National Cancer Institute

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Lessons Learned From BEIR VII

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My Role in BEIR VII

Primary responsibility for

- Japanese A-bomb survivor chapter

- Developing risk estimates

From BEIR VII Statement of Task

"The primary objective is to develop the best possible risk estimate for exposure to low-dose, low energy transfer (LET) radiation in human subjects."

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"The primary objective is to develop the best possible risk estimate for exposure to low-dose, low energy transfer (LET) radiation in human subjects."

- BEIR VII committee defined "low dose" as
  - < 100 mGy (0.1 Gy) or
  - < 0.1 mGy/min over months or a lifetime

Risk Estimates: What's Involved?

- Choice of data

- Conducting analyses

- Choices that go beyond the data

Risk Estimates: What's Involved?

- Choice of data
  - Main data used were the Japanese A-bomb survivor cancer incidence data (1958-1999)

  - Breast and thyroid cancer models based on published pooled analyses of several studies of medically exposed persons

  - Other data

Risk Estimates: What's Involved?

Other data (considered but not analyzed)

– To be useful need

- Individual dose estimates
- Low/moderate doses
- Reasonable statistical power

– Medically exposed patients

– Nuclear workers

Risk Estimates: What's Involved?

- Choice of data
  - Main data used were the A-bomb survivor incidence data (1958-1999)

  - Breast and thyroid cancer models based on published pooled analyses of several studies of medically exposed persons

  - Other data

  - Data availability

Risk Estimates: What's Involved?

- Choice of data

- Conducting analyses

- Choices that go beyond the data

Risk Estimates: What's Involved?

- Conducting analyses
  - Developing models for several specific cancer sites
    - Allow for dependence of risk on sex and age
    - Both incidence and mortality
  - Applying models to obtain sex- and age-specific lifetime risk estimates for the US population
  - Evaluating uncertainty in these estimates

Risk Estimates: What's Involved?

- Choice of data

- Conducting analyses

- Choices that go beyond the data

Risk Estimates: What's Involved?

- ## Choices that go beyond the data
  - Estimating risk at low doses and dose rates
    - Linear no-threshold (LNT) model
    - Dose and dose rate effectiveness factor (DDREF)

  - Transporting risk from Japanese A-bomb survivors to US population

  - Both issues discussed in Chapter 10: Integration of Biology and Epidemiology

Review

- By BEIR VII committee members

- By outside reviewers

- Use of models after BEIR VII published
  - EPA
  - NCI's radiation risk calculator

Communicating risk to the public

If 100 people exposed to

0.1 Gy (100 mGy), expect

- 1 cancer from this exposure 🔴

- 42 cancers from other causes ⚫