NIOSH epidemiologic studies of radiation-exposed workers and opportunities for coordination of low-dose radiation research

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Developing a Long-Term Strategy for Low-Dose Radiation Research in the United States
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The NIOSH mission is to develop new knowledge in the field of occupational safety and health and to transfer that knowledge into practice.

- Conduct research to reduce worker illness and injury, and to advance worker well-being
- Promote safe and healthy workplaces through interventions, recommendations, and capacity-building
- Enhance worker safety and health through global collaborations

Radiation research at NIOSH focuses on rigorous epidemiologic and exposure evaluation.

NIOSH Division of Field Studies and Engineering, Field Research Branch

- Conduct epidemiological studies of the health effects of occupational exposure to ionizing radiation
- Evaluate exposures to ionizing radiation and other chemical and physical exposures

NIOSH Division of Compensation Analysis and Support

- Reconstruct occupational radiation dose for certain workers with cancer who file claims under the EEOICPA

In previous DOE-HHS coordinated activities, NIOSH conducted important radiation research that directly informed worker protection.

- Occupational Energy Research Program (OERP)
  - ~250 completed research products
- NAS evaluation of OERP was favorable
- Main findings
  - Nuclear workers receive low average external ionizing radiation dose (10-20 mGy lifetime)
  - Evidence of a dose-response at low doses of external ionizing radiation for leukemia and solid cancers
  - Evidence of an association of absorbed organ dose from internally-deposited uranium with multiple myeloma and kidney cancer
  - Evidence of an association of both external ionizing radiation and internal dose from uranium with ischemic heart disease

NIOSH continues to conduct rigorous, high-impact radiation research on a variety of workers.

Exposures include:

- External ionizing radiation
- Internally-deposited radionuclides
- Galactic cosmic radiation and solar energetic particles at commercial aviation altitudes
- Non-radiological exposures

Outcomes include:

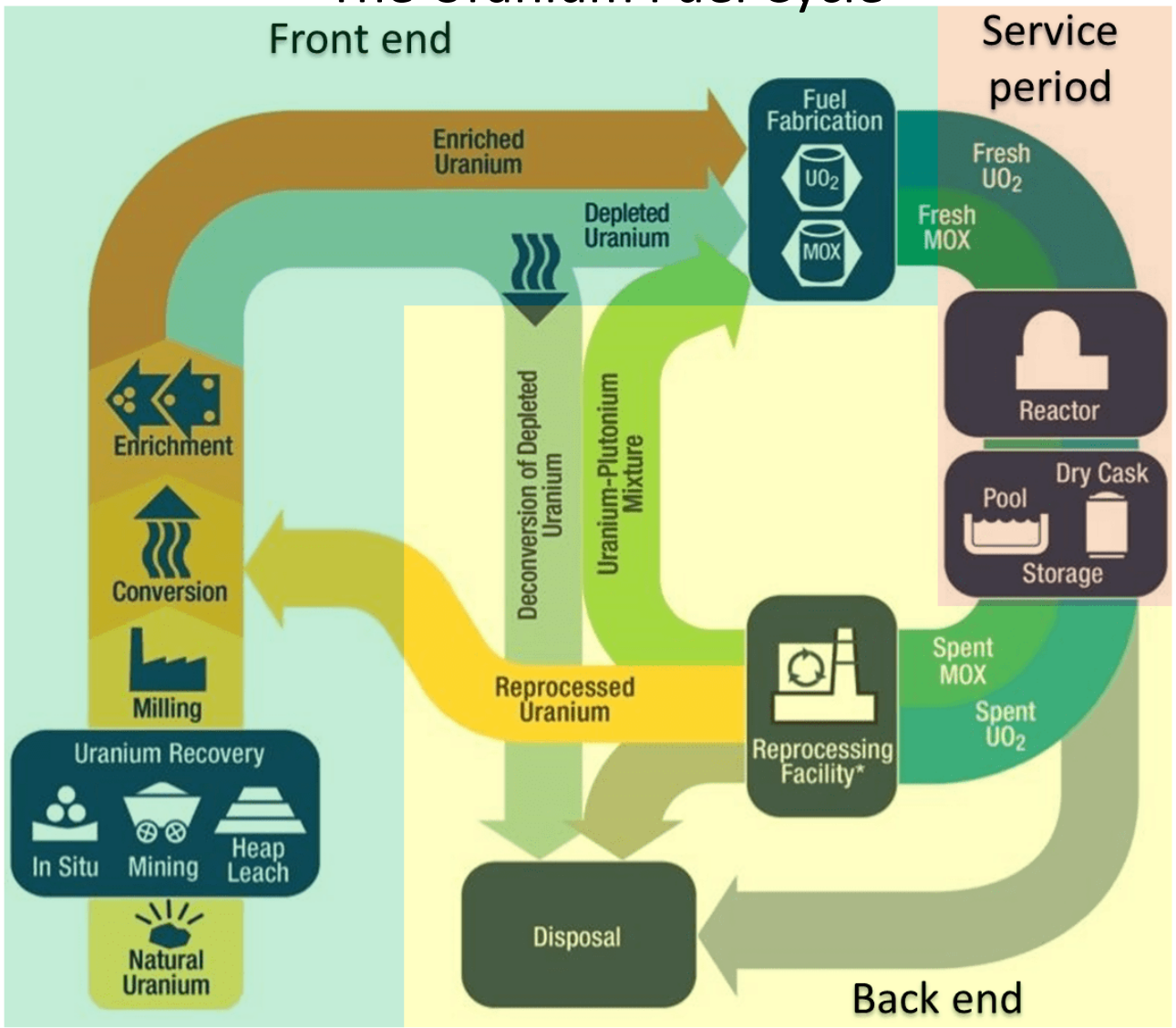
- Cancer
- Non-malignant respiratory and renal disease
- Cardiovascular and cerebrovascular disease
- Neurodegenerative disease
- Cataracts

NIOSH air crew studies have evaluated cancer risks from cosmic radiation exposure and circadian rhythm disruption and will use a novel approach to evaluate chronic disease risk.

Source: National Institute for Occupational Safety and Health

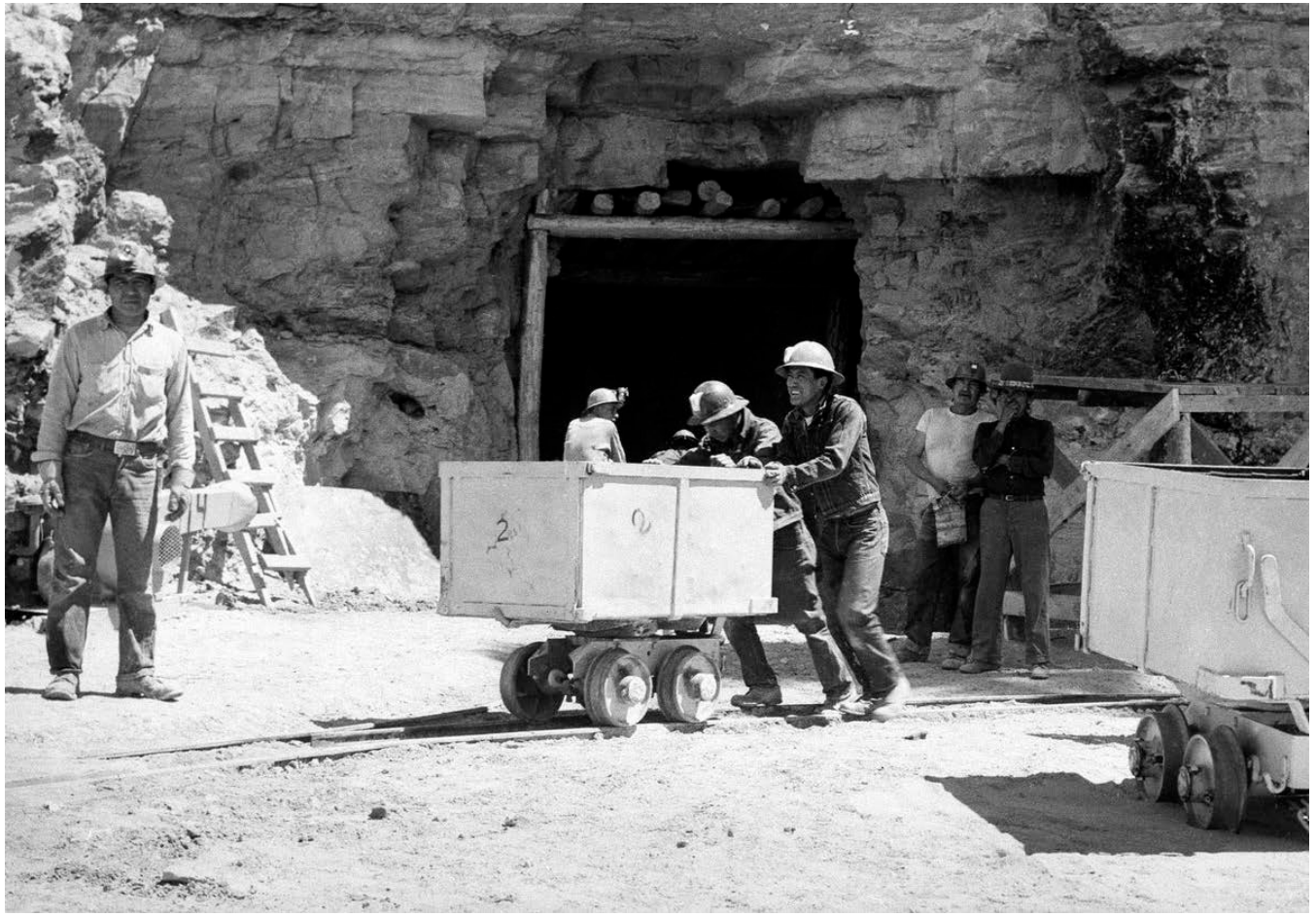
The NIOSH uranium workers study evaluates cancer and chronic disease mortality among workers employed in different phases of the uranium fuel cycle.

The Uranium Fuel Cycle



Source: Nuclear Regulatory Commission

NIOSH participates in the Pooled Uranium Miners Analyses (PUMA), which leverages historical data to understand risks of radon among contemporary workers.



NIOSH continues to study US nuclear workers and is an INWORKS partner. These studies provide important evidence on disease risks from low-dose external radiation.

There are avenues for NIOSH to coordinate with the DOE low dose program.

- DOE could provide data on employment, exposure, and any health follow-up for epidemiologic analysis by NIOSH.
- New DOE data would greatly further the NIOSH radiation research mission.
- This coordination could follow a similar structure to past OERP operations.
- Incorporating suggestions from the NAS assessment of the OERP and HHS-DOE coordination could facilitate data transfer.

NIOSH has unique radiation research capabilities that are useful assets for low-dose radiation research coordination.

- Statistical, epidemiological, and exposure assessment expertise specific to occupational radiation research
- Absence of financial or institutional conflicts of interest
  - Rigorous peer and tripartite review
  - Historically positive relationship with workers
- Long-established and standardized protocols for retaining, maintaining, updating, and analyzing nuclear worker data
- Long and successful history of participation in international pooled studies of workers exposed to low-dose radiation

Coordination with the DOE low dose program would align with the NIOSH radiation research priorities.

- Quantifying and controlling for sources of uncertainty affecting dose-response relationships
- Improving individual exposure assessment
- Evaluation cancer incidence and non-cancer mortality and incidence
- Expanding of research on neutrons, tritium, and plutonium
- Investigating potential synergistic effects between radiation and other agents
- Conducting research that overlaps with the NAS research recommendations.

Thank you. Questions?

Special thanks to my NIOSH radiation research colleagues who have assisted in the preparation of this presentation:
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