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December 6, 2021

## MEMORANDUM

To: U.S. House Judiciary Committee

From: Chris Shuey, MPH  
Director, Uranium Impact Assessment Program  
Southwest Research and Information Center  
[REDACTED]

Re: **SUMMARY OF RESEARCH FINDINGS SUPPORTING RECA REFORM  
LEGISLATION (H.R.5338 and S. 2798)**

### **Purpose and Summary**

This paper summarizes relevant studies and information regarding the health conditions of former uranium workers since enactment of the Radiation Compensation Exposure Act (“RECA”) of 1990 and its amendments of 2000. The particular focus of this report is on “Post-’71” uranium workers who worked after December 31, 1971 and are therefore not eligible for compensation benefits under the current provisions of RECA. Downwinder issues are not addressed in this report. Three major issues regarding Post-71 workers emerge from a review of recent and historic studies.

- Post-1971 workers experience lung disease as severe as Pre-1971 RECA eligible workers
- American Indian uranium workers continue to be disproportionately affected by mining exposures
- The Federal Government failed to enforce requirements of the 1977 Mine Safety and Health Act among uranium workers of the 1970s and 1980s.

The author of this paper has documented, studied and worked with former uranium workers, especially Navajo and Pueblo uranium miners, for more than 40 years. While this summary focuses on Post-1971 workers, it also reflects on the large body of published scientific and medical evidence that demonstrates the role of radiation exposure in miners’ disease profiles since creation of U.S. Government policies promoting the development and production of fissile material for the nuclear weapons program in the 1940s and 1950s.

**I. Post-1971 uranium workers experience lung disease as severe as Pre-1971, RECA-eligible workers, and in some cases, lung disease is more severe**

**Table 1** below summarizes scientific and medical literature on health status among Post-1971 uranium workers since 2000 – the last time RECA was amended. These recent studies are annotated in this section.

Table 1. Summary of Findings of Health Studies of Uranium Workers since 2000

Reference	Study Population (period)	Post-71 Workers	RECA-Eligible Workers	Findings/Health Endpoint(s)
Assad et al., 2019	169	122 (76 Native American)	47	No significant difference in abnormal chest X-rays, forced expiratory volume (FEV) and various lung diseases between the groups
Pueblo of Laguna Home Healthcare Workers (2019)	Members of Laguna Pueblo	402 eligible for RECA home healthcare	Not given	352 (87.6%) of the 402 former Laguna miners receiving home healthcare had medical diagnoses of pulmonary fibrosis, a RECA compensable disease
Al Rashida et al., 2018	7,215 (1989-2016)	Uranium miners: 3,151 (43.7%) Non-uranium miner: (56.3%)		U miners more likely to exhibit angina than non-uranium miners, even after adjustment for exposure covariates; OR = 1.51 (95%CI: 1.23-1.85)
Korcher et al., 2017	81	53 (66%)	55 (68%)	No significant difference in prevalence of abnormal chest X-rays indicative of pneumoconiosis between the Post-871 and RECA-eligible workers
Schabauer-Berigan (2009)	4,137 (779 NA)	<ul style="list-style-type: none"> <li>• No differentiation between groups</li> <li>• 826 White miners</li> <li>• 230 Native American miners</li> </ul>		Standardized mortality rates (SMRs): <ul style="list-style-type: none"> <li>• White miners: 3.99 (95CI: 3.43-4.62)</li> <li>• Native American miners: 3.27 (95CI: 2.19-4.73)</li> </ul>
Post-71 Uranium Workers Committee (Evers et al., 2009)	1,302 (survey conducted 2008-2009)	Self-reported respiratory disease: 68%                      71%		70% of respondents had one or more “uranium-related medical conditions,” as defined by federal agencies, only 9% had medical conditions compensable under RECA
Gilliland et al., 2000	94 Navajo men	67% of incident lung cancer cases (1969-1993) were attributed to uranium mining		Study population included Post-1971 U workers, but the exact proportion was not delineated.

Post-1971 workers have similar radiogenic lung disease patterns to Pre-1971 workers, according to recently reported studies from the University of New Mexico and the Miners Colfax Hospital in Raton, NM. (Kocher et al. 2017). Korcher’s group reported that of 81 miners who were examined at the Colfax mobile miners’ clinic, 68% of Pre-1971 workers and 66% of Post-71 workers had abnormal chest X-rays indicative of pneumoconiosis, a RECA-listed miners’ lung disease. The authors concluded that

*[T]he prevalence of abnormal chest radiograph pattern is **not significantly different** between pre-1971 and post-1971 uranium industry workers....This argues that post-1971 uranium industry workers should be screened for the presence of respiratory diseases and that expansion of RECA to this group may be warranted.*

A follow-up study by the UNM group also found little difference in abnormal chest X-rays,

forced expiratory volume (FEV) and various lung diseases between the Pre-1971 (N=47) and Post-71 (N=122) groups (Assad et al., 2019). The authors concluded that their findings

*[S]upport the conclusion that...uranium miners continued to be exposed to harmful levels of mining dust, resulting in a high burden of respiratory disease **among former uranium workers in New Mexico employed after 1971**. Our findings argue that medical screening for respiratory diseases...should be extended to post-RECA era uranium workers... [emphasis added].*

A larger study (al Rashida, et al., 2018) involving more than 7,200 New Mexico miners between 1989 and 2016 found that uranium miners (N=3,151 (43.7%)) were more likely to have angina than non-uranium miners (OR=1.51, 95%CI: 1.23 to 1.85), even after adjustment for exposure covariates. The uranium miners were older and more diabetic, but had lower smoking prevalence. This study demonstrated an association between cardiovascular disease and occupational radiation exposure. While it did not differentiate between Post-71 miners and Pre-RECA miners, it used data from the MiDUS (Mining Dust in the United States) database that covered a period in which many, if not most, of the uranium miners worked after 1971.

The al Rashida study (2018) found that uranium miners were older, less educated, and more likely to be American Indian than non-uranium miners. Uranium miners had a significantly higher prevalence of self-reported diabetes mellitus than non-uranium miners (P < 0.001). Absolute and percent predicted FEV1 values were also lower and self-reported prevalence of COPD was higher in uranium miners than in non-uranium miners (P < 0.001).

A lay survey of more than 1,300 Post-71 workers by the Post-71 Uranium Workers Committee (UWC) based in Milan, NM, between 2008 and 2009 (Evers et al., 2009) found that Pre-RECA and Post-RECA self-reported respiratory illnesses was roughly equivalent: 71% to 68%, respectively. And while more than 70% of respondents had one or more “uranium-related medical conditions,” as defined by federal agencies, only 9% had medical conditions compensable under RECA because of the limited number of uranium-related medical conditions defined in the statute (Evers et al., 2009). The Post-71 UWC findings were referenced and copies provided in Supplemental Written Testimony submitted on behalf of the Pueblo of Laguna to the U.S. Senate Committee on Indian Affairs following a field hearing on the effects of radiation in Indian Country in October 2019. (See, Senate Hearing Report 116-94, Oct. 7, 2019; <https://www.indian.senate.gov/hearing/field-oversight-hearing-america-s-nuclear-past-examining-effects-radiation-indian-country>.)

As a general matter, uranium workers of the Colorado Plateau are among the most studied occupational groups in the world, with more than 30 published papers and reports documenting their vital status since the early 1950s. A selected bibliography of studies between 2019 and 1952 appears at the end of this report. This record shows that underground miners exposed to radon and radon progeny had lung cancer mortality rates nearly four times that of the general population, and Native American miners, who were largely nonsmokers, had mortality rates 3.3 times greater in the most recent update of the Colorado Plateau miners cohort by researchers at the National Institute for Occupational Safety and Health (NIOSH) (Schabauer-Berigan et al., 2009).

Studies of literally thousands of uranium workers, many of whom worked exclusively after 1971, document a legacy of excess mortality and morbidity (Assad et al., 2019; Korcher et al., 2017; Schabauer-Berigan et al., 2009; Archer et al., 2004; Gilliland et al., 2000; Roscoe et al., 1995; Samet et al., 1991). Despite this large body of evidence, the preeminent scholar Dr. Victor Archer, considered one of the world's authorities in uranium miner lung diseases, concluded in 2004 that a "lung cancer epidemic" among American uranium miners was "inevitable" because researchers "disregard[ed] the European radon mine exposures and wait[ed] for strong evidence of lung cancer among U.S. uranium miners...during the [25-year] latency period" (Archer et al., 2004).

## ***II. American Indian uranium workers have increased risks of lung disease and other health problems compared with non-Indian worker.***

Lung cancer mortality among American Indian miners paralleled that of white miners on the Colorado Plateau for the follow-up period 1991-2005 (Schabauer-Berigan, et al., 2009). The standardized mortality ratio ("SMR") for lung cancer among American Indians was 3.27 (95% confidence interval: 2.19, 4.73) and 3.99 (95% confidence interval: 3.43, 4.62) among white miners. Mortality rates from silicosis, interstitial pulmonary fibrosis, multiple myeloma, and non-Hodgkin lymphoma remained highly elevated in the updated cohort, especially among the Native American miners. Significant trends were observed with increased radon exposure in silicosis and pulmonary fibrosis mortality.

RECA case workers on the Pueblo of Laguna reported in 2019 that of 402 Post-71 Laguna uranium workers reported to have received home health services, 352 (or 87.6%) had been diagnosed with pulmonary fibrosis, a RECA compensable disease (U.S. Senate, 2019 at 79). These individuals received their diagnoses from examinations conducted in a mobile van brought to the area by the Miners' Colfax Medical Center.

Gilliland and colleagues (2000) found that two-thirds of all incident (i.e., new) lung cancer cases among Navajo men between 1969 and 1993 were attributable to a single exposure, underground uranium mining. While the proportion of cases exclusively among miners after 1971 was not given, the period studied covered by the traversed the transition era (1971-1972). The authors concluded with a stark observation:

*The Navajo experience with uranium mining is a unique example of exposure in a single occupation accounting for the majority of lung cancers in an entire population.*

Studies finding excess mortality and morbidity among Native American miners (Brugge and Goble, 2002; Gilliland et al., 2000; Roscoe et al., 1995; Samet et al., 1984; Gottlieb and Husen, 1982; Wagoner et al., 1975) were particularly revealing because Native American miners were largely nonsmokers, reducing the influence of cigarette smoking as a confounder for lung cancer and nonmalignant respiratory diseases. Systematic underestimation of diminished lung function among Native American miners was attributed to the use of lung-function models based on White miners (Maple et al., 1997), while other studies of Navajo workers documented the evolution of exposure measurements and mortality studies (Brugge and Goble, 2002) and psychosocial impacts (Dawson and Madsen, 2011).

**III. *The Federal Government shares responsibility for Post-RECA workers' adverse lung and cardiovascular disease profiles because it failed to enforce requirements of the Mine Safety and Health Act among uranium workers in the 1970s and 1980s.***

The Mine Safety and Health Act (“MSHA”) of 1977 (PL 91-173 as amended by PL 95-164; 30 U.S.C. 811) imposed requirements on uranium mining companies to record in-mine exposures to gamma radiation and radon and radon progeny for each worker, and to report those exposures to a centralized database. Despite these rules, the Federal Government appears not to have enforced worker protections embodied in the law and its implementing regulations (30 CFR 50, 30 CFR 57.1) during much of the Post-1971 mining period.

In 2009 and 2010, when contacted by telephone and email, officials with Mine Safety and Health Administration (MSHA) in Albuquerque, NM, Denver, CO and Arlington, VA could not identify where the required exposure records were consolidated. NIOSH officials in Cincinnati provided a link to a spreadsheet that was said to contain exposure records reported by mining companies and by mines. Our examination of those data indicated that no information was compiled *prior to 1983* when most mines on the Colorado Plateau had closed. For example, the database contained only three entries for the Anaconda Company (or Atlantic Richfield or ARCO), which operated the massive Jackpile-Paguate Mine on the Pueblo of Laguna between 1952 and 1982, and only one entry for a worker at the Jackpile Mine. We know that hundreds, if not thousands, of men and women worked at the The Jackpile-Paguate Mine from 1952 to after its closure in 1982. At nearly 2,700 acres of distributed land inside an 8,000-acre lease area, the Jackpile Mine remains the largest open-pit uranium mine in the U.S.

The failure to enforce exposure measurements and reporting limited MSHA from reporting exposure data or vital health status among Post-71 uranium workers. As described above, an update of the Colorado Plateau Uranium Miners cohort by NIOSH (Schubauer-Berigan et al., 2009) included vital status among more than 4,000 miners, including those who worked between 1991 and 2005. As late as 2019, the Congressional Research Service (2019) noted that “[a]n expansion of RECA to cover post-1971 uranium activities would largely cover workers in the commercial uranium sector, which would expand the program *beyond its original statutory intent*” [emphasis added].

## **Conclusions**

As many of the studies reviewed here demonstrate, the Post-71 cohort was (1) not uniformly or consistently informed of the hazards of mining-related radiation exposures in the same ways that Pre-1971 workers were kept in the dark; (2) not protected by the Federal Government even after in-mine exposure standards and reporting requirements were enacted in the mid-1970s; and (3) suffers from the same radiogenic disease profile as currently compensated Pre-1971 workers. The moral, ethical and scientific reasons to include Post-1971 workers in the RECA program are no different than they were for Pre-1971 workers when RECA was enacted in 1990.

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