



Dose Reconstruction Process Overview

Mark R. Rolfes, M.S.

Research Health Physicist

National Institute for Occupational Safety and Health

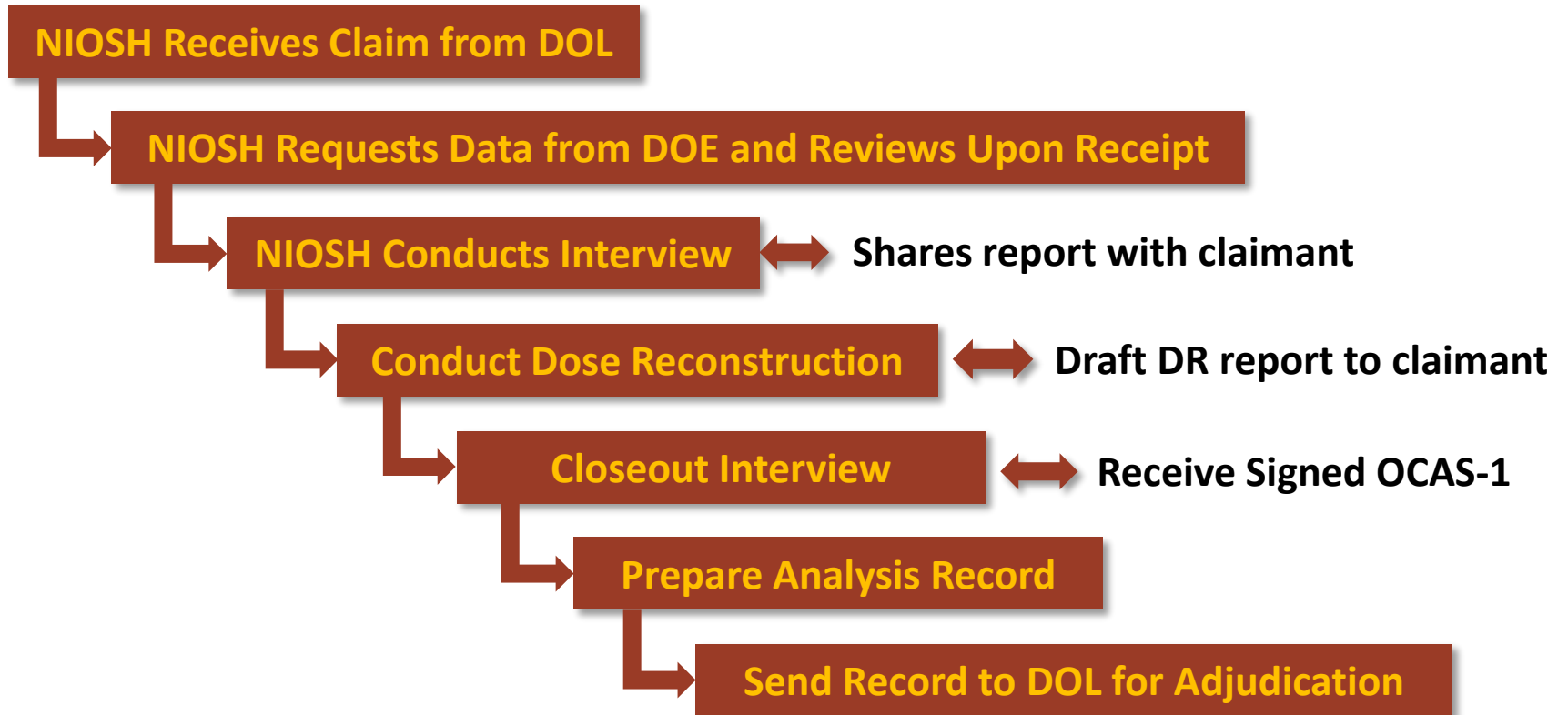
Division of Compensation Analysis and Support

North Las Vegas and Pahrump, NV

February 28 and March 1, 2023

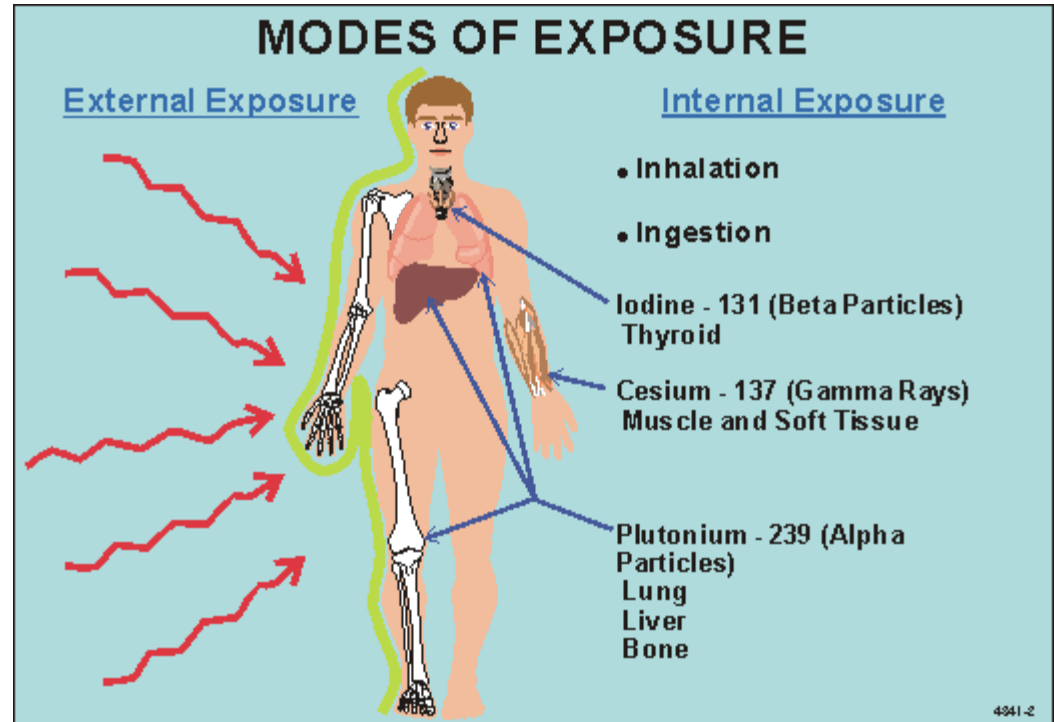


Dose Reconstruction Process



Frequently Used Terms

- **External Dose**: Dose received from radiation originating outside the body.
- **Internal Dose**: Dose received from radiation originating inside the body.



Frequently Used Terms - continued

Occupational Medical Dose

- Includes diagnostic X-rays required as a condition of employment.
- Does not include diagnostic X-rays resulting from illness or injury, or dose resulting from nuclear medicine tests or radiation therapy.

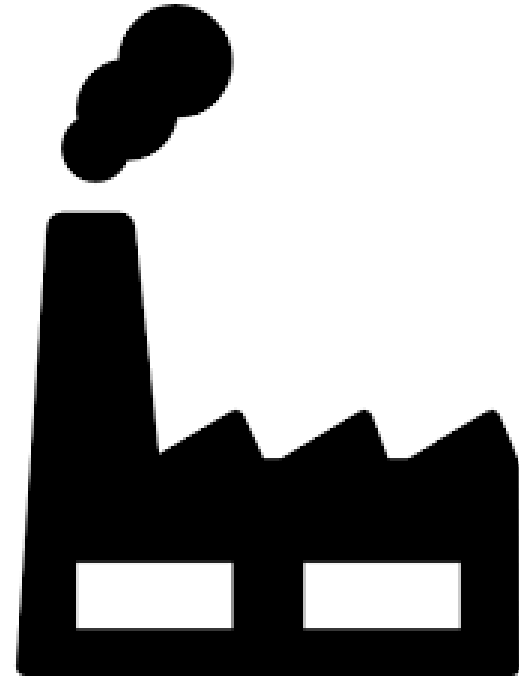




Frequently Used Terms - continued

Environmental Dose

- The dose measured on and around these facilities.
- Includes external radiation as well as airborne radioactivity.
- Most useful in cases where no personnel dosimetry records exist.



Frequently Used Terms - continued

- **Overestimate**
- **Best Estimate**
- **Underestimate**
- **Partial Estimate**

Factors Impacting Dose Reconstructions

- Recorded and Missed Dose
- Radiation Types & Energies
- Cancer Type & Number
- Exposure Rate / Age / Latency
- Ethnicity (Skin Cancer)
- Smoking History (Lung Cancer)
- Claimant Favorability
- Special Exposure Cohort Designation

Basics of Dose Reconstruction

- **Use all available worker and workplace information to reconstruct dose**
- **Evaluate all doses of record for data quality shortcomings**
- **Evaluate potential for undetected dose**
- **Use recommendations established by national and international organizations**

Basics of Dose Reconstruction - continued

- **Prefer to use individual monitoring data if available and of sufficient quality**
- **Use standard methods to evaluate “missed dose”**
- **Rely on use of area dosimeters, radiation surveys, and air sampling if individual data are not available**
- **If no monitoring data, then use available data on source term, etc.**



Basics of Dose Reconstruction - continued

- **Annual organ doses are computed from date of first employment (as verified by DOL) to date of diagnosis**
- **When possible, provide an estimate of uncertainty**
- **Dose output will be compatible with IREP- the probability of causation software (Interactive RadioEpidemiological Program)**



Basics of Dose Reconstruction - continued

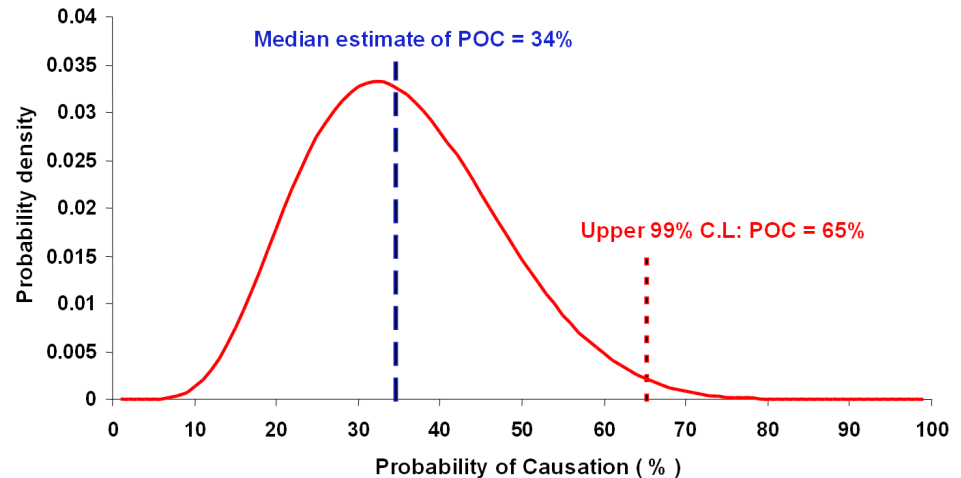
When individual dose monitoring results are not available, doses can be estimated using:

- **Co-exposure Models**
- **Surrogate Data**
- **Source-term modeling**

Probability of Causation

- The Act set the guidelines for determining probability of causation (PC or PoC).
- Eligible for compensation if the cancer was “at least as likely as not” caused by radiation on the job.
- $PoC \geq 50\%$

Applying Credibility Limits



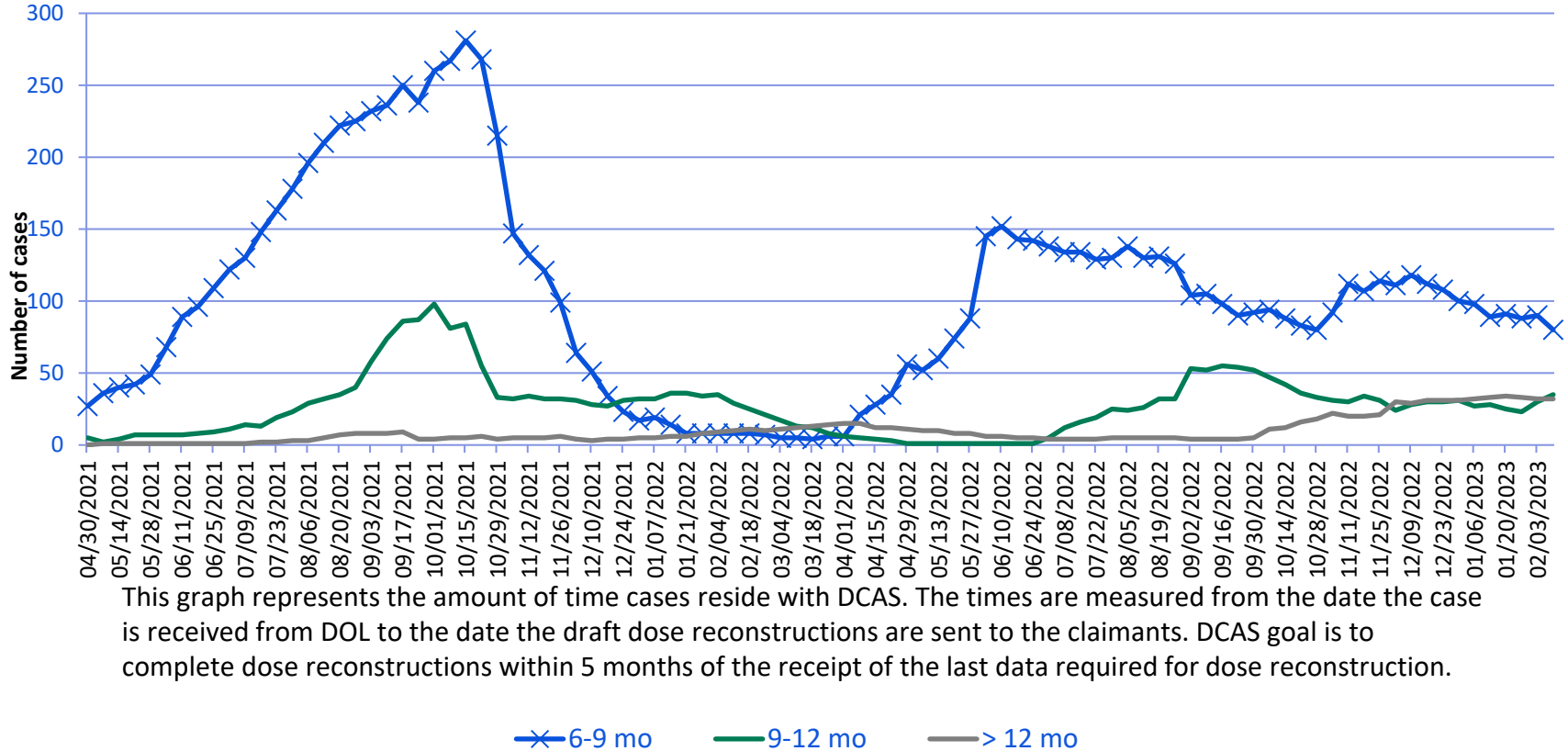
Claimant Favorable Approach

When a choice must be made between different approaches and there is no information about which approach is most technically accurate, NIOSH chooses the approach resulting in the highest probability of causation.

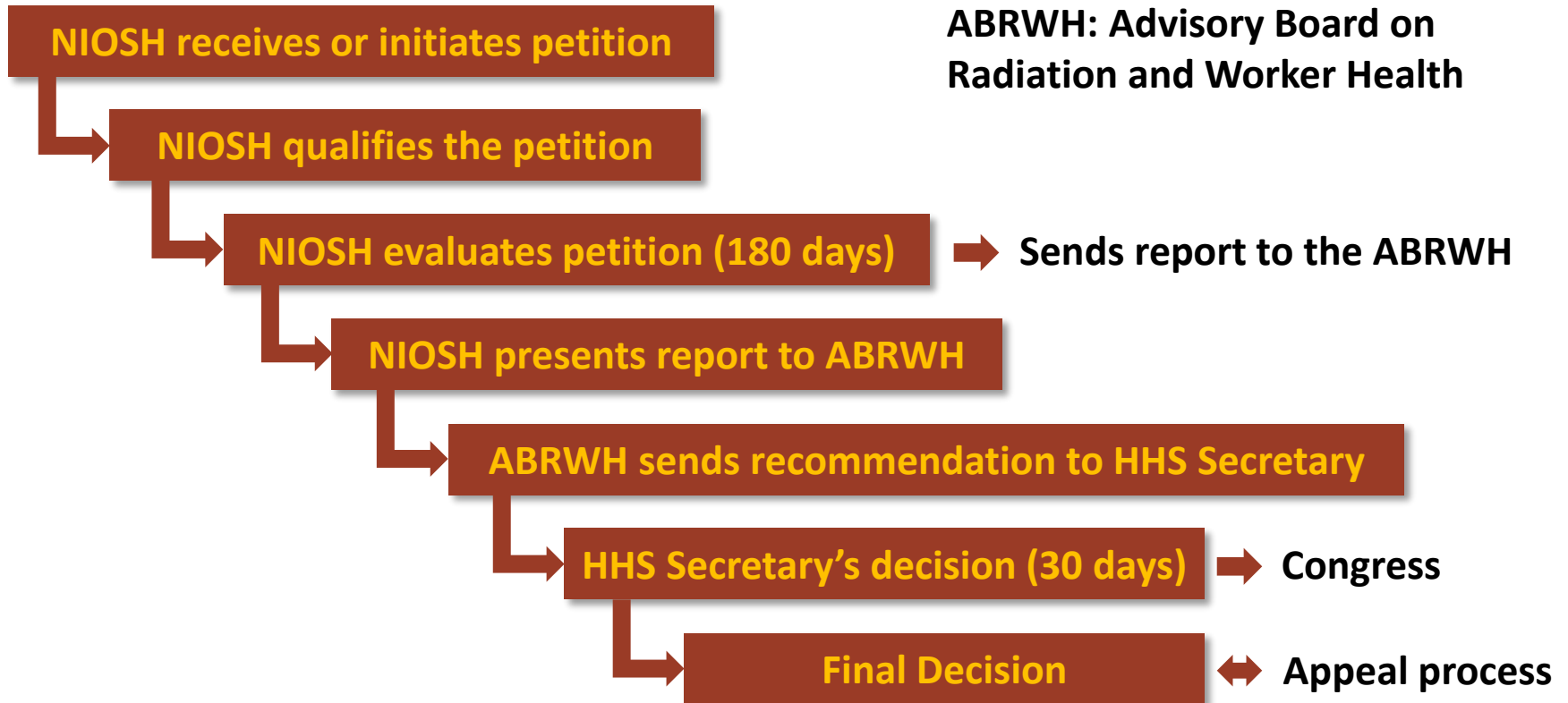
Some examples include:

- Conservative dose conversion factors
- Addition of potential missed dose
- Solubility class of radionuclide for internal dosimetry calculations
- Composition of aged WG plutonium
- Upper 99th percentile credibility limit to determine POC.

Age of Cases Since the Pause Began



Special Exposure Cohort Petitioning Process (42 CFR 83)



Nevada Test Site Special Exposure Cohort Designations

- Department of Energy (DOE) employees or DOE contractor or subcontractor employees who worked at the Nevada Test Site from January 27, 1951 through December 31, 1962 for a number of workdays aggregating at least 250 workdays, either solely under this employment or in combination with workdays within the parameters (excluding aggregate workday requirements) established for other classes of employees included in the SEC, and who were monitored or should have been monitored.

NTS Special Exposure Cohort Designations - continued

- All employees of the Department of Energy, its predecessor agencies, and its contractors and subcontractors who worked at the Nevada Test Site, from January 1, 1963 through December 31, 1992, for a number of workdays aggregating at least 250 workdays, occurring either solely under this employment or in combination with workdays within the parameters established for one or more other classes of employees in the SEC

22 Types of Cancer Covered by the SEC

Anytime

Bone cancer

Kidney cancer

Lung cancer (other than in-situ cancer that is discovered during or after a post-mortem exam)

Onset 2 Years after First Exposure

Leukemia (other than chronic lymphocytic leukemia)

Onset 5 Years after First Exposure

Multiple myeloma

Lymphomas (other than Hodgkin's disease)

Primary cancer of the:

- Bile ducts
- Brain
- Breast (female)
- Breast (male)
- Colon
- Esophagus
- Gall bladder
- Liver (except if cirrhosis or hepatitis B is indicated)
- Ovary
- Pancreas
- Pharynx
- Salivary gland
- Small intestine
- Stomach
- Thyroid
- Urinary bladder

General Information

513-533-6825
dcas@cdc.gov

SEC Petition Counselor
Phone 513-533-6831
jkinman@cdc.gov

Denise Brock
NIOSH Ombudsman
636-856-0487 or 636-236-0932
CKO7@cdc.gov

DCAS Website
www.cdc.gov/niosh/ocas

Questions?

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

