科学的附属書B:

福島第一原子力発電所における事故による放射線被ばくのレベル
と影響: UNSCEAR2013年報告書刊行後に発表された情報の影響



UNITED NATIONS



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Outreach in Japan and ongoing work

- UNSCEAR Outreach in Japan to discuss in detail the findings of the UNSCEAR 2020 report (in Japanese) has been postponed a number of times because of the pandemic.
- UNSCEAR Outreach is now being planned for mid-late summer 2022 subject to ongoing pandemic situation and suitable local arrangements
- UNSCEAR will also consider relevant scientific publications and reports related to the Fukushima accident through its broader ongoing programme of work, for example, the *Evaluation of Public exposure to ionizing radiation from natural and other sources* (planned for completion in 2024)
- Progress on UNSCEARs ongoing programme of work will be reviewed and discussed at the Committee's 69th session in Vienna, 9-13 May 2022.



Scope and content

- Summary of current understanding based on information up to end 2019 and implications for the findings of the 2013 report:
 - releases to atmosphere, dispersion and deposition
 - releases to and dispersion in the marine environment
 - transfer through the terrestrial and freshwater environments
 - doses to the public
 - doses to workers
 - health implications
 - doses and effects in non-human biota
- Validate/revise estimates of doses to the public (including variability and uncertainty) and their health implications.



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Some highlights from other thematic areas

- No change in **total amounts** of radionuclides released to the environment—but significant changes in their **temporal patterns of release**
- Releases of radiocaesium to the Pacific Ocean continue from site ground water and draining of catchment areas – but now much smaller (less than 0.01% and 0.1% of release in 2011)
- Concentrations of radiocaesium in monitored foodstuffs since 2015 generally below limits established by the Japanese government (ten times lower than guideline levels for international trade)



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Some highlights from other thematic areas

- Decontamination: extensive 5-year programme - reduced annual doses to less than 1 mSv in inhabited areas; and enabled return to many evacuated municipalities
- Broad consensus on levels of exposure of non-human biota
- Regional impacts on wildlife populations unlikely but detrimental effects on individual organisms have been observed and others may have occurred
- Comparison of the accidents at Fukushima-Daiichi and Chernobyl nuclear power stations



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environment

United Nations
Environment Programme

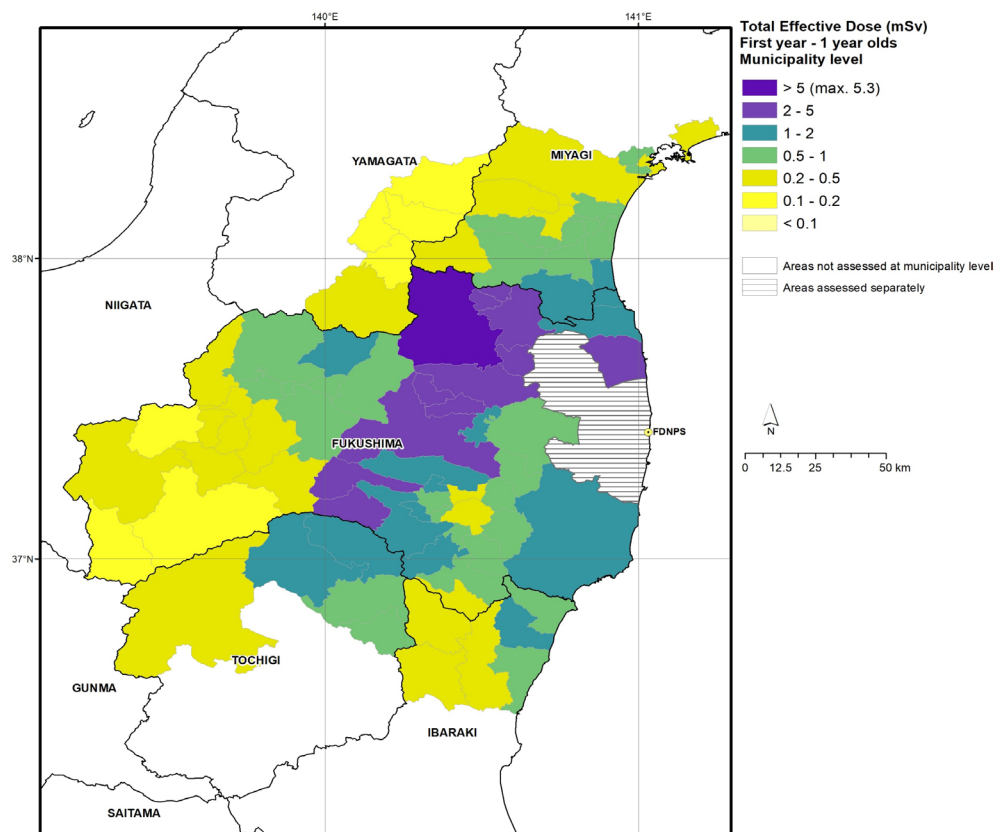
Estimated doses to the Japanese Public



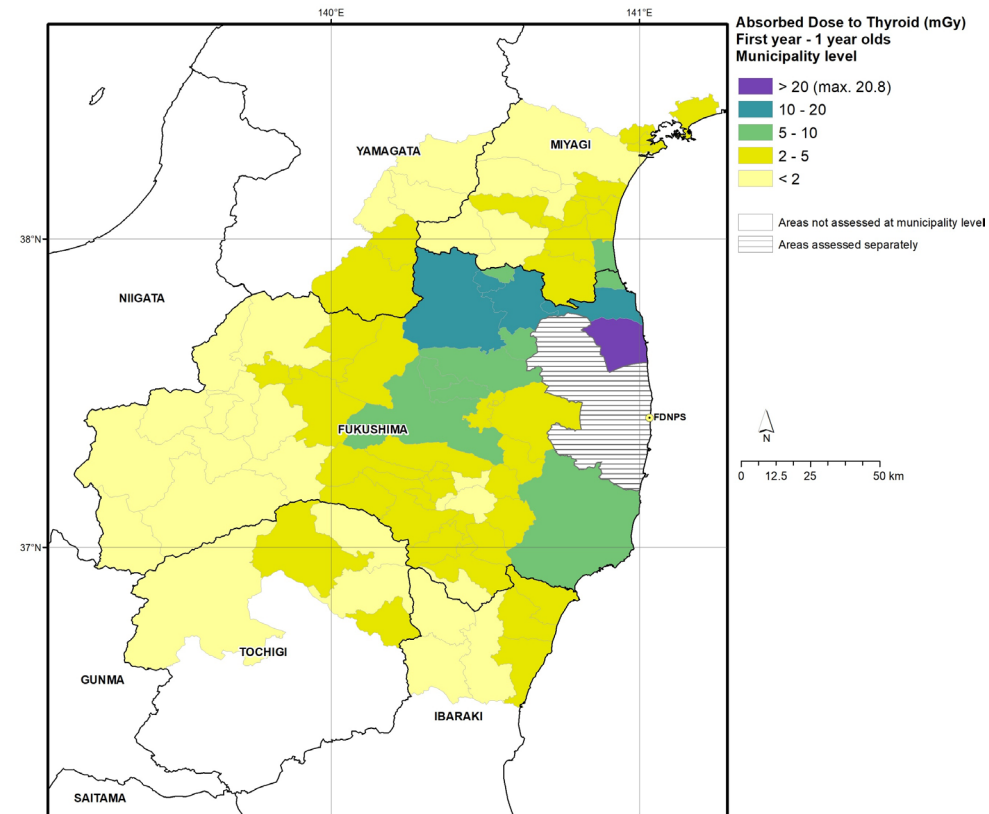
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Updated estimates of the 1st year doses to the public



Average effective dose to infants in the first year
(Fig. A-IV of UNSCEAR 2020 Report)



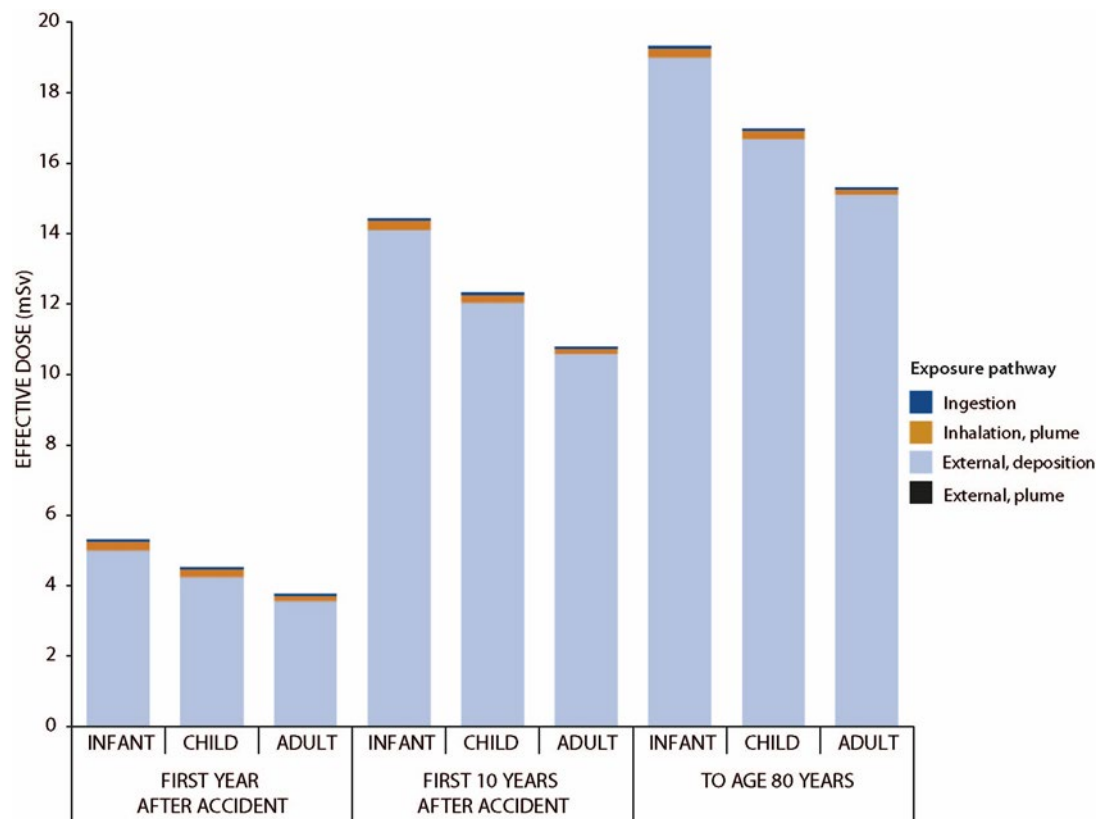
Average absorbed dose to the thyroid of infants in the first year
(Fig. A-VII of UNSCEAR 2020 Report)



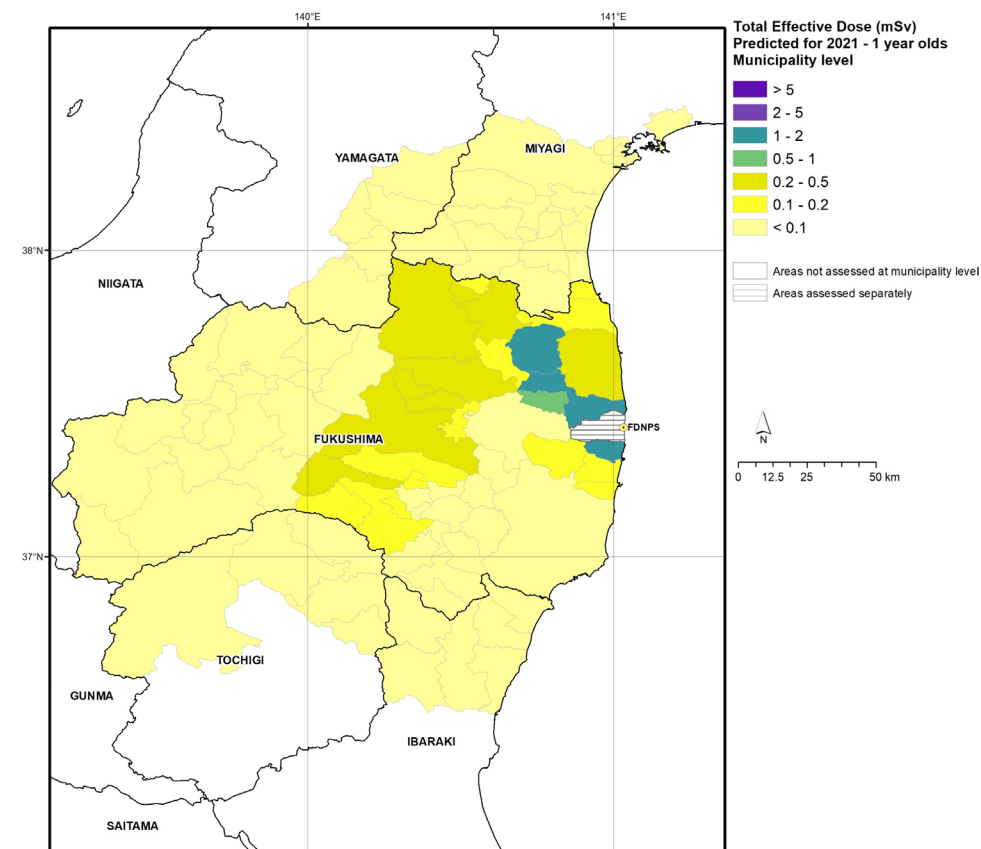
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Updated estimates of doses after the first year



Effective doses in Fukushima City over time
(Fig. A-X of UNSCEAR 2020 Report)



Annual effective doses in 2021 for infants
(Fig. A-XI of UNSCEAR 2020 Report)



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Main difference with 2013 Report – Public Exposures

- More measurement information
 - In the environment
 - From measurements made on people
- Improved and more realistic models
 - Improved description of pattern of releases and modelling of movement in environment
 - New model for external doses from deposited radionuclides
 - More realism in taking account of Japanese specific information
 - More realistic estimates of doses from eating food
 - Partial validation of models with measurement information



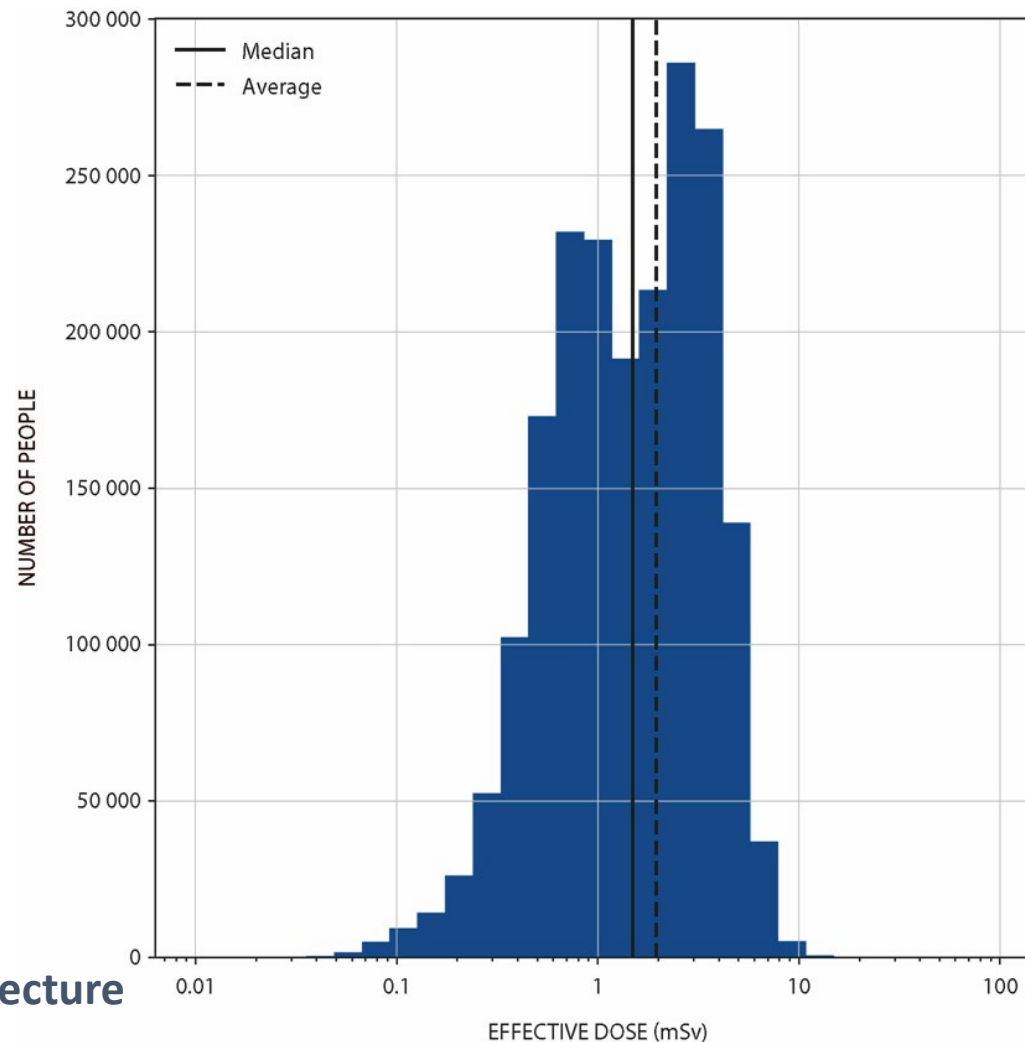
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New in 2020 Report

- Distributions of doses in defined populations
- Appendix A, section F of the UNSCEAR 2020 Report

**Distribution of effective dose in the first year in Fukushima Prefecture
(Fig. A-XII of the UNSCEAR 2020 Report)**





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Further research needs in the dose assessment area

- Further information needed about the effect of the remediation work in reducing doses as measured on people.
- Further data (if it exists) on radionuclide concentrations in air in the early phase of the accident would improve thyroid dose estimates.
- Human measurements provide best basis for estimating doses. Data collected soon after the accident can't be repeated.
- Uncertainties remain large, but further research unlikely to reduce them significantly.



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Estimated doses to Evacuees



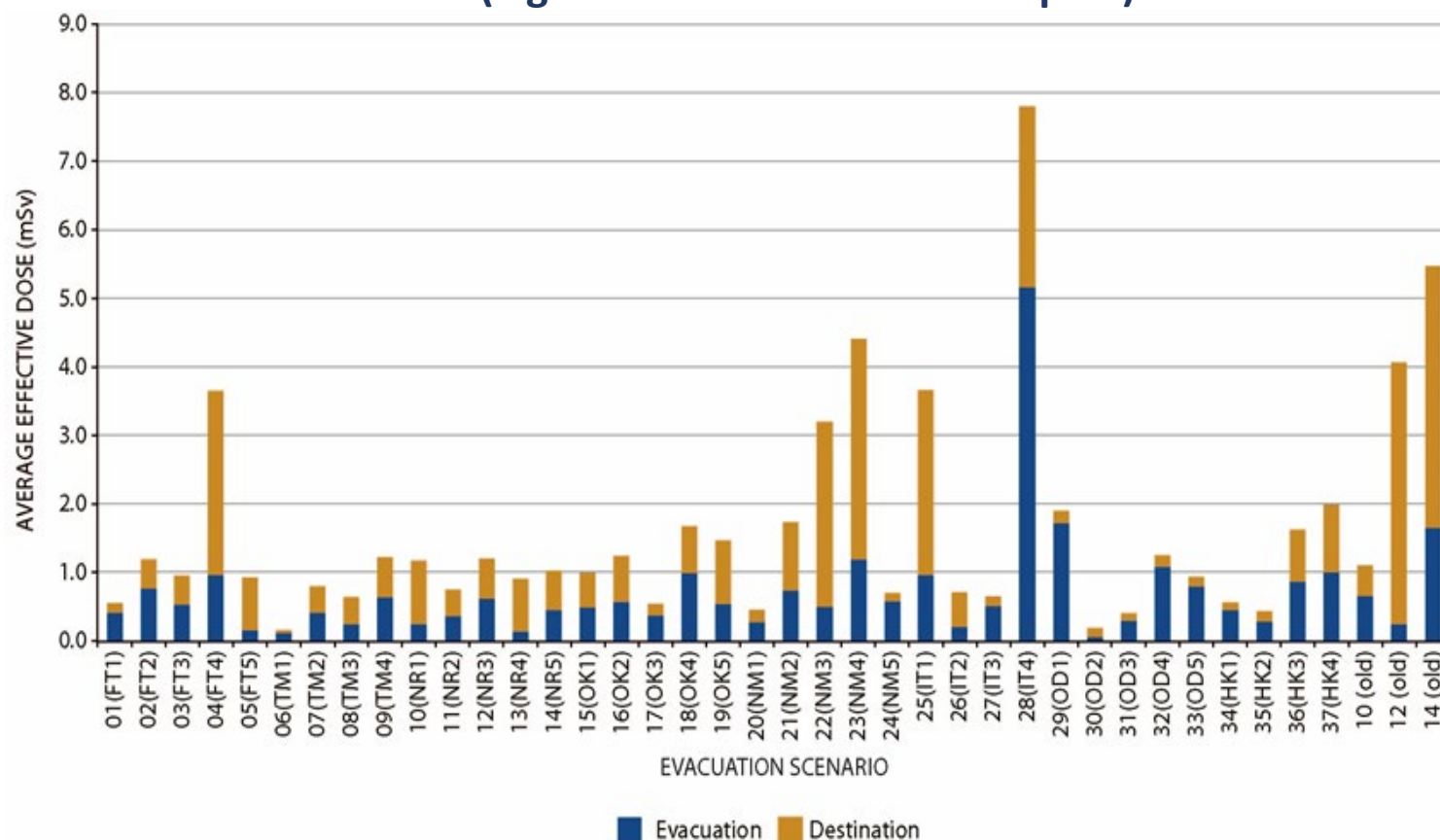
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Main findings for estimated exposure of evacuees

- More realistic evacuation scenarios used in 2020 Report (18 v 37)
- The estimated **average effective doses to infants** in the first year for the different evacuation groups ranged from about **0.2 mSv to about 8 mSv**. Adults less than 6 mSv
- High doses did not occur because of the evacuation (but also due to other non-human factors, mainly the wind blowing to the ocean during the first 2 days of the accident).

Average Effective dose in the first year to infants
(Fig. A-VIII UNSCEAR 2020 Report)





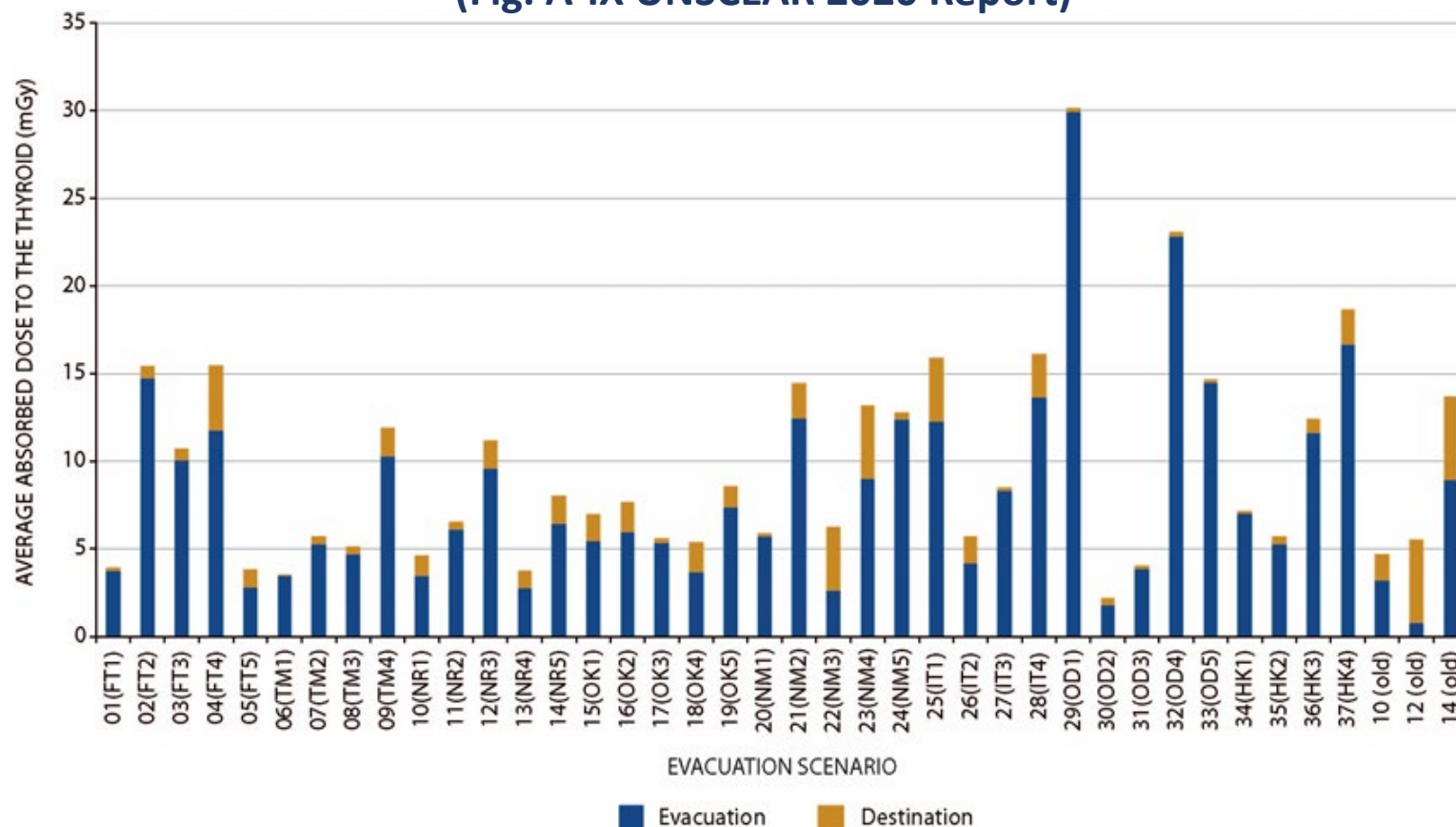
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Main findings for estimated exposure of evacuees

- Average **absorbed doses to the thyroid** in the first year ranged from about **2 mGy to about 30 mGy** for evacuated infants (see graph). Adults 1- 15 mGy.
- The evacuation averted absorbed doses to the thyroid of infants of up to about 500 mGy.

Average absorbed dose to the thyroid in the first year to infants
(Fig. A-IX UNSCEAR 2020 Report)



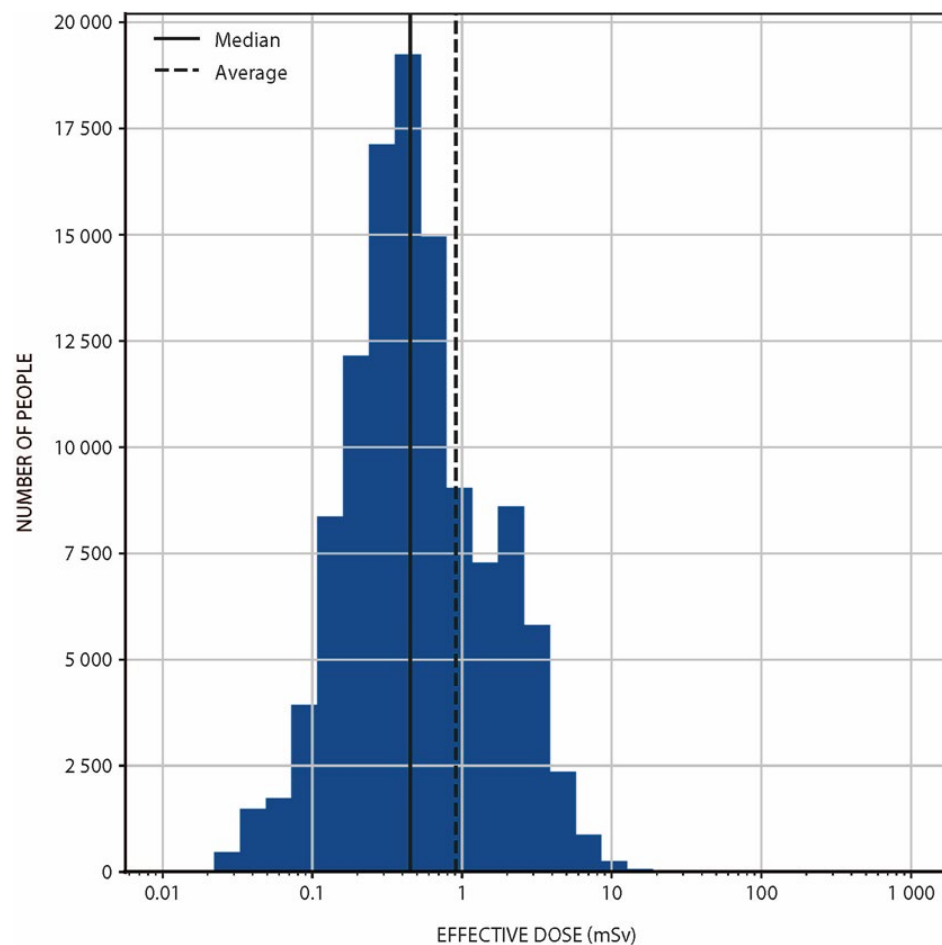


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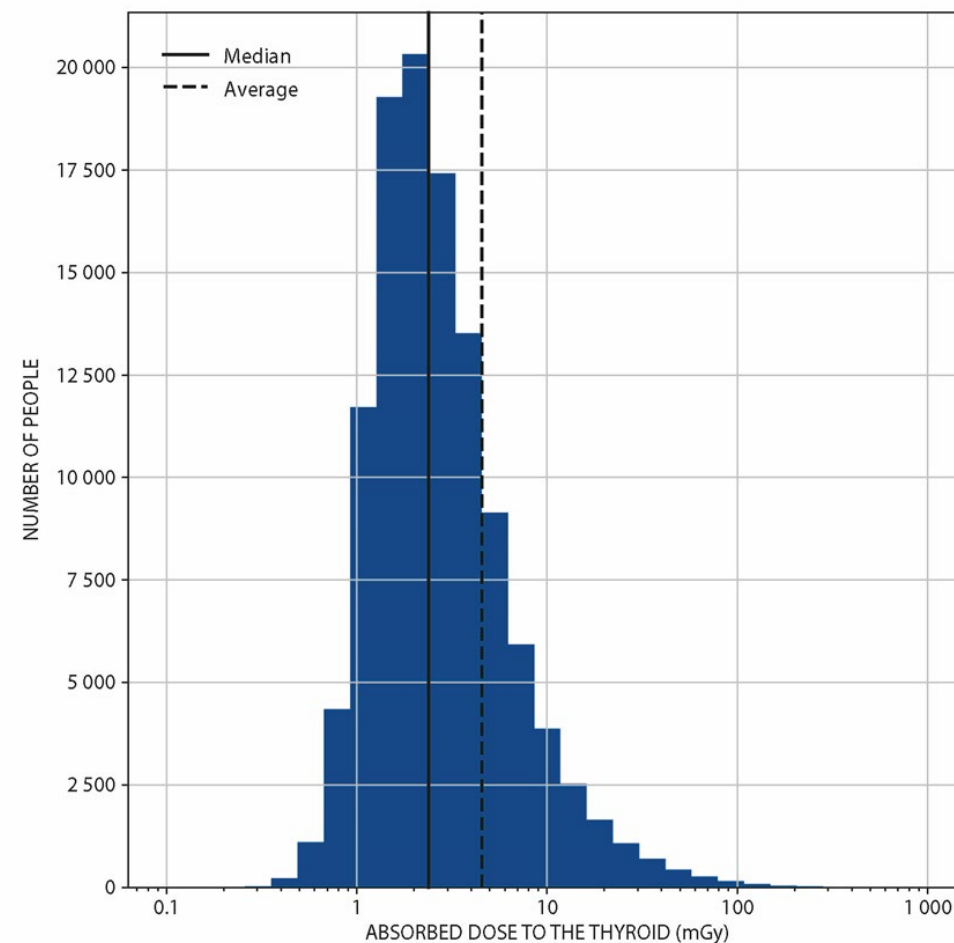
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Distributions of doses in the first year to evacuees

(Fig. A-XIV UNSCEAR 2020 Report)



(Fig. A-XV UNSCEAR 2020 Report)





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Estimated Doses to Workers



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Doses to workers - Main findings

- Doses to Fukushima Daiichi Nuclear Power Station (FDNPS) workers resulting from the accident
 - There were **24,832 on-site workers** during the period March 2011 – October 2012
 - Delays in commencing thyroid monitoring increased uncertainty in reported thyroid doses for a fraction of the workers
 - **Two re-evaluations** of reported doses have been performed since the UNSCEAR 2013 Report
 - BUT the **general findings of the 2013 Report remain valid**



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Doses to workers - Main findings

- Doses to off-site environmental remediation workers
 - There were about **77,000 remediation workers** between 2012 and 2016
 - The average cumulative dose received was 1.0 milli-sieverts (mSv) *
 - The results confirm that doses to remediation workers were small

* Doses are effective doses, measured in units of **mSv** unless stated otherwise.



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Health Effects – Main findings



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Health Effects - Main Findings

- Future discernible cancer excesses unlikely in the sensitive groups exposed in childhood, given the generally low doses.
- Discernible excesses of thyroid cancer caused by the radiation exposure are unlikely, up to ages 30 or 40 years, or over the entire lifespan.
- The large number of diagnosed thyroid cancers judged to be due to ultra-sensitive thyroid screening and not attributable to radiation exposure



Health Effects - Main Findings

- Studies showed no discernible excess of adverse reproductive outcomes, this includes birth defects, stillbirths, preterm births or low birthweights
- An elevated prevalence of cardiovascular and metabolic conditions observed *among evacuees, but not non-evacuees*. Likely from lifestyle changes and psycho-social stresses, not from radiation exposure.
- Health Effects on Emergency Workers - Little information on health outcomes available to date. Future discernible increases in cancer rates considered unlikely.



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Key Lessons from Fukushima

- UNSCEAR is an independent UN scientific committee and not a policy or radiation protection body, focussed on science, sources and exposures; health effects and mechanisms.
- Health, wellbeing and social impacts are broadly a major issue for the population. Identified but not addressed by UNSCEAR.
- Importance of early data collection (in the event of an accident) and available measurement data (in people and environment) for as realistic dose estimates as possible – modelling tends to make dose estimates more conservative.
- Understanding baseline rates of cancer in a population, and the effects of screening techniques that may be applied to follow up.



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Conclusion

- The 2020 report is an authoritative, independent and up to date assessment of the levels and effects of radiation exposure due to the Fukushima accident
 - Based on latest science and monitoring data to end 2019
- The main findings are robust and unlikely to change significantly in the foreseeable future



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Acknowledgments

Coordination expert group: *Project Manager:* N. Kelly (UK), *Senior technical advisors:* W. Weiss (decd.) (Germany) and M. Akashi (Japan)

Expert Group: *Coordinating Lead Writer:* N. Kelly (UK), *Members and lead writers:* S. Solomon (Australia), C. Estournel (France), F. Gering (Germany), P. Strand (Norway), M. Balonov (Russian Federation), G. Etherington (United Kingdom), B. Howard (United Kingdom) and R. Shore (United States)

Task Group public exposure: *Leader:* M. Balonov (Russian Federation); *Members:* D. Broggio (France), L. Chipiga (Russian Federation), V. Berkovskyy (Ukraine), B. Drozdovitch (United States); *Observers:* S. Kinase (Japan)* and A. Ulanowski (IAEA).

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Critical Reviewers: G. Hirth (Australia), H. Vandenhove (Belgium), J. Chen (Canada), S. Charmasson (France), J-R. Jordain (France), R. Michel (Germany), S. Shinkarev (Russian Federation), A. Wojcik (Sweden), J. Brown (United Kingdom)**, R. Wakeford (United Kingdom), N. Harley (United States), B. Napier (United States) and D. Pawel (United States).

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All the organisations that provided data to support this assessment and the scientific community for their efforts.

* Until May 2019 (IAEA observer) and later (Japan)

** As of 2019 (IAEA observer)



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Thank you



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