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Communicating Low-Dose Risk to Government Stakeholders

**NAS NRSB Committee on Developing a Long-Term
Strategy for Low-Dose Radiation Research in the U.S.**

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EPA's Role

Stakeholders in low-dose messaging



Regulatory

- Industry
- Federal Partners
- State, Local, Tribal, Territorial Partners
- Activist Groups
- Concerned Citizens

Environmental Monitoring

- State, Local, Tribal, Territorial Partners
- Researchers
- Activist Groups
- Concerned Citizens

Emergency Response

- State, Local, Tribal, Territorial Partners
- Responders
- Affected Community
- Concerned Citizens

Daily Public Communications

- Concerned Citizens
- Teachers
- Students
- Researchers

Radon

- Builders
- School Administration
- Concerned Citizens
- General Public

Low-Dose Questions

Examples of challenging questions



Regulatory/
Industry

How can you justify regulating to such low levels without definitive scientific evidence of risk?

Environmental Monitoring/
Activist Groups

If there is no threshold, how can you say levels are below levels of public health concern?

Emergency Response/
Responder

What are you going to tell me that makes me feel safe enough to do my job?

Daily Public
Communications/
Concerned Citizen

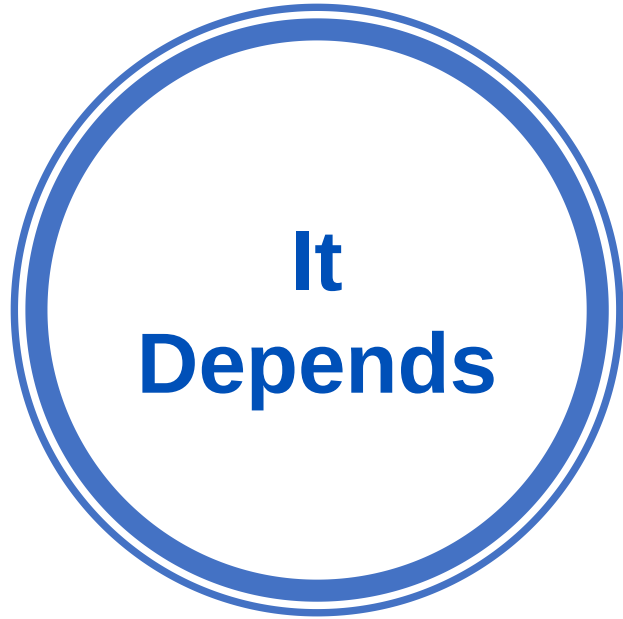
I have been exposed. What is MY risk of getting cancer?

Radon/
General Public

With all the other risks in my life, why should I focus on radon?



How Much Radiation is Safe?



Radionuclide

Exposure Pathway

Dose or Concentration

Whole Body or Organ

Time

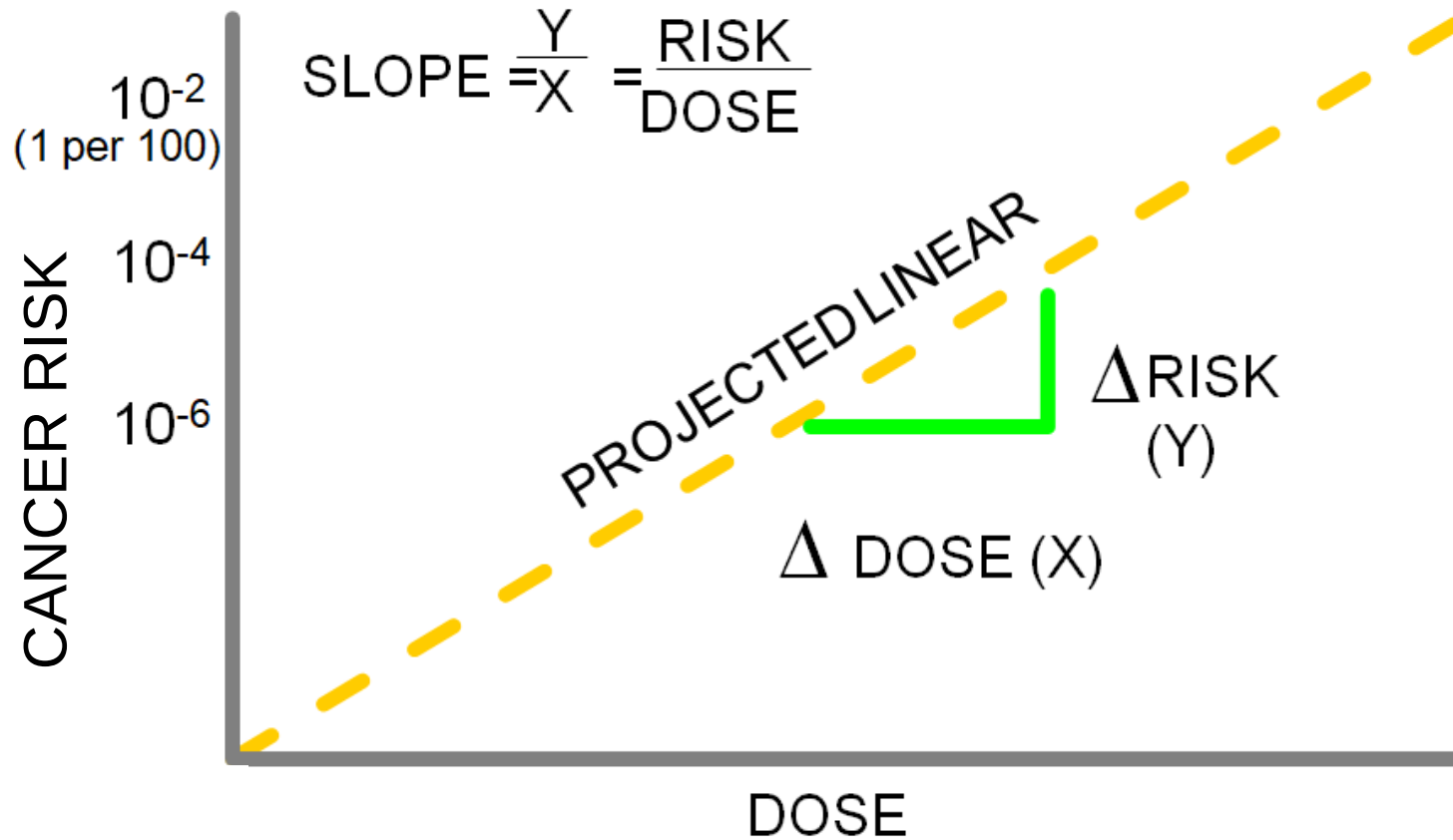
Shielding

Age & Sex

When Professionals Think About Risk



Dose-Response Relationship (Cancer):



Definitions of Risk (noun)

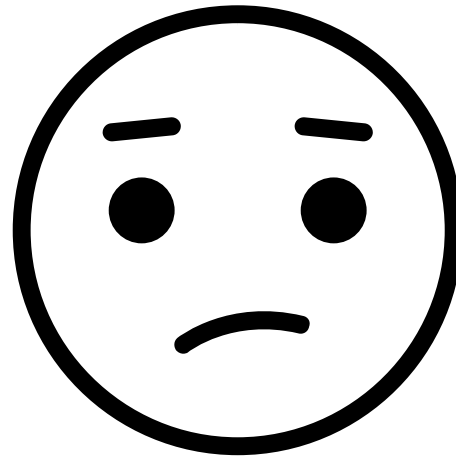


- Danger, or the possibility of danger, defeat, or loss¹
- Someone or something that could cause a problem or loss¹
- Someone or something that creates or suggests a hazard²

1 <https://dictionary.cambridge.org/us/dictionary/english/risk>

2 <https://www.merriam-webster.com/dictionary/risk>

When Everyone Else Thinks About Risk



Will this hurt me or not?

Website Language

Radiation Exposure and Cancer Risk

Exposure to low-levels of radiation does not cause immediate health effects, but can cause a small increase in the [risk](#) of cancer over a lifetime. There are studies that keep track of groups of people who have been exposed to radiation, including atomic bomb survivors and radiation industry workers. These studies show that radiation exposure increases the chance of getting cancer, and the risk increases as the dose increases: the higher the dose, the greater the risk. Conversely, cancer risk from radiation exposure declines as the dose falls: the lower the dose, the lower the risk.

Radiation doses are commonly expressed in millisieverts (international units) or [rem](#) (U.S. units). A dose can be determined from a one-time radiation exposure, or from accumulated exposures over time. About 99 percent of individuals would not get cancer as a result of a one-time uniform whole-body exposure of 100 millisieverts (10 rem) or lower.¹ At this dose, it would be extremely difficult to identify an excess in cancers caused by radiation when about 40 percent of men and women in the U.S. will be diagnosed with cancer at some point during their lifetime.

Risks that are low for an individual could still result in unacceptable numbers of additional cancers in a large population over time. For example, in a population of one million people, an average one-percent increase in lifetime cancer risk for individuals could result in 10,000 additional cancers. The EPA sets regulatory limits and recommends emergency response guidelines well below 100 millisieverts (10 rem) to protect the U.S. population, including sensitive groups such as children, from increased cancer risks from accumulated radiation dose over a lifetime.

Low-dose Health Effects Messaging



Key Message 1

Exposure to low-levels of radiation can cause a small increase in the risk of cancer over a lifetime.

- There are studies that keep track of groups of people who have been exposed to radiation.
- Studies include atomic bomb survivors and radiation industry workers.
- Studies show the higher the dose, the greater the cancer risk: The lower the dose, the lower the cancer risk.

Low-dose Health Effects Messaging



Key Message 2

About 99 percent of individuals would not get cancer as a result of a one-time uniform whole-body exposure of 100 millisieverts (10 rem) or lower.

- At this dose, it would be extremely difficult to identify an excess in cancers caused by radiation.
- Because about 40 percent of men and women in the U.S. will be diagnosed with cancer at some point during their lifetime.

Low-dose Health Effects Messaging



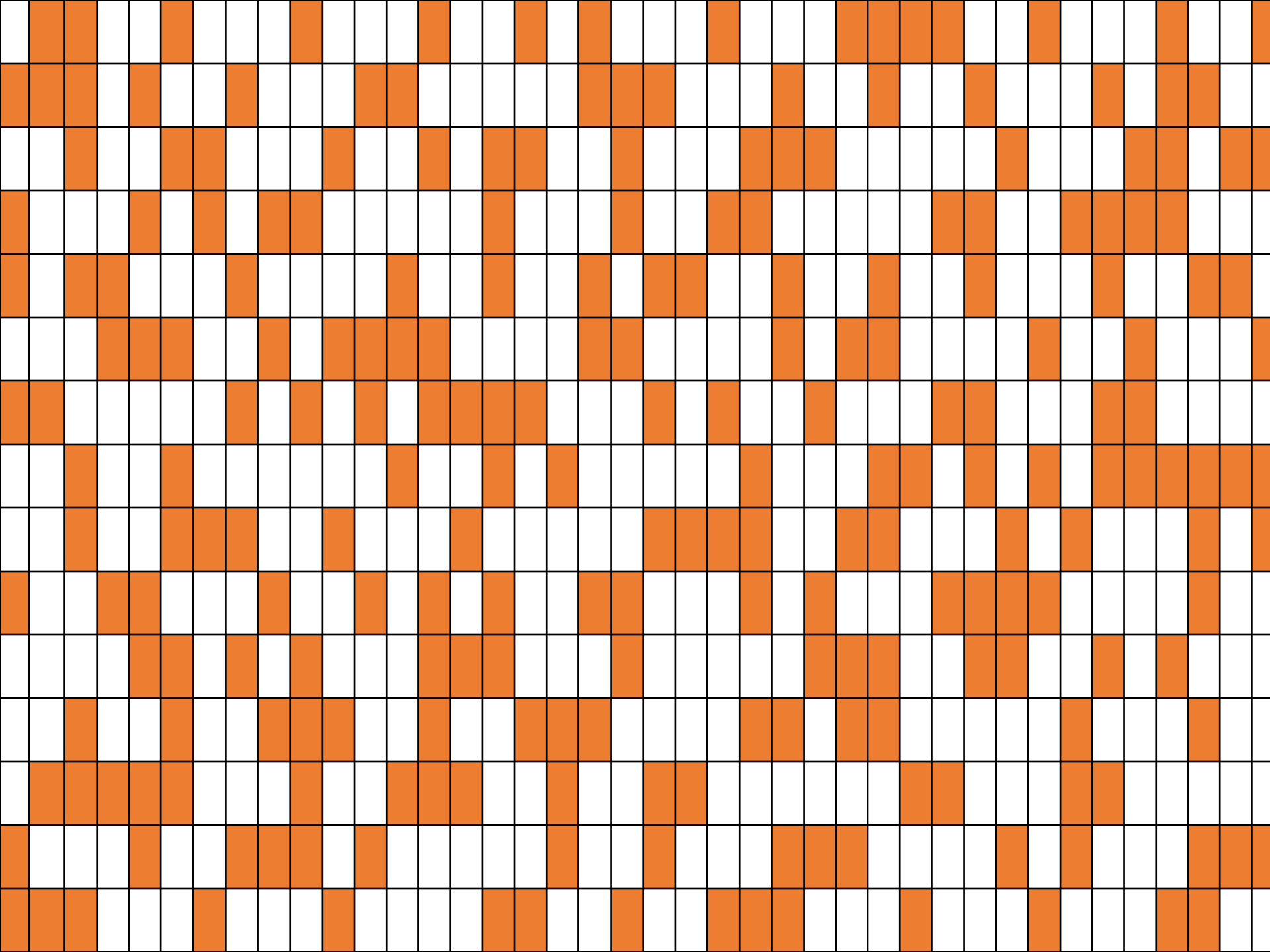
Key Message 3

Risks that are low for an individual could still result in unacceptable numbers of additional cancers in a large population over time.

- For example, in a population of one million people, an average one-percent increase in lifetime cancer risk for individuals could result in 10,000 additional cancers.
- The EPA sets regulatory limits and recommends emergency response guidelines well below 100 millisieverts.
- This protects the U.S. population, including sensitive groups such as children, from increased cancer risks from accumulated radiation dose.

About 99% of individuals **would never get cancer** as a result of a uniform whole-body exposure of 100 mSv.

Estimate for a population with an age and sex distribution similar to that of the entire U.S. population (BEIR VII, Executive Summary, p.7)



“Approximately 38.4% of men and women will be diagnosed with cancer at some point during their lifetimes (based on 2013–2015 data).”

National Cancer Institute
(accessed 1/31/2019)
<https://www.cancer.gov/about-cancer/understanding/statistics>

People are prone to...probability neglect, especially when their emotions are intensely engaged. When probability neglect is at work, people's attention is focused on the bad outcome itself, and they are inattentive to the fact that it is unlikely to occur.

Cass R. Sunstein

The Journal of Risk and Uncertainty, 26(2/3); 2003



**It is the possibility that is scary;
Not the probability**

“The ultimate purpose of risk communication is to enable people at risk to take informed decisions to protect themselves and their loved ones.”



<https://www.who.int/risk-communication/background/en/>

Possible Low-Dose Research Questions

Answers would enhance radiation risk communication capabilities



What risk is acceptable
for a child?

What are the risks to
children from a variety of
different exposure
situations?



Possible Low-Dose Research Questions



Answers would enhance radiation risk communication capabilities

How does cumulative exposure affect risk?

How does duration of exposure affect risk?

How can we effectively explain how time is associated with health risk?



Possible Low-Dose Research Questions



Answers would enhance radiation risk communication capabilities

Are some communities at higher risk from radiation due to compounding risk from other environmental exposures and/or stressors?



Possible Low-Dose Research Questions



Answers would enhance radiation risk communication capabilities

What are the best words to describe levels of risk so that the risk perception of the stakeholder matches the intended meaning?



**“A brilliant scientific discourse is
wasted if no one listens or
understands it.”**

Dr. S.Y. Tan, 1994

*American Medical Association Presentation on
How Physicians can be Better Speakers*



Thank You

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