The Fukushima nuclear disaster

An international perspective on public health needs

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International Campaign to Abolish Nuclear Weapons

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Consultant: Australian Red Cross, WHO, occasional vaccine manufacturers: CSL, GSK

Acknowledgement: Prof Tim Mousseau, Prof Steve Wing

Tokyo 6 Nov 2013

The Australian connection

- About 30% of uranium sourced by TEPCO comes from Australia
- "We can confirm that Australian obligated nuclear material was at the Fukushima Daiichi site and in each of the reactors – maybe five out of six, or it could have been all of them; almost all of them."

  – Dr Robert Floyd, Director-General, Australian Safeguards and Non-proliferation Office, before Joint Standing Committee on Treaties, Canberra, 31 Oct 2011

  – http://www.aph.gov.au/hansard/joint/commttee/j412.pdf

The Australian connection

- Yvonne Margarula to Ban Ki-Moon 6 April 2011:

  "We Aboriginal people opposed Ranger's development and even though our opposition was overruled it has never gone away. .. It is likely that the radiation problems at Fukushima are, at least in part, fuelled by uranium derived from our traditional lands. This makes us feel very sad."

WHO Radiation risk assessment Feb 2013

- Preliminary risk estimates based on exposure data to 9.11
- Most affected areas (~27,000): Y1 effective doses 12-25 mSv
  - Risk for male infants:
    - 7% ↑ leukemia
  - Risk for female infants:
    - 6% ↑ breast cancer
    - 4% ↑ solid cancer
    - 70%↑ thyroid cancer
- Area with 3-5 mSv Y1 effective dose (>1m), risks 25-33% of these
- Plant emergency workers
  - 15x ↑ risk thyroid cancer
  - ↑ leukemia and solid cancer

WHO radiation risk assessment

- Generally conservative assumptions claimed, however:
  - Dose data only to 9.11 – excludes continuing radioactive releases
  - Excludes exposures of additional workers
  - Excludes first responders – fire, police, military
  - Excludes population doses within 20 km, even though some evacuations were delayed at time of highest radiation
  - No specific estimates for fetuses or breast-fed infants
  - Assumes long-term dose 2x Y1 dose – Chernobyl experience suggests factor should be 3x
  - Excludes exposures in 5 neighbouring exposed prefectures, in range of 0.1 – 10 mSv
  - Excludes exposures for rest of ~100m Japanese population

UNSCEAR re Fukushima nuclear disaster

- Press release May 2013
- Section on Fukushima in report to UNGA Oct 2013 supported by 2 annexes not yet available

United Nations

Report of the United Nations Scientific Committee on the Effects of Atomic Radiation

Sixtieth session
(27-31 May 2013)

UNSCEAR

- Established 1955 by and reports to UNGA
- Broad mandate radiation doses and effects
- Membership by states, progressively expanded to current 27
  - Includes 7/9 nuclear armed states
  - Substantial bias towards states with npp or other nuclear chain involvement
  - States can provide funding and in-kind contributions
- State-nominated representatives
  - Institutional biases- lack of independent voices
  - Conflicts of interest
  - Overlap with other bodies eg ICRP (“club”)
  - Presence of individuals with extreme/fringe views eg radiation hormesis
- Context of wider UN agency pro-nuclear industry bias esp IAEA
  - Structural conflict of interest – promoting and regulating
  - Dominance in nuclear/radiation matters eg re WHO

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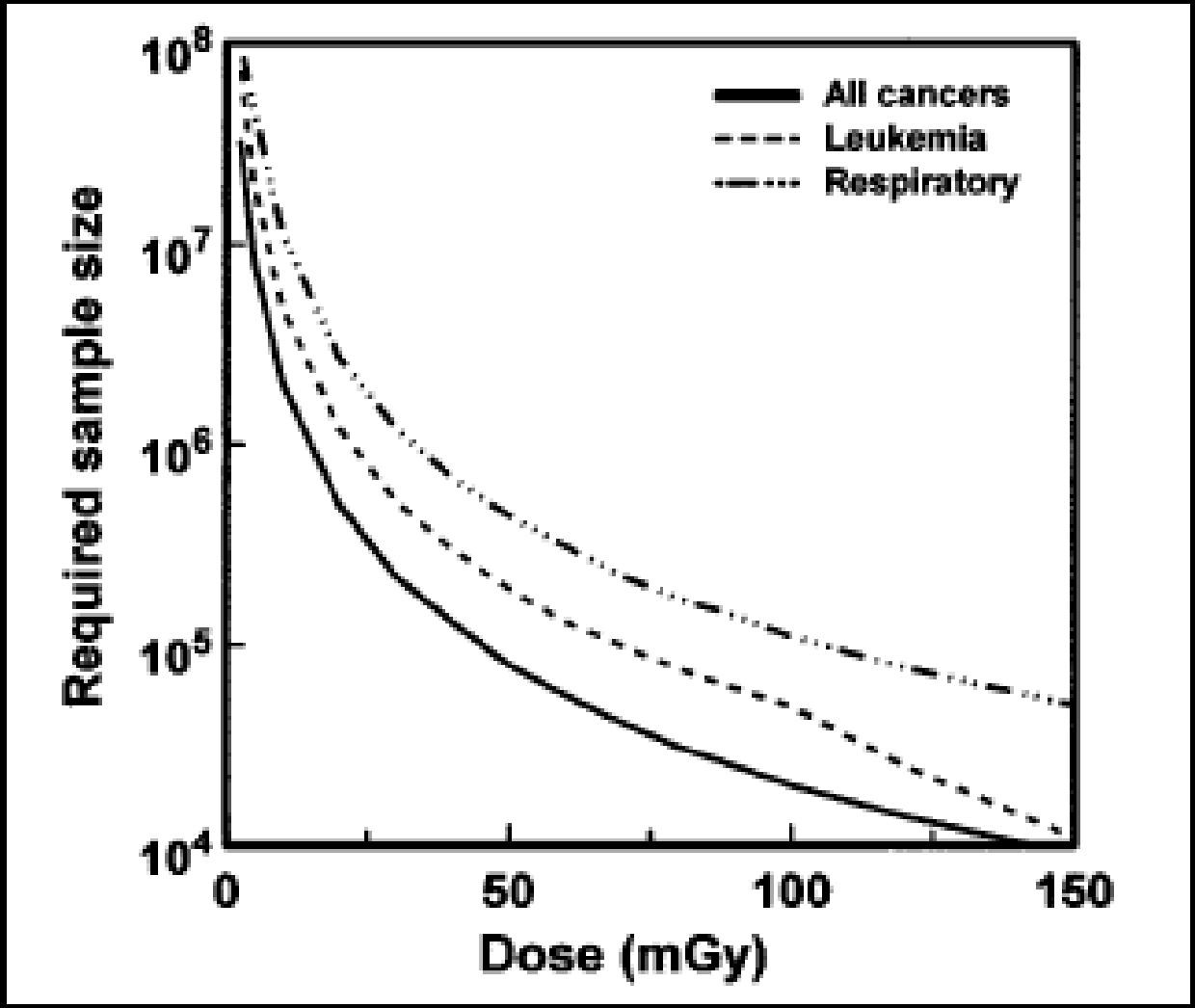
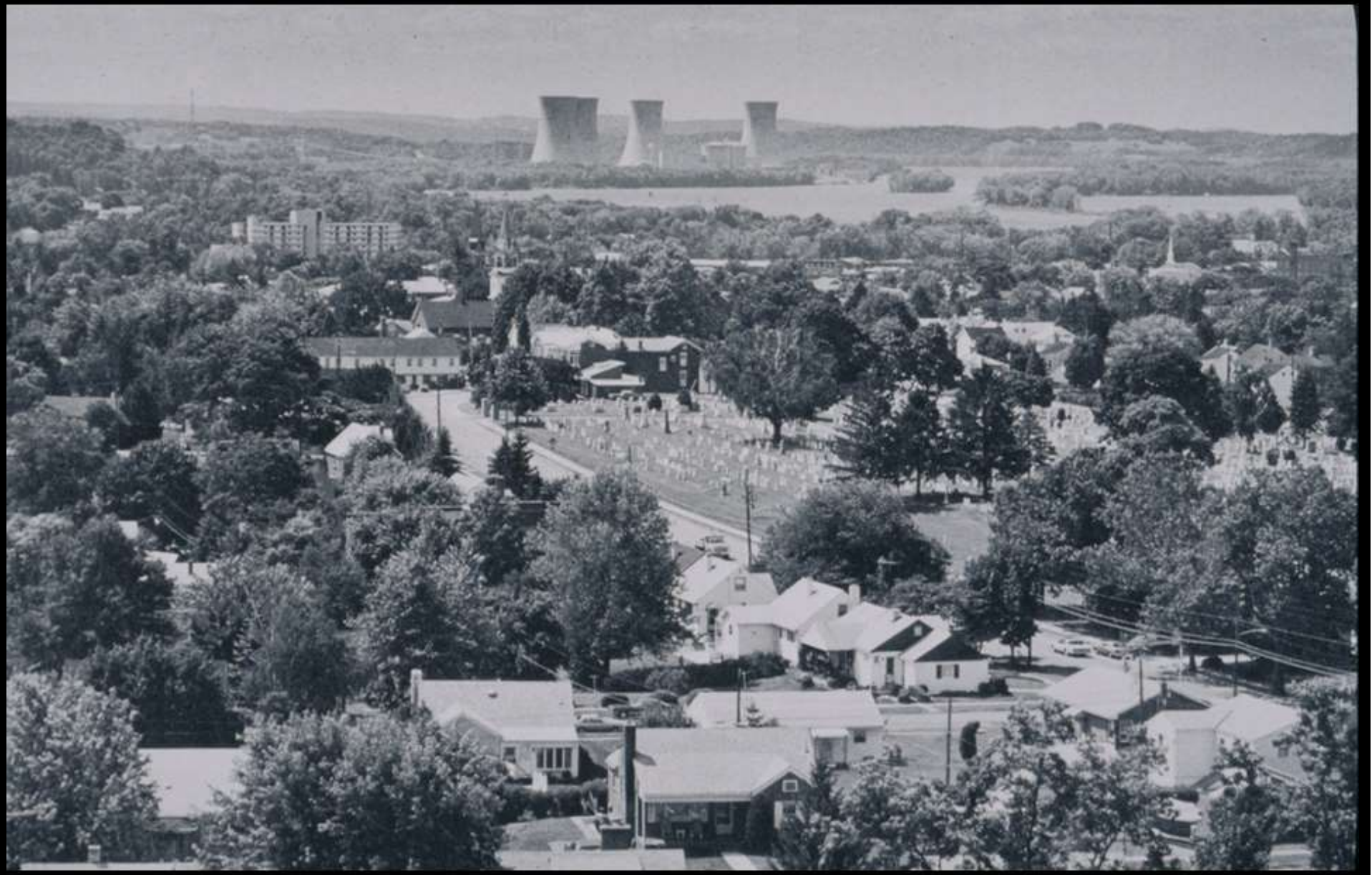
- "release, over a prolonged period, of very large amounts of radioactive material into the environment" p7, … but "The doses to the general public, … are generally low or very low." p11

- "No discernible increased incidence of radiation-related health effects are expected among exposed members of the public or their descendants" p12 … but "An increased risk of thyroid cancer in particular can be inferred from infants and children." p12
  - Disingenuous language
  - No reference to WHO report
  - Critical issue of detection and surveillance



Estimated number of people who would need to be followed for life
to detect an increase in cancer mortality
based on dose response estimates from the Life Span Study

Brenner et al., 2003, Proceedings of the National Academy of Sciences



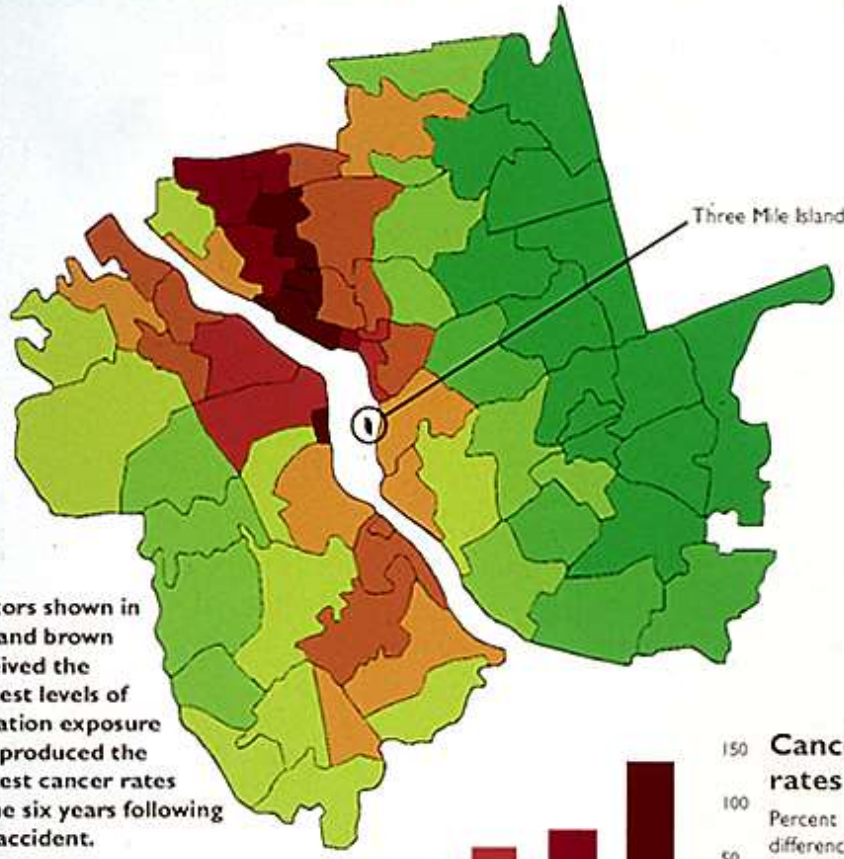
Robert Del Tredici: The People of Three Mile Island

Three Mile Island Cancer Incidence Study

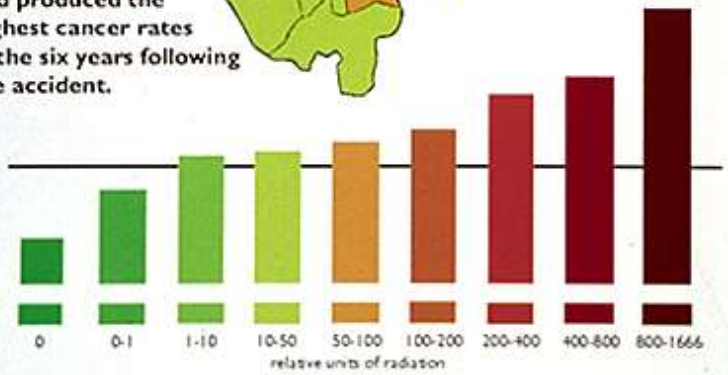
Population	Approximately 160,000 within 10 miles
Cancer cases	5,493 incident cancers, 1975-1985
Study tracts	Census block groups
Radiation dose estimates	Limited on-site measures, meteorological data, dispersion models

Wing S et al. Environmental Health Perspectives 1997;**105** (1): 52–57

Radiation Emissions and Cancer Incidence within 10 miles of TMI



Sectors shown in red and brown received the highest levels of radiation exposure and produced the highest cancer rates in the six years following the accident.



Cancer rates

150
100
50
0
-50

Percent difference between observed & expected lung cancer rates in the ten mile area. (1981-1985)

Radiation doses resulting from the 1979 nuclear accident.

Data Source: *Environmental Health Perspectives*, Volume 5, Number 1, January 1997
Graphic: Julia R. Bryan, *Endeavors*, Volume XIV, No. 1, Fall 1997

Chernobyl Prediction: 1991

"On the basis of the doses estimated by the Project teams and currently accepted radiation risk estimates, future increases over the natural incidence of cancers or hereditary effects would be difficult to discern, even with large and well designed long term epidemiological studies."

The International Chernobyl Technical Project, International Atomic Energy Agency, p 508

Leukemia in Chornobyl cleanup workers

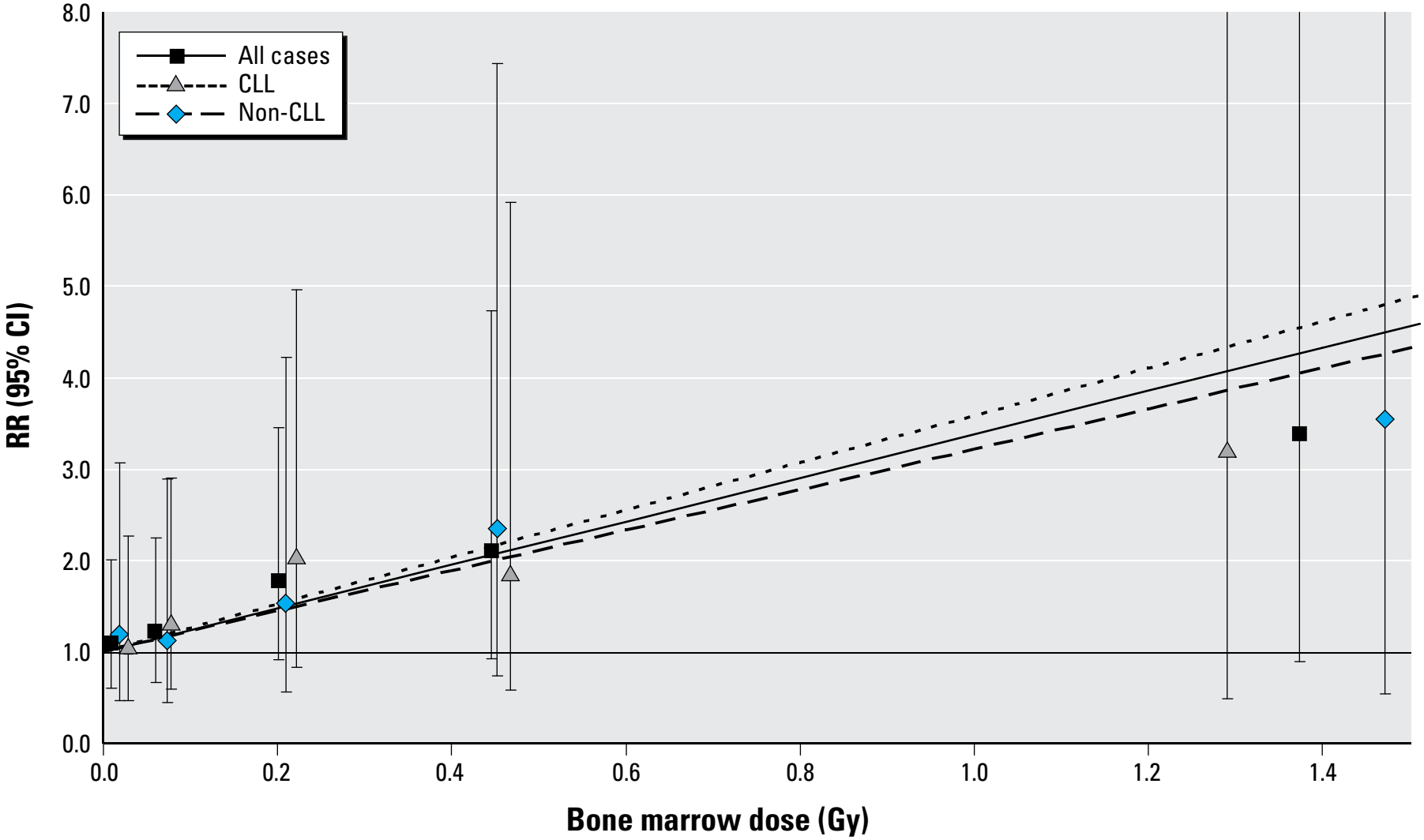


Figure 1. RRs (95% CIs) of leukemia by categories of radiation dose and fitted linear dose–response models. For display purposes, we added offsets to category mean doses on the abscissa coordinate to separate the overlapping estimates (10 mGy for non-CLL and 20 mGy for CLL analyses, respectively).

Zablotska LB et al Env Health Perspectives 2013;121:59-65

Nuclear industry workers 1

- 15 country retrospective cohort study of cancer mortality auspiced by IARC
- Largest such study ever conducted
- Workers involved in fuel enrichment or reprocessing, reactors, weapons or isotope production (excl uranium mining)
- 407,391 workers (90% male):
  - employed ≥ 1 y
  - monitored for external photon (X and gamma) radiation
  - > 90% whole body dose from external photons rather than neutrons or internal exposures
- Total FU 5.2 million person y

Nuclear industry workers 2

- Doses to colon used for all and solid cancer, active bone marrow for leukemia analyses, lagged by 2 y for leukemia and 10 y for other cancers

- Doses:
  - Average 19.4 mSv
  - 90% < 50 mSv
  - < 0.1% > 500 mSv

- Total deaths 6516 from cancer other than leukemia, 196 from leukemia excl CLL

Nuclear industry workers 4

- Mortality from all cancers except leukemia – central estimate 2-3 times higher than linear extrapolation from atomic bomb survivors
  - Current recommended 5 y occup dose limit of 100 mSv → 9.7% (1.4 - 19.7%) increase in cancer excl leukemia
  - For leukemia excl CLL 100mSv → 19% (<0 - 84.7%) increase

Cardis E, et al. BMJ 2005 (29 June 2005)
BMJ,doi:10.1136/bmj.38499.599861.EO

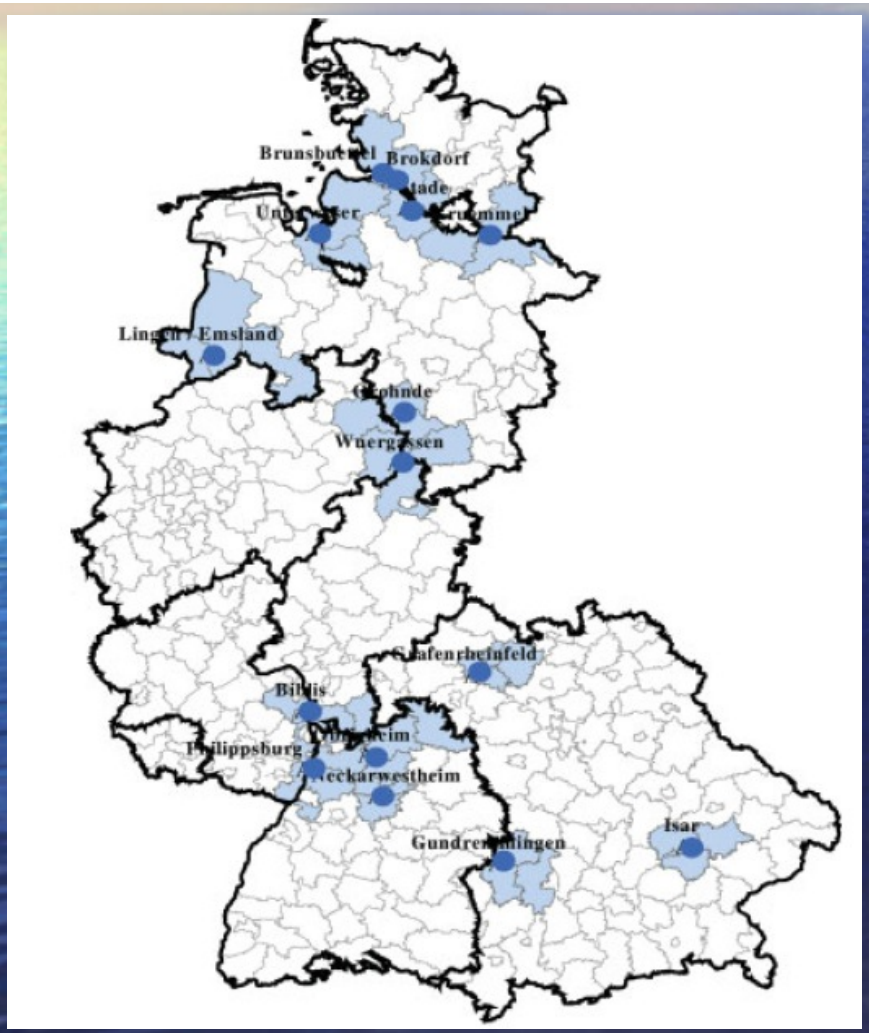
Int. J. Cancer: **1220,** 721–726 (2008)

FAST TRACK

Leukaemia in young children living in the vicinity of German nuclear power plants

Peter Kaatsch*, Claudia Spix, Renate Schulze-Rath, Sven Schmiedel and Maria Blettner

Institute for Medical Biostatistics, Epidemiology and Informatics, German Childhood Cancer Registry, Obere Zahlbacher Strasse 69, 55131 Mainz, Germany



- German Childhood Cancer Registry data 1980 – 2003, <5y
- Matched case-control study
- 593 leukemia cases
- Odds ratio for leukemia 2.19 (lower 95% CI 1.51) for residence within 5 km of nuclear power plant

Low individual doses does not mean small effects across a population

- Low exposures to many people can cause significant disease at a population level eg
  - 1 mSv for 100 million people ➔10,000 cancers (~half fatal)
  - 10 mSv for 100 million people ➔ 100,000 cancers
  - 1 mSv for 7 billion people ➔ 700,000 cancers
  - NB young children at higher risk

If you don't or can't look, you won't find

- Inadequate cancer registries impair surveillance
  - Regional cancer registry in Fukushima was only established in April 2010
  - Metropolitan Tokyo lacks a cancer registry
  - International Agency for Research on Cancer reports fewer than 10 prefectural cancer registries among the 47 prefectures in Japan
    - Akiba S. J Radio Prot 2012; 32:1-10.
    - Yasumura S et al for the Fukushima Health Management Survey Group. Study protocol for the Fukushima Health Management Survey. *J Epidemiology* 2012; 22(5):375-83.

- Need comprehensive population register of those significantly exposed, with total exposure estimates, to enable long-term linkage to health outcomes
  - eg mortality, cancer, birth outcome and congenital malformation registers
  - Need to include people exposed outside Fukushima prefecture, and wherever people move

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- "Victim blaming"
  - "larger doses … if they consumed certain locally produced foodstuffs in the aftermath of the accident despite governmental advice or continued living in evacuation areas …" p10
  - "The most important health effect is on mental and social well-being, related to the enormous impact of the earthquake, tsunami and nuclear accident, and the fear and stigma related to the perceived risk of exposure to ionising radiation." p12
    - Implication of blame due to ill-informed, unfounded concerns rather than what happened and its mismanagement by TEPCO and government, neglect of public safety, cover-up, deliberate misinformation to downplay risks and reduce evacuations and costs, and lack of support to assist people make and act on informed choices

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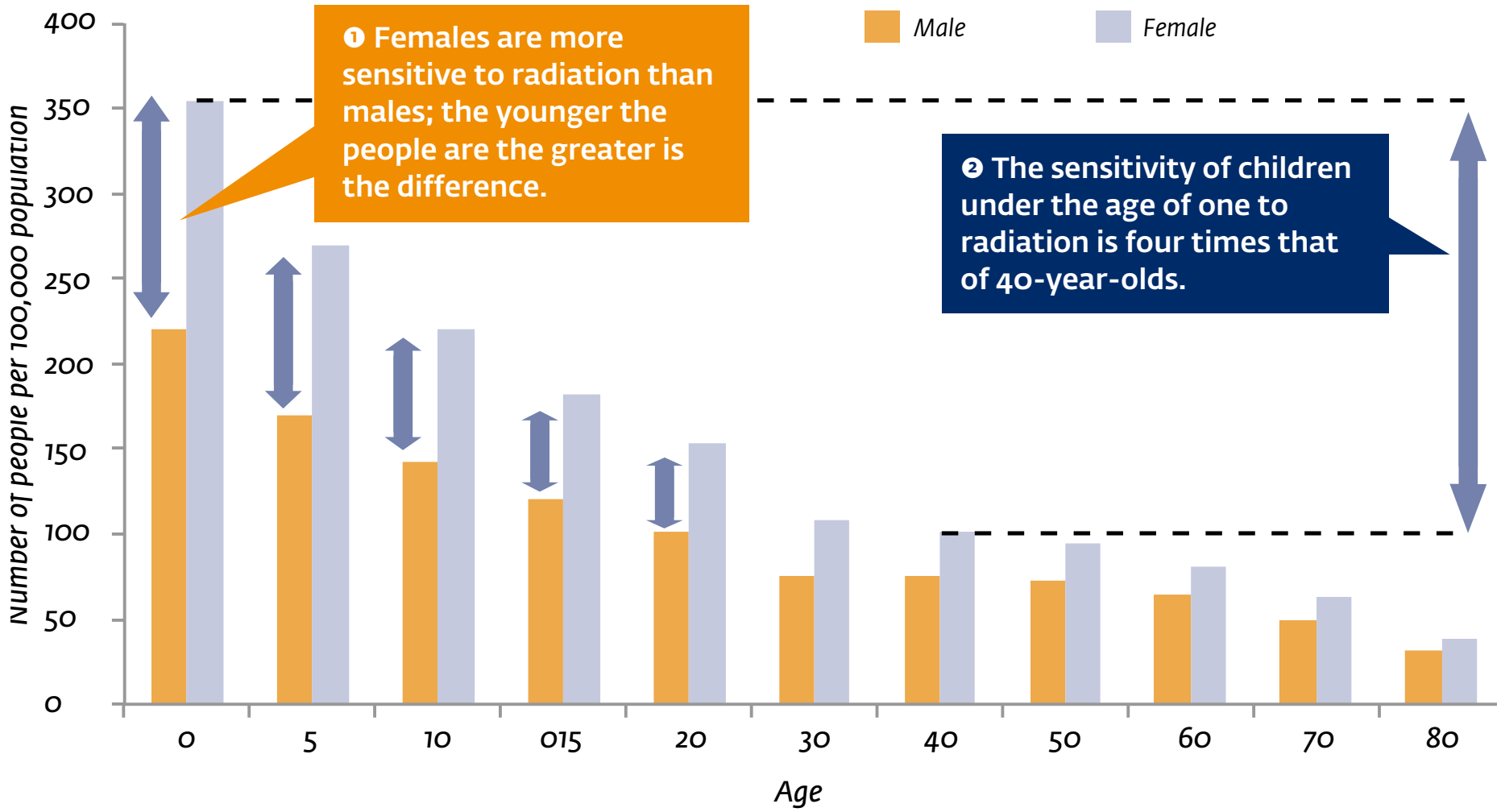
- Effects of radiation exposure of children
  - Inconsistency, despite growing evidence of higher risks at young age:
  - "… 54th session, the Committee stated that estimates of lifetime cancer risk for those exposed as children were uncertain and might be a factor of 2 to 3 times as high as estimates for a population exposed at all ages." p14 … but
    " …the Committee recommends that generalizations on the risks of effects of radiation exposure during childhood should be avoided." p14

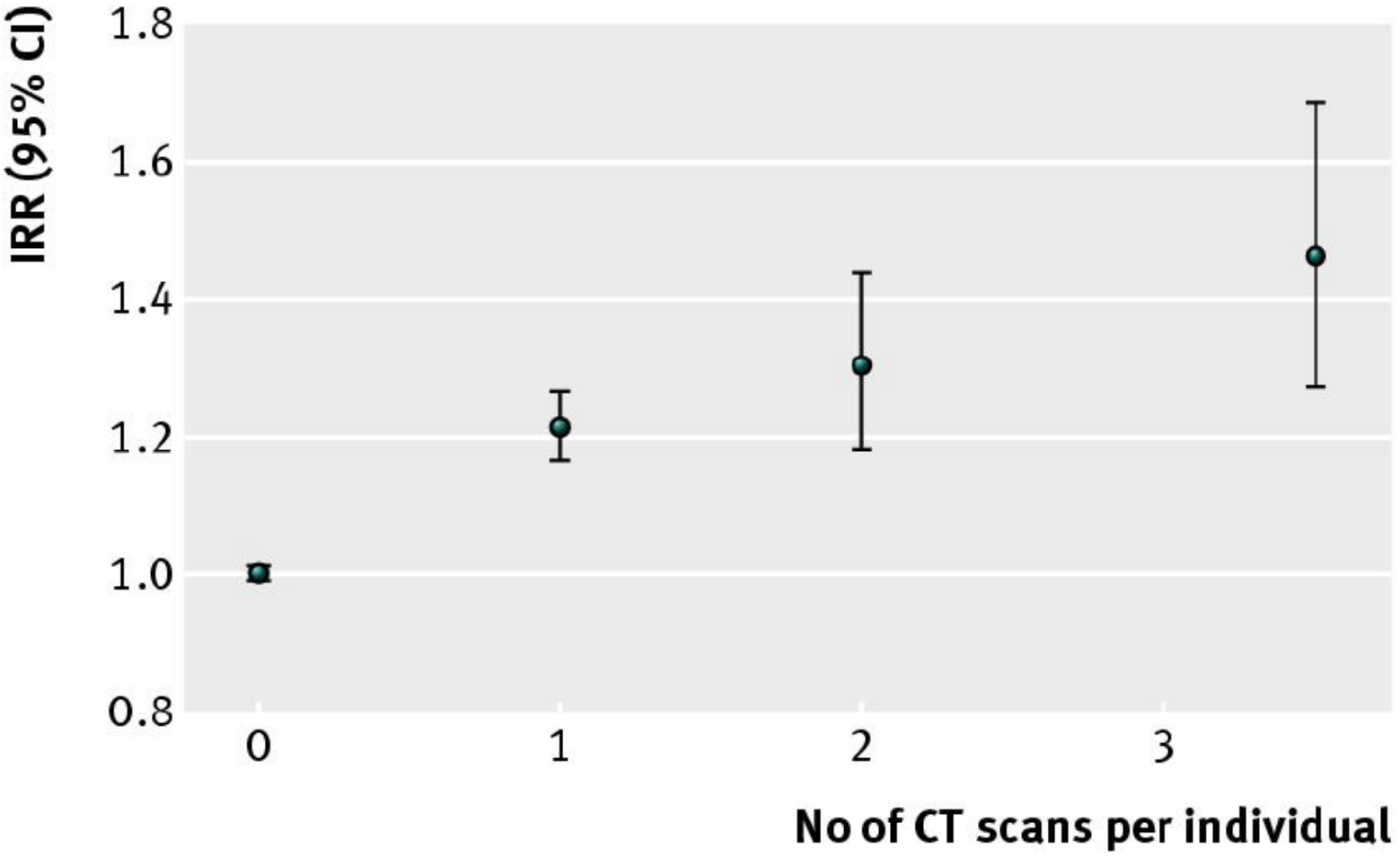
- No recommendations for public health action

Cancer risk varies by age and gender



NAIIC report, based on BEIR VII, US NAS 2006

Cancer risk in 680 000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million Australians



Mathews et al BMJ 22 May 2013

Cancer risk following CT scans in childhood or adolescence

- Population based, cohort, data linkage study using universal health insurance scheme (Medicare)
- 680,000 CT scans in 10.9 million cohort aged 0-19y
- Average effective dose per scan 4.5 mSv
- Mean follow-up 9.5 y
- 60,674 cancers
- 24% increase in cancer incidence in CT group vs no CT
  - 95%CI 20-29%, p<0.001, already evident 1-4 y after scan
  - 1 extra cancer per 2000 scans
- Relative risk increased 16% (95%CI 13-19%) with each additional scan
- Risk greater at younger age and for females
- Increased relative risk per mSv greater than for LSS
  - 0.027 vs 0.003
- Greater statistical precision than for LSS 0-19 y age participants

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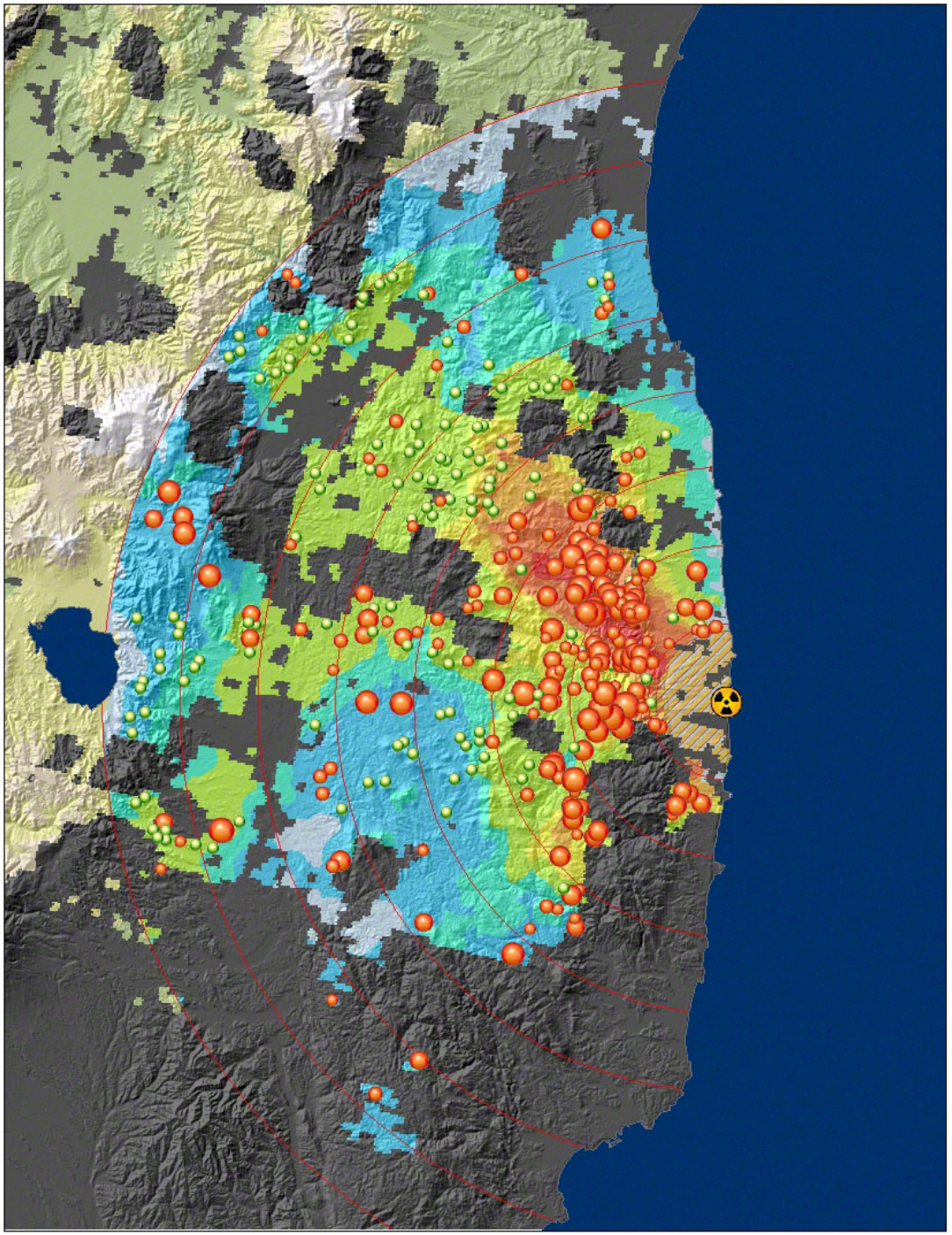
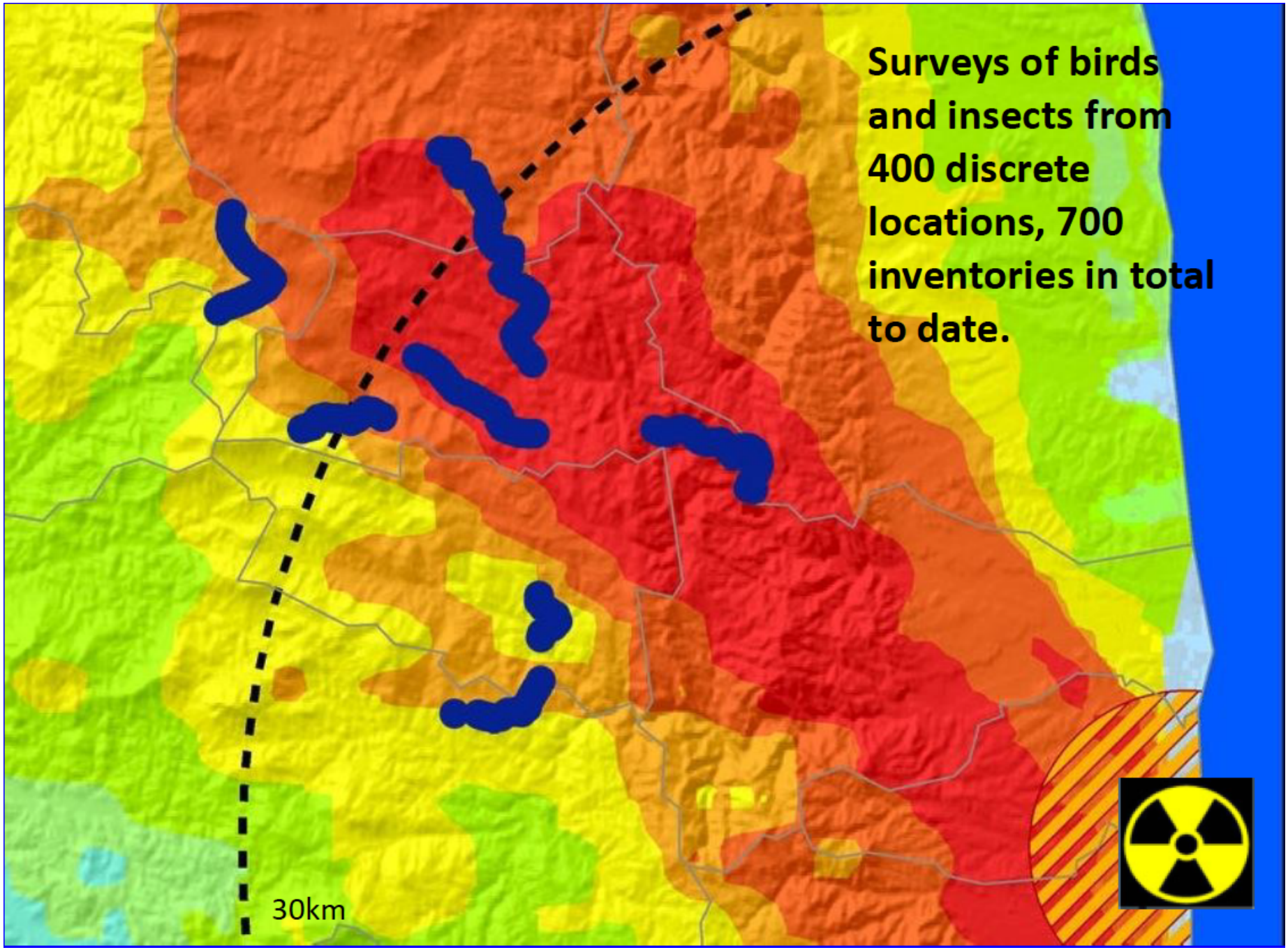
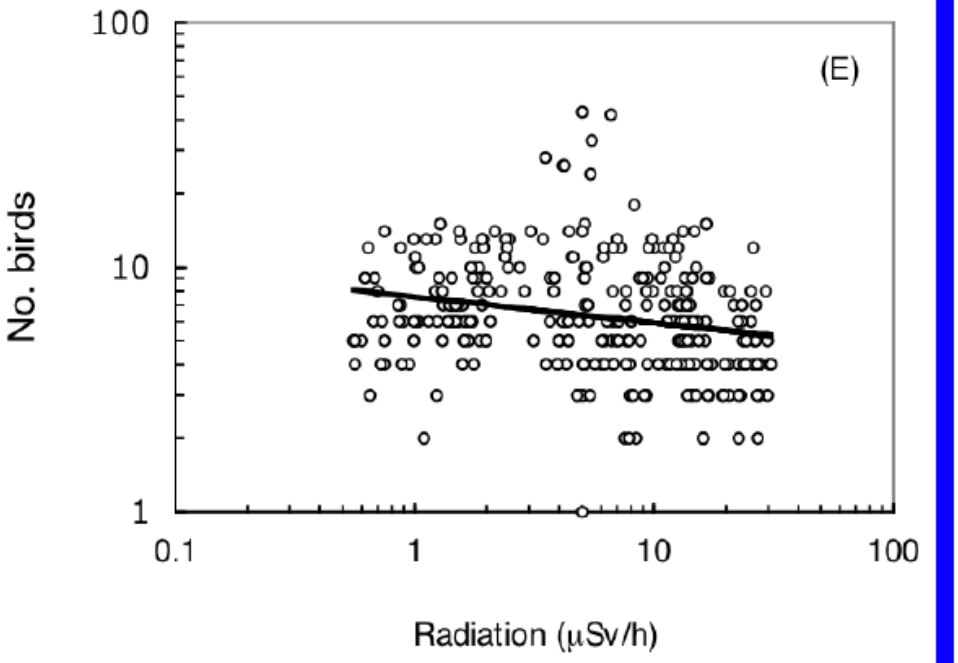
- Radiation exposures and effects on non-human biota
  - Exposures of both marine and terrestrial non-human biota following the accident were, in general, too low for acute effects to be observed, though there may have been some exceptions because of local variability" p13
  - Not consistent with evidence



Impacts of Fukushima Fallout on Vegetation as Revealed by Satellite Imagery. Mousseau, Waldron, Welch, Bonisoli-Alquati, ….Moller. In Prep.


Surveys of birds and insects from 400 discrete locations, 700 inventories in total to date.
30km

Fukushima 2011



Chernobyl 2006-09

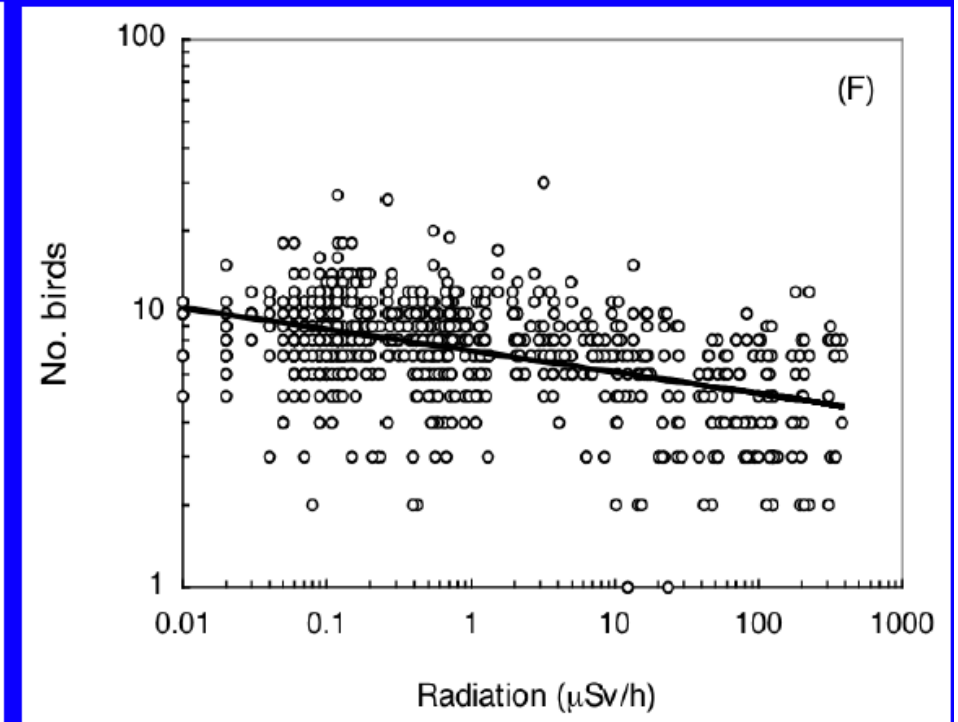


Table 1. Bird abundance in Fukushima and Chernobyl in relation to radiation level.

	SS	d.f.	*F*	*P*	Estimate (SE)
Fukushima:					
No. bird individuals	0.775	1, 298	14.89	0.0001	-0.105 (0.027)
Chernobyl:					
No. bird individuals	6.973	1, 896	256.89	< 0.0001	-0.078 (0.005)

A.P. Møller, A. Hagiwara, S. Kasahara, S. Matsui, I. Nishiumi, H. Suzuki, K. Ueda and T. A. Mousseau. 2012. Environmental Pollution.

SCIENTIFIC REPORTS

OPEN

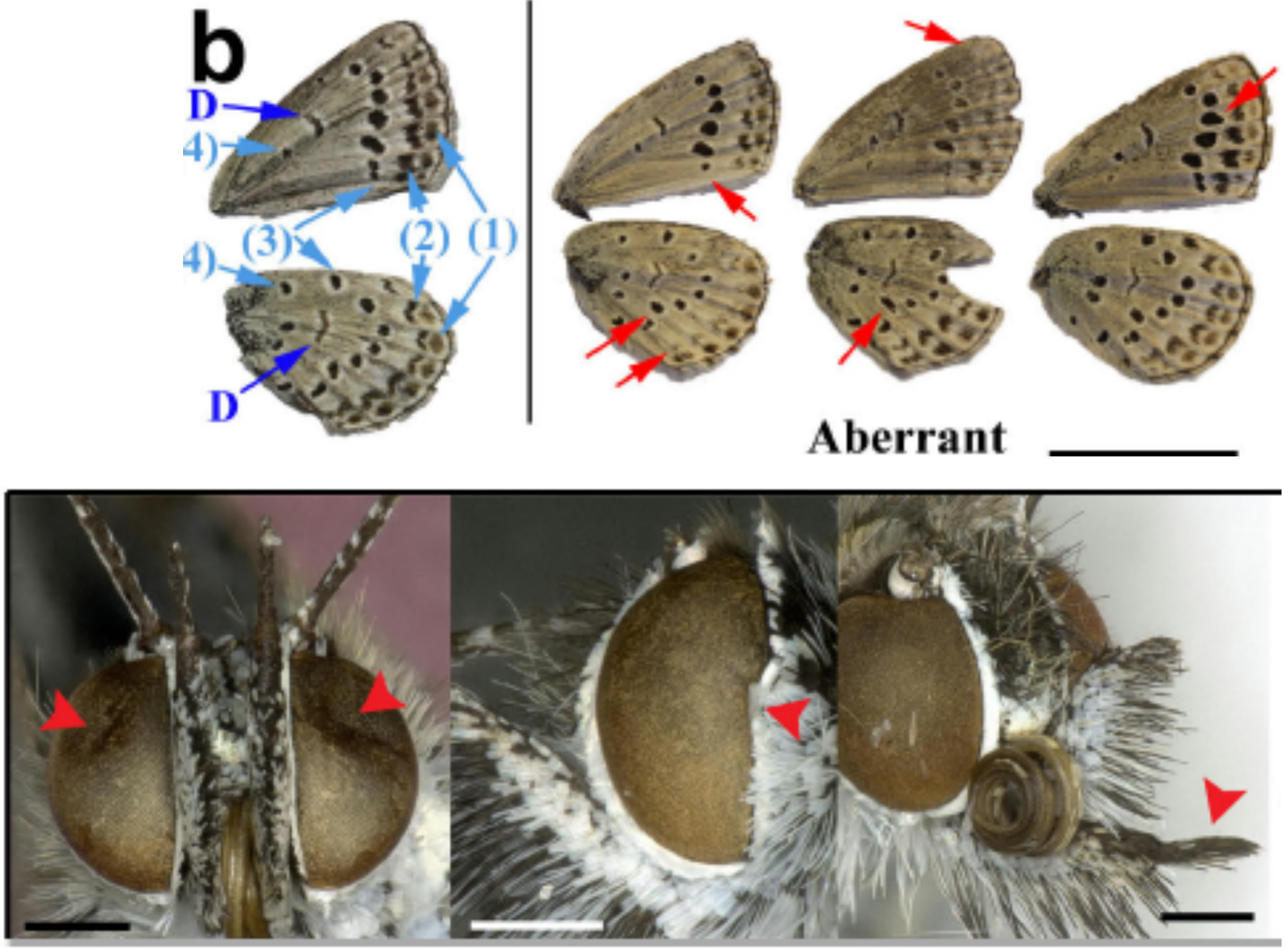
The biological impacts of the Fukushima nuclear accident on the pale grass blue butterfly

SUBJECT AREAS:
ENVIRONMENTAL SCIENCES
ECOLOGY
BIODIVERSITY

Atsuki Hiyama[1]*, Chiyo Nohara[1]*, Seira Kinjo[1], Wataru Taira[1], Shinichi Gima[2], Akira Tanahara[2] & Joji M. Otaki[1]

accident on animals has not been available. Here we show that the accident caused physiological and genetic damage to the pale grass blue *Zizeeria maha*, a common lycaenid butterfly in Japan. We collected the first-voltine adults in the Fukushima area in May 2011, some of which showed relatively mild abnormalities. The F_1 offspring from the first-voltine females showed more severe abnormalities, which were inherited by the F_2 generation. Adult butterflies collected in September 2011 showed more severe abnormalities than those collected in May. Similar abnormalities were experimentally reproduced in individuals from a non-contaminated area by external and internal low-dose exposures. We conclude that artificial radionuclides from the Fukushima Nuclear Power Plant caused physiological and genetic damage to this species.

9 Aug 2012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Aberrant

Workers

- Masayuki Ono, TEPCO:
  - An estimated 1,972 plant workers, or 10 percent of those checked, had thyroid exposure doses exceeding 100 millisieverts, instead of the 178 based on checks of 522 workers reported to the World Health Organization last year.
    - AP 22 July 2013

IPPNW statements re Fukushima

- Statement by IPPNW Board of Directors on the ongoing nuclear disaster in Japan and the report of the UN Special Rapporteur on the right to health to the UN Human Rights Council
  - 30 May 2013, Villingen-Schwenningen, Germany
  - http://peaceandhealthblog.com/2013/06/05/fukushima-disaster/
  - in Japanese: http://chikyuza.net/n/archives/35196

- Many additional resources at:
  - http://peaceandhealthblog.com/disaster-in-japan/

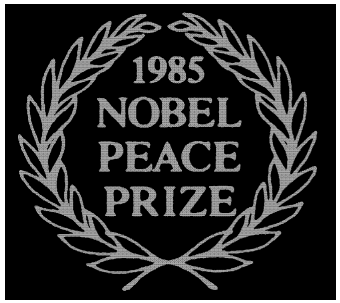
Public health recommendations

- Prioritise public health and safety and environmental protection
- Protect people and the environment
  - National approach
  - Comprehensive population register with doses to provide health care and assess health outcomes
  - Lifetime radiation register for nuclear industry workers
  - Effective national implementation with adequate resources of Act on the Protection and Support for the Children and other Victims of TEPCO Disaster, including for voluntary evacuees
  - Measures to reduce additional exposures to <1mSv – especially for children
- Control the source
  - Mobilise whatever resources and global expertise required
- Prevent further large releases from Fukushima Daiichi and other facilities
  - Keep all facilities closed and decommission them

Some suggestions

- Urge periodic monitoring and review of progress and needs by NAIIC
- Urge periodic monitoring and review by UN Special Rapporteur on Right to Health, other UN agencies eg IARC, WHO, UNDP, UNEP
- Regular conference for presentation of independent research findings re nuclear disaster
- Document compromise/corruption of scientists and physicians by "nuclear village"
  - conflicts of interest of officially-linked radiation health experts
    - eg NAIIC findings re FEPC funding ICRP members
- Utilise Tokyo Olympics and PM Abe's lie that the situation is stable and contamination highly localised to keep international attention on Fukushima and pressure on government to control FD plant, and protect and care for people

International Physicians for the
Prevention of Nuclear War



Thank you!