

Session 3

Emergency Exposure Situation

ICRP Task Group 124

Application of Justification Principle:
Setting the Scene

15 – 16 May 2023

Dr. Jessica Callen-Kovtunova

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Session 3 Plan

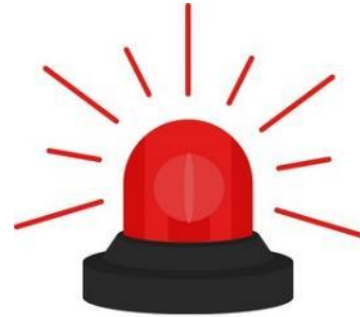
- 15 minutes presentation
- 45 minutes discussion
 - Guided by 4 questions
 - To speak during the session please use function



Raise Hand

How do you know when you're doing more good than harm in an emergency exposure situation?

Nuclear or radiological emergency:



- People are protected from radiation by protective actions
- Sheltering, evacuation or iodine thyroid blocking...

**Health, societal,
economic, or other
effects?**

After the Fukushima accident:

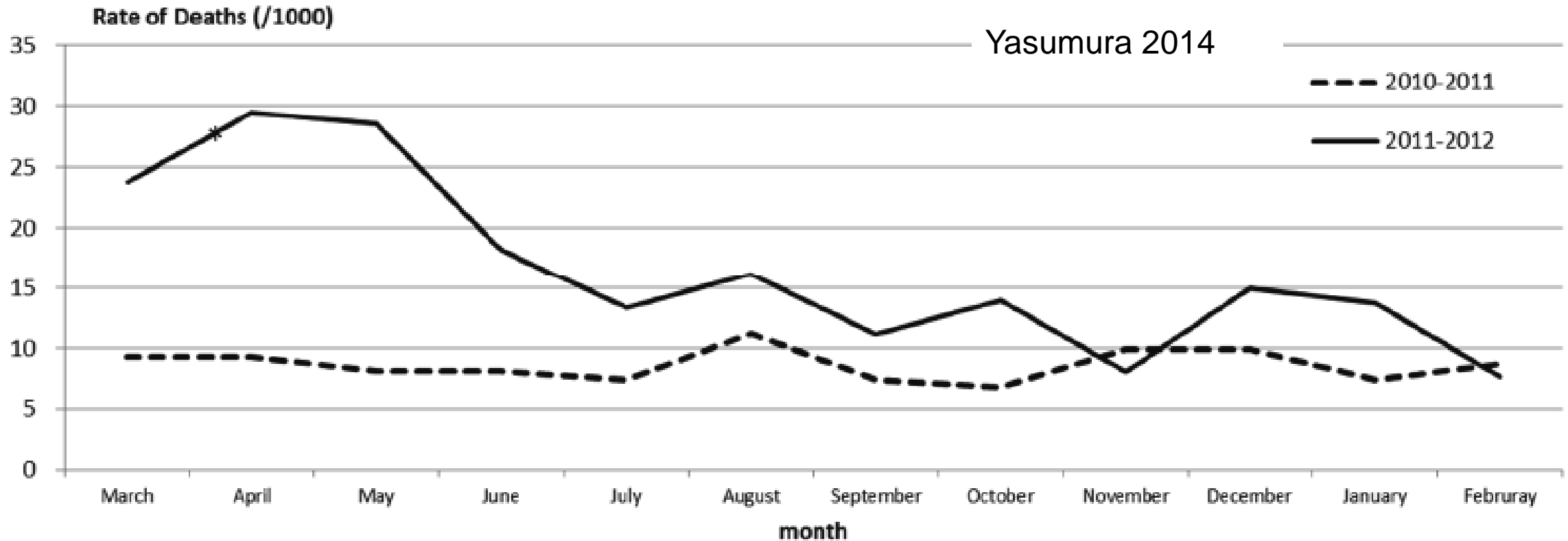


Fig. 1. Changes of mortality rates among the institutionalized elderly before and after the Fukushima NPP accident.

After the Fukushima accident:

Hindawi Publishing Corporation
Journal of Diabetes Research
Volume 2015, Article ID 627390, 9 pages
<http://dx.doi.org/10.1155/2015/627390>



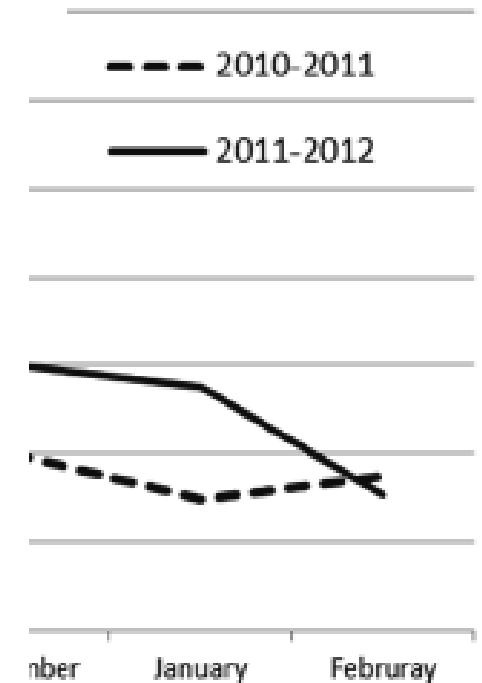
Research Article

Evacuation after the Fukushima Daiichi Nuclear Power Plant Accident Is a Cause of Diabetes: Results from the Fukushima Health Management Survey

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Akira Sakai,^{2,5} Tsuyoshi Watanabe,^{1,2} Akira Ohtsuru,^{2,6}
Yukihiko Kawasaki,^{2,4} Hitoshi Suzuki,^{2,7} Atsushi Takahashi,^{2,8}
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Fukushima NPP accident.

After the Fukushima accident:

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<http://dx.doi.org>

Review Article

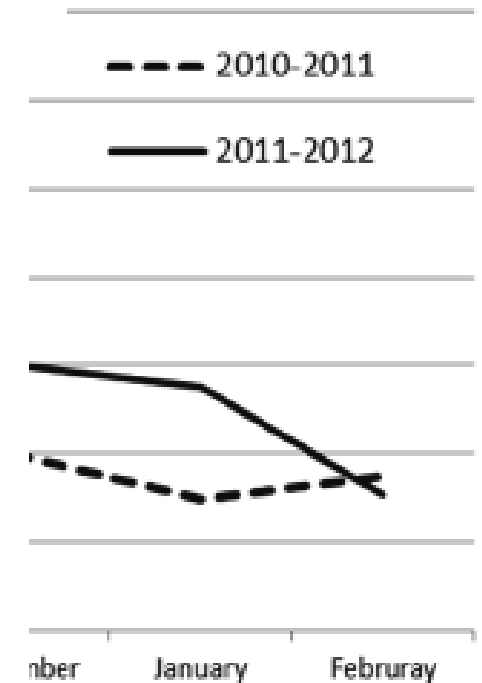
Mental Health Consequences and Social Issues After the Fukushima Disaster

Masaharu Maeda, MD, PhD¹ and Misari Oe, MD, PhD^{1,2}

Abstract

The Great East Japan Earthquake and subsequent nuclear power plant accident caused multidimensional and long-term effects on the mental health condition of people living in Fukushima. In this article, focusing on the influence of the nuclear disaster, we present an overview of studies regarding the psychosocial consequences of people in Fukushima. Studies revealed that the experiences of the explosions at the plant as well as the tsunami are deeply embedded in their memory, leading to posttraumatic responses. Chronic physical diseases, worries about livelihood, lost jobs, lost social ties, and concerns about compensation were also associated with posttraumatic responses. Furthermore, the radioactive fallout brought chronic anxiety regarding physical risks of radiation exposure to people, especially young mothers. People often have different opinions about the radiation risk and their own future plans,

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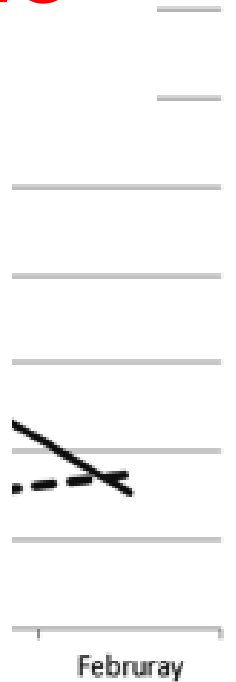


Fukushima NPP accident.

After Fukushima accident – no discernible radiation induced health effects

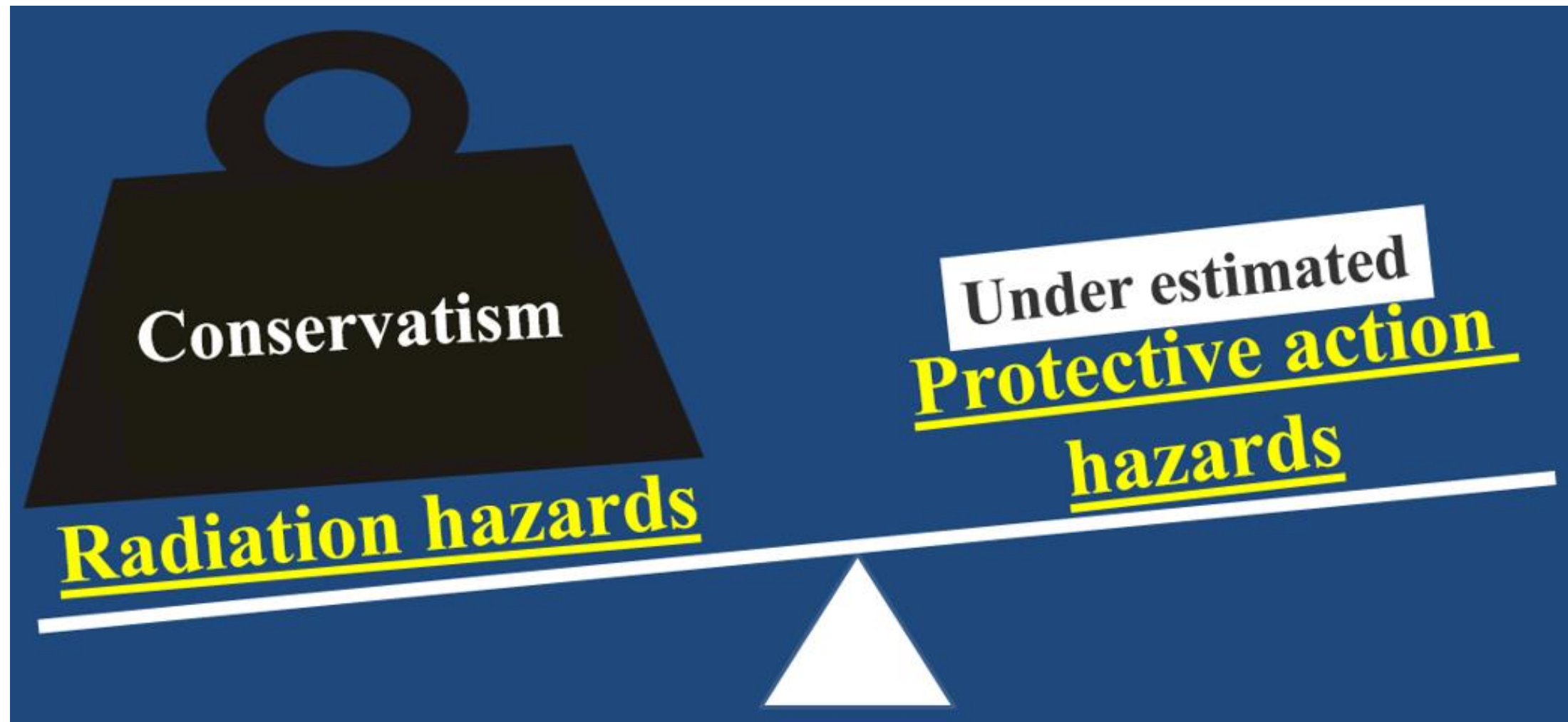
Were the protective actions justified?

Didn't they do more harm than good?



NPP accident.

Current basis for protective actions



ICRP - Justification in emergencies

- Any decision altering a radiation exposure situation should do more good than harm (ICRP 103).
- A dose rising towards 100 mSv will almost always justify protective action (ICRP 103).
- An assessment based on health effects would be insufficient and due considerations must be given to societal, economic and other consequences (ICRP 103).
- Should take careful account of all non-radiological factors in order to preserve or restore the living and working conditions of all those affected (ICRP 146).

Comparing radiation risks with protective action risks

ICRP Publication 103 Dose Constraints and Reference Levels

Table 5. Framework for source control actions to protect workers and the public from sources with examples of constraints for situations that can be controlled.

Types of constraints and reference levels ^a	Characteristics of exposure situations	Control actions	Examples
Greater than 20 to 100 ^{b,c}	Individual sources that are not controlled by actions to reduce doses would be disproportionately disruptive. Exposures are usually controlled by action on the exposure pathways.	Individuals should be made to reduce doses as they approach 100 mSv. Individuals should receive information on radiation risk and on the actions to reduce doses. Assessment of individual doses should be undertaken.	Reference levels should be the highest planned dose from a radiation emergency.

Greater than 20 to 100 mSv

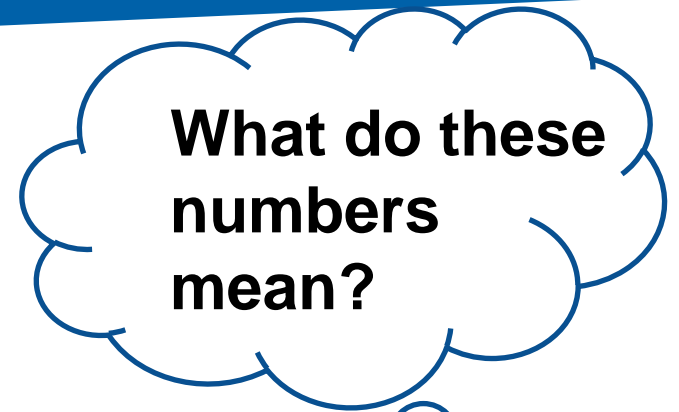
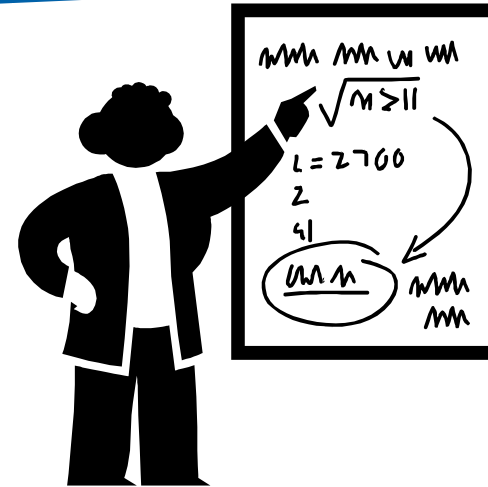
Actions to reduce doses would be disproportionately disruptive.

Individuals should receive information on radiation risk

Numerical guidance lacking

Key stakeholders need to be involved

Need to present risks in understandable way



Relocate or remain – what is justified?

Which is doing more good than harm?

- Averting 20 mSv E when relocating, or receiving 20 mSv E and remaining?
- What if the protective action is more harmful?



Absolute Excess Risk [per 1000]							
Dose criterion [mSv]	Radiation-induced deaths possibly prevented by triggered protective actions			Deaths associated with protective actions or dislocations		Mental health problems associated with dislocations and perceived risk of exposure to ionizing radiation	
	General population	Elderly (70 and above)	Under 18	General population	Residents of facilities for long stays & elderly	General population	Under 18
1	0.05	0.02	0.1				
5	0.25	0.1	0.5				
Relocate	0.5	0.2	1				
20	1	0.3	2	3	17 to 60	200	120
50	2.5	1	5				
100	5	2	10				

Journal of Radiological Protection



PAPER

What's better for our health? Conducting protective actions during a nuclear emergency or accepting a certain radiation dose?

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Keywords: nuclear emergencies, radiation risk, protective action risk, radiation-induced health effects, radiological protection, justification

Abstract

The threat caused by ionising radiation has resulted in the establishment of strict radiation protection guidelines. This is especially true for severe nuclear power plant (NPP) accident scenarios, which may involve the release of significant amounts of ionising radiation. However, we believe that the fine balance between the benefit of a certain protective action (e.g. evacuation) and its risks is not always accounted for properly. Deaths and mental health problems have been associated with protective actions (e.g. evacuation) implemented in the response to the Fukushima

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Example scenarios

- Whether to evacuate or shelter residents located around an NPP based on conditions at the NPP (actual or projected severe core damage).
- Whether to monitor and decontaminate the affected population.
- Whether food restrictions in terms of consumption, distribution or export will need to be implemented.

For discussion:

Think of different scenarios when justification could be applied in an emergency exposure situation and identify those that may need further analysis by TG124

Discussion – Guiding Questions

- Which scenarios require in-depth consideration?
- What factors need to be taken into account in the relevant scenarios?
- What areas of expertise and stakeholders could provide additional insight?
- What guidance would be helpful to improve the application of the justification principle?

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