Investigation of Awareness and Knowledge of Workplace Hazards at the Portsmouth Gaseous Diffusion Plant

Piketon, OH, August 2022

A report completed with the support of OHIP, United Steelworkers Local 1-689, and the Tony Mazzocchi Center

Anna Stabnick, MPH Candidate, University of Michigan
Hannah Humphrey, BA Candidate, Oberlin College

Abstract:

Background:

This project was completed in partnership with the Occupational Health Internship Program (OHIP), the United Steelworkers (USW) Local 1-689, and the Tony Mazzocchi Center (TMC) to investigate for evidence of radiological and chemical exposures and deficiencies in worker health and safety training in an effort to expand eligibility for Special Exposure Cohort (SEC) status. The plant formerly enriched weapons-grade uranium, but these processes ceased in 2001, and the plant has had ongoing decommission and decontamination work since. The U.S. Department of Energy contracts the site to private contractors and subcontractors. Local 1-689 represents approximately 1,000 workers at the site. Expansion of the SEC will allow for a greater number of PORTS workers to be compensated and receive medical care coverage for treatment of health issues resulting from both radiological and chemical exposures at work.

Methods:

We surveyed 312 workers and conducted 14 worker interviews to investigate inadequacies in reporting and documentation of hazardous exposures to workers on plant site. Questions asked about workers' radiological and chemical exposures, health and safety measures, reporting and documentation methods, and perceptions of attitudes towards reporting in their workplace. Workers surveyed and interviewed represented a variety of job titles and time periods working at the site, both retired and current workers. We also reviewed union archives of documents supporting our findings that there have been shortcomings in hazard monitoring procedures.

Findings:

Most of our survey respondents did not qualify for SEC status. Questions asking about attitudes towards health and safety problem reporting indicate prevalent issues preventing comprehensive documentation of worker exposures including discouragement from reporting and threats of retaliation from their employer. We also found evidence that strongly supports the possibility that urinalysis bioassay procedures, a primary method of detecting and monitoring worker exposures, are inconsistent at best, and being willfully neglected at worst. Our evidence supports the case that while this has been an ongoing problem, it has become worse for workers in more recent time periods. While most workers had experienced a radiological or chemical exposure incident, most responded that these were rarely or never reported or documented. Survey data tells us that most workers frequently wore Radiation Dosimetry badges, but write-in comments and interview transcripts reveal that there is worker skepticism about the efficacy of radioactive exposures being detected and whether these are being correctly documented. Finally, while survey data indicates that workers feel they have sufficient health and safety training overall, narratives from interviews highlight concerning deficiencies in worker knowledge of safely working around chemical hazards.

Recommendations:

Based on our findings, we recommend cross-checking the SEM and survey data on reported chemical exposures to expand this database, further investigating the urinalysis bioassay program, investigating the change-out frequency of radiation dosimetry badges, and utilizing the archive directory to compile additional evidence of inadequate documentation and monitoring of worker radiological and chemical exposures.

Acronyms and Abbreviations used:

D&D - Decontamination and Decommission

DOE - Department of Energy

DOL -Department of Labor

EEOICPA - Energy Employees Occupational Illness Compensation Program Act

EPA - Environmental Protection Agency

HF - Hydrogen fluoride

HP – Health Physics/Physicist

IH – Industrial Hygiene/Hygienist

NIOSH - National Institute for Occupational Safety and Health

OHIP - Occupational Health Internship Program

PAPR – Powered Air Purifying Respirator

PCB - Polychlorinated biphenyls

PGDP - Paducah Gaseous Diffusion Plant

PORTS - Portsmouth Gaseous Diffusion Plant

PPE – Personal Protective Equipment

SEC - Special Exposure Cohort

TCE - Trichloroethylene

TLD – Thermoluminescent Dosimeter

TMC - Tony Mazzocchi Center

USEC - United States Enrichment Corporation

USW - United Steelworkers

Introduction:

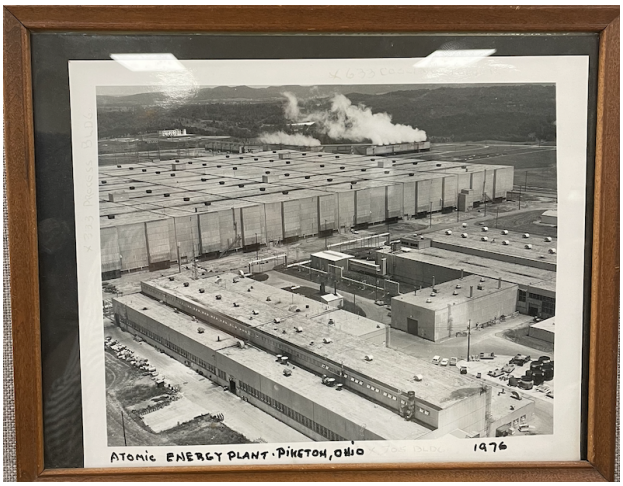
Plant Background:

In 1952, the United States Atomic Energy Commission announced plans for a new gaseous diffusion plant to increase production of fissionable materials in support of the Cold War. That same year, President Truman signed a bill appropriating the funds for expansions of the K-25 plant in Oak Ridge, Tennessee, and Paducah Gaseous Diffusion Plant in Paducah, Kentucky (PGDP) (1).

← Locations of Government Cold War Nuclear Facilities in the United States. *Photo from the Portsmouth Virtual Museum (portsmouthvirtualmuseum.org).*

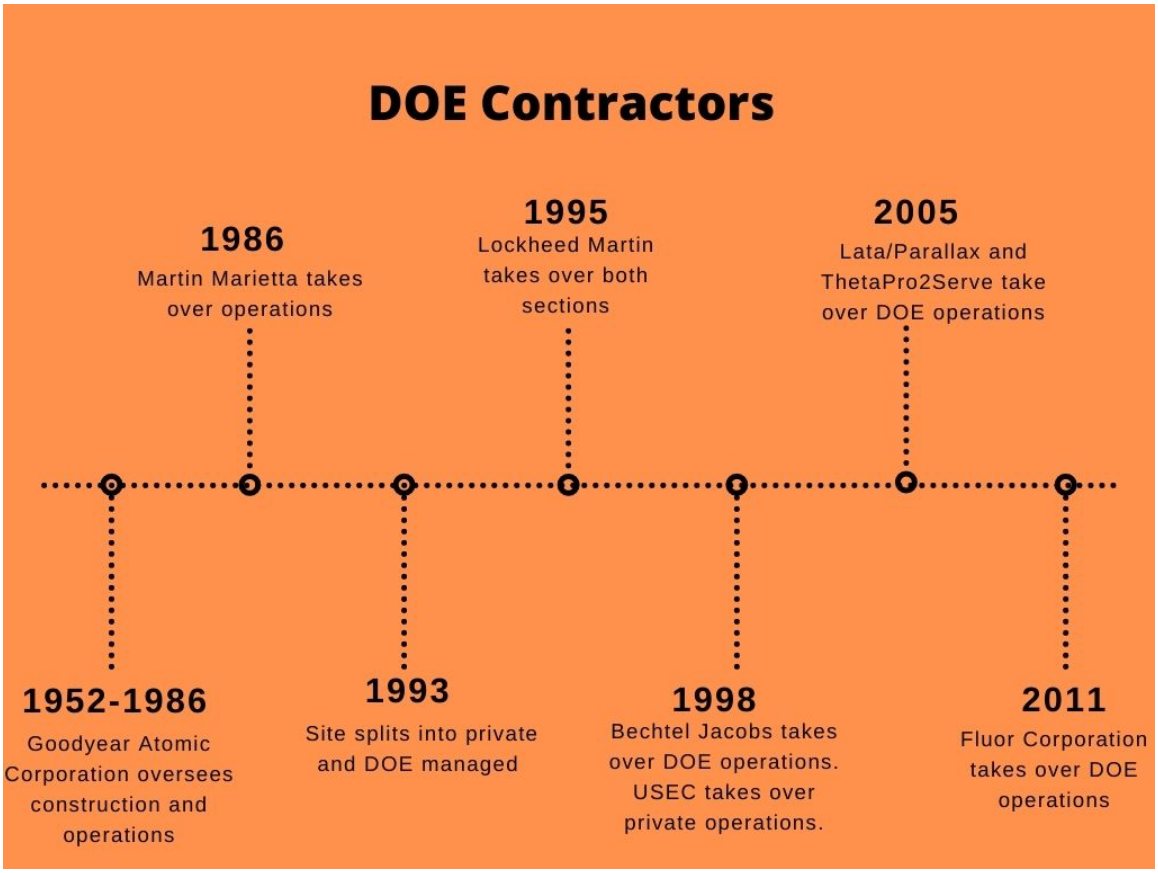
In November 1952, construction began in Pike County, Ohio for the new plant, which became the Portsmouth Gaseous Diffusion Plant (PORTS) (1). The completed plant covers approximately 3,777 acres with 109 buildings with approximately 500 acres of roofed area (1). In addition to process buildings, the plant operated as its own small community complete with a fire department, hospital, water/sewage plant, repair shops, garages, cafeteria, and office spaces. The job duties of workers at the plant were diverse in scope and daily activities. Job titles of plant workers included Project Workers, Laundry Workers, Radiological Control Technicians, Welders, Process Operators, Chemical Operators, Laborers, and Lab Workers, to name a few.

→Aerial photo of PORTS, 1976. *Photo taken at the Local 1-689 union hall, where the original photo is hung and framed.*



Uranium enrichment was the primary goal of production at PORTS, a process which resulted in an increased concentration of the radioactive isotope of uranium, U235, from two percent composition up to as much as 97% (2). Uranium containing lower concentrations of U235 was manufactured as fuel for commercial nuclear power plants, and highly enriched uranium (HEU, greater than 20% U235) supplied the U.S. Navy Propulsion Program and production of atomic weapons (2).

The site was initially operated by Goodyear Atomic Corporation from its construction until 1986, when operation was taken over by Martin Marietta Energy Systems Inc. In 1993, the plant split into a section managed by the U.S Department of Energy (DOE) and a section that was managed privately. Throughout its years of operations, different contractors operated the plant, each on with its own practices for protecting the health and safety of its workers (United States Enrichment Corporation (USEC) still runs the private section of the plant, and Fluor-Babcock & Wilcox (Fluor-BWXT) continues to run the part of the plant DOE is responsible for.



Uranium enrichment processes began in 1952. Production of HEU ceased in 1991, and all uranium enrichment processes ceased in 2001 when USEC transferred all enrichment operations to the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky (2).

Although PORTS is no longer the center of uranium enrichment, it remains the dominant employer in the local economy. Local 1-689 has nearly 1,000 workers, in addition to all of the (non-union) salaried workers on the plant site, making PORTS a large employer in the area (12).

The DOE began environmental clean-up in 1989 and is working with the Ohio Environmental Protection Agency (EPA) to carry out clean-up and environmental monitoring (3). Clean-up and Decontamination & Decommission (D&D) projects are ongoing at the site, along with efforts to repurpose leftover materials. Key parts of this project include waste management and the demolition of site buildings (4). In 2022, Congressman Tim Ryan won approval for a report to the Appropriations Committee on recycling 20,000 tons of nickel present at the plant (5).

Hazardous Exposures

The most monitored for and documented exposures at PORTS have been and continue to be radiation exposures from uranium and transuranics. It is well documented that long-term exposure to these low to moderate doses of ionizing radiation and contamination on plant site contributes to the development of many cancers (8).

While much attention has been paid to radiation-related health risks, workers at the plant have described that many of their health concerns come from non-radiological exposures including asbestos, beryllium, trichloroethylene (TCE), hydrogen fluoride (HF) gasses, heavy metals, polychlorinated biphenyls (PCBs), and chlorinated compounds. Without proper protection, these exposures are known to contribute to the development of cancers, in addition to non-cancerous conditions of the lungs and respiratory tract, skin, and cardiac and vascular systems (9, 10, 11).

Other hazards encountered by workers include exposure to noise and heat. While these exposures lead to worker health issues that should be reviewed and considered for their impact on workers' quality of life, they will not be the focus of this report.

Worker Health and Safety Protections

Health and safety protections are in place to protect workers from radiological and chemical exposures. Current measures to protect workers from radiological exposures include the establishment of labeled boundaries where radiological work is taking place and where personal protective equipment (PPE) is required. Worker protections from chemical exposures currently include use of some environmental controls including gas detectors, fume hoods, and ventilation, but protection heavily relies on the use of PPE including Tyvek protective suits, gloves, shoe covers, masks, and respirators.

Workers whose job duties specify working around radiation are required to obtain Radiological Work Permits (RWPs), which entails receiving health and safety training on exposure to radiation in the workplace. Safety training on handling chemicals is only required for workers whose duties require direct handling of those chemicals, and trainings exist for a select few hazardous chemicals including asbestos, cyanide, and beryllium.

Workers at PORTS are monitored for their exposures using badge dosimeters to detect radiation, and bioassays via urinalysis testing used to detect exposure to fluorine gasses and uranium exposure. An in-vivo test may be used to detect a worker's dose from chemical or radiological exposures, but these are rarely administered, and only after incidents that may have resulted in workers getting unusually high doses. Most chemical exposures are not regularly monitored.

One way that exposure incidents can be documented is through filing a problem report on the safety incident that caused the exposure. However, this is not a required process and must be initiated by the workers themselves.

Worker Health Outcomes

There has not been a comprehensive study of worker health outcomes for PORTS workers, but existing evidence points to higher rates of disease. According to the Ohio Health Department's 2019 Cancer Atlas, Pike County's cancer incidence rate is the second highest in the state with more than 500 cases per 100,000 residents (13).

Most of the evidence for worker exposures leading to disease comes from anecdotal case-by-case reports of workers having significant exposures and developing a related illness later in life. While these reports are numerous, lack of sufficient documentation of exposures, especially for workers hired before the 1990s, creates a significant challenge for both producing evidence for worker compensation claims and for epidemiological study of worker health.

The Energy Employees Occupational Illness Compensation Program Act (EEOICPA):

The Energy Employees Occupational Illness Compensation Program Act (EEOICPA) was created for those who worked for DOE at nuclear sites. Part B of the EEOICPA compensates workers or their surviving family members for illnesses or death caused by exposures to radiation (cancers), beryllium (Beryllium Disease), and silica (Silicosis), while Part E provides a system for compensation for illnesses caused by some chemical exposures. The Department of Labor (DOL) manages the program.

There are two ways that workers can receive compensation for radiation-related cancers:

1. Dose reconstruction:

   When a worker or surviving family member files a claim under Part B or E, the National Institute for Occupational Safety and Health (NIOSH) makes a recommendation based on how likely it is that the worker's illness was caused from the exposures they received at work. This process is called dose reconstruction. NIOSH uses data on exposures and worker employment in order to reconstruct the amount of radiological or chemical dose the worker received over their time employed at DOE sites. If NIOSH determines that the probability of causation (POC), or the likelihood that a worker's cancer was caused by radiation exposure at work, is greater than 50%, that worker qualifies for compensation under the EEOICPA. NIOSH attempts to make this process as claimant favorable as possible, erring in favor of workers where accurate dose reconstruction is difficult or impossible.

   To perform a dose reconstruction, NIOSH requests and reviews data from the DOE related to the worker's employment history and exposures. Then, they conduct a phone interview with the employee to verify information received from the DOE and ask about exposure incidents.

NIOSH also references stored data and documents on site exposures. For radiological exposures, they use Technical Basis Documents that include information on the site itself and specify how to reconstruct each type of radiological dose. For chemical exposures, there are Site Exposure Matrices (SEM) that connect chemicals to processes, buildings, and job titles. The SEMs are available online to workers to review as they report their exposures, and the public can submit both site specific and disease specific information for review to be added to the database (14).

Throughout the process, workers can request changes to documents and provide additional evidence to NIOSH to assist with dose reconstruction.

2. Special Exposure Cohort (SEC) status:

Under Part B of the EEOICPA, the second way that workers can be compensated is by qualifying for SEC status. SEC is by definition "a class of employees for whom sufficiently accurate dose reconstructions are not possible". For this reason, workers who fit the SEC class definition can be compensated for cancer claims without having to go through dose reconstruction. The PORTS SEC class is defined by the CDC as:

> *"Employees who worked at least 250 days before February 1, 1992, at a GDP in Paducah, KY, Portsmouth, OH, or Oak Ridge, TN, and who were or could have been monitored by dosimetry badges, and have one of the 22 specified cancers."*

The 22 cancers are: Bone, renal, leukemia, lung, multiple myeloma, lymphomas, bile ducts, brain, breast (female), breast (male), colon, esophagus, gall bladder, liver, ovary, pancreas, pharynx, salivary gland, small intestine, stomach, thyroid, and urinary bladder cancer. If a worker has a cancer that is not among those in this list, they can go through the dose reconstruction process, but these are difficult to get compensated for (the most common being non-melanoma skin cancers and prostate cancers).

SEC Petitioning Process:

If an employee, their survivor(s), their authorized representative, or a union believes that dose reconstruction is not possible for a particular class of workers, they can file a petition to NIOSH. In some circumstances, NIOSH may also realize on their own that they cannot accurately do a dose reconstruction, and they can initiate the process themselves. The petition must specify the buildings, job titles, and locations of exposures that were "unmonitored, unrecorded, or inadequately monitored or recorded", as well as describe those exposures. The petition can demonstrate a lack of monitoring or monitoring records not being reliable (due to being destroyed, falsified, or lost), or it can rely on expert or scientific reports. NIOSH then reviews the petition with the information they have available and makes a report to the Presidential Advisory Board on Radiation and Worker Health. The Advisory Board then holds a public meeting where petitioners can make comments (7). Afterwards, they make a recommendation to the Secretary of Health and Human Services, who makes a final decision and presents it to Congress.

Objectives & Methods

This investigation is the first part of a larger project to increase the number of workers being compensated for health conditions resulting from working at a DOE-contracted nuclear facility.

Working towards this objective, the strategy of USW Local 1-689 is to file a petition to expand the SEC at PORTS for workers who do not currently qualify, and to gather information to expand the SEM so that hazardous chemical exposures are better documented for when workers file for compensation under part E of the EEOICPA.

To support the efforts of Local 1-689, we compiled evidence that workers not included in the SEC are still experiencing hazardous chemical and radiation exposures, and that the documentation of these exposures is insufficient or missing, leading to the determination that a dose reconstruction cannot be adequately performed.

Because we couldn't physically be on-site, we relied on information from workers and the union's archives to inform our investigation.

A. Background Research

We attended a NIOSH dose reconstruction workshop to learn the details of the dose reconstruction process. We also attended union hall meetings in which this project was discussed to better understand what the goals and ideal outcomes of this project would be and what kinds of evidence are needed for the petition.

To complete the written background on the plant, worker health, and the details of the EEOICPA legislation, information was gathered from a NIOSH-written booklet on the dose reconstruction process, internet research on the plant and workers' compensation legislation, information from a presentation created by our site leader on the most pressing concerns regarding worker health, and information gathered from informal conversations with workers, retirees, and union leadership and benefits representatives.

B. Union Archives

Local 1-689 has an archive of health and safety issues at the plant. We created a directory of relevant files including scientific reports on hazards and their presence on site, problem reports that were filed about health and safety issues, news stories, contractors' plans and reports, safety procedures and training, safety data sheets, meeting minutes, emails, faxes, letters, memos, and handwritten notes.

C. Surveys

To develop a survey, we met regularly with a small team that included retirees, a union benefits representative, union leadership, and our site leader. Our conversations during these meetings informed the direction of the survey including length, structure, design, topics covered, and methods of distribution. The survey gathered information about the kinds of radiological and

chemical exposures workers experienced, how well they were prepared for that exposure with the use of PPE and/or proper training, and the practices documenting and reporting health and safety issues. The survey was built, and tested for length, readability, and accuracy by test-administering the survey to those on the team who currently or formerly worked at the plant.

Physical copies were produced for physical distribution, and a digital version of the survey was built into Qualtrics. The survey was distributed at two retiree events, two union meetings, and was handed out to workers who were present in the union hall during the period of data collection. The digital version of the survey was circulated on worker Facebook pages and published to the Local 1-689's website. The period of data collection was approximately two weeks in which 312 surveys were collected.

D. Qualitative Interviews

The interview guide was developed with the input and feedback of the same team that was involved in the development of the survey. The document was composed of question categories with one central question followed by a bulleted list of potential follow-up questions, intended as a guide to the interview structure, and not as a script to be followed verbatim. Interview questions were designed to gather worker descriptions of radiological and chemical work processes and exposure incidents, and perspectives on safety practices, documentation and reporting practices, and workplace safety practices.

We conducted 14 semi-structured interviews with current and former workers at PORTS. Interviews were recorded and transcribed using Otter.ai and transcripts were reviewed and hand-edited for accuracy, removing identifiable information to preserve participant confidentiality.

E. Analysis

Statistical analysis of surveys was conducted using R and Qualtrics Stats iQ. An unstructured qualitative review of interviews was done to pull significant quotes reporting on common themes of the interviews, and themes that supported or added context to the results we gathered from the survey.

Survey Results

There were 312 total responses to the survey, with 206 completed in full and 106 partially completed. Most survey respondents did not qualify for the SEC, with 63.6% indicating that they did not work at the plant for 250 days prior to February 1, 1992. About 71% worked at the plant at some point after 1990 (Figure 1). All job titles listed in the survey responded, with the largest groups being D&D Workers (55), Project Workers (46), and Radiological Control Technicians (32) (Table 1). The Other category was checked by 88 survey respondents, and the most common job titles listed in this category were Janitors (14), Non-Destructive Assay (NDA) Technicians (9), and Escorts (7) (Table 1).

Respondents were asked to check the buildings that they primarily worked in. Of the buildings that respondents worked in, the most frequently checked were the three process buildings, the X-333 (158), the X-326 (154), and the X-330 (153) (Table 2). The survey also asked if respondents were frequently working between multiple buildings, to which 92.4% of respondents responded "Yes".

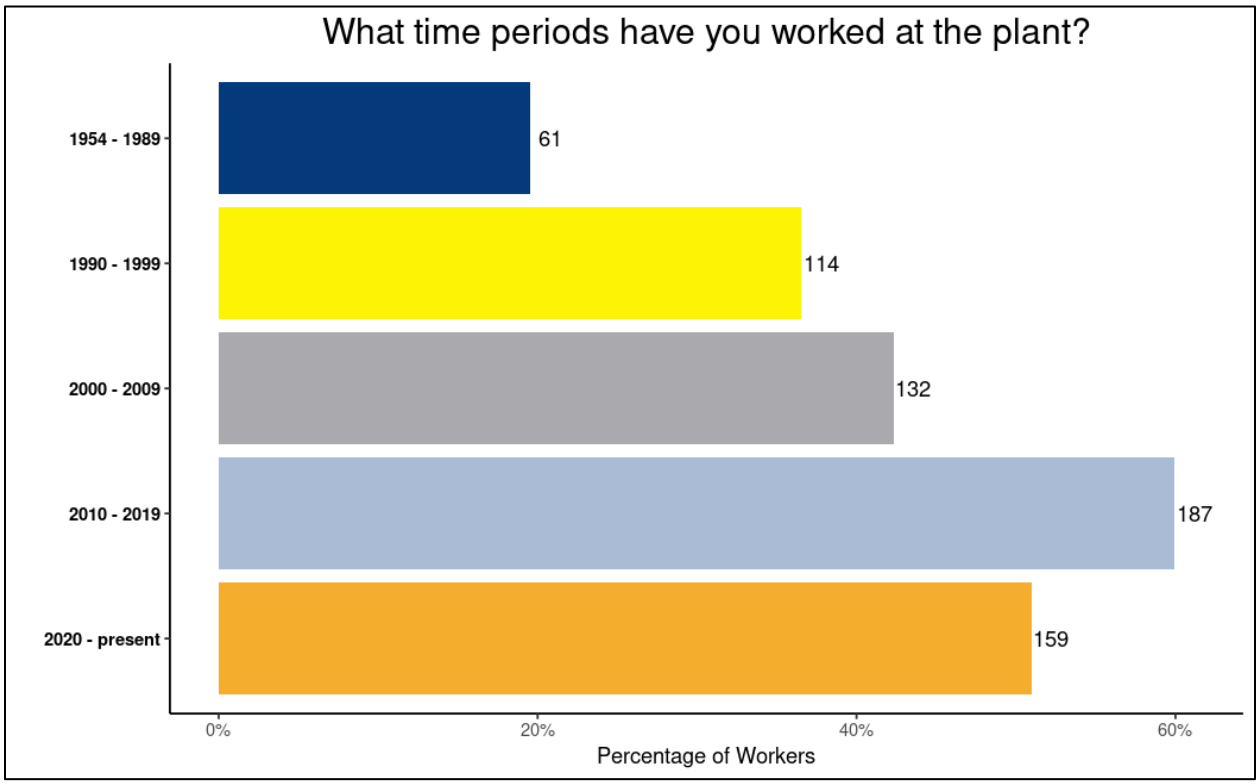


Figure 1: *Number of survey respondents that worked at the plant in each time period 1954 - 1989, 1990-1999, 2000-2009, 2012-2019, and 2020-present. Percentages were calculated out of the total number of respondents (N = 312).*

Table 1: *Job classifications of survey respondents.*

Job Title	Count
Chemical Operator	23
D&D Worker	55
Electrician	18
Fire Department	12
Instrument Technician	18
Lab Worker	8
Laborer	26
Laundry Worker	21
Maintenance Mechanic	27
Power and Utilities Operator	9
Process Operator	30
Project Worker	46
Radiological Control Tech/IH	32
Security/Police Force	11
Supervisor	24
Uranium Material Handler	24
Welder	8
Other	88

Table 2: *Buildings worked in by survey respondents.*

Building Name	Count
X-111A/B Special Nuclear Material (SNM) monitoring portal	21
X-300 Plant Control Facility	75
X-326 Process Building	154
X-330 Process Building	153
X-333 Process Building	158
X-340 Complex	115
X-342(a) Feed Vaporization and Fluorine Generation Facilities	97
X-343 Feed & Sampling Facility	109
X-344A Feed Manufacturing/ UF_6 Sampling Facility	85
X-345 Special Nuclear Materials Storage	77
X-600 Steam Plant	83
X-611 Water Treatment Plant	81
X-626 Recirculating Water Pump House and Cooling Tower	47
X-700 Convertor Shop and Chemical Cleaning Facility	110
X-705 Decontamination Building	125
X-705E Oxide Conversion Facility	54
X-710 Technical Services Building	110
X-720 Maintenance and Stores Building	141
X-744G Aluminum Smelter and Recovery	69
X-770 Mechanical Testing Building	40
X-7725 Waste Storage Facility	75
Other	89

A. Discouragement and Intimidation in Problem Reporting

It has been observed by workers that practices of discouragement and intimidation in filing problem reports are prevalent.

Most workers indicated that they could identify and describe the process they would go through to file a problem report. When asked how often workers felt they could identify and describe the process of reporting a health and safety concern, 85.5% of those who responded to the question said that they felt they knew this process "Most of the Time" or "Always", and 69.2% reported being confident in their ability to go through it "Most of the Time" or "Always" (Figures 2, 3).

However, 46.1% of survey respondents indicated that they felt reporting was discouraged "Most of the Time" or "Always", and 48.7% said that there was a perceived threat of retaliation against workers who report health and safety issues at work "Most of the Time" or "Always" (Figures 4, 7). Only 12.0% felt that there was "Never" a threat of retaliation for reporting (Figure 7).

While most respondents felt that when health and safety hazards were identified at work, measures were taken to ensure it was addressed, it should be noted that only 12.4% indicated that this was "Always" the case (Figure 5). Additionally, while workers generally felt that their employer took health and safety issues seriously, about a quarter (25.8%) felt that for their employer, this was "Rarely" or "Never" the case (Figure 6).

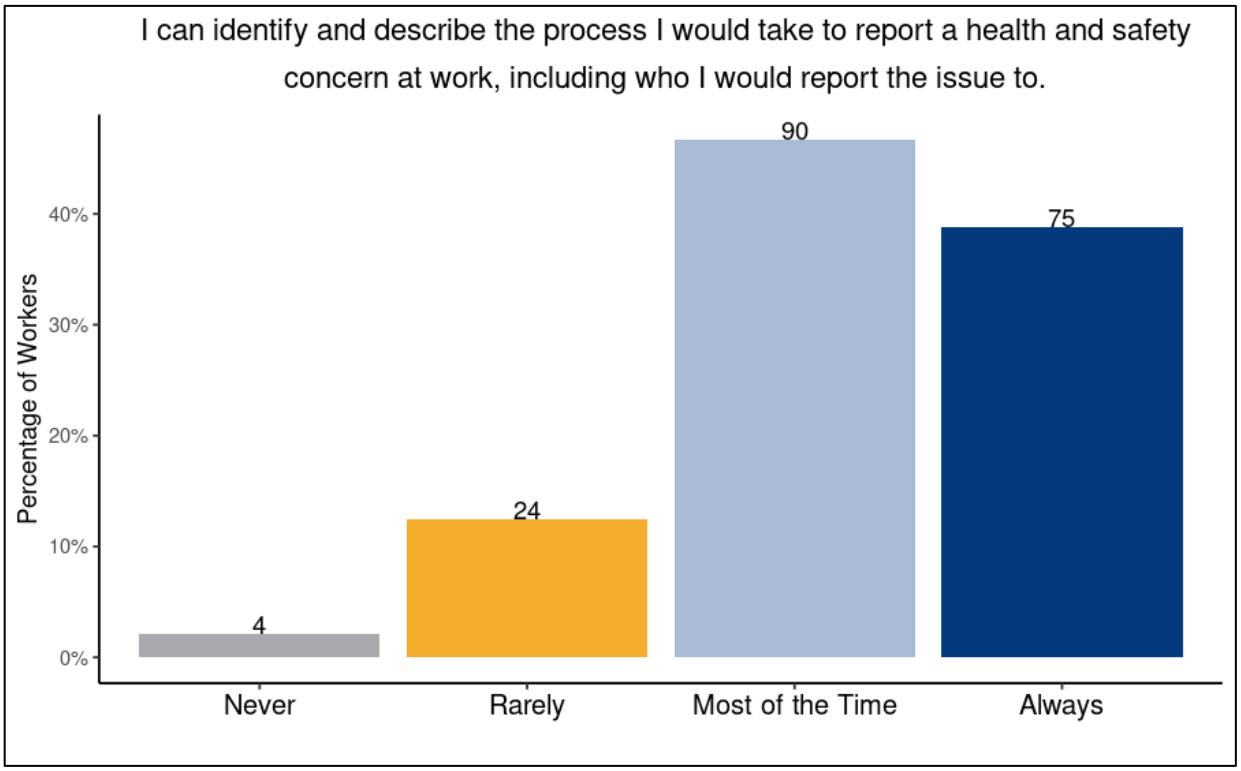


Figure 2: *Worker knowledge of the problem reporting process. Percentages were calculated out of those who responded to this question (N = 193).*

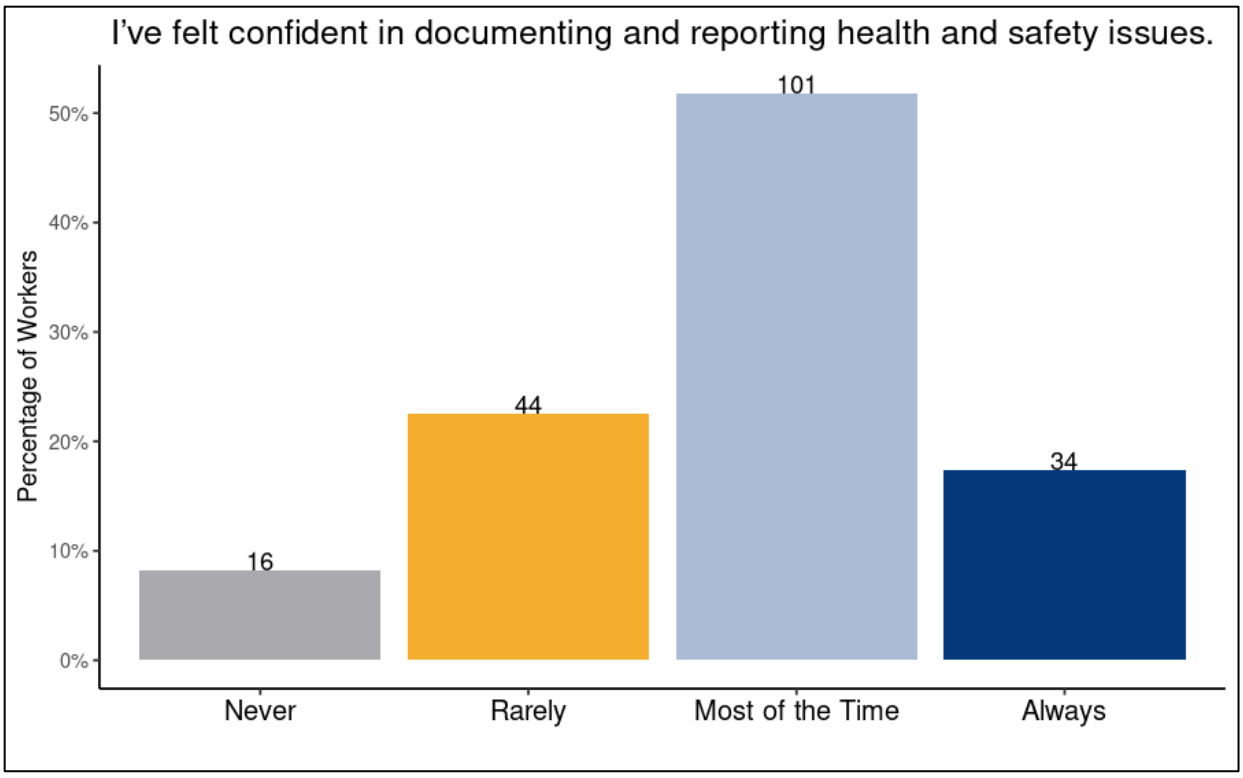


Figure 3: *Worker confidence in documenting and reporting health and safety issues. Percentages were calculated out of those who responded to this question (N = 195).*

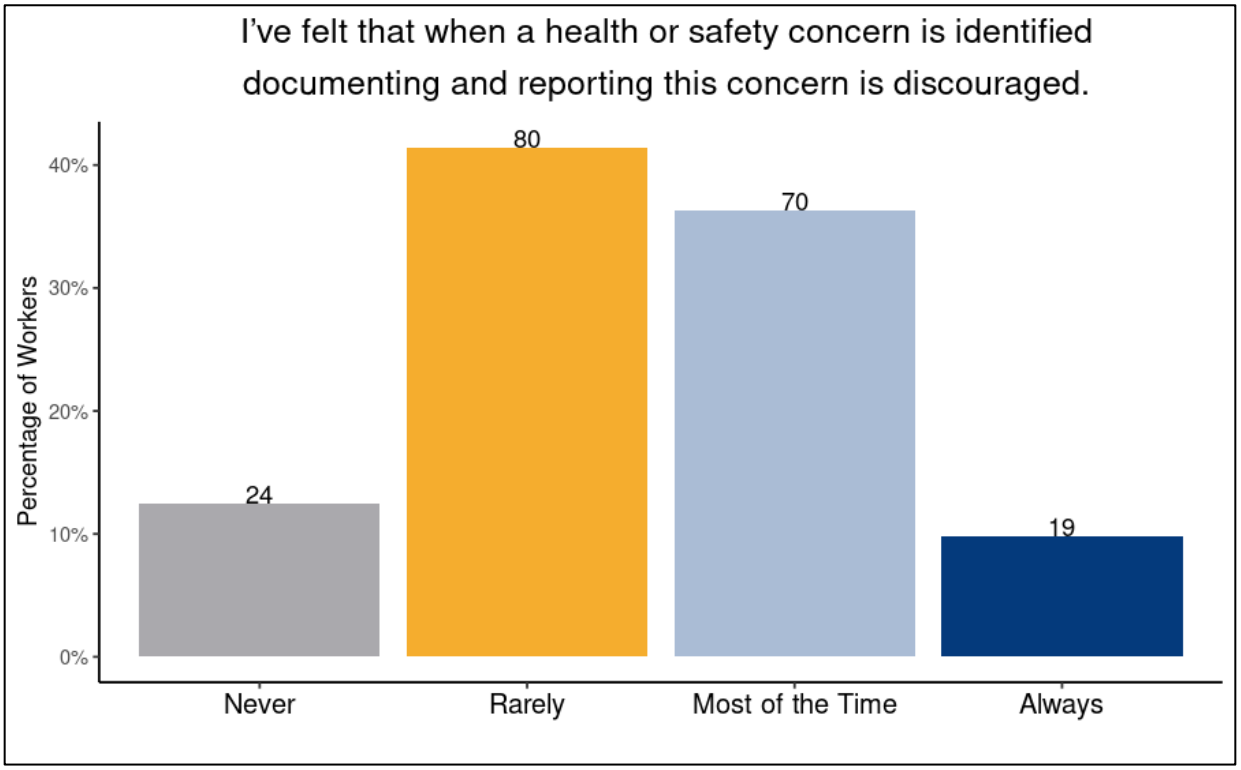


Figure 4: *Worker perceptions of discouragement in documenting and reporting health and safety issues. Percentages were calculated out of those who responded to this question (N = 193).*

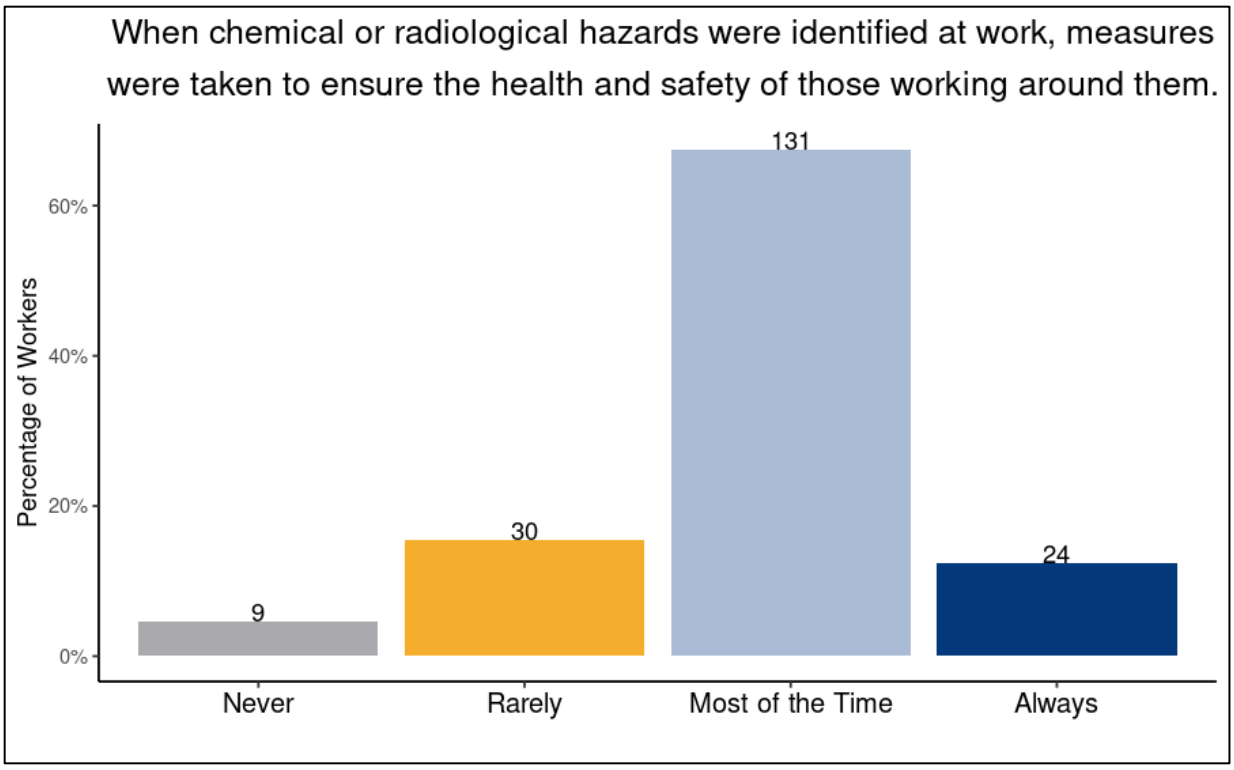


Figure 5: *Worker perceptions of workplace response to health and safety issues being identified. Percentages were calculated out of those who responded to this question (N = 194).*

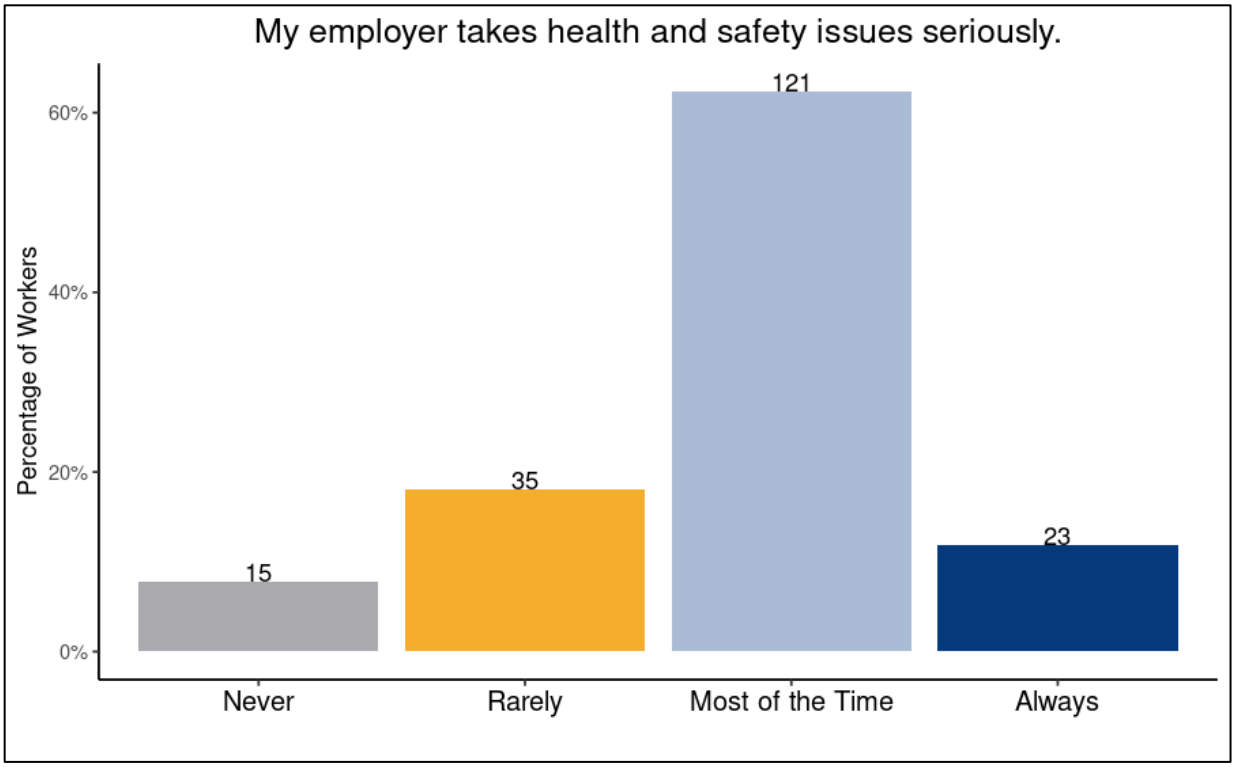


Figure 6: *Worker perceptions of employer's attitude towards health and safety issues. Percentages were calculated out of those who responded to this question (N = 194).*

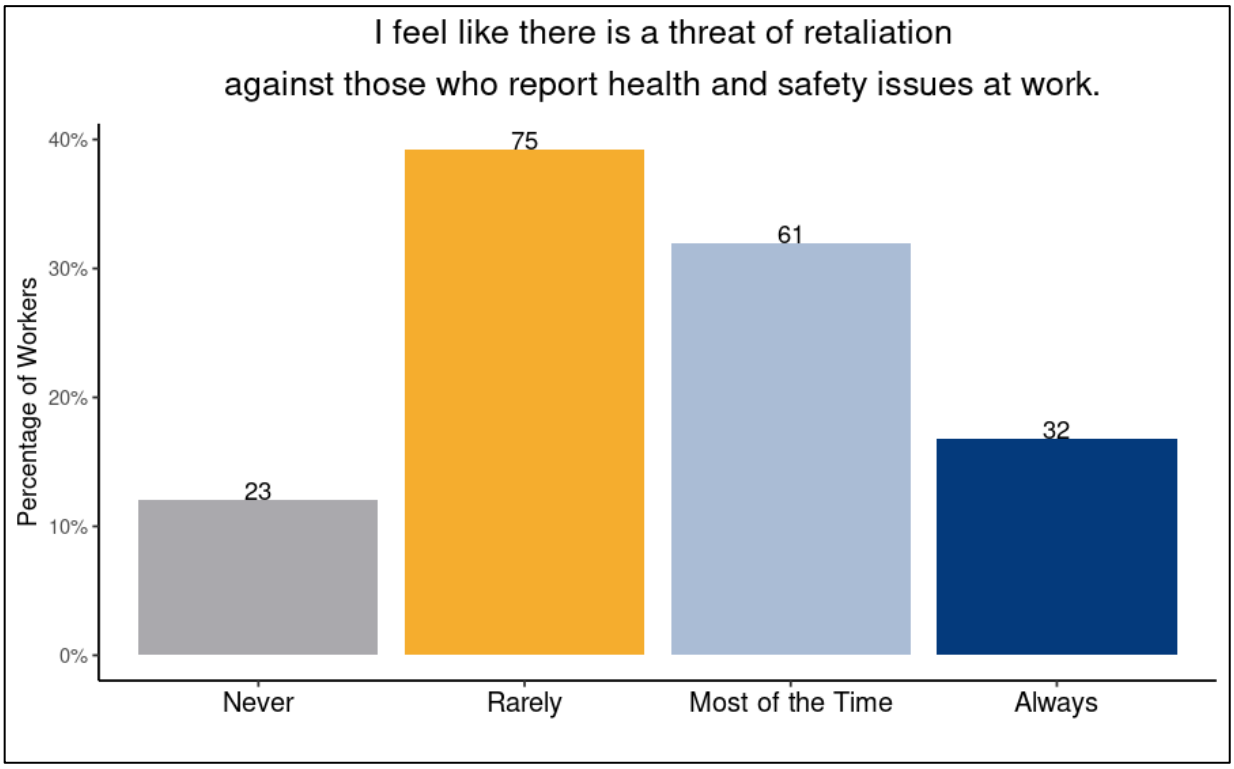


Figure 7: *Worker perceptions of a threat of retaliation against those who report health and safety concerns. Percentages were calculated out of those who responded to this question (N = 191).*

B. Inconsistent Urinalysis Procedures

There has been worker skepticism about whether urinalysis procedures were being correctly followed for how often workers should be reporting to give a urine sample, an important tool that, if used correctly, could pick up on worker radiological dose. Just over half of survey respondents (179, 57.4%) reported participating in urinalysis testing at some point during their employment (Figure 8). Of those who participated in urinalysis, most respondents had participated in urinalysis on a yearly schedule (64.2%) or just after an exposure incident (45.3%), with fewer having ever participated in monthly (38.0%) or weekly (4.5%) testing schedules (Figure 9).

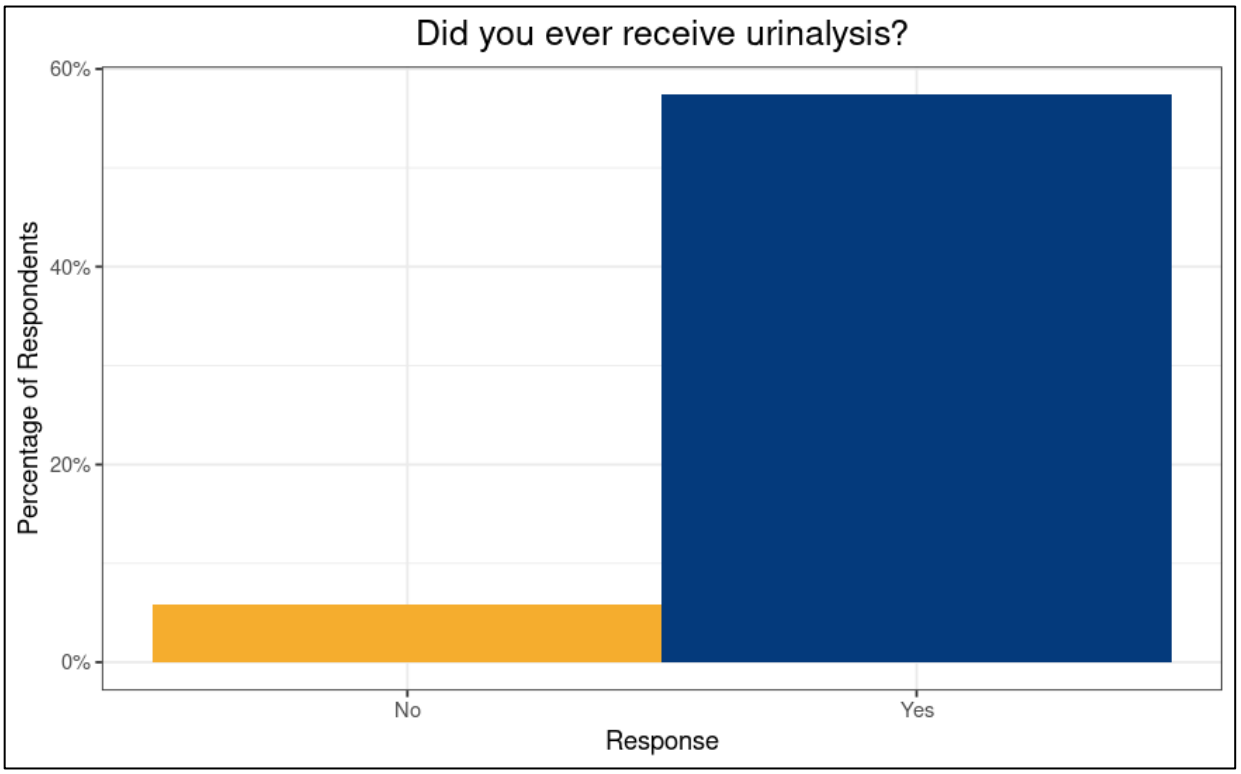


Figure 8: *Respondents that had ever participated in the urinalysis bioassay sampling program. Percentages were calculated out of all survey respondents (N = 312).*

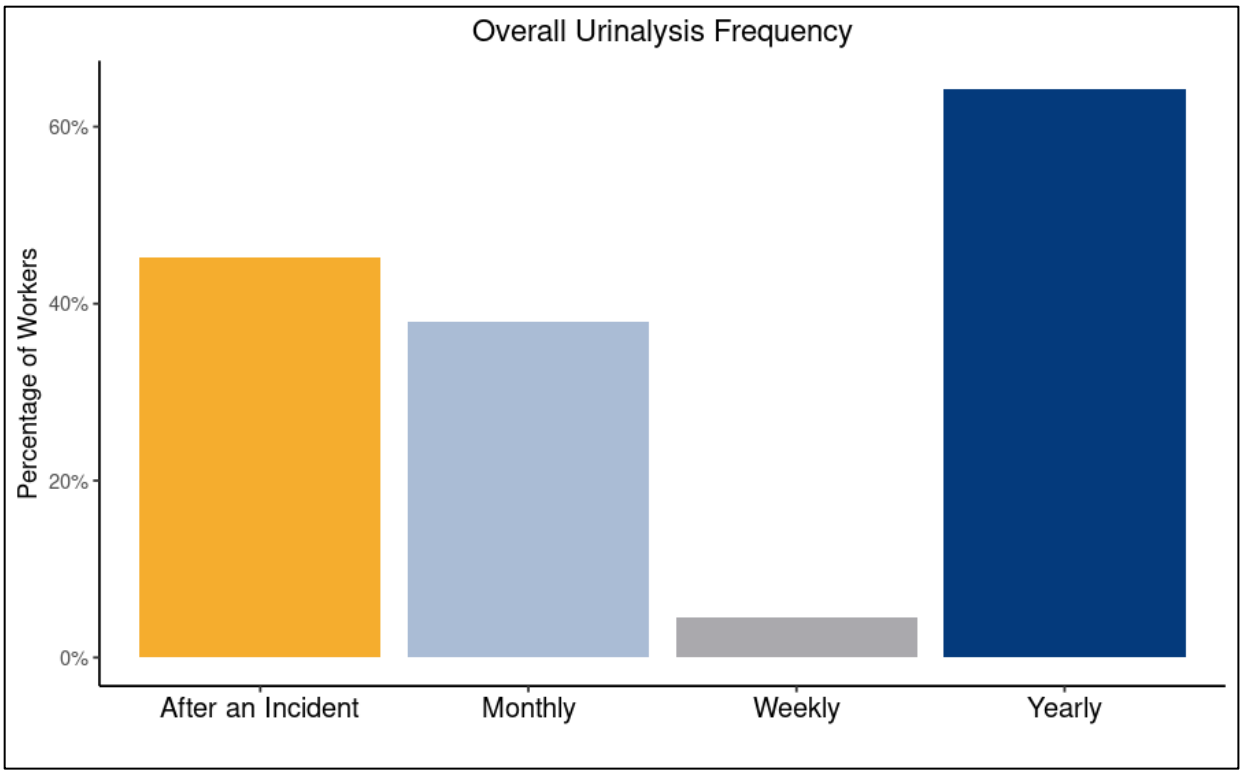


Figure 9: *Overall distribution of respondents' frequency of urinalysis during their employment. Percentages were calculated out of all respondents that indicated they had gone through urinalysis testing at some point during their employment (N = 179).*

To understand how this might have changed over time, we asked about the frequency of urinalysis testing for workers stratified by the time periods they worked in.

First, we examined how many workers underwent any kind of urinalysis testing, broken down by time period. As shown in Figure 10, in the first four time periods, the proportions of people reporting any urinalysis testing were fairly consistent (starting with the time period 1954-1989 and listing chronologically, the proportions of workers who reported giving urinalysis in these time periods were 68.9%, 71.1%, 78.8%, and 81.3%). There is a notable drop in the proportion of workers reporting any kind of urinalysis testing between the last two time periods, 2010-2019 and 2020-present, in the latter only 62.9% reporting urinalysis testing (Figure 10)

Because survey respondents could indicate that they worked in multiple time periods and the question asking about frequency of urinalysis was not tied to a time period, the categories were made by filtering for those that worked in the indicated time period, and not in any of the time periods prior, allowing us to see how urinalysis procedures changed for workers hired in sequentially later time periods.

As shown in Figure 11, there was a gradual decrease in the numbers of workers giving monthly and weekly urinalysis samples over time. While about 16.7% of respondents that worked at some point in the time period 1954-1989 and gave urinalysis were giving weekly samples, only 2.3% of those

that worked at some point in the time period 1990-1999 and not prior who gave urinalysis samples reporting giving weekly samples, and no respondents that only worked in the year 2000 or later and gave urinalysis samples gave weekly samples (Figure 11). This trend is consistent for those who underwent monthly urinalysis sampling, which was 61.9% of respondents in the time period 1954-1989, 51.2% of respondents in the time period 1990-1999 and not prior, 36.7% of respondents in the time period 2000-2009 and not prior, 15.5% of respondents in the time period 2010-2019 and not prior, and none of respondents in the time period 2020-present and not prior (percentages calculated out of all workers who worked and gave urinalysis samples during that time period) (Figure 11).

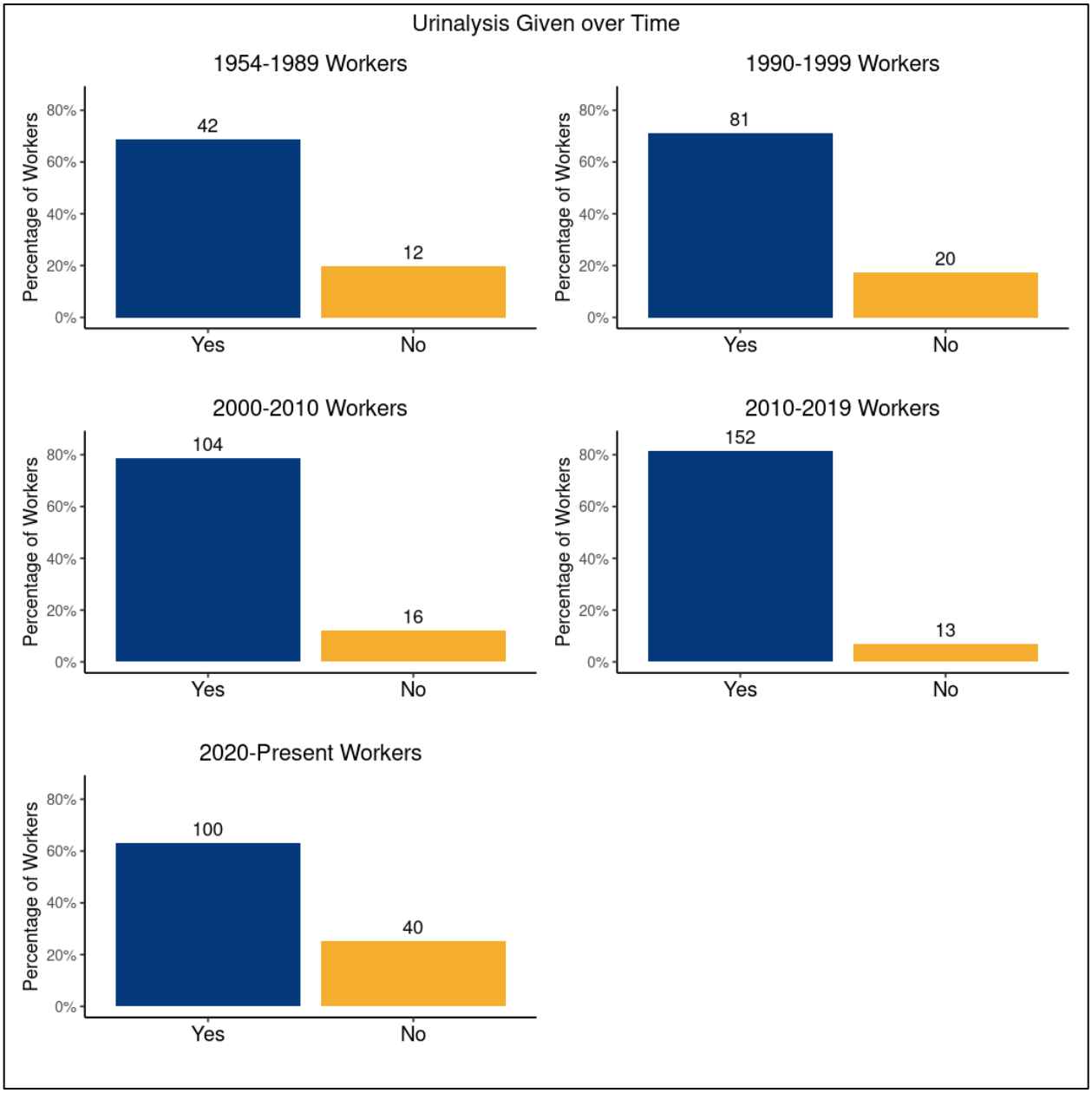


Figure 10: *Frequency of reporting undergoing any urinalysis testing by time period. Percentages were calculated out of the total number of workers that worked in each time period (starting with the time period 1954-1989 and listing chronologically, N = 61, N = 114, N = 132, N = 187, N = 159).*

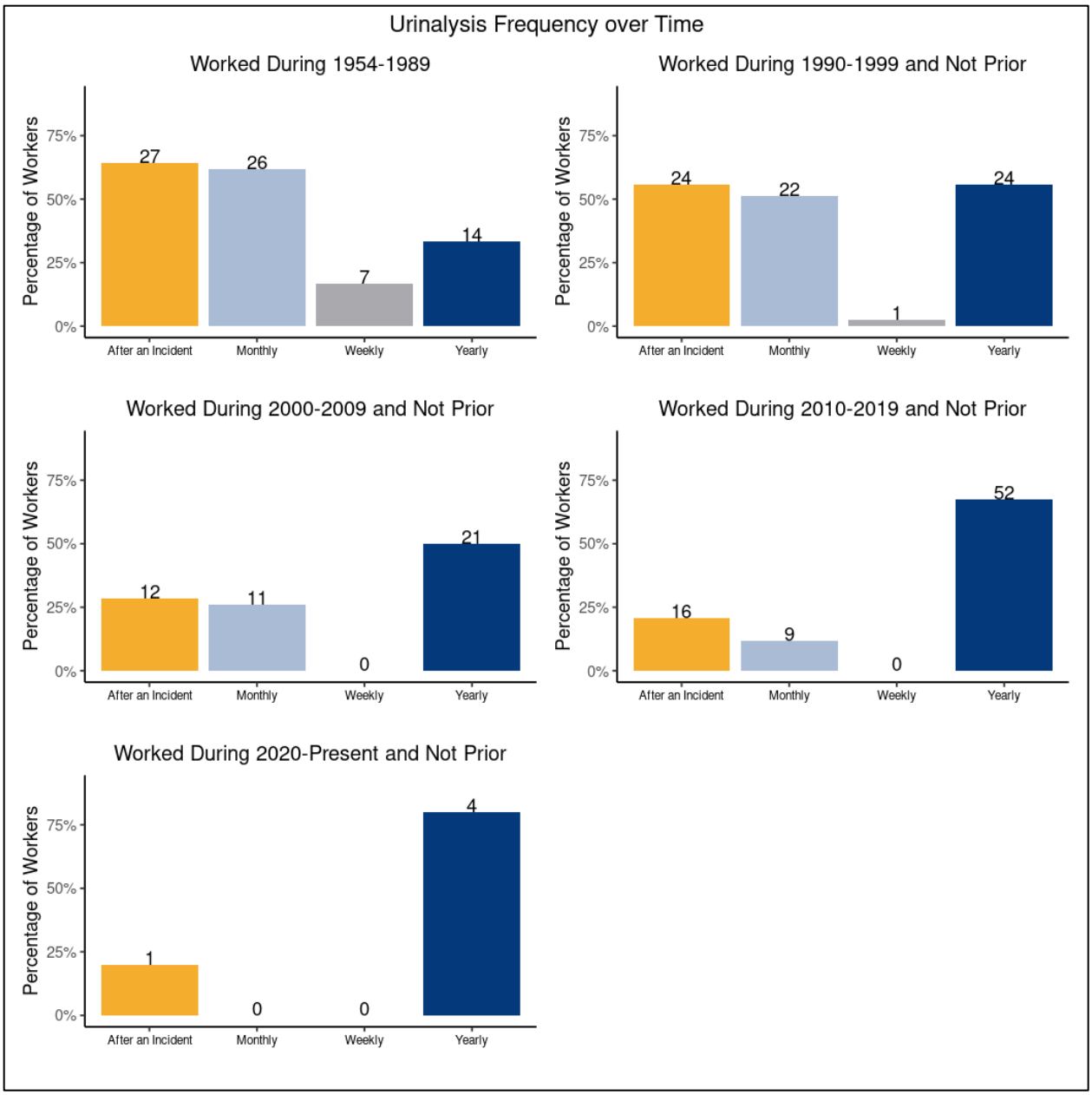


Figure 11: *Participant's self-reported frequency of urinalysis, stratified by time periods worked. Percentages were calculated out of the total number of workers who underwent urinalysis testing in each time period, filtering by those who worked in that time period and not prior as the question for frequency of testing did not specify the time period of that frequency (starting with the time period 1954-1989 and listing chronologically, N = 42, N = 43, N = 30, N = 58, N = 5).*

We were then interested in demonstrating whether this trend appeared for workers who qualify for the SEC versus those who do not solely based on whether they worked for 250 days prior to February 1, 1992. For workers who did not qualify for the SEC based on their time of employment, there was a greater proportion of workers who reported having yearly schedules for urinalysis (60.8%) versus those who qualified for the SEC (34.1%) (Figure 12,13). For those who do not qualify for SEC, there was a smaller proportion of workers who had been on monthly (25.2%) or weekly (0.7%) urinalysis schedules than workers who qualify for SEC (39.0% reporting monthly and 8.5% reporting weekly) (Figure 12,13). Finally, the proportion of workers who report giving urinalysis samples after an incident was greater for those who qualify for SEC status (43.9%) than for those who do not (31.5%) (Figure 12,13).

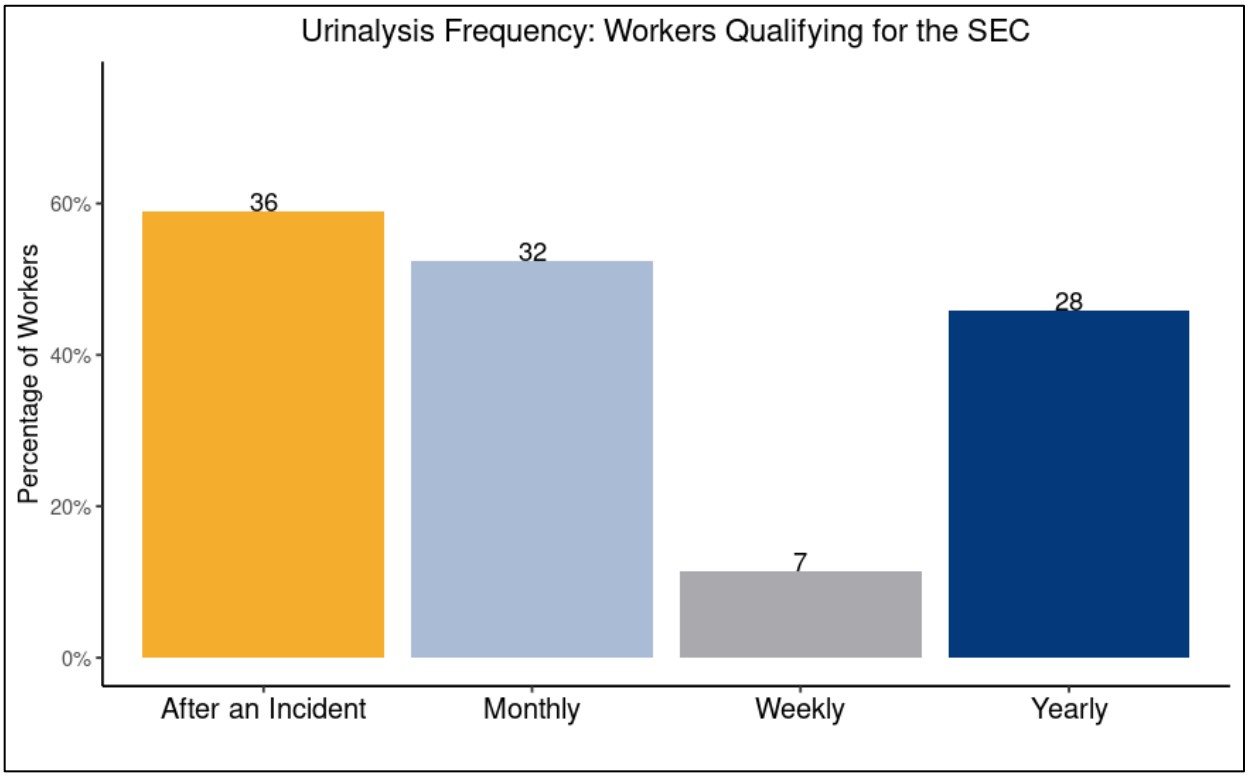


Figure 12: *Urinalysis frequency for workers who qualify for SEC based on time of employment (worked for at least 250 days prior to February 1, 1992). Percentages were calculated out of all respondents that indicated they had gone through urinalysis testing at some point during their employment, and worked for the 250 days prior to February 1, 1992 (N = 61).*

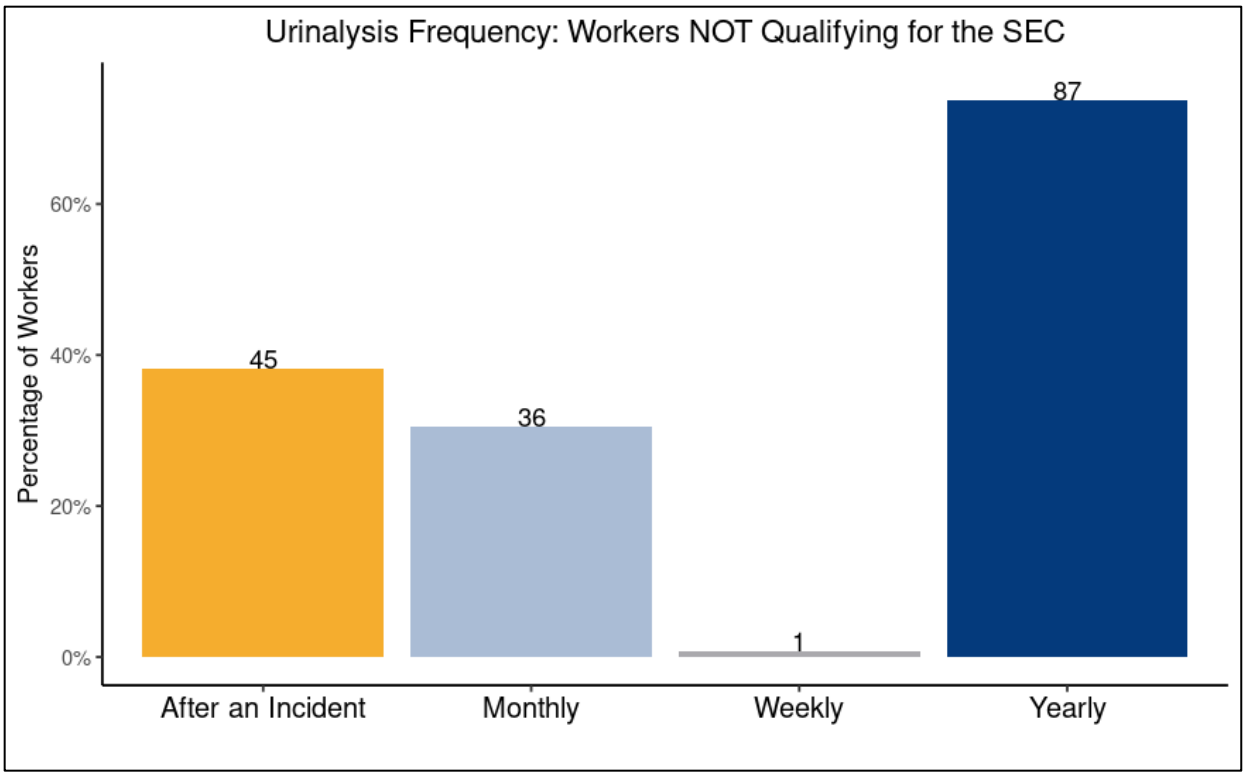


Figure 13: *Urinalysis frequency for workers who do not qualify for SEC based on time of employment (did not work for at least 250 days prior to February 1, 1992). Percentages were calculated out of all respondents that indicated they had gone through urinalysis testing at some point during their employment, and worked for the 250 days prior to February 1, 1992 (N = 118).*

C. Chemical and Radiological Exposure Incidents

We were interested in investigating how many survey respondents had experienced an exposure incident, defined as any exposure where a worker was exposed to an unknown chemical or unknown radiation, was not told about the presence of a known chemical or known radiation until after they started working, was not told about the chemical or radiation's associated health risks, was not adequately trained in for given enough time to learn about needed safety precautions, was not protected by the proper PPE or other safety measures, or was not properly monitored for exposure to the chemical or radiation. A full chart of chemical exposures by job title is included a the end of this report (Appendix A).

For chemicals, the most commonly reported type of incident was not being properly monitored for exposure to the chemical (34.29%) and being exposed to an unknown chemical (34.0%) (Figure 14).

As a follow-up to this question, respondents were asked how often these incidents were reported. Two-thirds (66.7%) of respondents reported that these incidents were reported either "Rarely" or "Never", with only 7.3% saying that these incidents were "Always" reported (Figure 15).

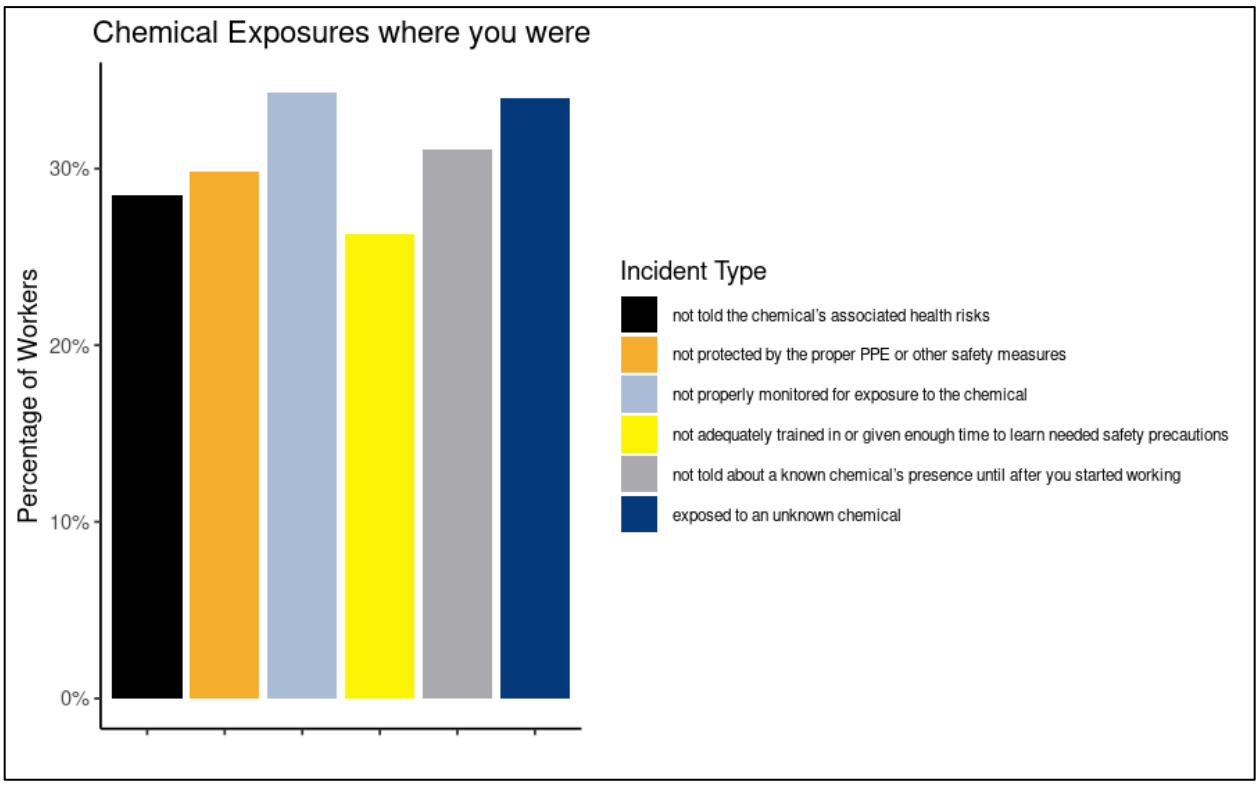


Figure 14: *Chemical exposure incidents experienced by workers. Percentages were calculated out of all survey respondents (N = 312).*

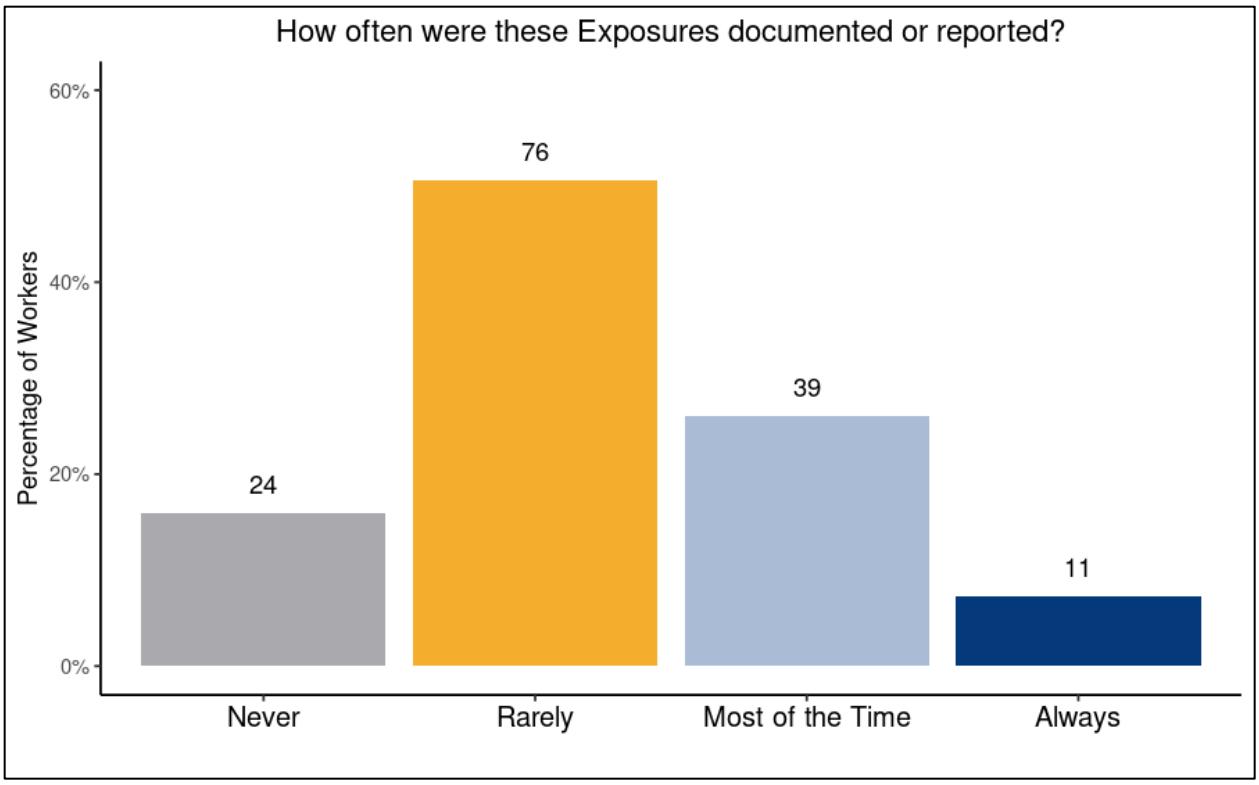


Figure 15: *Frequency of reporting chemical exposure incidents among respondents. Percentages were calculated out of those who had experienced some kind of chemical incident and who responded to the follow-up question about the frequency of documentation and reporting (N=150).*

Similar to chemical exposure incidents, the indicated type of radiological exposure incident was being exposed to unknown radiation (29.5%) and not being properly monitored for exposure to radiation (26.0%) (Figure 16). When asked if these were reported or documented, 68.5% said that they were reported “Rarely” or “Never”, with only 5.5% reporting that they were “Always” reported (Figure 17).

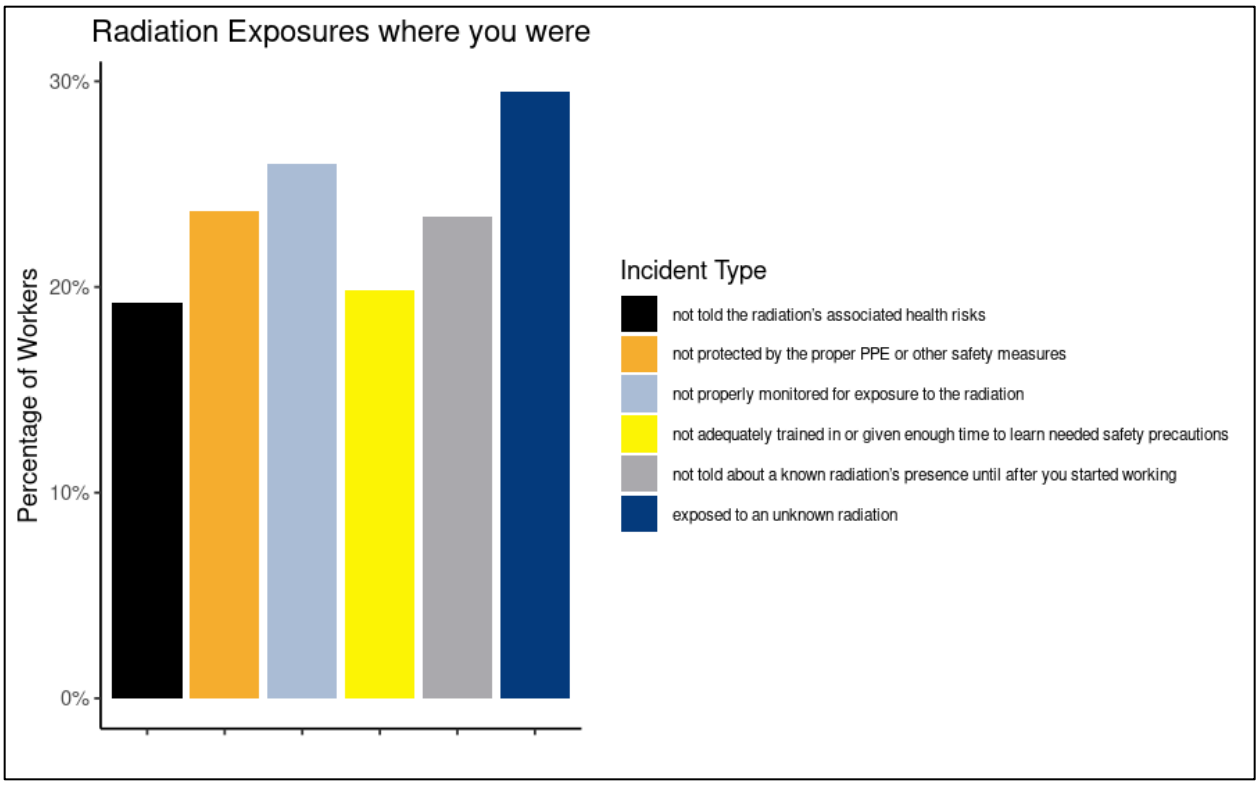


Figure 16: *Radiological exposure incidents experienced by workers. Percentages were calculated out of all survey respondents (N = 312).*

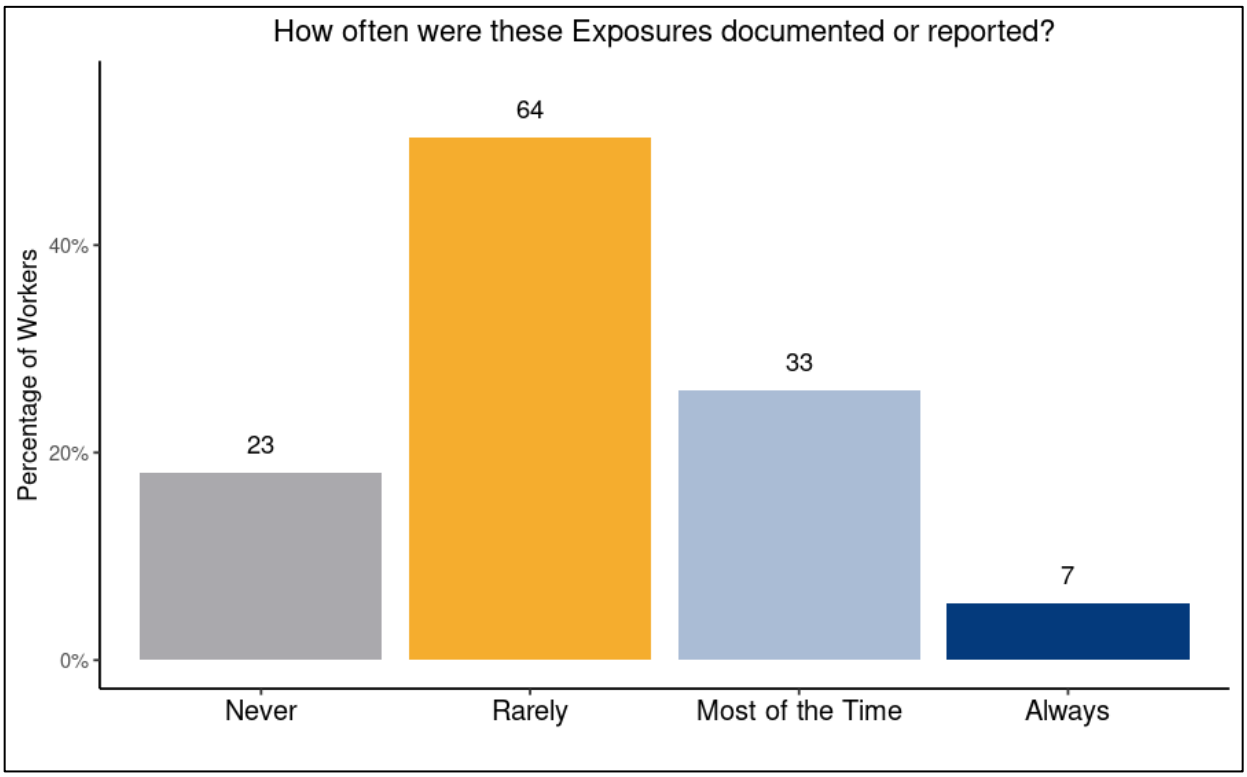


Figure 17: *Frequency of reporting radiological exposure incidents among respondents. Percentages were calculated out of those who had experienced some kind of radiological incident and who responded to the follow-up question about the frequency of documentation and reporting (N=127).*

D. Use of Radiation Dosimetry Badges

We were interested in understanding worker perspectives on the use of Radiation Dosimetry Badges, as this is the primary method of monitoring worker exposure to radiation and contamination. Overall, it was reported that badges were frequently worn, with 96.9% reporting that they were worn "Most of the Time" or "Always" (Figure 18).

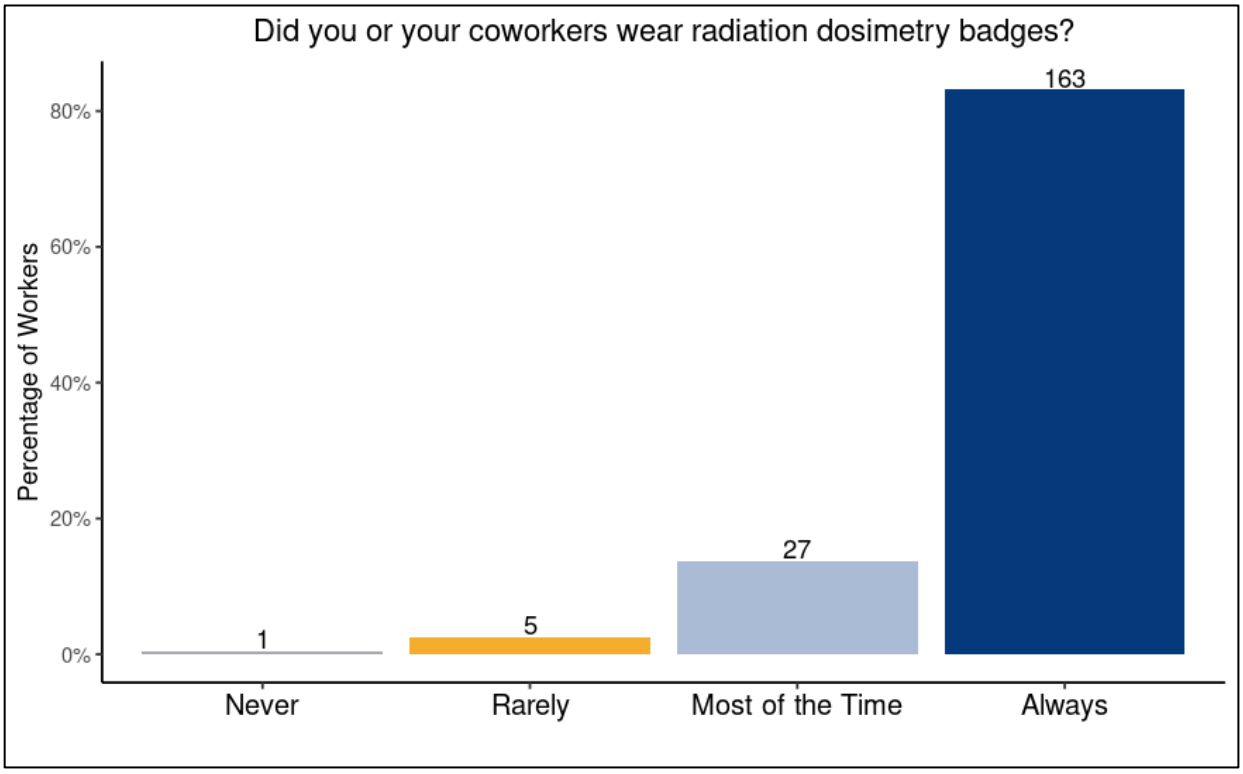


Figure 18: *Frequency of badge use among respondents. Percentages were calculated out of those who responded that they wore radiation dosimetry badges (N = 196).*

E. Health and Safety Training

We asked survey respondents whether they felt they received sufficient health and safety training, and 65.4% responded "Yes" (Figure 19). While this means the majority feel that health and safety training is adequate, it is notable that just over a third do not believe they were given sufficient training.

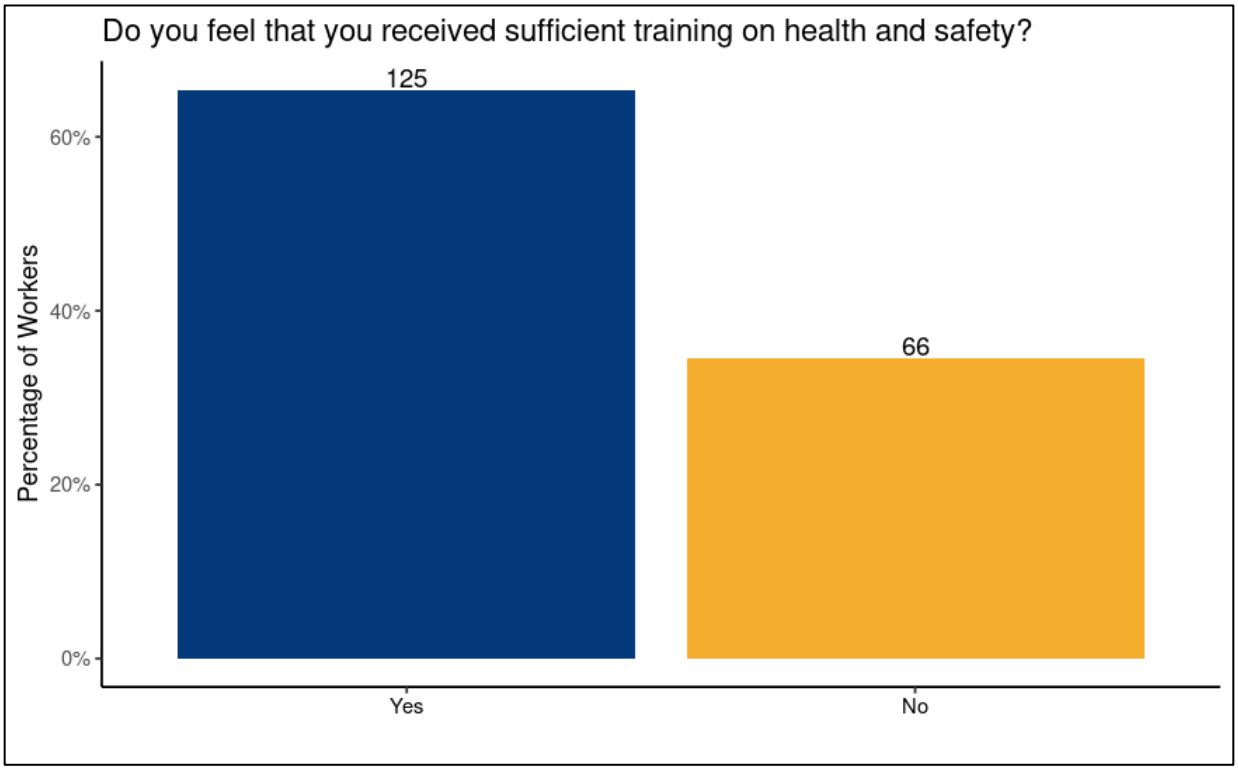


Figure 19: *Worker perceptions of sufficiency of health and safety training. Percentages were calculated out of the total number of respondents to the above question (N = 191).*

Discussion & Worker Narratives

Our survey results bring to light issues in documentation and reporting of worker exposures and health and safety incidents at PORTS. These issues are prevalent across time periods worked, with some new issues emerging for more recent groups of workers, such as the evidence presented of inconsistent urinalysis procedures.

To bring context to our survey results, we conducted 14 semi-structured interviews with workers who volunteered their time for the study. These interviews were transcribed and reviewed for comments relating to key findings from our surveys.

Through our interviews, several themes emerged: discouragement and fear of retaliation when reporting health and safety issues, inconsistent urinalysis procedures, chemical and radiological exposures, insufficient protections from radiological and chemical hazards, suspicion of the validity of radiological dose measured by TLDs, and the perception of insufficient training on chemical and radiological hazards. These themes emerged from both current and former workers' interviews, and from a selection of our interviews, we've gathered related quotes. A list of interview quotes collected from an initial review of interview transcripts with current workers relating to each of these themes is included at the end of this report (Appendix B).

Below, we discuss the results of our surveys with added context from worker interview data, providing selected quotes from worker interviews.

Note: *Fluor or FBP is the main, largest contractor on plant site today, while USEC was the main contractor immediately prior to Fluor. This switch occurred in 2011.*

A. Discouragement and Intimidation in Problem Reporting

Reporting health and safety issues on site is not always easy or successful. Overall, survey data showed that while most workers could identify the process of problem reporting and felt confident in their ability to complete a problem report, many felt practices of discouragement and intimidation were prevalent. Workers explained that they or their co-workers were afraid to report issues because they might face retaliation in the form of losing access to job perks or being moved to a worse job.

One worker shared their experience with continually smelling something through their Powered Air-Purifying Respirator (PAPR):

> *"I brought it up in pre-job every day. 'I can smell something,' I said, 'come over'. You can smell it in your PAPR and it's you know 'you ain't smelling nothing'. It's like 'yeah, I can smell something'. 'Oh, you're just saying that'. I was like 'no, I smell something'. I asked the other guys, 'can you smell it?' and they're like 'yeah, when you're over here where you're at you can smell it'. Well ended up they moved me off the crew."*
>
> - *D&D Worker*

Being able to report safely depends on the supervisor or manager the worker directly reports to, and practices changed between contractors (Appendix A).

Furthermore, several said that reporting did not always lead to anything being done to address the issue. Even if reporting could be done safely, workers' reports could be dismissed. Successful reporting for some workers looked like reporting an issue repeatedly until something was done about it:

> *"So we did have an incident where some supplied air hoses that we purchased actually were--we found out because I had complained and testing them after we had fixed our airline issue. This actually happened under Fluor, under the current contractor. They still had an odor so we knew it wasn't coming from our supplied airline and in the building because...we had those [charcoal] filters and they did change those out frequently. We come to find out...I mean it was a chore I had to continue to complain and I had to continue to pull in IH and we finally found out that the maker of the supply air houses for the manufacturer coated them...with something that they should not have done. And when we would use them we would get--people would get headaches or we get headache when I would train or when we would test them and come to find out they were spraying them with something they shouldn't have been spraying them with. But it took a while to get to that point. So like you gotta fight and dig to keep bringing things up, you know, so because they'll come do monitoring for something and you may not get a hit on anything. You may not find anything. So there there might still be an odor or an issue or you might still have something visible but it can't determine what it is because it doesn't fall into that any other spectrums for anything. So that's one of the problems."*
>
> - *Current IH/HP worker*

Workers also gave accounts on how safety practices have shifted with each contractor. Workers often commented on the difference between Fluor-BWXT, the current and largest DOE contractor on site, and USEC, the largest DOE contractor prior. One worker commented on the shift in reporting practices when Fluor-BWXT took over D&D most operations:

> *"Prior to 2011,... I felt very comfortable reporting, whatever I needed to report through whatever means. After 2011 , not so much…I don't feel comfortable. In fact, a lot of times, I'll go through a USW safety representative or we'll go through what they call an employee concerns, reporting methods that can kind of keep your identity secret, give you some anonymity because it's just they're not as well received on now than they used to I don't think…That's at least that's been my experience. It's more looked at that you're trying to stop something versus you want to make sure…what you're doing is safe and in accordance with procedure and it's really all about just getting it…whatever they need done completed."*
>
> - *IH/HP Technician*

B. Inconsistent Urinalysis Procedures

Survey data points to inconsistencies in the urinalysis bioassay procedures both in how often workers were called to submit a urine sample for regular monitoring, and in how quickly they were called to give samples in special urinalysis cases after an exposure incident.

In interviews, workers were skeptical of how urinalysis procedures were carried out for both regular monitoring and in the amount of time after an exposure that urinalysis was given. They felt that the timing was used to reduce the chance of elevated dose showing up in the urinalysis (Appendix A). When asked how long after an exposure urinalysis was given, one worker commented:

> *"Right away. Once they know it they send you right away…Sometimes I think maybe, maybe they should wait just, I went over instantly, but did that have time to get in, in my urine by then? You know, maybe the next day? Yeah, it might sense something then. But we, they sent us pretty quick."*
>
> - *Current Electrician*

There was also concern among workers whether the urinalysis results were accurate:

> *"I have been told that on site that there's zero dose that anyone's received, which I know I have been in some areas where I should have received dose and I didn't."*
>
> - *Current Supervisor*

C. Chemical and Radiological Exposure Incidents

Over half of surveyed workers reported a chemical exposure incident, and close to half reported a radiological exposure incident. It was clear that these exposure incidents were rarely reported, based on survey data.

Many interviewed workers reported experiencing some kind of chemical or radiological exposure incident on plant site (Appendix A). In describing those incidents, workers were often concerned about the lack of PPE or monitoring or in some cases, that the hazards and incidents were not noticed at all.

> *"I was exposed a lot to HF. So when you're burning with [a] plasma cutter you're burning, you're blowing 90 pounds of pressure into that that plasma tip and it blows through that metal as oxygen to it and every time we burn you can smell through our PAPRs. Were our PAPR sufficient? I don't know. Would fresh air had been sufficient? Possibly. But they told us PAPRs or face shield or full face respirators what you would…use."*
>
> - *Current D&D Worker*

> *"So there's drips on the floor of oil that potentially contain PCBs and they you know, go around every now and then just paint a big black square over and contain them and then put a sticker on it. Well, that gets wore off over time because people drive over and walk over all that. And eventually they'll get repainted, maybe, but they're there. There's oil catch cans with PCB and there'll be a little hose that has oil all over it. That is just out there where anyone can walk by and brush against it. They're in clean areas, not not really controlled. So you can be exposed If you're not paying attention. Just by walking through a building and brushing up against something."*
>
> - *Current Supervisor*

One worker brought up that there was a current practice of exposing workers beyond what was necessary to give the outward appearance of more work being done.

"And there was times when there wasn't a whole lot of work and so…they'd say 'hey you guys need to get up on the cell floor. I don't care what you do, just go up to the cell floor', and you'd be up there two, three hours and then you'd come down. Our supervisor actually said that–told us to go up there. So we were on a RWP and we'd go upstairs and sit and wait for work or sit because they didn't have something for us to do right at the moment. And that was not really practicing ALAR [As Low as Reasonably Achievable–practice of avoiding radiation]. We finally got to where we were trying to tell them 'hey you can't make us do that if you got work for us…we will go do the work. We're not going to sit up there in an area that is contaminated just…for no reason'."

- *Current Worker*

D. Use of Radiation Dosimetry Badges

While survey data showed they were being worn frequently, in interviews, workers were skeptical about the efficacy of their radiation dosimetry badges or of the dose being accurately reported (Appendix A). Most workers wear at least a Thermoluminescent Dosimeter (TLD), which is meant to record radiation dose that workers have received. It is normally worn on their lanyard at chest level, outside of coveralls and inside of PPE, like anti-contamination clothing:

"So this [the TLD] is supposed to measure my dose. However, anytime I go into an area I wear under my anti-C's [anti-contamination clothing], which is blocking a lot. Especially if…I'm not required to wear a PAPR. You know, this is all under here. My face is exposed. I've been in areas where you know, I have a Rad tech there. I was doing a tour with DOE and they wanted to see a certain pipe. So I showed it to them. I said 'there it is right there' and they're like, 'oh, that's the wrong color. It's completely covered in uranium.' And the rad tech just held his meter up and it completely pegged it out. So I've been in that area many, many times without a respirator so my face is exposed. But my badge is covered up. So maybe it's reading the right dose. Maybe it's not."

- *Current Supervisor*

E. Health and Safety Training

Survey data showed that two thirds of workers felt they had sufficient health and safety training, while a third did not. In interviews, workers raised concerns over insufficient health and safety training to work with hazards on site. Most often workers felt that their training on hazardous chemicals and their dangers was insufficient to nonexistent (Appendix A). They felt that they only learned through their experience onsite the degree to which hazardous chemicals were present onsite:

"[W]e were just kind of on the job trained on how to take the beryllium sampling. Of course with the protocol, they have the NIOSH protocol for it. As far as…the health physics technician side of the house that was more stringent. We had a six month class we went through on how to be radiological control technician and then they put us on the job for on the job training and then we had JPMs [job performance modules] we had to pass and then we had a test and an oral board. So there was a lot more training on the radiological side to be a technician than there was on the IH side to be a technician. And then for the respirator facility. There was job performance modules that just told you how to handle the equipment. It didn't really deal with any of the chemicals or anything that you would use to help to clean it or do anything like that."

- *Current IH/HP worker*

"My general impression when I first started here…I didn't really think of this as a chemical plant. I thought this is the A-plant you know, nuclear radiation…I was more concerned about radiation than I was chemical even though the chemicals were everywhere."
- *1990s-2010s Chemical Operator*

Recommendations

These results indicate that workers at PORTS who are not currently included in the SEC have a strong case for inclusion based on a lack of adequate documentation of both their chemical and radiological exposures.

Based on our findings, we present the following recommendations:

A. Cross-check the SEM and survey data on reported chemical exposures

The SEM has the potential to be an accessible tool for worker knowledge of exposures to assist workers in their process of filing a compensation claim under the EEOICPA. However, former workers and union benefits representatives have serious concerns about the comprehensiveness of this database.

The survey collected self-reported data on chemical exposures by time period. Aligning this data with time periods, job titles, and building worked in could create a strong case for chemical additions to SEM or other modifications.

B. Further investigate the urinalysis bioassay program

A clear result of this investigation was the inconsistency in worker experience with the urinalysis bioassay program. Worker interviews gave these inconsistencies some context and potential routes of further investigation. For example, one route of investigation might be the overall usefulness of the urinalysis bioassay program for detecting worker exposures. Current information that the union has indicates that the yearly testing schedule that many current workers are on is only useful for ensuring controls are working, and it is not a useful method of monitoring individual exposure levels. Another promising route of investigation is company adherence to urinalysis bioassay testing procedures. In interviews, it was identified that workers were not sure if they were being tested when they should have been, and in the case of special urinalysis tests ordered after an exposure incident, it was unclear whether workers were being instructed to submit a urine sample in the recommended amount of time after the exposure event.

C. Investigate change-out frequency of radiation dosimetry badges

While survey data shows that workers who reported regularly wearing badges wore them consistently, in interviews, workers identified a different area of potential concern. There is prevalent worker skepticism of whether badges are being changed out at the correct frequency, or if badges are being read and recorded correctly. Cases of employer tampering with badge records have been identified in the past, giving legitimacy to these concerns. It is not clear whether this issue has been completely resolved.

D. Investigate Effectiveness of Health and Safety Training

Many workers indicated in surveys that they felt they had sufficient health and safety training, however, in interviews, workers identified situations when this was not always the case. While workers are being provided with all of the trainings required by their job title, many workers felt that once on the job, the trainings they received lacked usefulness or practical application. Because many health and safety trainings are given in a classroom setting (such as the HAZWOPER training) or through packets of information or online training modules, once on the job site, things tended to look and feel different, and in some cases, workplace practices played a bigger role in whether safety procedures were being adhered to than what workers retained from their training courses. Current health and safety training, especially regarding work around chemical hazards, should be reviewed for how well it is translating to on-site work, and how useful workers find it in informing them of hazards they regularly encounter.

E. Utilize Archive Documents

Due to time constraints, this report does not review the findings of our initial search through the union archives. However, there were many documents found in the union archives that provide evidence of neglectful documenting of worker exposures. Future work should identify which documents to pull from these archives to use as additional evidence before submitting the petition.

Giveback Products

Over the course of this project, we developed several giveback products for Local 1-689 to use in their future efforts to garner support for and eventually file an SEC petition.

A. Presentation of Investigative Methods

We created a presentation describing our process of investigation for the purpose of presenting to union leadership representing workers at other DOE-contracted facilities with workers also eligible for SEC under the EEOICPA.

This presentation covered the following topics:

- Overview of the EEOICPA
- Parts B & E
- Entities involved with the law and the process of filing for workers' compensation
- The dose reconstruction process conducted by NIOSH
- The SEM
- The SEC and the petitioning process
- Our methods of investigation
- Provided materials used including our survey, interview guide, and setup of the archive directory

This presentation was created to be delivered to the Atomic Energy Workers Council and to other union leadership representing workers at DOE contracted sites that have SEC qualifying status.

B. Union Archive Directory

We began the process of looking through the file cabinet archives stored at the Local 1-689's office in Piketon for documents which provide evidence of a lack of documentation of exposures, poor handling of reports of health and safety issues, changes in procedures that may have led to exposures being monitored differently, or other documents that could help prove a dose reconstruction would not be possible for certain exposures or time periods.

The start of this archive directory is a shared Excel spreadsheet with information about documents, including the name of the folder we found it in, the year of that document, where in the file cabinets it was found, what type of document it was (a citation, NIOSH report, safety procedures, incident or problem reports, etc.), a description of the contents of that folder, and notes about the relevance of the material to our investigation. The spreadsheet was categorized by subject of the entries, with the initial categories being Beryllium, Hexavalent Chromium, PCB's, Badge/monitor malfunctions

and changes, Chlorinated compounds, Arsenic, Asbestos/Lead, Hydrofluorine/Fluoride issues, and Miscellaneous/Problem reports.

At the time that the directory was handed over to the union, there were 443 entries.

C. Transcripts and Recordings of Worker Interviews

After the editing process, transcripts and recordings of interviews were compiled and transferred onto a flashdrive which was returned to the union for secure storage, so that only union leadership and those who directly worked on this project have access to these files. Also included on the flashdrive was the participant log of those we interviewed (not tied to which interview transcript was theirs), and a copy of the interview guide.

D. Raw Data from the Survey Results

Files containing the raw data from the surveys collected were also returned to the union on a flashdrive to be securely stored and accessed by only those officially authorized for further data analysis.

Challenges

PORTS and the EEOICPA are intertwined with many different bureaucracies, along with the fact that the plant has its own acronyms and lingo. Learning, understanding, navigating the various systems and their languages was an ongoing process throughout the internship and required consulting and reconsulting our notes and resources as we worked on each part of our project. We were lucky to have the support of workers who had spent decades working at PORTS and working with agencies involved in the EEOICPA to help us figure it out.

Because PORTS is a DOE site, it requires special clearance to access. While the site does tours, they are only once a year and wouldn't grant us the ability to interview workers. We were able to ask current workers to suggest to other workers to take the survey and have it posted on Local 1-689's website and social media; however, there were limited opportunities to pass the survey out on site. Despite this, workers, both union and non-union, were very enthusiastic about filling out the survey and particularly retired workers, were interested in giving interviews, which made it much easier for us to work around this barrier.

Since we were interested in the workers from all time periods, we also wanted to survey and interview former workers of the plant, but there isn't one straightforward way to access these workers. We needed to find personal connections through some of the retired members of our work team. One way we were able to approach this problem was through a Home Health assistance company which our local site leader worked at that serves former DOE employees who have received medical coverage for their illnesses. We were able to attend a monthly luncheon hosted by the company to meet retirees. From there, we were able to connect with a breakfast of retired instrument mechanics.

We had both an electronic and paper version of our survey. The paper option was a more accessible option for most workers; however, the disadvantage of a paper survey is that it's much easier for people to make mistakes in filling out the survey that don't translate well to data analysis. For example, someone circles two responses to a question that should only have one response. We had to consult with each other to decide whether to invalidate a response or what answer should be selected.

Successes

Reflecting on the process of our investigation, we can highlight several achievements. First, we aimed to survey, at most, 250 workers from PORTS. With the enthusiastic help of staff at Local 1-689 and current workers, we surpassed this goal with a total of 312 survey responses in just two weeks.

For the interviews, we aimed to speak with workers who have experiences in different job titles and time periods, hoping to cover as many job titles as we surveyed, and speak to workers from each of the five time periods we surveyed for.

Personal Reflections

Anna

I came to this internship wanting to learn more about how public health works with labor activists to make lasting changes in the workplace for the most at-risk worker populations. Working with the local proved to me how powerful union organizing can be to protect the health and safety of workers. Our project only reached the successes that it did because of the dedication of their leadership and supports to the mission of this project, and their investment in both of us as interns and as future worker health advocates. My biggest takeaways from this summer are first, that labor organizing is something that I hope to continue to engage in whatever capacity I am able, second, that effective public health work in occupational health and safety must center the voices of workers first always, and third, to never underestimate the power of a strong union!

Coming from primarily doing academic work in research, the project we worked on this summer challenged the ways I was taught to think about "valid" evidence in an investigation of this kind. Because the central health and safety concerns for workers at the plant are often also the least well-documented, and in many cases, intentionally covered-up, to create an accurate report on health and safety concerns not tainted by the agenda of those invested in keeping things under wraps, our most valuable information and evidence was often anecdotal and based in worker retellings of how things really went, or worker corrections to the way things were previously documented. Putting high value on subjectivity directly challenges how formal academic research teaches what "good" evidence looks like, but in this case, proves the practice of using only official reports or validated physical evidence to work against the interests of those we aim to help, and actually moves the investigation further from the truth. In our final report, much of the information gathered came from informal conversations with workers, or was vetted for accuracy through the perspectives of workers before being included in the final version.

I deeply appreciate and will remember most the personal and professional relationships built with my project partner, Hannah, union leadership and our site leader, and all the workers and retirees that volunteered their personal time to help with this project.

Hannah

In this internship, I hoped to gain perspective on how a union runs and uses its political power and how health and safety issues are fought to be addressed by the union. Reading through the union archives granted me insight into how union leadership took on the company to defend workers' health and safety. Through learning from current union workers, I learned how those issues recur and how new generations of workers have to continue to be educated to fight these issues again. While I had some experience in health and safety when it comes to industrial kitchens, I was excited to learn more about what hazards exist in industrial work. I also have mostly academic experience in how to do data analysis and visualizations and how to pursue those projects. This internship

gave me the opportunity to gain practical experience in doing surveys and interviews and see how those things get messy in the real world.

Personal challenges for me were working more independently and not asking enough questions. The organizations I worked for prior involved a lot more large group work, while Anna and I were mostly working alone together and once or twice a week meeting up with union leadership or the OHIP team. I'm used to asking a lot more people for their insight and what they think rather than going off of my own gut and checking in later about how what I've put together looks overall. On the other hand, whenever someone would mention an acronym or reference something I didn't necessarily get, I wouldn't necessarily ask for clarification, which I think could have improved my understanding. For both of these challenges, I was able to get better over time as the summer continued, and I adapted to this kind of work. Having my co-intern to consult was very helpful, as we worked problems out together. Her practical experience with surveys and interviews was also very helpful, as I was figuring them out for the first time.

Acknowledgements

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Appendix

A. Table of Chemical Exposures by Job Title

	Chemical Operator	D&D Worker	Electrician	Fire Department	Instrument Technician	Lab Worker	Laborer	Laundry Worker
Arsenic	65.2%	69.1%	50.0%	75.0%	61.1%	75.0%	61.5%	52.4%
Asbestos	78.3%	92.7%	83.3%	83.3%	83.3%	75.0%	88.5%	76.2%
Beryllium	82.6%	83.6%	66.7%	91.7%	61.1%	75.0%	80.8%	66.7%
Chlorinated Solvents	47.8%	38.2%	50.0%	75.0%	55.6%	50.0%	42.3%	38.1%
Chlorine	69.6%	52.7%	61.1%	83.3%	61.1%	50.0%	53.9%	42.9%
Chlorine Trifluoride	56.5%	40.0%	27.8%	66.7%	44.4%	37.5%	38.5%	38.1%
Chromium	43.5%	45.5%	38.9%	83.3%	33.3%	50.0%	38.5%	42.9%
Cyanide	34.8%	23.6%	22.2%	58.3%	33.3%	25.0%	30.8%	23.8%
Fluorine	73.9%	58.2%	50.0%	83.3%	66.7%	87.5%	65.4%	47.6%
Freon	65.2%	63.6%	55.6%	83.3%	72.2%	75.0%	61.5%	47.6%
Green Salt	65.2%	38.2%	16.7%	58.3%	44.4%	37.5%	30.8%	23.8%
Hydrochloric Acid	52.2%	41.8%	38.9%	66.7%	61.1%	75.0%	50.0%	33.3%
Hydrofluoric Acid	78.3%	60.0%	38.9%	83.3%	66.7%	62.5%	65.4%	57.1%
Lead	73.9%	83.6%	77.8%	75.0%	66.7%	62.5%	76.9%	57.1%
Mercury	82.6%	58.2%	77.8%	75.0%	77.8%	75.0%	61.5%	52.4%
Mixed Waste	73.9%	78.2%	61.1%	75.0%	61.1%	62.5%	76.9%	47.6%
Polychlorinated Biphenyls (PCBs)	73.9%	74.6%	66.7%	75.0%	66.7%	50.0%	73.1%	52.4%
Spray Nine	91.3%	89.1%	100.0%	83.3%	77.8%	87.5%	80.8%	81.0%
Transuranics	78.3%	74.6%	44.4%	66.7%	83.3%	62.5%	65.4%	47.6%
Uranium Hexafluoride	95.7%	87.3%	44.4%	83.3%	77.8%	100.0%	84.6%	61.9%

	Maintenance Mechanic	Other	Power and Utilities Operator	Process Operator	Project Worker	Radiological Control Tech/IH	Security/ Police Force	Supervisor	Uranium Material Handler	Welder
Arsenic	63.0%	50.0%	66.7%	66.7%	63.0%	59.4%	72.7%	45.8%	58.3%	75.0%
Asbestos	81.5%	76.1%	77.8%	83.3%	89.1%	84.4%	90.9%	70.8%	91.7%	87.5%
Beryllium	70.4%	70.5%	77.8%	76.7%	78.3%	75.0%	90.9%	50.0%	79.2%	75.0%
Chlorinated Solvents	51.9%	39.8%	44.4%	43.3%	41.3%	40.6%	45.5%	37.5%	50.0%	75.0%
Chlorine	55.6%	47.7%	44.4%	53.3%	47.8%	62.5%	54.6%	50.0%	58.3%	62.5%
Chlorine Trifluoride	22.2%	34.1%	44.4%	63.3%	32.6%	43.8%	54.6%	41.7%	50.0%	37.5%
Chromium	37.0%	38.6%	44.4%	40.0%	47.8%	40.6%	72.7%	25.0%	45.8%	62.5%
Cyanide	22.2%	25.0%	11.1%	23.3%	21.7%	21.9%	27.3%	20.8%	20.8%	37.5%
Fluorine	70.4%	53.4%	66.7%	73.3%	58.7%	68.8%	63.6%	58.3%	75.0%	87.5%
Freon	66.7%	51.1%	44.4%	86.7%	63.0%	62.5%	63.6%	66.7%	66.7%	75.0%
Green Salt	29.6%	28.4%	11.1%	40.0%	37.0%	46.9%	36.4%	37.5%	45.8%	75.0%
Hydrochloric Acid	48.2%	39.8%	33.3%	43.3%	37.0%	46.9%	54.6%	41.7%	41.7%	50.0%
Hydrofluoric Acid	59.3%	58.0%	33.3%	73.3%	63.0%	84.4%	54.6%	50.0%	79.2%	75.0%
Lead	74.1%	64.8%	33.3%	66.7%	76.1%	71.9%	81.8%	58.3%	58.3%	62.5%
Mercury	51.9%	48.9%	66.7%	66.7%	54.4%	65.6%	63.6%	54.2%	66.7%	62.5%
Mixed Waste	74.1%	54.6%	44.4%	53.3%	71.7%	68.8%	81.8%	50.0%	70.8%	75.0%
Polychlorinated Biphenyls (PCBs)	66.7%	61.4%	55.6%	73.3%	63.0%	71.9%	90.9%	58.3%	66.7%	75.0%
Spray Nine	85.2%	76.1%	88.9%	83.3%	82.6%	78.1%	72.7%	79.2%	91.7%	75.0%
Transuranics	63.0%	54.6%	33.3%	76.7%	67.4%	81.3%	72.7%	41.7%	70.8%	75.0%
Uranium Hexafluoride	81.5%	65.9%	77.8%	93.3%	87.0%	87.5%	90.9%	62.5%	91.7%	87.5%

	Supervisor	Uranium Material Handler	Welder
Arsenic	45.8%	58.3%	75.0%
Asbestos	70.8%	91.7%	87.5%
Beryllium	50.0%	79.2%	75.0%
Chlorinated Solvents	37.5%	50.0%	75.0%
Chlorine	50.0%	58.3%	62.5%
Chlorine Trifluoride	41.7%	50.0%	37.5%
Chromium	25.0%	45.8%	62.5%
Cyanide	20.8%	20.8%	37.5%
Fluorine	58.3%	75.0%	87.5%
Freon	66.7%	66.7%	75.0%
Green Salt	37.5%	45.8%	75.0%
Hydrochloric Acid	41.7%	41.7%	50.0%
Hydrofluoric Acid	50.0%	79.2%	75.0%
Lead	58.3%	58.3%	62.5%
Mercury	54.2%	66.7%	62.5%
Mixed Waste	50.0%	70.8%	75.0%
Polychlorinated Biphenyls (PCBs)	58.3%	66.7%	75.0%
Spray Nine	79.2%	91.7%	75.0%
Transuranics	41.7%	70.8%	75.0%
Uranium Hexafluoride	62.5%	91.7%	87.5%

B. Interview Quotes from an Initial Review of Current Worker Interviews

A. Discouragement and Fear of Retaliation When Reporting Health and Safety Issues

Workers commented that they did not always feel safe reporting health and safety issues:

> *"…the people that are under me, they will tell me they have no problem with it. But I feel like other people may say 'oh no, we'll just clean that up. Don't worry about it.' So I know that happens, because I've seen it happen. But you know, there are other times where I say 'hey, you know we need to stop; this spilled. Let's clean it up. Let's get to Chem ops over here, clean it up. Go from there'."*
>
> - *Current Supervisor*

When commenting whether or not incidents were regularly reported:

> *"it seems like one we're starting a new process…[something] just spilled all over the floor. They stopped. They got the right people in there. Over time, you know, when we're cutting components out of converters, you know, they'd spill a bunch on the floor. It just became 'Oh get a broom and sweep it up and dump it over here in a can' but yeah, 'oh we'll just sweep it up. It's no big deal'. And eventually that it wasn't documented at all whenever that would happen. I believe at first it was like 'Hey they put it in the work doc log hey, we spilled about this much material on the floor. We called these people over they cleaned it up'. Eventually it was 'oh, hey, they spilled some right there and have one of the workers clean it up'."*
>
> - *Current Supervisor*

When explaining why they weren't following the standard safety procedure:

> *"You're supposed to exit the area immediately. I was like, Well, I was told, you know, keep working. I mean, you got in [a particular D&D project], that's not how it works there. You know, if you're one of those guys that say something there, they'll, you know, push you someplace else will make it harder on you."*
>
> - *Current D&D worker*

And again later in the interview, explaining why they wouldn't report their PAPR not working properly:

> *"I mean, we were told to…do that, right. It wasn't like if you would do that if you got in the pattern of being a guy that says his [PAPR] battery went dead or you know, you're just getting…pushed [to] another crew or you were kind of chastised for that."*
>
> - *Current D&D worker*

Several workers specifically commented on the safety culture created by the current contractor. One current D&D worker explained the difference between in how Fluor promoted safety culture versus what actually happened on plant site:

"So what Fluor says and what Fluor does is two different things. Well, like I said when it comes down to a production issue when there's a PBI [Performance-Based Incentive] on the line. They're all about getting their PBI, and we helped them do it. I mean those guys in D&D right now, you know, I'm not the only guy, there's a lot of them over there, men and women, that helped them get their PBIs and, you know, they didn't care how it got done. They just, they want it done."

- *Current D&D worker*

"Prior to 2011,... I felt very comfortable reporting, whatever I needed to report through whatever means. After 2011 , not so much…I don't feel comfortable. In fact, a lot of times, I'll go through a USW safety representative or we'll go through what they call an employee concerns, reporting methods that can kind of keep your identity secret, give you some anonymity because it's just they're not as well received on now than they used to I don't think…That's at least that's been my experience. It's more looked at that you're trying to stop something versus you want to make sure…what you're doing is safe and in accordance with procedure and it's really all about just getting it…whatever they need done completed."

- *Current Industrial Hygiene/Health Physics (IH/HP) worker*

Even when workers reported, they found that their concerns were not always addressed. When sharing their experience with continually smelling something through their Powered Air-Purifying Respirator (PAPR) one worker said:

"I brought it up in pre-job every day. 'I can smell something,' I said, 'come over'. You can smell it in your PAPR and it's you know 'you ain't smelling nothing'. It's like 'yeah, I can smell something'. 'Oh, you're just saying that'. I was like 'no, I smell something'. I asked the other guys, 'can you smell it?' and they're like 'yeah, when you're over here where you're at you can smell it'. Well ended up they moved me off the crew."

- *Current D&D worker*

Another worker commented on how health and safety issues went unaddressed:

"That's the problem you run into out here is you may bring up an issue but then you're told there's really it's really not an issue. So then you're kind of left with well 'what do I do now?'"

- *Current IH/HP worker*

One worker reported an instance of intimidation after attempting to use Stop Work Authority after encountering a safety issue:

"I did stop work one time. And I put all tools up…we were doing a job and we went downstairs [to] stop work. I went down to fill out the paperwork and now tell [...] supervisor guy…I'm gonna stop work on this. The rest of crew came back downstairs okay, we finished that job up. They just–two other guys got in the lift and went up and did what we were doing...And I was like 'why would you do that? 'I was like 'because I stopped I mean I stopped work. I put the tools away guys'. I said 'I stopped work and you didn't listen' and the supervisor let them go on and work. So, the next day they come in…and they said 'can–can you come in here and talk?'...I said 'Yeah I'll come in'. And they all surround me and I'm not intimidated by any of them. Because I really don't give two shits about them honestly, you know, when it comes to it they're not gonna threaten me. I mean, I've been here out long enough that I know you know, I follow the policies…I do my job. I've given them

way more than they ever should have gotten…So but would I think it was intimidation? I think they tried to…And they're like [...] 'Did you, Did you really just stop work yesterday?' And they're trying to get around and I said 'I don't care…what you do. You know, I'm not reporting that you didn't stop work. I'm just saying I stopped work. You didn't do nothing about it you let the guys go back to work.'... 'Well, can you sign off on this?' I was like, 'Yeah, I don't care I'll get back to work'...I tried to do one stop work since I've been hired.It's something that I- I've done a lot of pause works like 'hey, let's stop guys.'...So I think it's more of a pause work there's really not such a thing as stop work with, with Fluor."

- *Current worker*

B. Inconsistent Urinalysis Procedures

Workers reported several inconsistencies with how urinalysis has been done on site. While some reported that urinalysis procedures were as they should be, one issue brought up was not being given urinalysis or not being given it in a timely manner:

"[W]hen you cut these pipes, you know you're being exposed to these additional radiological hazards that you really aren't monitored for, on your bioassays. Your bioassay only detects uranium, doesn't detect technetium, doesn't detect plutonium, doesn't take…neptunium and americium, thorium, any of that. And that's all on site here. So, how are we being monitored for that if we're not actually being monitored for it?"

- *Current Supervisor*

"I used to do one every couple of months. And over the last two years. I may have done one…I'm still in the area the same amount of time around all the cutting the same amount of time. Nothing's changed other than I have less bioassays which, so far, all the data I've gotten says that it all comes back to zero."

- *Current Supervisor*

After an HF exposure:

"We asked for urinalysis, had a big meeting on it [...], refused to give us urinalysis. They finally after 31 days gave us a urinalysis. So you know timeframe's 30 days on urinalysis but they waited 31 days to give us…one."

- *Current D&D worker*

After being asked how long after an exposure, a urinalysis was given:

"[I]t might have been the next day. In some cases, that might have…happened on a Friday and come back on a Monday and have us do it… I've known that that happened on a number of different occasions to different people where they were exposed to something, they reported it, and they finally sent up for a special pee call. But like I said it was like two or three days later when whatever they might have been exposed to and we suspect it might have been arsenic at the time. They burped out of some poly bottles. It would have…processed through your system. It'd be gone by the time they got around to check in you. And that wasn't uncommon unfortunately."

- *1990s-2010s Chemical Operator*

"Right away. Once they know it they send you right away…Sometimes I think maybe, maybe they should wait just, I went over instantly, but did that have time to get in, in my urine by then? You know, maybe the next day? Yeah, it might sense something then. But we, they sent us pretty quick"

- *Current Electrician*

On whether or not the urinalysis results were accurate:

"I have been told that on site that there's zero dose that anyone's received, which I know I have been in some areas where I should have received dose and I didn't."

- *Current Supervisor*

C. Chemical and Radiological Exposure Incidents

Current workers often reported that they felt the PPE they had or monitoring that was done was not sufficient and worried about the exposures resulting from the lack of PPE or the lack of monitoring:

"And do I think that they [Fluor] provided…the safest environment to work in? No, but do I think that they tried to do as much as they could to the level [that] they had to do for DOE? I think they tried to do that. But do I think…there was a sufficient amount of PPE? I know I'm gonna die of cancer."

- *Current D&D worker*

"They say, Well, you guys don't have potential [to] be around chromium. However, I see all the sampling data. Like when we do a physical sample, I get the data back. And I know that the converter shells had a lot of chromium in them. And we were there when they sat and cut them all up. And we sat there and wrote new numbers on every piece. So I know we're exposed to chromium."

- *Current Supervisor*

"I don't know if they ever documented PAPR failures. Last time they tried to blame the worker saying the worker wasn't using PPE properly."

- *Current D&D worker*

"I was in X-326 as a guard. I was in every building with zero-I never wore a respirator once as a guard."

- *2000s-2010s Guard*

"[W]e did the 232 C2 tie line that had a chlorine fluo-trifluoride line in it, you know, you have potential for residue in there, I know the system has been air gapped and all that but you still have potential for residue of certain chemicals. There are fluorine lines that we've been around, we've cut out you know when whenever we cut and do an actual process system I know there's you know potential for HF you have potential for you know, actual uranium…potential for plutonium, neptunium, and…americium, thorium. And I-I see all the samples with all those data of all the pipes that we've cut out, so I know it's there. It may be in trace amounts. But we're not really monitored for any of it."

- *Current Supervisor*

"I was exposed to pertechnic acid…It burnt through one of their PAPRs and he got an uptake then instantly could taste an iron taste in his mouth. And the Chem Op got burnt through his glove. Burnt through two pieces of glove."

- *Current D&D worker*

"I have worked in a few beryllium areas in 326 [a former uranium process building]. …[W]hen I first came on site, I was monitored for it. But since then all my items on my JWC have went to 'Hey, you don't need monitored for that'… We originally had a lead baseline that came off, the chromium, the asbestos all that just kind of came off. And…I'm currently trying to get it redone to line up with what we do and…I'm being told 'oh you guys don't need that'. And I know that it's there. But I'm also being told we don't need it because we don't meet the minimum. The minimum is without regard to respirator. So it's kind of confusing."

- *Current Supervisor*

"I was exposed a lot to HF. So when you're burning with [a] plasma cutter you're burning, you're blowing 90 pounds of pressure into that that plasma tip and it blows through that metal as oxygen to it and every time we burn you can smell through our PAPRs. Were our PAPR sufficient? I don't know. Would fresh air had been sufficient? Possibly. But they told us PAPRs or face shield or full face respirators what you would…use."

- *Current D&D worker*

"[W]e had [a] component when we're working the MSA [Material Sizing Area] catch on fire, and that shut things down for a little bit and then they said, 'well, well, there's concerns with this chemical'. All of a sudden, that's not a concern anymore. But were they testing for the right things? Because they tested for beryllium, but did they test for arsenic? Because both those come back when I see those samples"

- *Current Supervisor*

When asked about their exposure to hazardous chemicals on site, a current worker said:

"But like I said I can't tell you all the chemicals because I don't know the chemicals. I'm sure there was mercury. You know our PAPRs don't cover mercury and we found a jar of mercury, asn actual mason jar of Mercury when we were finishing up D&D."

- *Current D&D worker*

Some workers also reported that they would wear additional PPE than what was required to reduce the risk of exposure:

"Me and my people we always wear respirators if we're ever on the cell floor because we have had incidences where we were working in an area one time and we were told it was non airborne. Well, we know the area is dirty so we just wore respirators. And there are times where you know, you…come out of the dirty area, you open up your PAPR to talk and then you close it again. They did some air sampling in that area. The day we were finishing and [they] said hey, that should have been airborne that whole time. Well, we had PAPRs on but we'd open them whenever we needed to talk."

- *Current Supervisor*

One worker shared their experience working in the respirator cleaning facility in comparison to doing radiological control work in the field:

> *"[W]e didn't…usually always have prescribed PPE. Back then…because of the material coming back to us that we needed to process and either clean or assemble or get ready for cleaning was filthy from the field, you know. So a lot of times we took it upon ourselves to wear gloves. Sometimes we didn't. For years, we used Loctite on fittings and stuff and wore no gloves. With Loctite, if you've read any kind of safety data sheet, it's pretty it's kind of a hazardous type material…and we didn't wear gloves a lot of times to use the spray nine [potentially carcinogenic cleaning agent] when we were cleaning supplied air hoods or viricide which is a cleaner we used on supplied air equipment. So in that area, there really wasn't as stringent controls as there were actually out in the field. Because typically in the field, you're working under a job hazard analysis or you're working under a radiological work permit, but actually in the respirator facility we didn't have that."*
>
> - *Current IH/HP worker*

Workers are also concerned that some radiological and chemical hazards aren't noticed at all:

> *"So there's drips on the floor of oil that potentially contain PCBs and they you know, go around every now and then just paint a big black square over and contain them and then put a sticker on it. Well, that gets wore off over time because people drive over and walk over all that. And eventually they'll get repainted, maybe, but they're there. There's oil catch cans with PCB and there'll be a little hose that has oil all over it. That is just out there where anyone can walk by and brush against it. They're in clean areas, not not really controlled. So you can be exposed If you're not paying attention. Just by walking through a building and brushing up against something."*
>
> - *Current Supervisor*

> *"[I]t's more industrial hygiene type material, I think that we may have been exposed to and maybe didn't know about, or if we questioned it we were told it really isn't probably an issue."*
>
> - *Current IH/HP worker*

> *"Like there was a fire in 2572 years ago, it was a big deal, then, because it was…the 326 building. You know that that got a whole lot of publicity around site. Well, in the 30, building 31 3-10 stage 8 also caught on fire. And when I talk to people, no one knows about that."*
>
> - *Current Supervisor*

One worker discussed their experience in the D&D process in the 326 building:

> *"We didn't take all the pipes out of that place. I cut a valve out one time…[an IH/HP worker] couldn't get a reading because it was so high. He couldn't get a reading on this valve I was cutting out so I have to get another meter so he went and got another meter. I mean pegged out. I couldn't tell you how many millions of counts it was DPM [disintegrations per minute] and…the rest of the line going down through there…It could have been two inch to an inch and a half to two inch long. And you could stick a number two pencil probably down; it was clear fold. It never came out. It*

stayed in there. I could tell you the exact location where it was at but it was unreadable. Couldn't read with a meter. It just got tore down with that building."

- *Current D&D worker*

One worker mentioned their experiences taking a radiation meter in the cylinder yard:

> *"[Y]ou think you're gonna get some radiation, right so you get in there and yeah…there's some cylinders way hotter than others. But then most of the time…there was some radiation coming off there. You get tails out…It's all in the bottom of the cylinder. If you would have stuck that down underneath there, you'd have been off the chart. The radiation probably going down this way [towards the ground] probably not go out this way so much [towards the side]. We actually had to guard those in the 40s complex. We're in a shack out there. They bring a hot cylinder out there and they would set it out on the concrete path, if it's emitting. It's emitting radiation. You know it's been emitting radiation…because the autoclave the electrons neutrons are going whichever which way…*
> *I think the guys working with in the [...] complex the 344 I think those guys are exposed to radiation on a daily basis."*
>
> - *Guard in 2000s-2010s*

A worker brought up a current practice of exposing workers unnecessarily to create the outward appearance of accomplishing more work:

> *"And there was times when there wasn't a whole lot of work and so…they'd say 'hey you guys need to get up on the cell floor. I don't care what you do, just go up to the cell floor', and you'd be up there two, three hours and then you'd come down. Our supervisor actually said that–told us to go up there. So we were on a RWP and we'd go upstairs and sit and wait for work or sit because they didn't have something for us to do right at the moment. And that was not really practicing ALAR [As Low as Reasonably Achievable–practice of avoiding radiation]. We finally got to where we were trying to tell them 'hey you can't make us do that if you got work for us…we will go do the work. We're not going to sit up there in an area that is contaminated just…for no reason'…"*
>
> *"[T]here has been times that they said you know, 'hey, we're gonna go downstairs and come back and just do a little bit of work that way shows time on the floor' like we want–made two jumps when we could have just stayed up for five hours and had it done, you know…no more work got done. It was just a thing when they says we're gonna put you back in that area. So it looks like we're doing something more, but we really aren't."*
>
> - *Current worker*

D. Use of Radiation Dosimetry Badges

Several workers expressed doubts over the effectiveness of TLDs, the badges used to measure radiological dose:

"So this [the TLD] is supposed to measure my dose. However, anytime I go into an area I wear under my anti-C's [anti-contamination clothing], which is blocking a lot. Especially if…I'm not required to wear a PAPR. You know, this is all under here. My face is exposed. I've been in areas where you know, I have a Rad tech there. I was doing a tour with DOE and they wanted to see a certain pipe. So I showed it to them. I said 'there it is right there' and they're like, 'oh, that's the wrong color. It's completely covered in uranium.' And the rad tech just held his meter up and it completely pegged it out. So I've been in that area many, many times without a respirator so my face is exposed. But my badge is covered up. So maybe it's reading the right dose. Maybe it's not."

- *Current Supervisor*

"We'd…always wore a TLD…think of how a TLD works and now don't hold me to this but I always think of a TLD like it's an average across the board if they got 2000 employees and they send all these TLDs in and it comes back, I'm not sure how they work. Across the board here is zero but never had. I've never had one that's high, you know? And I've been around a lot of stuff so I have a hard time believing that like that's not my TLD, but if it was, I have a hard time believing that little thing right there is going to tell you if I was exposed to radiation or exposed to contamination or I think it was more of a thing. It's more of a thing that if you die in a radiation exposure, and it blows it's got little film and it blows."

- *Current D&D worker*

"I think that was probably the biggest time in my career…as [a] HP, health physics technician that I had exposure to radiation. Now they…always came back on my dosimetry reports, I was always below all the required limits."

- *Current IH/HP worker*

E. Health and Safety Training

Workers also raised concerns over insufficient health and safety training to work with hazards on site:

"However, the majority of what we're being guided on doesn't include any of these other things that they say, 'oh well that doesn't exist here'...Well it does because I see the data."

- *Current Supervisor*

"[W]e were just kind of on the job trained on how to take the beryllium sampling. Of course with the protocol, they have the NIOSH protocol for it. As far as…the health physics technician side of the house that was more stringent. We had a six month class we went through on how to be radiological control technician and then they put us on the job for on the job training and then we had JPMs [job performance modules] we had to pass and then we had a test and an oral board. So there was a lot more training on the radiological side to be a technician than there was on the IH side to be a technician. And then for the respirator facility. There was job performance modules that just told you how to handle the equipment. It didn't really deal with any of the chemicals or anything that you would use to help to clean it or do anything like that."

- *Current IH/HP worker*

"Training? I wouldn't really say we were trained on anything other than like trained on how to use our PPE. I mean, we had quality training on using the PPE. All the men knew how to use it properly, they knew how to do if something happened to like…if your battery went dead to exit the area you know we've had to do that several different times. If you get a hold on something to you know, leave the area immediately."

- *Current D&D worker*

"Other people like they see a ClF3 line and they're like, I don't know what that means. And I'm like, don't cut that line open. It'll explode. So there's certain things like that, that, that's not mentioned in training, but other stuff is like, HF, you should stay away from it. Okay, well, that's good. But it I really think it should go into more detail on Hey, these are the the actual dangers and it's it's a very dry subject so a lot of people kind of gloss over it especially for HAZWOPER it's a 40 hour class when you do it at first and after that it's an eight hour class and it's it's terrible."

- *Current Supervisor*

"And then we were just trained in the radiological control technician classroom how to read a RWP [radiological work permit] and then we in turn at that time under USEC, USEC utilized their HP technicians to conduct their actual radiological worker training. Now the new contractor doesn't do that. They use a separate contractor to do that. You just go through and it's like a very long computer based module of like 200 slides that you're probably never going to retain and then you go over and sit through an hour class. So it's not–I don't know that it's as effective as what we used to do under the former contractor. And it's not taught by radiological control technicians or HP technicians and taught by administrative staff now."

- *Current IH/HP worker*

They also felt that they only learned through their experience onsite the degree to which hazardous chemicals were present onsite:

"My general impression when I first started here…I didn't really think of this as a chemical plant. I thought this is the A-plant you know, nuclear radiation…I was more concerned about radiation than I was chemical even though the chemicals were everywhere."

- *1990s-2010s Chemical Operator*