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Health and Suffering: Measuring and Managing Occupational Valley Fever in California

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Health and Suffering: Measuring and Managing Occupational Valley Fever in California

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Abstract

This dissertation investigates "Valley fever" or *Coccidioidomycosis* as a social, particularly as an occupational health problem. Valley fever is, primarily, a respiratory infection caused by breathing in tiny spores of the *coccidioides* fungus, a native of California. Most people infected experience mild flu-like symptoms; however, for some disease experiences can be severe and life-threatening. Cases of Valley fever are increasing and significant racial/ethnic, sex, and age disparities exist in rate of infection, hospitalization, and death. However, analysis of Valley fever as a social problem is limited. I analyze Valley fever as a problem for California workers. First, I examine the relationship between social class and disease exposures by analyzing Valley fever claims submitted to California's Workers' Compensation Information System from 2000 to 2019 and by building an archival dataset of work-related Valley fever exposures reported in news media, legal cases, and government agency reports. Second, I examine how class politics and scientific and disease uncertainties shape workers' ability to achieve recompense after exposure in two institutional contexts tasked with managing worker health and safety: Workers' Compensation and California's Occupational Safety and Health Administration. Third, I theorize how inequalities in workers' ability to claim occupational disease and the messiness of administrative data shape and challenge knowledge construction about occupational Valley fever. This dissertation contributes to our knowledge about the scope of work-related Valley fever in California, how the responsibility of protecting occupational health and safety is managed by employers and the state, and finally, how stratification shapes data collection and knowledge construction about health and safety issues more broadly.

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Introduction

Occupational health and safety issues are problems of social class. Social class is conceptualized and measured a variety of ways; however, studies repeatedly find that higher socio-economic status is associated with greater health outcomes (Clouston and Link 2021; Link and Phelan 1995; Phelan, Link, and Tehranifar 2010). Social class is intimately linked with occupation which structures opportunities, rewards, social prestige, personal meaning-making and health and safety risks (Ahonen et al. 2018; Burgard and Lin 2013; Kalleberg 1983; Kalleberg and Mouw 2018; Navarro 1982; Weeden and Grusky 2005, 2012). Occupations are significant determinants of health outcomes but are understudied relative to individual or biological understandings of disease or injury.

This dissertation analyzes the relationship between social class and health, specifically by studying work-related "Valley fever" in California. Valley fever or *Coccidioidomycosis* is primarily a respiratory illness caused by breathing in tiny spores of the *coccidioides* fungus. C*occidioides* is a native of California and is particularly found in soils in the San Joaquin Valley and Central Coast regions. Like a virus or bacteria, *coccidioides* is too small for human eyes to see. When *coccidioides* becomes dislodged from the soil through natural disasters, wind, or human activity it can become airborne in dust and inhaled into the lungs. It is estimated that a majority of people who inhale the fungus will have mild, if any, symptoms of infection (CDPH 2013). However, for some the fever, cough, fatigue, chest pain, headache, rash, and joint pain can be debilitating, and in rare cases, life-threatening when the infection spreads beyond the lungs to the brain, spinal cord, or other parts of the body. Significant racial/ethnic, sex, and age disparities exist in rates of infection, hospitalization, and death (Flaherman, Hector, and Rutherford 2007; Seitz, Prevots, and Holland 2012; Sondermeyer Cooksey et al. 2013, 2016, 2020). Although these disparities have not been significantly explained by either social or biological mechanisms. While anti-fungal therapy exists, there is no cure for Valley fever and there is always the potential for disease relapse or progression.

The extent of suffering from Valley fever appears to be growing. Rates of disease increased nearly 800% between 2000 and 2018 (Sondermeyer Cooksey et al. 2020). In 2019, California reported record high rates with over 9000 cases or a rate of 23 cases out of 100,000 people (CDPH 2019). Endemicity of the fungus in particular regions creates disparities in infection rates by county. The Southern San Joaquin Valley's incidence rate in 2019 was 90.6 out of 100,000 people, with Kern County estimated at 367.5 out 100,000 (CDPH 2019; Sondermeyer Cooksey et al. 2020). These incidence rates are likely conservative estimates due to underreporting of mild or misdiagnosed infections (Sondermeyer Cooksey et al. 2020). While scholars have known about the hazards of Valley fever infections for over 100 years (Hirschmann 2007), explicit study of Valley fever a social, particularly occupational health problem is limited.

I examine the relationship between social class and Valley fever in multiple ways. First, I ask: To what extent is Valley fever an occupational health problem in California? How many workers and which types of workers may be at greater risk of disease? How might these patterns reflect Valley fever as a class-based exposure? To answer these questions, I analyzed Valley fever claims data from California's Workers' Compensation Information System (WCIS) from 2000 to 2019 and I systematically collected news media, legal cases, and government agency reports to build an archival dataset of work-related Valley fever exposures. Chapter 1 outlines the method of data collection and management. Chapter 2 – "Identifying Work-related Valley fever in California", constructs our knowledge about the scope of work-related Valley fever.

Drawing on fundamental cause theory (Link and Phelan 1995; Phelan et al. 2010) and literature operationalizing occupations as social class (Weeden and Grusky 2005, 2012), I analyze inequalities in Valley fever exposures by examining differences by occupation and industry and theorize how these potential differences may be reflective of social class. I also examine sex differences in the occupations and industries claimed by men and women. I argue that social class shapes Valley fever exposures in three ways. First, social class shapes the potential for exposure to *coccidioides*. Workers in occupations associated with lower income and education may be particularly at risk of work-related Valley fever due to their concentration in jobs that require outdoor or manual labor. Second, social class likely shapes patterns in underreporting of Valley fever disease. I find occupations associated with greater levels of education make up approximately 25% of workers' compensations claims. Based on prior research, I question to what extent workers of lower social class (and other status groups) are undercounted (an issue examined in depth in Chapter 4). Third, I argue the intersection of social class and sex shape exposure opportunity and exposure source. Men submitted over 80% of workers' compensation claims for Valley fever. I theorize that occupational sex segregation means men are likely at greater risk of exposure from soil disturbance. However, women's overrepresentation in office and administrative support and healthcare occupations may mean greater risk of exposure to due to working in an endemic place or via a laboratory outbreak.

Second, in Chapter 3 – "The Class Politics of Health and Safety: Resolving Work-related Valley Fever Legal Disputes" – I ask how social class shapes dispute resolution for employers and workers navigating two regulatory environments tasked with managing worker health and safety: Workers' Compensation and California's Occupational Safety and Health Administration (OSHA). I ask: How do employers (and their lawyers and insurance companies) try to limit their responsibility for the cost of occupational disease? What role do medical doctors and state actors play? How does uncertainty associated with Valley fever disease influence case outcomes? Who does uncertainty favor? And in what ways? And why?

I analyze workers' compensation and OSHA appeals board legal cases involving disputed Valley fever disease (n = 54), to examine the nature of conflict between employers and workers over the costs of occupational health. Drawing on Marxist labor process theory, I conceptualize these cases as a site of class conflict in which the costs of occupational health and safety cut into employers' extraction of surplus value (Marx 1867; Navarro 1982, 1985; Walters 1985). I examine how employers (and their lawyers and insurance companies) attempt to minimize their responsibility for the costs associated with workers' compensation claims and OSHA citations by focusing on the types of arguments employed.

Considering previous scholarship (Botsch 1993; Michaels and Monforton 2005; Smith 1987), and the invisible and endemic nature of Valley fever disease, I theorized that employers would seek to capitalize on disease uncertainties to avoid responsibility for exposures. I find employers use arguments about uncertainty to try to limit their liability in 40 to 60% of cases. Employers argue that an inability to know the source of a workers' infection and current gaps in scientific knowledge and regulatory practice should resolve them of responsibility. Additionally, in line with previous literature (Draper 1991, 1993, 2000; Dwyer 1991b; Go 1996; Gray 2009; Nichols 1999; Smith 1987; Walters 1985), I find employers blame the individual workers, other employers, or the general hazard of industry in 16% of cases. And, when in doubt, employers attempt to lower their liability by disputing aspects of process over substance.

However, employers lose these cases more often than not. Favorable outcomes for workers occurred around 70% of the time in workers' compensation cases and around 57% of the time in OSHA cases. I theorize that greater wins in the workers' compensation cases can be located in the structure of the regulatory environment and the role of medical doctors. First, tracing the history of workers' compensation, I show that the institutional environment of workers' compensation was designed to be more lenient when it comes to workers' burden of proof than in OSHA's regulatory environment. The "Grand Bargain" of workers' compensation removed issues of negligence from consideration and was designed to shift the balance of power slightly in favor of the worker. Second, previous scholarship is generally critical of the medical profession and the state as serving the interests of employers over workers (Navarro 1985; Smith 1987; Walters 1985) while others suggest that the role doctors play is structured by the institutional environment (Draper 2003; Lippel et al. 2016). I find that the medical profession has significant power in shaping the direction of workers' compensation cases in the California context. Doctors are called on to resolve uncertainties related to Valley fever disease. While state judges have the final say, they look to doctors to determine if a workers' disease was caused by work, if their disease could get worse, and how disabled they might be considered. I find that doctors speaking the "magic words" of medical probability, that the workers' risk of infection from Valley fever was greater at work as compared to elsewhere, seals the fate of these cases in favor of the worker. The workers' compensation system is structured such that doctors possess significant power in resolving occupational disease disputes. In this way doctors can serve as resources to undermine employer power on the behalf of workers.

However, the OSHA regulatory environment is structured differently. Unlike workers' compensation cases for Valley fever which extend back to at least 1942, OSHA's less well-developed regulatory environment for Valley fever appears highly contested and still developing. OSHA's regulatory environment requires a higher burden of proof making landing successful cases more challenging. However, recent and concerted effort by state actors to establish Valley fever as a citable hazard cannot be discounted.

Finally, Chapter 4 – "What counts? How Stratification and Data Practices Shape Knowledge Construction in Health and Safety Research" – draws on theory from feminist and critical data studies, dispute resolution, and stratification to analyze challenges in constructing knowledge about occupational health issues. Workers' compensation data are often used to understand the scope and cost of many work-related injuries and illnesses (Cox and Lippel 2008). However, while they are critical sources of data, I argue they reflect existing power relations that stratify workers' ability to achieve their rights to compensation and, thus, how much of work-related disease actually "gets counted" (D'Ignazio and Klein 2020; Martin and Lynch 2009).

Drawing on theories of dispute resolution (Albiston, Edelman, and Milligan 2014; Alexander and Prasad 2014; Felstiner, Abel, and Sarat 1980; Miller and Sarat 1980), I identify processes of underreporting and underclaiming work-related injuries and illnesses that create barriers to getting counted in workers' compensation data. I identify four barriers to getting counted or what I call getting "Data in" including: unrecognized work-related Valley fever disease, inaccurate diagnosis, challenges linking Valley fever infections back to the workplace, and, finally, how unequal power shape workers' ability to file a workers' compensation claim. Additionally, I reflexively trace my process of working with messy workers' compensation data on Valley fever and argue that the structure of workers' compensation data and the uncertainties surrounding Valley fever disease complicate and shape the process of determining "what counts". I identify how under extracting relevant claims, classifying claims as received in error, de-duplicating claims, and standardizing data shapes what gets counted as work-related Valley fever or as I call getting “Data out” into the world. Overall, these processes structure our ability to know the scope and extent of health and safety problems and create challenges for disease surveillance and prevention efforts.

Valley fever is considered a rare, “orphan” or “neglected disease” because it is not prevalent across the entire United States and thus has never attracted significant research funding on ecology, vaccine development, or newer anti-fungal treatments (Lauer 2017:151). However, cases are increasing and likely will continue to do so. The fungus appears to thrive under the effects of a changing climate while increased development in central California places more people in the fungus’ path (CDPH 2019; Gorris et al. 2018; Lauer 2017). Valley fever should be understood as a social problem, particularly as a problem of work. Social class, gender, race, ethnicity, and its intersection with work are significant determinants of health and well-being (Ahonen et al. 2018; Berdahl 2008; Link and Phelan 1995; Phelan and Link 2015). Valley fever disease is associated with significant racial/ethnic, geographic, and income inequalities (Rios 2015, 2018, 2021; Sondermeyer Cooksey et al. 2020). This dissertation provides a robust analysis of the scope of Valley fever as an occupational health problem (Chapter 1 and 2), examines the ability of the California’s regulatory environment to manage the employers’ responsibility for worker health (Chapter 3), and identifies key challenges facing workers’ ability to access their rights to compensation and our ability to construct knowledge (Chapter 4). Despite its rare status, the structural processes identified here that shape who gets exposed, whose disease gets counted, and how disputes are resolved are challenges for health and safety research, prevention, and resolution more broadly.

Chapter 1. Data Collection and Method

Introduction

This chapter describes data collection and management steps for examining work-related Valley fever exposures in California. First, I obtained confidential workers' compensation claims for Valley fever from 2000 to 2019 from the Workers' Compensation Claims Information System (WCIS). Second, I collected and built an archival database of work-related Valley fever exposures using news media articles, legal cases, and government agency reports and documents. In Chapter 2 I analyze the industries of employers and the occupations of employees across both sources of data to identify potential class-based inequalities in "Valley fever" infections.

Workers' Compensation Data

I obtained Workers' Compensation data from the California Department of Industrial Relations' – Division of Workers' Compensation (DIR-DWC) Workers' Compensation Information System (WCIS). I obtained these data through a partnership with the California Department of Public Health – Occupational Health Branch (CDPH-OHB) and through a 9703(e) data request with DIR-DWC (Barclays Official California Code of Regulations 1999). WCIS data contain Workers' Compensation claims submitted by employers or health care providers called a First Response of Injury (FROI) report. With Subsequent Response of Injury (SROI) reports filed later. These reports are required for illnesses and injuries requiring more than first-aid treatment or that result in lost time beyond the date of the incident. Having workers' compensation insurance is required for all employers in California (even if they only have one employee) and is required for out-of-state businesses with employees who regularly work in California (DIR 2020a). Certain individuals performing work may be excluded from coverage if they are independent contractors, volunteers, family members, student athletes, and others (CA Labor Code 3351 1937). DIR required insurance companies or claims administrators electronically submit claims in 2000 and in 2006 associated medical billing data for the worker was also required. Guidance on available data can be found in the WCIS Guide (DIR-DWC 2018).

Data Requested from the WCIS

Working with CDPH-OHB and DIR-DWC, I developed a request for confidential Workers' Compensation FROI/SROI and Medical Billing Data for Valley fever. Appendix A includes a list of requested variables. Claims for Valley fever were identified in the WCIS if they had “cocci” or “valley fev” in the injury description and/or the medical billing data contained the appropriate International Classification of Diseases (ICD) Ninth or Tenth revision codes for Valley fever. The ICD 9 codes included 114 -114.9 and the ICD 10 codes included B38.0 - B38.9. Claims were requested from January 2000 to December 2019 and were extracted in October 2020. The data obtained from DIR-DWC included 2979 claims.

The WCIS data provide some demographic data about employees including sex (defined as Male, Female, or Unknown), occupation (as text description), date of birth, date of death, marital status, number of dependents, and address information. The data do not provide any information on the race or ethnic identity of the worker. The data also provide information about the injury or illness including: an injury description (with varying level of detail), codes for part of body injured, cause of injury, and nature of injury, date of injury, date of disability, postal code of injury site, initial treatment code, and payment information. The data also provide some information about the employer including their address, industry code, and insurance class code.

Data Management

I took several steps to ensure data quality. All data management steps and analysis were conducted using R. R is a free and open-source statistical analysis software. Most of the steps in the data wrangling process were designed to be reproducible. Code to reproduce the steps will be made publicly available, with any identifying information redacted.

Identifying Valley Fever Claims

Examination of the data received revealed claims for workplace illness or injuries that were likely not related to Valley fever. I identified non-Valley fever claims from the extracted data and, after all other subsequent steps, removed them. I identified non-Valley fever claims in several ways. First, I removed claims extracted by the keyword “cocci” that were not related to Valley fever. Searching the keyword “cocci” in the injury description as part of the initial extraction criteria extracted some claims that were bacterial infections like enterococci or misspellings of some words like “coccyx.” Second, upon review some claims extracted from the medical billing data using the ICD criteria alone were not related to Valley fever. Claims that had a keyword identifying Valley fever in the injury description or that had a keyword AND an ICD code for Valley fever were maintained in the dataset. All claims that only had an ICD code but no keyword for Valley fever in the injury description were thoroughly reviewed for potential error using an iterative computational and qualitative analysis that examined the injury description, part of the body, cause of injury, and nature of injury codes to determine if the claim was likely for Valley fever or a potential error (detailed documentation available in Appendix B). In total, 432 claims were identified that suggested some other kind of injury. See table 1.1 for types of claims removed.

Third, about 15% (n = 478) of the claims involved an employee who had two or more claims in the dataset. Some duplicate claims where likely extracted from the medical billing data in error. For example, some claims clearly indicated Valley fever in the injury description while a second claim for the same employee described a different event where the employee obtained some other kind of injury. Non-Valley fever claims were removed (n = 104). Reading the injury descriptions, some of the duplicated claims appeared to represent either new exposures to Valley fever or additional Valley fever claims filed over time by the same employee. However, reasons for other duplicate claims were unclear. Employees who had multiple claims that were within 120 days of one another were de-duplicated leaving only the oldest claim. This is in line with CDPH-OHB previous practice preserving the claim that represents the first exposure that likely caused illness. For claims that had the same injury date or dates within 120 days of one another, the claim with the most recently updated dates was maintained as these claims generally had the most complete information. Out of the 478 duplicated claims, 212 were preserved and 266 were removed. Appendix C provides a detailed workflow charting how claims were de-duplicated.

Fourth, in the dataset three claims were submitted before 2000 and 38 were from 2020. These claims were removed because I did not possess full data from either of these years. Finally, I identified 56 claims from prison workers by examining occupation descriptions. These claims were not eliminated from the dataset but are not included in the calculation of incidence rates in Chapter 2 because the American Community Survey does not include incarcerated populations. Of the initial 2979 claims received from Workers' Compensation, I identified 2240 or 75% of the claims to be likely Valley fever and within the date range of 2000 to 2019.

Table 1.1: WCIS Data Removed, California 2000-2019

Type of Claims	Number of Claims Identified	Number of Claims Removed
Claims sourced from the WCIS medical billing data suggesting other kind of injury or errors from keyword extraction	432	432
Duplicate Claims	478	266
Claims outside of 2000 - 2019	41	41
Claims from Prison Workers	56	0
Total		739

Data source: California Workers' Compensation Information System 2000-2019.

Industry Data

Industry information for employers in the WCIS contained either Standard Industrial Classification (SIC) codes or North American Industry Classification System (NAICS) codes. NAICS codes describe the economic activity of an employers' business. NAICS information provided in the WCIS ranges from 2-digit NAICS codes (e.g., 22 - Utilities) to 6-digit NAICS codes which provide the most detailed industry description, giving the provided claims different levels of detail. I converted SIC codes to NAICS 2017 codes using a crosswalk (NAICS Associations 2018). Some SIC codes can be converted to a specific NAICS code. However, many SIC codes can be cross walked to several different NAICS codes. In these cases, I examined the employers' insurance class code and looked up the employers' information and assigned an NAICS code closely applicable to the employers' business.

About 15% of the claims were missing industry information. I approached handling missing industry data in several ways. First, some of the claims with missing industry information were from employers who were already in the dataset for a different claim that did have an NAICS code. I developed code to identify the mode (the most frequent) NAICS code for each employer and assigned that code to any claims with the same employer name that were missing an NAICS code. This decreased the percentage of claims with missing data to 10%. I manually assigned NAICS codes to the remaining claims with missing industry information by examining the insurance class code and looking up the employer's business. I assigned the employer as detailed an NAICS code as possible. Some industry codes were easily determined as employers' NAICS codes were publicly available. Others were more challenging either because of lack of available information or, in some cases, their range of business activities meant several NAICS codes could apply. For these claims I provided a less detailed NAICS code which provided broad information about their industry, e.g., 23 - Construction. Since the NAICS codes had varying levels of detail and considering the small number of claims in some industries I ensured all claims had NAICS codes at the 2-digit level. I also converted NAICS 2-digit codes to Census Industry Codes using a crosswalk for incidence rate calculation (US Census Bureau 2021c).

Occupation Code Creation

The workers' occupation information is recorded as a text description in the WCIS. To standardize the occupations, I used the NIOSH Industry and Occupation Computerized Coding System or NIOCCS (CDC NIOSH n.d.) which uses machine learning to covert occupation descriptions to Census codes (it can also return Census Industry Codes and Standard Occupation Classification codes). NIOCCS reads the industry and occupation descriptions and returns a Census code along with a probability that the text description matches that code. Of the nearly 3000 claims, NIOCCS returned 1729 (58%) with a predicted probability of 90% or greater that the Census code matched. About 30% of the occupation codes assigned by NIOCCS were reported to be accurate with a probability between 50% and 89% and around 10% of occupation codes were assigned a probability lower than 50%. I reviewed all results returned by NIOCCS to check for accuracy and assess if a better Census occupation code could be applied based on information not provided to NIOCCS (for confidentiality reasons) including the injury description, the insurance class code, and the employer's name.

I used two resources to assist me in determining if a more accurate Census code could be identified: the 2010 Census Alphabetical Occupations Index (US Census Bureau 2021d) which lists 31,000 detailed occupation titles and their corresponding Census codes and the 2010 Census Occupation Code Lists with Crosswalk (US Census Bureau 2021c). To systematically review the claims, I first sorted the returned Census codes from NIOCCS from highest to lowest probability of accuracy. I then examined all Census codes with a probability of 90% or greater and changed codes that appeared to be inaccurate. I then sorted all the claims alphabetically by the Census occupation title returned by NIOCCS. I reviewed claims for accuracy by 1) comparing the newly cleaned 90% probability or higher codes to the same Census codes that were given a lower probability to check for consistency and accuracy, 2) by comparing consistency of the results across occupation text descriptions and the Census codes returned, and 3) examining if the Census codes returned made sense based on the information in the injury description, insurance class code, and employer's name. I marked 906 claims to double check more closely. As a final step I double checked specific types of occupation descriptions that NIOCCS may have had trouble coding including "inmates," volunteers, laborer, and student. In the case of prison workers if the occupation or injury description described their work I assigned them an applicable Census occupation code otherwise they were assigned as "Did not work." After these steps, I changed 686 occupation descriptions provided by NIOCCS out of 2979 claims. Indicating the NIOCCS tool was accurate about 77% of the time.

The NIOCCS helpfully converted occupation text to standardized Census occupation codes. However, the machine learning algorithm demonstrated consistent types of problems that had to be corrected. First, the tool struggled to distinguish between types of laborers often confusing construction, agricultural, and manufacturing laborers. Second, the tool had difficulty consistently assigning a Census occupation code to archaeologists. Third, police sergeants were often classified as military personnel. Fourth, the tool at times assigned agricultural workers Census occupation code 0205 - Farmers, Ranchers, and Other Agricultural Managers which is under the Census' management occupations category. I changed many of these to Census occupation code 6050 - Miscellaneous Agricultural Workers if it did not seem reasonable to assume that the claim came from a manager. Fifth, the tool relies on the industry description and the occupation description to assign a Census occupation code, but sometimes the algorithm ties that relationship too closely together resulting in the tool not assigning a Census code that would have made more sense. For example, some of the claims have the employers' industry code listed as an insurance company. Despite having a complete occupation description, the tool would assign an occupation from the family of occupations associated with insurance companies - like Claims Adjuster - even when that assignment to human eyes made no sense. If the tool allowed for greater flexibility in its predicted codes perhaps there could be less errors. Finally, as part of deep engagement with the claims' occupation and industry information, I noted a few employers whose NAICS codes appeared to be wrong and corrected those manually.

Archival Data Collection

To build an archival dataset of historical work-related Valley fever exposures I used three types of data: news media articles, legal cases, and government agency reports and document. Table 1.2 provides an overview of each archival document type, the number of documents retrieved from database searches and website collection methods, the number of documents determined to be work-related, and finally the total number of unique work-related exposures. I describe each collection method below.

News Articles

A research assistant and I searched for work-related Valley fever exposures in California newspapers involving at least one worker from 1980 to 2020. We used three newspaper databases to locate articles: Access World News, Acceda Noticias, and Proquest. This included

94 California newspapers including three Spanish language newspapers. We restricted the search to include papers from 1980 as this includes the earliest digital newspapers available in these databases. Across newspapers the average earliest year available is 2000. See Appendix D for a list of all newspapers and dates available.

We conducted several searches between June and July 2021 to locate relevant newspapers then restricted the pool of papers to those most relevant as a second step. In Access World News and Proquest we conducted two main searches: Search one included: “valley fever” or “coccidioidomycosis” AND “outbreak*” OR “industry” OR “occupation” AND excluded any newspaper that contained mention of another disease called “rift valley fever.” Search two included: “valley fever” or “coccidioidomycosis” AND “sick” OR “ill” OR “infect*” OR “caught” AND “work*” OR “employ*” OR “job” and NOT “rift valley fever.” For Acceda Noticias we simply searched “fiebre de valle” or “coccidioidomicosis” due to the limited number of articles available in Spanish language papers.

Our search resulted in over 1000 potentially relevant newspapers. For comparison, a general search for “valley fever” restricted to California newspapers and the 1980–2020 date range in the Access World News database brought up a total of 2420 results. Developing search terms that were not so broad as to return too many irrelevant papers while not being so specific that it excluded potentially relevant papers was challenging. Particularly since the search had to include the term “work” this resulted in many papers being irrelevant.

We coded papers as relevant using the following guidelines. 1) Someone in the article claimed they got Valley fever at work. 2) Someone claimed someone else got Valley fever at work. 3) Someone did not claim they got Valley fever at work, but they did have Valley fever and they did work in an occupation where they might be exposed - like in construction, agriculture, oil field work, police work, prison guard or prisoner labor, laboratory work, trucking, custodial work, landscaping, and teaching. 4) A report of a general outbreak that makes connections to workers being exposed. 5) A report of a workplace outbreak. 6) Rumors workers had gotten Valley fever at a certain location or workplace or rumors of a workplace outbreak. And 7) lawsuits or investigations of workplace outbreaks or exposures. We initially classified articles claiming that community members got Valley fever because of some outdoor project like a construction project as relevant; however, ultimately these were not included in the final dataset because we could not make the explicit link between work and disease. Generally, we coded articles as relevant if we could make the link between the individual and a work-related exposure.

For consistency in determining if articles were relevant, the research assistant and I reviewed 29 articles together and compared our coding. Many of the articles we marked as not relevant generally discussed Valley fever symptoms, the hope for a vaccine, rates of disease, or calls for awareness. We also encountered articles that described weather-related outbreaks (~85), exposure of prisoners incarcerated in endemic areas (~500), and development projects where citizens expressed concern about potential disease outbreak (~6).

California Legal Cases

I obtained legal case decisions related to occupational Valley fever by using Nexis Uni which provides legal case decisions from federal and state courts. I used general search terms ("valley fever" or "Coccidioidomycosis") to retrieve as many relevant cases as possible. I conducted the searches between March and July 2021. I examined other databases like the California Courts Collection, HeinOnline, and the Department of Labor's website for federal workers' compensation legal cases; however, these searches ended up being redundant to Nexis

Uni or did not identify any relevant cases. The Nexis Uni searches identified over 600 legal cases. I reviewed the legal cases restricting the pool to those litigated in California involving a work-related exposure and eliminated duplicate cases. The search additionally identified over 500 Valley fever legal cases involving veterans. These cases were not included in the database as they involved non-civilian workers.

California Government Agency Documents

I obtained investigation documents involving work-related Valley fever from the California Department of Public Health (CDPH) website and from the federal and California Occupational Safety and Health Administration (OSHA) websites. These documents were collected between January and July 2021. The CDPH website provided eight documents including detailed case investigation reports and academic articles. The OSHA documents included: OSHA citations, Catastrophe and Fatality Investigations, and OSHA citation appeals documents. I confirmed the documents described a work-related exposure involving at least one worker in California. I also pulled one report from the Centers for Disease Control and Prevention (CDC) after the initial collection period as two outbreaks among prison employees and prisoners in newspaper reports referenced the CDC report several times.

Building the Archival Work-related Valley Fever Database

All archival documents were stored and coded in MAXQDA, a qualitative data analysis software. The research assistant and I deductively coded all documents at the “variable” or attribute level (Deterding and Waters 2018). We coded each work-related exposure for: the first and last years of exposure, the number of workers exposed, the sex of the workers, the reported severity of illness, the employer(s) name, employer(s) location, exposure location, industry (coded as 2-digit NAICS codes), and occupation (coded as worded in the document). We recorded information as described in the documents as closely as possible which meant that some data were recorded at different levels of specificity. For example, the exposure locations range from as specific as a street address to as broad as an entire county. Some of the documents did not provide all desired exposure information. Missing information was coded as “NA” to mark that we attempted to identify the information, but it was not present. Across the multiple sources of data, we obtained around 1732 potential documents (see table 1.2). Of these, I identified 108 unique work-related Valley fever exposures involving at least one worker in California.

Table 1.2. Number of Archival Documents Retrieved, Classified as Work-related, and Deduplicated for Valley Fever, California, 1933-2019

Archival Document Source	**Number Retrieved**	**Number Work-related**	**Number Work-related Deduplicated**
California Newspaper Articles	1041	39	18
California Legal Cases			
CA Court Cases	39	3	1
CAL/OSHA Appeals Board Documents and Cases	38	32	0
CA Workers Compensation Appeals Board Cases (including those that reached an appellate court)	140	46	41
Federal Employee Compensation Board Appeals Cases	26	9	8
Federal Court Cases	401	6	6
Government Agency Reports			
*CDC Report**	1	2	2
CDPH Investigations	8	8	6
OSHA Citations	15	15	4
OSHA Catastrophe and Fatality Investigations	23	23	22
Total	1732	183	108

*Note: The "Number Retrieved" column provides the number of documents retrieved from database and website collection methods. The second column describes the number of documents determined to involve a potential work-related exposure to Valley fever. The final column provides the number of documents that involved a unique potential work-related exposure not listed in other sources. *CDC Report listed two potentially work-related exposures.*

Chapter 2. Identifying Work-related Valley Fever in California

Introduction

Social class structures health and disease. While there are many way in which social class shapes health outcomes, studies consistently find that people with more resources and power are better able to protect themselves from disease and death (Clouston and Link 2021). One significant, but often underappreciated, link between social class and health is work. Work can be positive force providing access to social mobility (Kalleberg and Mouw 2018; Torche 2015) and offers activities which provide a worker with a sense of purpose, pride, and dignity (Hodson 2001). However, the workplace can also serve as a site for the reproduction of categorical inequality (Kalleberg 1983; Tomaskovic-Devey 2014), and critically, for this study, structure exposure to illness, injury, and death (Ahonen et al. 2018; Burgard and Lin 2013).

Occupational illness, injury, and death have a long and dark history in the United States. With the expansion of industrialization in the 19th century work became an increasingly dangerous activity involving contact with heavy machinery, exposure to toxic chemicals and dust, and long, grueling hours (Berman 1977; Rosner and Markowitz 2020). These dangers were not felt evenly with lower class workers, often immigrants, exposed to unsafe conditions in mining, steel, garment, and other manufacturing industries (Berman 1977; Smith 1987). Today, work has generally become a safer place. In large part due to dogged social movements organized by labor unions and women's organizations devoted to increasing safety (Reynolds and Brady 2012; Rosner and Markowitz 2020). The creation of health and safety standards through Occupational Safety and Health Administration in 1970, for example, was the result of decades of mobilization by unions and social movements (Rosner and Markowitz 2020). While work has generally become safer than during peak industrialization in the 19th and early 20th century, injuries and illness at work continue to plague many occupations and industries in class-based ways (Burgard and Lin 2013; Lipscomb et al. 2006).

I examine potential class-based inequalities in “Valley fever” exposures by analyzing the occupations and industries of infected workers. Valley fever or *Coccidioidomycosis* is a growing health problem in California. Valley fever, also called the “San Joaquin Valley fever” or “desert rheumatism” because of its association with California’s Central Valley, is caused by inhaling tiny spores of the *coccidioides* fungus. While it is believed that most people who breathe in the spores will have few, if any, symptoms, for some illness with Valley fever causes permanent disability and death. And while treatment is available, preventative measures like vaccines have yet to be designed successfully.

Researchers began to understand the health impacts of work-related Valley fever particularly in 1930s and 1940s after examining migratory laborers affected by the Dust Bowl and military personnel active in the Central Valley during WWII (Hirschmann 2007). Public attention to Valley fever waxes and wanes after highly publicized outbreaks like the 1977 “Tempest from Tehachapi” which blew dust from Bakersfield to Sacramento (Goodyear 2014) or after the 1994 Northridge Earthquake near Los Angeles (Schneider et al. 1997), or more recently on solar farm construction projects in Monterey and San Luis Obispo counties (Sondermeyer Cooksey, Wilken, et al. 2017; Wilken et al. 2015). Generally, cases of Valley fever are trending upward (Sondermeyer Cooksey, Nguyen, et al. 2017) and survelliance studies continually document racial, ethnic, sex, and age-based inequalities in infection, hospitalization, and death rates (Flaherman et al. 2007; Seitz et al. 2012; Sondermeyer Cooksey et al. 2013, 2016). Despite this growing attention, research linking Valley fever to underlying social conditions that shape infection has been challenging.

General epidemiological surveillance of the disease using lab reports and/or clinical diagnosis has improved over time (Benedict et al. 2019); however, surveillance of work-related *coccidioides* exposures has not kept pace. General epidemiological surveillance cannot tell us if the individual became infected while at work. Das et al. (2012) used one of the only sources of data available, California Workers' Compensation Information System Data, to examine work-related rates of Valley fever by occupation and industry for the years 2000 to 2007. However, this work has not been updated, and since 2007 general epidemiological surveillance has reported a 3-fold increase in cases (CDPH 2019) but we have no similar estimate for work-related exposures.

Drawing on literature conceptualizing social class through occupations, I seek to provide a stronger link between social class and Valley fever exposures by examining occupations and industries of work-related Valley fever cases. This chapter asks: How many workers and which types of workers may be at greater risk of Valley fever disease? And how might these patterns reflect class-based or sex-based differences in risk of exposure? To answer these questions, I engage closely with several types of data to understand work-related exposures in California. I construct knowledge about workplace *coccidioides* exposures by analyzing worker occupation, industry of employment, and sex using claims submitted through California's Workers' Compensation Information System from 2000 to 2019 and work-related exposures reported in government agency investigation documents, news reports, and California legal cases.

This chapter expands on previous work in several ways. First, the chapter reproduces and extends the analysis of Das et al. (2012) to examine workers' compensation claims data from

2000 to 2019. I analyze claims from additional years[2], attempt to locate missing employer industry information, and analyze the data for sex differences by industry and occupation. Due to underreporting, workers' compensation data likely represent a conservative estimate of work-related disease (Azaroff, Levenstein, and Wegman 2002; Cox and Lippel 2008; Fan et al. 2006; Probst, Brubaker, and Barsotti 2008; Wuellner, Adams, and Bonauto 2016). To complement the workers' compensation data and build on the work of Freedman et al. (2018), I analyze work-related Valley fever exposures reported in government administrative agency investigation documents, news reports, and legal cases. Freedman et al.'s (2018) meta-analysis highlighted important workplace outbreaks documented in the academic literature; however, this meta-analysis did not examine non-academic sources that may provide a valuable record of outbreaks that drew the attention of state agencies, the public, or private legal disputes that were not the focus of academic research. Systematic collection and analysis of these sources can provide important counter-data (D'Ignazio and Klein 2020) to build our understanding of workplace exposures wholistically using a variety of sources. Additionally, analyzing both workers' compensation claims and archival reports provides an opportunity to compare results across different data sources offering a check on study validity. This chapter provides some of the most detailed collection and analysis of work-related Valley fever exposures to date.

Additionally, this chapter studies Valley fever as a *social* problem. With the exception of the work of Rios (2015, 2018, 2021) and public health investigations, much of the research on Valley fever has been concentrated in the fields of biological and clinical sciences. A sociological approach linking health outcomes to social conditions is desperately needed to not

[2] It is also important to note that reporting of workers' compensation claims often lag. My dataset contains more claims for the same years examined by Das et al. (2012) because these claims were reported following their analysis.

only understand who is at risk but how individuals become exposed to risk. In this chapter I draw on fundamental cause theory (Link and Phelan 1995) and examine Valley fever particularly as a worker, and thus a class-based, problem. While we know there are challenges to Valley fever surveillance generally, like undiagnosed or misdiagnosed disease, this chapter constructs our knowledge about the scope of work-related Valley fever in California. Knowledge construction on this topic may be a critical step toward documenting and preventing human suffering, particularly for vulnerable groups of workers. This chapter attempts to engage in knowledge construction using an holistic approach examining workers' compensation data and an archival collection of administrative, legal, and news data to triangulate our knowledge.

Theory

Fundamental Cause of Disease

This chapter is concerned with how social class may structure health and disease, particularly focusing on work-related Valley fever. In contrast to studies locating injury and disease in individual risk factors, sociologists, particularly in the 1980s and 1990s, called for locating health problems in social conditions spurring an entire field of research. Integral to this perspective shift was fundamental cause of disease theory which argued that social conditions shape health outcomes (Link and Phelan 1995; Phelan et al. 2010). Fundamental cause theory attempted to explain the persistent finding that socioeconomic status is positively associated with a multitude of health outcomes. Link and Phelan (1995) theorized that socioeconomic status was a fundamental cause of disease because it provided access to "flexible resources", such as power, prestige, money, social networks, and knowledge, making it easier for those with greater privilege to overcome and avoid disease. Flexible resources operate at both the individual and the collective level such that people in privileged neighborhoods and affinity groups pool their resources in the promotion of health (Phelan et al. 2010). Later work acknowledged that systemic racism and gender-based inequality are also fundamental causes of disease that shape socioeconomic status and thus health outcomes (Clouston and Link 2021; Phelan and Link 2015; Phelan et al. 2010). Finally, fundamental cause theory demanded that health studies contextualize risk factors, that is, understand the social, economic, and cultural forces that place people at risk of disease (Link and Phelan 1995; Phelan et al. 2010). Pointing out that without a firm understanding of how structure shapes health, interventions might not only be inappropriate but actually increase health disparities. Over 25 years later fundamental cause theory continues to be a dominant and well-supported model for understanding health disparities (Clouston and Link 2021).

Theory at the intersection of work and health have similarly argued for contextualizing health problems as fundamentally issues of social class (Burgard and Lin 2013; Desmond 2007; Draper 1991; Dwyer 1991a; Hall 1993; Lipscomb et al. 2006; Navarro 1982; Nelkin 1985; Novek 1992; Paap 2006; Rosner and Markowitz 1984, 2020; Walters 1985) while also acknowledging intersecting gender and racial/ethnic-based inequalities (Berdahl 2008; Berdahl et al. 2018). Social class and work are intimately related. Social class structures access to particular types of work, while work reciprocally shapes an individual's socio-economic position by differentially allocating income, social prestige, and power (Ahonen et al. 2018; Kalleberg 1983; Lipscomb et al. 2006). Work also influences the extent and type of physical and psychological demands placed on the body, potential exposures to chemical and safety hazards, and access to compensation and benefits (Ahonen et al. 2018; Burgard and Lin 2013; Lipscomb et al. 2006). Workers of lower social class are particularly vulnerable to health and safety issues at work in part because they are sorted into occupations involving manual labor in industries that are particularly hazardous like construction, mining, and agriculture but also because differentials in power may limit workers' ability to know about hazards and instill fear of retaliation that may prevent workers' from voicing concern (Burgard and Lin 2013; Lipscomb et al. 2006; Paap 2006).[3]

Occupations as Social Class

Conceptualizing and measuring social class is highly debated with no one dominate approach in sociology. For Marx, class divisions were based on property ownership and the division of labor with largely two big classes, capitalists who owned the means of production and workers who did not (Bendix 1974; Marx 1847). For Marxists, exploitation was central to class analysis as capitalists appropriate surplus from the oppressed (Marx 1847; Sorensen 2005; Wright 1984). Additionally, under Marx, class-based interests formed the basis of identity and group formation (Bendix 1974). Later scholars worked to identify the class position of middle class professional workers who occupy contradictory class locations (Wright 1984) or people who own different types of property or rents (Sorensen 2005). What is often central in the Marxist tradition in analyzing class conflict between employers, workers, and other actors.

For Weber, class was also linked to a workers' life chances under capitalism. However, he broadened the number of potential class groupings by tying social class to a workers' market situation or their relative control over goods and skills (Bendix 1974; Weber 1946). While workers could share class interests they were not necessarily united. Additionally, Weber

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[3] There is a cultural dimension to understanding how social class shapes work-related injury and disease. Studies suggest that working class culturs may shape how workers perceive and respond to hazards (Desmond 2007; Paap 2006).

proposed the concept of status groups, communities identified with a particular degree of social honor, prestige, or life style that also served as sources of stratification (Ridgeway 2011; Weber 1946). Weber's contributions provided sociologists a useful tool, by examining a workers' occupational group, sociologists could measure a workers' relative standing in the labor market (Weeden and Grusky 2005, 2012).

However, the number and distinction between class groupings is debated. Class groupings have ranged from five, seven, nine, or twelve big occupational groupings to "microclasses" consisting of detailed and disaggregated occupations (Grusky and Sørensen 1998; Torche 2015; Weeden and Grusky 2012). Studies have also examined a workers' industry or the intersection of occupation and industry to understand patterns in social class mobility and other outcomes. Erikson, Goldthorpe, and Portocarero (1979) proposed a class schema of nine occupational groupings taking into account industry, self-employment, and skill. Others have examined industry-occupation cells (for example: a clerical worker in public administration) arguing this approach more accurately reflects a workers' position in the labor market (Hirsch and Schumacher 1992; Huffman and Cohen 2004). A variety of social class models include occupation and other social, geographic, cultural, and employment-related characteristics (Eyles, Manley, and Jones 2019).

The delineation between class groupings, while debated, generally considers social class as structured by level of income, education, and/or occupational prestige (Weeden and Grusky 2012). Higher social classes often include professional and managerial workers in possession of higher education and, relatedly, higher levels of income, resources, and power (Weeden and Grusky 2012). While lower social classes often reflect occupations that do not require advanced degrees and involve heavy physical labor, devalued skills, and lower pay (Weeden and Grusky

2012). Conceptualizing how social classes relate to other another is also debated (Eyles et al. 2019). Gradational approaches conceptualize social classes as hierarchical with each occupation positioned relative to others by income or some other measure of prestige (Weeden and Grusky 2012). This approach privileges income, prestige, and resources as the primary mechanism predicting class outcomes. Others have argued that underlying mechanisms shaping class outcomes are too complicated for a purely gradational approach to class analysis (Erikson et al. 1979). However, Weeden and Grusky (2012) find that class-based politics, attitudes, and lifestyle choices are increasingly organized along a hierarchical gradient of income. Thus, a gradational approach is a useful strategy for comparing occupational groups relative standing, and thus power, in the labor market.

Scholars have debated whether or not social class (Wilson 1987) or race/ethnicity (Omi and Winant 2014) or gender (Ridgeway 2011) matter more for shaping structural disadvantage. Some scholars have argued that social class hardly matters in the face of other categorical inequalities and identity-based social movements (Pakulski and Waters 1996b, 1996a, 1997). While particularly feminist work has called on social science to understand domination and inequality as operating via multiple intersecting oppressions including race, ethnicity, class, gender, sexuality, and nation (Collins 2000, 2015). Regardless, studies have demonstrated that occupations do matter for shaping life outcomes as workers in occupations are similarly affected by large-scale structural changes in the world of work (Weeden and Grusky 2012; Zhou and Wodtke 2019). In short, examining occupations and industries are helpful tools that reflect a workers' class standing and shape politics, identity, attitudes, material outcomes (Kalleberg 1983; Mouw and Kalleberg 2010; Weeden and Grusky 2012) and, of course, exposure to work-related safety and health hazards (Ahonen et al. 2018; Burgard and Lin 2013; Lipscomb et al.

2006). Occupations and industries are meaningful manifestations of class and critical for examining inequality at work (Kalleberg 1983; Kalleberg and Mouw 2018; Mouw and Kalleberg 2010).

The intersection of social class and sex may be particularly relevant for Valley fever exposure. Occupational segregation by sex, or the differential distribution of men and women in particular occupations, both reflect existing social structure and shape inequality (Reskin, McBrier, and Kmec 1999). While occupational sex segregation has decreased over time, these gains have primarily occurred as more women moved into previously male-dominated professional, managerial, and service occupations (Blau, Brummund, and Liu 2013). However, women have not made much headway into blue collar employment dominated by men and men have made little progress moving into primarily female-dominated occupations like those in healthcare, household employment, and personal service (Blau et al. 2013). In fact, education is highly correlated with sex segregation. Sex segregation in occupations requiring lower levels of education have seen less improvement compared to occupations requiring higher levels of education.

Drawing on the occupations as social class literature, I examine potential class-based inequalities in Valley fever exposures by examining differences by occupation, industry, and the overlap between the two. Workers in similar occupations and industries performing similar types of work are subject to similar health and safety issues. In other words, work is a social determinant of health (Ahonen et al. 2018; Burgard and Lin 2013; Lipscomb et al. 2006), making occupations and industries important categories for examining patterns in disease. The Bureau of Labor Statistics routinely reports injuries, illnesses, and fatalities by occupational and industry categories (BLS 2021). And public health research and surveillance, particularly as a result of the

Covid-19 pandemic, has called for increased standardized collection of individuals' occupation and industry information to better link health outcomes to work (CDC NIOSH 2020).

Valley fever

Valley fever is an illness caused by breathing in tiny spores of the *coccidioides* fungus which lives natively in the soil in California and is particularly common in the San Joaquin Valley and Central Coast regions (CDPH 2019). When an individual inhales the fungus' spore it can take hold in the lungs and can lead to symptoms such as fever, cough, fatigue, chest pain, headache, rash, and joint pain (CDPH 2013). In rarer cases the disease can cause long-term disability, particularly when the infection becomes disseminated or moves from the lungs into the brain causing meningitis, and/or to the bones, joints, skin, and other organs (CDPH 2013). Individual experiences coping with Valley fever symptoms are varied. A majority of people infected by the fungus will have none to mild flu-like symptoms (~60%), but for some the symptoms can range from moderate to severe (around 40%) (CDPH 2013). There is no cure for Valley fever and no vaccine. Anti-fungal therapy is available to help the immune system combat the fungus, but the treatment can come with harsh side-effects and cannot kill the fungus entirely (Amaro and Wood 2012). Qualitative studies on individuals' experiences coping with Valley fever are few, but from what we do know living with Valley fever can be painful and the fatigue that accompanies the disease can derail every day activities including working and caring for others (Filip and Filip 2008; Garrett et al. 2016; Rios 2018).

Generally, rates of Valley fever are rising across California. Incidence rates from 2000 to 2018 have increased nearly 800% (Sondermeyer Cooksey et al. 2020). In 2019, the state recorded the highest rates ever with over 9000 new cases or a rate of 23 cases out of 100,000 people (CDPH 2019). On average there are 78 deaths from Valley fever in California every year

(Sondermeyer Cooksey et al. 2016). Important regional differences in incidence rates exist. While California's overall incidence rate for the years 2000-2018 was 7.9 out of 100,000 people, the Southern San Joaquin Valley had an incidence rate of 90.6 out of 100,000 people (Sondermeyer Cooksey et al. 2020). These incidence rates are based on provider and laboratory test-based reporting which likely underestimate the total cases of Valley fever for all years as some individuals with milder cases may not see a healthcare provider or be tested (Sondermeyer Cooksey et al. 2020). In some cases, Valley fever is misdiagnosed as pneumonia.

Additionally, these rates do not include California prisoners who contract Valley fever while serving time in endemic areas. For example, in 2011 two prisons which account for over 80% of all Valley fever cases among prisoners reported over 500 cases with estimated rates of over 7,000 cases per 100,000 at one prison and over 3,800 per 100,000 at the second prison (Wheeler, Lucas, and Mohle-Boetani 2015). Cases of Valley fever are expected to continue to rise as periods of drought and heavy rain associated with climate change appear to encourage the fungus' growth, dispersal of spores, and subsequent infections (Gorris et al. 2018).

Overall, clinical and public health research highlights racial/ethnic and sex disparities in infection, hospitalization, and death rates for Valley fever (Flaherman et al. 2007; Seitz et al. 2012; Sondermeyer Cooksey et al. 2013, 2016). Incidence rates for Valley fever are higher among men, adults older than 40, African Americans, and Central California residents (Sondermeyer Cooksey et al. 2020). Additionally, men and African Americans and Asian-Pacific Islanders (compared to Whites) are at reportedly greater risk for severe disease (Flaherman et al. 2007). Men, African Americans, and Hispanics are at greater risk of hospitalization (Seitz et al. 2012; Sondermeyer Cooksey et al. 2013). And African Americans are at reportedly greater risk of being hospitalized with the disseminated form of the disease (Seitz et al. 2012). Rates of death are also reported to be higher among men and African Americans (Sondermeyer Cooksey et al. 2016). Continued research is needed to link these disparities to social processes such as racial/ethnic concentration in certain parts of the state, social class and occupations, and barriers in accessing healthcare and proper treatment, which expose certain bodies to greater hazard.

Research linking Valley fever disease to work has grown over time. Some of the earliest work-related outbreaks involved Stanford University students and faculty members on a biology field trip (Davis 1942) as well as among members of the military stationed at Camp Roberts in Central California during WWII (Shelton 1942). More recently, California Department of Public Health (CDPH) investigations have documented that construction workers (Laws 2018; Sondermeyer Cooksey, Wilken, et al. 2017; Wilken et al. 2015) and wildland firefighters (Laws et al. 2021) may be particularly at risk due to the nature of their work. Additionally, agricultural workers, the majority of which are Hispanic or Latino(a), are likely also at greater risk of infection because their work requires being outdoors and engaging in soil and dust-disturbing activities (McCurdy et al. 2020). Freedman et al.'s (2018) meta-analysis of *coccidioides* outbreaks recorded in academic journal articles demonstrated that almost half of recorded outbreaks (n = 25) involved workers, primarily among military members, archaeologists, laboratory scientists and construction workers. However, the focus on academic articles alone meant that no agricultural outbreaks were reported. These studies highlight the potential range of occupations at risk of exposure but particularly locate workers in outdoor occupations and who engage in soil-disturbing activities as especially at risk.

Hypotheses and Contributions

Engaging with fundamental cause theory, I examine Valley fever exposures by occupation and industry and theorize how potential disparities in disease may be reflective of social class. Following Weeden and Grusky (2012), I conceptualize social class as gradational – an approach that evaluates life chances of social classes by their position in a hierarchy indexed by income or prestige. The gradational approach aligns well with fundamental cause theory which similarly argues that the ability to manage and avoid disease risks are shaped by resources and power. While a gradational approach sidelines cultural features of class, which can also shape disease risk (Desmond 2007), Weeden and Grusky (2012) find that class-based (i.e. occupationally-based) politics, attitudes, and lifestyle choices are increasingly organized along a hierarchical gradient of income. Weeden and Grusky (2012) adjudicate between "big classes" and "microclasses", I present findings at both more aggregate and less aggregated occupation and industry levels.

I hypothesize that workers in occupations that coincide with lower social class will be more highly represented in the data. Rather than dogmatically assign workers to a lower or higher social class, following a gradational approach I conceptualize lower class as a generally associated with lower levels of income. As a general guide, figure 2.1 provides Census occupations ordered hierarchically by median income for California work using 2019 American Community Survey data. Fundamental cause theory predicts that workers with lower levels of income, and thus with lower access to "flexible resources" like knowledge, power, and prestige, will be less able to avoid disease. This may be particularly true because for Valley fever as an environmental exposure. Lower paid outdoor workers in farming, transportation, construction, and oil and gas extraction are likely particularly at risk. Not only are these workers more likely to be employed in outdoor settings but a variety of power dynamics associated with working in low wage and precarious employment may structure infection like lack of knowledge about Valley fever as a hazard, fear of retaliation for speaking up about safety issues, or even masculine culture interfering with safe work practices (Burgard and Lin 2013; Ness 2012; Paap 2006).

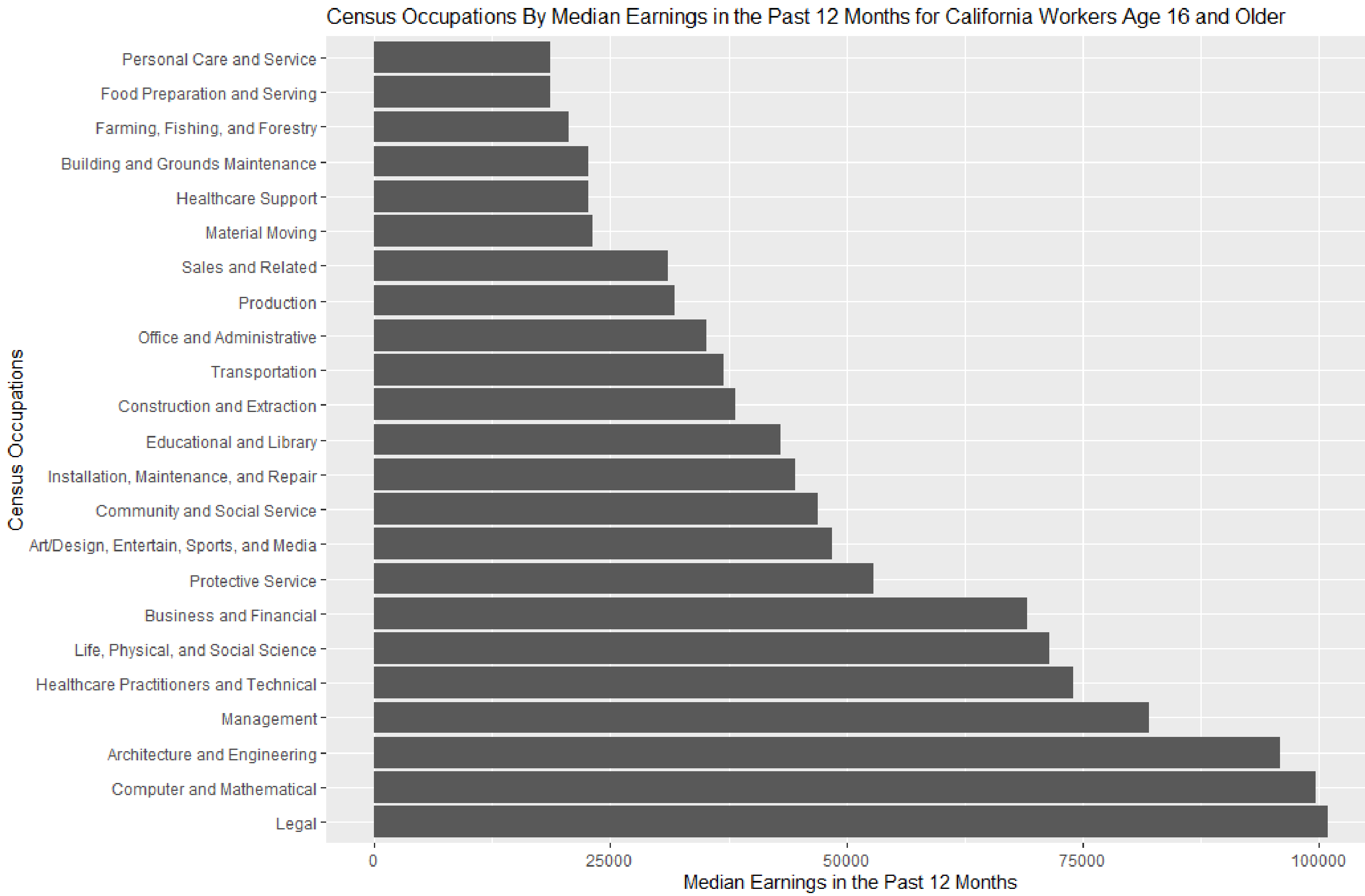

Figure 2.1. Census Occupations by Median Earnings in the Past 12 Months for California Workers Age 16 and Older, American Community Survey 2019.

However, Valley fever's endemic nature may challenge fundamental cause theory. Previous research finds that archaeologists and biologists performing research or providing technical assistance have also become exposed while working outdoors. Some occupations earning higher incomes that require advanced degrees or specific technical skills used in outdoor settings may also be represented. Finally, considering the endemic nature of Valley fever, workers in some occupations not directly involved in outdoor manual labor may be exposed just by working in an endemic place. However, I predict that lower paid workers in occupations requiring regular outdoor work and direct engagement with the soil will be more highly represented in the data compared to workers of higher social class.

Finally, acknowledging that health disparities are intersectional in nature (Berdahl 2008; Collins 2000), I examine potential sex differences in disease by occupation and industry. Racial or ethnic identity of the workers is not available. In the context of Valley fever disease, occupational sex segregation may particularly shape disease outcomes. Workers in occupations requiring higher levels of education tend to be less segregated by sex (Blau et al. 2013). However, lower paid blue collar occupations continue to be dominated by men while healthcare and personal services are dominated by women (Blau et al. 2013). Considering the nature of Valley fever exposure and pattens in occupational sex segregation which concentrates more men in manual labor and outdoor occupations, I hypothesize that men will be more highly represented in the data. Broader Valley fever disease surveillance finds that men tend to be at greater risk of disease compared to women (CDPH 2019) but has not identified causal mechanisms.

A consistent challenge of Valley fever research is locating systematic sources of data on work-related disease. Das et al. (2012) used one of the only sources of data linking Valley fever and work and examined employer industry and worker occupation using Workers'

Compensation Information System (WCIS) data from 2000 to 2007. However, an analysis of workers' compensation claims for Valley fever has not been updated while general epidemiological surveillance has reported a 3-fold increase in cases since 2007 (CDPH 2019). I expand on Das et al. (2012) to examine workers' compensation claims data from 2000 to 2019. Additionally, I examine claims from additional years, attempt to locate missing employer industry information, and analyze the data for sex differences by industry and occupation. Workers' compensation data likely underestimate work-related injury and disease due to underreporting by employers and workers (Cox and Lippel 2008; Fan et al. 2006; Probst et al. 2008; Wuellner et al. 2016), particularly among less advantaged workers who fear retaliation or stigmatization (Cox and Lippel 2008; Scherzer, Rugulies, and Krause 2005).

Knowing this limitation, I followed Freedman et al.'s (2018) approach and conducted a systematic collection and analysis of work-related Valley fever cases reported in news media, government agency reports, and legal cases. Examining these two sources of data in tandem may provide the opportunity to triangulate findings or expose potential blind spots in workers' compensation data. In particular the archival data may provide a source of counter-data (D'Ignazio and Klein 2020) documenting work-related Valley fever exposures that never made their way through the workers' compensation system. For example, state investigations can be triggered proactively if a clustering of cases is reported by laboratory data which does not require workers to advocate for themselves through workers' compensation. Additionally, news reports may highlight individual workers' experiences where the state never became involved.

Method

To examine how many workers and which types of workers may be at greater risk of Valley fever disease and how these patterns might reflect class-based or sex-based differences in exposure, I analyzed 2240 confidential California Workers' Compensation Information System (WCIS) claims for Valley fever from 2000 to 2019. Additionally, I analyzed an archival database of collected government agency investigation documents, news reports, and California legal cases concerning 108 workplace exposures. I used R to conduct all analyses and Chapter 1 describes the method of data collection and data management for both data sources.

I conducted detailed descriptive and exploratory analysis of the WCIS and archival data. I provide descriptive statistics for occupation, industry, and sex of workers. Additionally, I used qualitative and computational approaches to assist with analysis of injury description text in the WCIS data. First, I read injury descriptions inductively noting keywords related to disease symptoms, exposure type, and mentions of Valley fever. Then I used R's "grep" function to deductively code claims looking for specific keywords. I used these keywords to assist with identifying claims as likely for Valley fever as described in Chapter 1 and to help identify laboratory and outdoor exposure types.

I calculated incidence rates for Valley fever using denominator data from the American Community Survey (ACS) for the years 2000 to 2019. To obtain ACS data I used an R package called "TidyCensus" (Walker and Herman 2021) to interface with the Census API and pull specific table estimates for Census industry, Census occupation, and sex of workers in California. I pulled ACS 5 Year Estimates for years available including 2010 to 2019. The ACS 5 Year Estimates have increased statistically reliability but are not available for all years (US Census Bureau 2021a). I pulled ACS one-year estimates for the years 2005 to 2009. I identified the relevant tables to use by examining Social Explorer's Data Dictionary (Social Explorer 2021). The Census API does not provide ACS data before 2005. For 2000 to 2004 I accessed ACS one-year estimates from the Census Archive (US Census Bureau 2021b). The archive data provide the same table data for the years that I used the Census API; however, the archive did not provide margins of error in 2000 and 2001 files.

Results

First, I report findings from analysis of workers' compensation data followed by the archival data. I identify how the results are reflective of social class and sex-based patterns in exposure to Valley fever disease.

Workers' Compensation Data

Years of Injury

The WCIS dataset contained a total of 2240 Valley fever claims from the years 2000 to 2019. See figure 2.2 for the distribution of claims by year of injury. The fewest claims submitted in any year was in 2000 with 35 claims. The most claims submitted in any year was in 2017 with 224 claims. On average, 112 claims were submitted annually. Generally, Valley fever claims are trending up each year with drops in specific years around the Great Recession (2008-2009) and in 2014-2015. These findings are similar to Sondermeyer Cooksey et al. (2017) who found similar drops in Valley fever reports in broader disease surveillance.

Table 2.1 provides demographic information for the claims by Census Industry, Census Occupation, Sex, and 5-Year Periods including frequency, percent, and incidence rates for 5-year periods between 2000 and 2019. Incidence rates calculated by 5-year periods also show an upward trend in claims. Incidence rates ranged from .39 out of 100,000 workers between 2000 and 2004 to a high of .83 between 2015 and 2019. While these rates are less than 1 out of 100,000 workers over 5 years, the rate itself has more than doubled since 2000-2004.

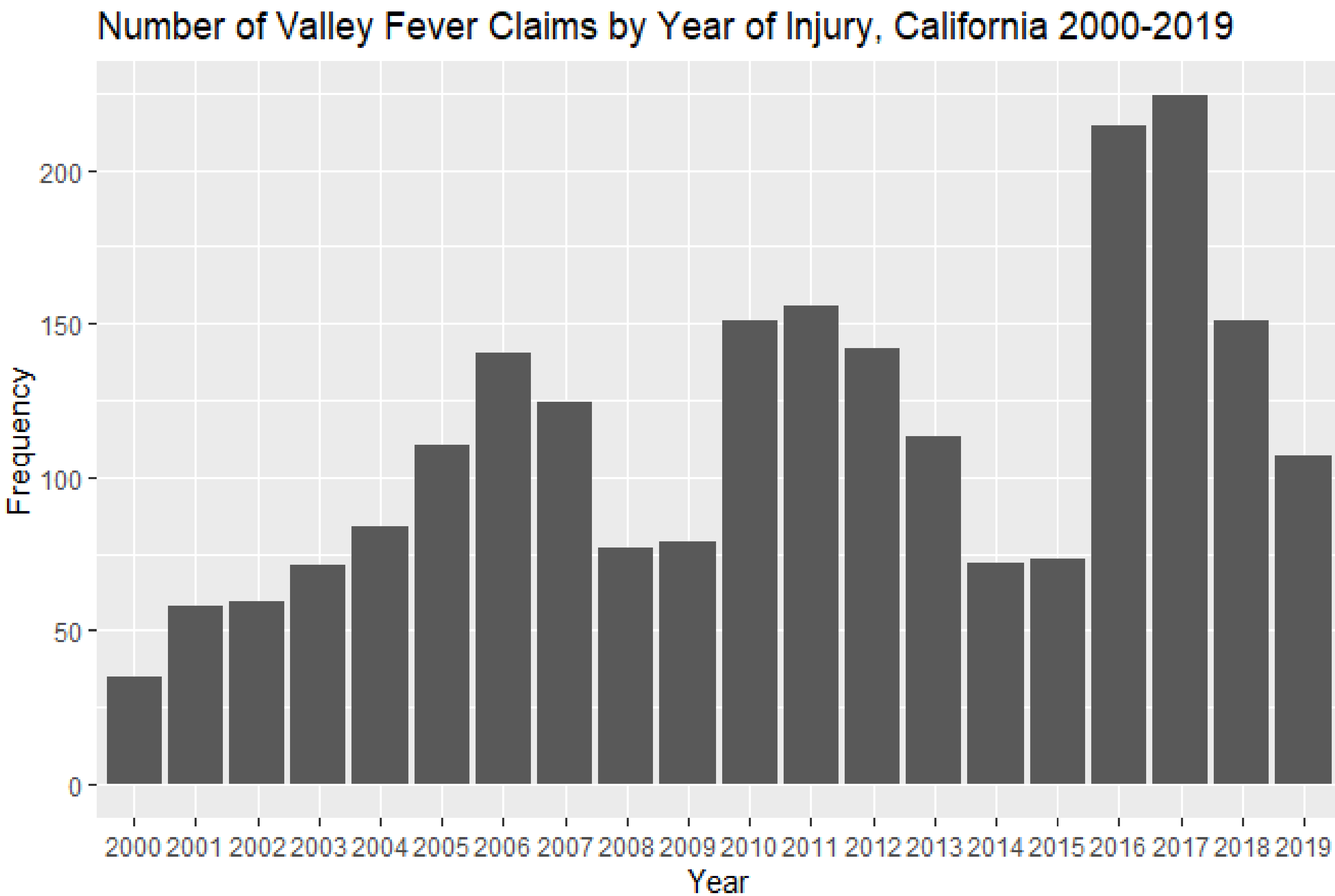

Figure 2.2 Workers' Compensation Claims for Valley Fever by Year of Injury, California 2000-2019

Table 2.1. Valley Fever Claims by Sex, Census Industry, and Census Occupation and 5-Year Periods, California 2000-2019

			Incidence Rates			
Demographics	**Frequency**	**Percent**	**2000-2004**	**2005-2009**	**2010-2014**	**2015-2019**
Sex						
Female	398	17.77	0.16	0.25	0.29	0.34
Male	1,828	81.61	0.57	0.93	1.11	1.24
Unknown	12	0.54	NA	NA	NA	NA
Census Industry Categories						
Ag, Forestry, Fishing, Hunting, and Mining	212	9.46	1.81	2.85	3.11	3.75
Transportation, Warehousing, and Utilities	127	5.67	0.52	0.84	0.64	1.12
Construction	313	13.97	1.43	0.90	1.78	1.60
Manufacturing	76	3.39	0.15	0.09	0.32	0.32
Wholesale Trade	22	0.98	0.06	0.17	0.30	0.26
Retail Trade	23	1.03	0.05	0.02	0.06	0.11
Information	11	0.49	0.11	0.12	0.08	0.11
Finance, Insurance, Real Estate, Rental and Leasing	49	2.19	0.20	0.32	0.15	0.20
Professional, Scientific, Management, Admin and Waste Management Services	202	9.02	0.12	0.57	0.61	0.60
Educational Services, Health Care and Social Assistance	183	8.17	0.24	0.21	0.16	0.47
Arts, Entertainment, Recreation, Accommodation, and Food Services	14	0.62	0.04	0.03	0.04	0.06
Other Services	26	1.16	0.10	0.18	0.16	0.15
Public Administration	982	43.84	2.61	6.56	7.29	7.62
Census Occupation Categories						
Management, Business, Science, Arts (0010-3540)	485	21.65	0.22	0.32	0.45	0.57
Service (3600-4650)	729	32.54	0.58	1.45	1.30	1.41
Sales and Office Related (4700-5940)	73	3.26	0.06	0.09	0.11	0.09
Natural Resources, Construction, and Maintenance (6005-7630)	672	30.00	1.45	1.75	2.43	2.64

Table 2.1. Valley Fever Claims by Sex, Census Industry, and Census Occupation and 5-Year Periods, California 2000-2019

			Incidence Rates			
Demographics	**Frequency**	**Percent**	**2000-2004**	**2005-2009**	**2010-2014**	**2015-2019**
Production, Transportation, and Material Moving (7700-9750)	253	11.29	0.43	0.41	0.65	0.78
Insufficient Information	28	1.25	NA	NA	NA	NA
5-Year Periods						
2000-2004	307	13.71	0.39	NA	NA	NA
2005-2009	530	23.66	NA	0.62	NA	NA
2010-2014	634	28.30	NA	NA	0.74	NA
2015-2019	769	34.33	NA	NA	NA	0.83

Data source: California Workers' Compensation Information System 2000-2019. Frequencies and percentages are for all workers, including prison workers and volunteers (n = 2240). Rates were calculated per 100,000 non-incarcerated civilian workers (n = 2185).

Occupation of Workers

Table 2.1 presents frequencies of claims from the five major Census occupations with incidence rates for 5-year periods. The most common Census occupations that submitted claims were in Service with 729 claims or about 32.5%. Followed by Natural Resources, Construction, and Maintenance with 672 claims or about 30% of claims. These occupations also had the highest incidence rates in each of the 5-year periods. Management, Business, Science, and Arts occupations submitted 485 claims or about 22% of all claims. Production, Transportation, and Material Moving occupations submitted 253 or around 11% of all claims. Figure 2.3 shows incidence rates for major Census occupations in each 5-year period. While rates are small they have generally increased in Natural Resources, Construction, and Maintenance, Production, Transportation, and Material Moving, and Management, Business, Science, and Arts Occupations. Additionally, in the most recent period, 2015-2019, Natural, Resources, Construction, and Maintenance and Service Occupations had the highest rates of disease 2.64 and 1.41 out of 100,000 workers respectively.

Census occupation categories were combined in table 2.1 to facilitate the production of incidence rates from ACS data. Appendix E table E2.1 provides detailed Census occupations with any occupations with fewer than 10 claims not shown. The high number of claims in Service Occupations primarily come from the Protective Service Occupations (n = 622), including Bailiffs, Correctional Officers, Jailers, Firefighters, Police and Sheriffs, Security Guards, and Building and Grounds Cleaning and Maintenance Occupations (n = 65). Construction and Extraction Occupations make up about 18% of the claims (n = 407). Occupations under this category including Construction Laborers, Operating Engineers, Electricians, Supervisors, Pipelayers, Carpenters, and Oil and Gas Workers. Farming, Fishing, and Forestry Occupations make up about 7.6% of claims. Census occupations do not distinguish between types of agricultural work thus most claims became classified as Miscellaneous Agricultural Workers (n = 154 or about 6.9%) using the NIOCCS tool (see Chapter 1). Installation, Maintenance, and Repair Occupations had 94 claims, about a third of which were electrical power-line installers and repairers. The broader Production, Transportation, and Material Moving Occupation category included Driver/sales Workers and Truck Drivers (n = 80), General Laborers (n = 63), Refuse and Recyclable Material Collectors (n = 12), Water and Wastewater Treatment Plant and Systems Operators (n = 14), and Welding, soldering, and brazing workers (n = 11).

Combined these occupations make up approximately 72% of the workers' compensation claims. As hypothesized these occupations may be associated with lower social class standing involving manual labor, extensive work outdoors, and lower levels of income (refer back to figure 2.1). The median income of these occupations in California according to ACS data from 2019 is generally less than $40,000 with Farming, Forestry, and Fishing and Building and Grounds Cleaning and Maintenance occupations particularly disadvantaged. The exception being Protective Service Occupations primarily employed in the public sector which typically provides better compensation and is more likely to be unionized.

About 22% of claims fall under the broader Management, Business, Science, Arts Occupation category. Within this broader category 43% of the claims were from Healthcare Practitioners and Technical Occupations (n = 209). Almost half of these claims were from Clinical Laboratory Technologists and Technicians (n = 90) but also included Registered Nurses and Licensed Vocational nurses, Health Practitioner Support Technologists and Technicians, and Physicians and Surgeons. Life, Physical, and Social Science Occupations made up about 17% of claims from the broader Management, Business, Science, and Arts category. Many of these claims were Biologists, Environmental Scientists, and Miscellaneous Life, Physical, Social Science Workers and Technicians. There were 46 claims from Architecture and Engineering Occupations, 34 claims from Community and Social Service Occupations, and 32 from Education, Training, and Library Occupations.

Overall, occupations generally associated with lower levels of education and income are more highly represented in the data. The analysis provides some support for fundamental cause theory, occupations associated with greater flexible resources such as higher levels of education and income are better able to avoid risk of disease to this environmentally based exposure. However, occupations associated with higher social class standing may still perform work outdoors in the case of biologists, environmental scientists, and engineers. Finally, the endemic nature of Valley fever may lead to exposures for some workers who do not work directly with soil as might be the case for some healthcare workers, community and social service workers, and education workers.

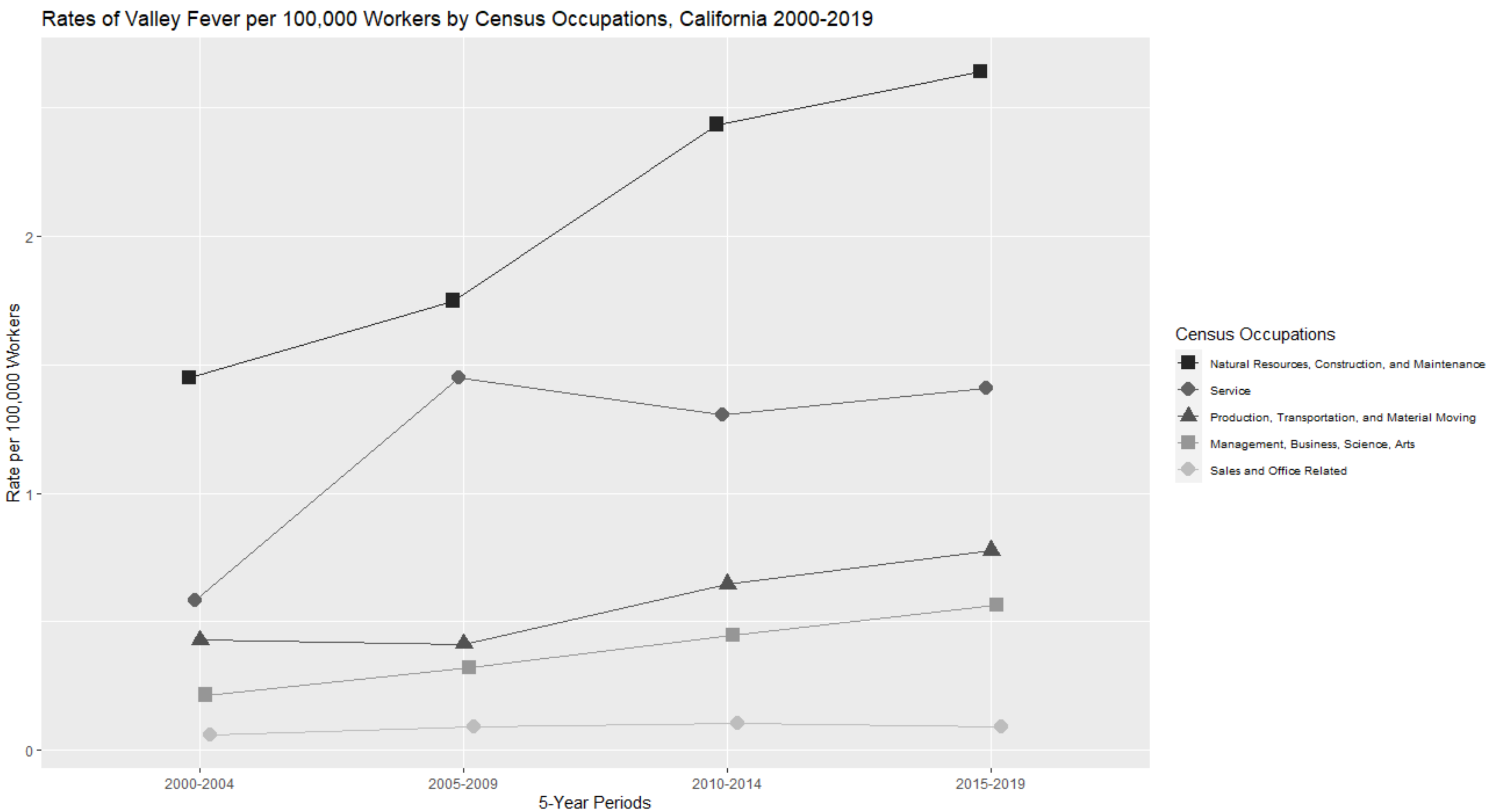

Figure 2.3 Rates of Valley Fever per 100,000 Workers by Major Census Occupations, California 2000-2019

Industry of Employers

The most common Census industries that submitted claims for Valley fever were from employers in Public Administration with 982 claims or about 44% of all claims, followed by Construction with 313 claims or around 14% of the claims, and Agriculture, Forestry, Fishing, Hunting and Mining reporting 212 claims or about 9.5% of claims (see table 2.1). Public Administration also reports the highest incidence rates across all 5-year periods (see figure 2.4). With rates in the 2015–2019-year period at 7.62 out of 100,000 workers. Second highest incidence rates were reported in Agriculture, Forestry, Fishing, Hunting and Mining with 3.75 out of 100,000 workers between 2015 and 2019. This was followed by Construction with 1.60 out of 100,000 workers in 2015-2019, Transportation, Warehousing, and Utilities with 1.12 out of 100,000 workers in 2015-2019, and Professional, Scientific, Management, Administrative and Waste Management Services with .60 out of 100,000 workers in 2015-2019.

Census industry categories are presented in table 2.1 to facilitate the production of incidence rates from ACS data. But the Census industry categories collapse distinct industry groupings like Agriculture, Forestry, Fishing, Hunting and Mining. Appendix E table E2.2 presents frequencies and percentages for North American Industry Classification System (NAICS) codes to allow the reader to see counts by more distinct industry groupings. NAICS codes provided by WCIS range from 2 to 6 digits. The table shows as detailed of industry information as can be provided. It is important to note that while all claims have a 2-digit NAICS code about 5% are missing 4-digit NAICS codes and 15% are missing 6-digit NAICS codes. Industries with fewer than 10 reported claims are not shown. Claims for Valley fever were submitted from all eleven NAICS 2-digit codes. Because of small numbers in some industries, they have been combined in the table E2.2 under “All other industries”.

Detailed examination of the NAICS codes shows that about 24% of claims in the broader Public Administration industry are from Justice, Public Order, and Safety Activities industries including Correctional Institutions, Fire Protection, and Police Protection. Claims from the broader Construction industry category are split primarily between three industry groupings Specialty Trade Contracting, Heavy and Civil Engineering Construction, and Construction of Buildings. Many of these industries suggest close work with soil including Electrical Contractors, Plumbing, Site Preparation Contractors, Foundation, Structure, and Building Exterior Contractors and Finishing Contractors, Highway, Street, and Bridge Construction, Water and Sewer Line Contractors, and Building Contractors.

Claims from the Agricultural, Forestry, Fishing, and Hunting industries are primarily from Crop Production industries with Fruit and Tree Nut Farming the most common industry. Health Care claims are split between Medical and Diagnostic Laboratories and Hospitals. Over half of the claims from the Professional, Scientific, and Technical Services industries are from Architectural and Engineering industries. Claims from the Utility industry include employers in Electric Power Generation, Transmission, and Distribution, Natural Gas Distribution, and Water, Sewage and Other Systems. Claims were also submitted for employers whose work entails Services to Buildings and Dwellings (n = 15) and Waste Management (n = 19). Manufacturing claims were spread across a range of industries with Food Manufacturing (n = 23) being the most common. Claims from Transportation and Warehousing industries were primarily from Truck Transportation, while claims for Mining industries were most often listed under Support Activities for Mining, over half of which are for oil and gas operations.

Finally, some of the industries assigned to employee claims potentially obscure job activities of the employer or employee. Some of the claims are from Employment Services industries providing temporary worker services (n = 28) and Finance and Insurance (n= 40) industries which include insurance companies. While under Support Activities for Crop Production (n = 45), 29 claims came from Farm Labor Contractors and Crew Leaders which supply laborers for agricultural production or harvesting but industry information about the type of crops grown or activities performed are unknown.

Appendix E table E2.3 is a two-way table showing the frequency of major Census occupations by 2-digit NAICS industry codes. The table highlights the close overlap between some industry and occupation groupings. For example, about 70% of Farming, Fishing, and Forestry occupations are concentrated in the Agriculture, Forestry, Fishing, and Hunting Industry and over 90% of Protective Service occupations are concentrated in Public Administration. The table also shows that some occupational exposures are taking place in more than one industry. For example, Healthcare Practitioners and Technical Occupations are split between Public Administration and Health Care and Social Assistance industries. And while the majority of Construction occupational exposures are taking place within the Construction Industry (56%), about one quarter are happening in other industries including: Mining, Public Administration, Administrative, Support, and Waste Management and Remediation, and Utilities. Finally, the table also illustrates that many occupational exposures are occurring in both Public Administration and some other industry. For example, Production occupations have claims coming from Manufacturing but also from Public Administration. The same is true of Installation, Maintenance, and Repair occupations, Material Moving occupations, Education, Training, and Library occupations, and Life, Physical, and Social Science occupations. Public Administration had the highest number of claims compared to other industries, but exposures involved a wide range of occupations.

Analysis of employer industry similarly suggests that a majority of claims from workers' compensation are coming from industries that rely on manual labor, involve outdoor working conditions, and generally provide lower pay. While workers employed in healthcare, professional and scientific, and education industries also submitted claims they only made up around 13% of the dataset. Suggesting again that workers with greater access to flexible resources may be better able to avoid an environmental exposure like Valley fever while workers in occupations and industries associated with lower class standing are at greater risk of exposure to disease.

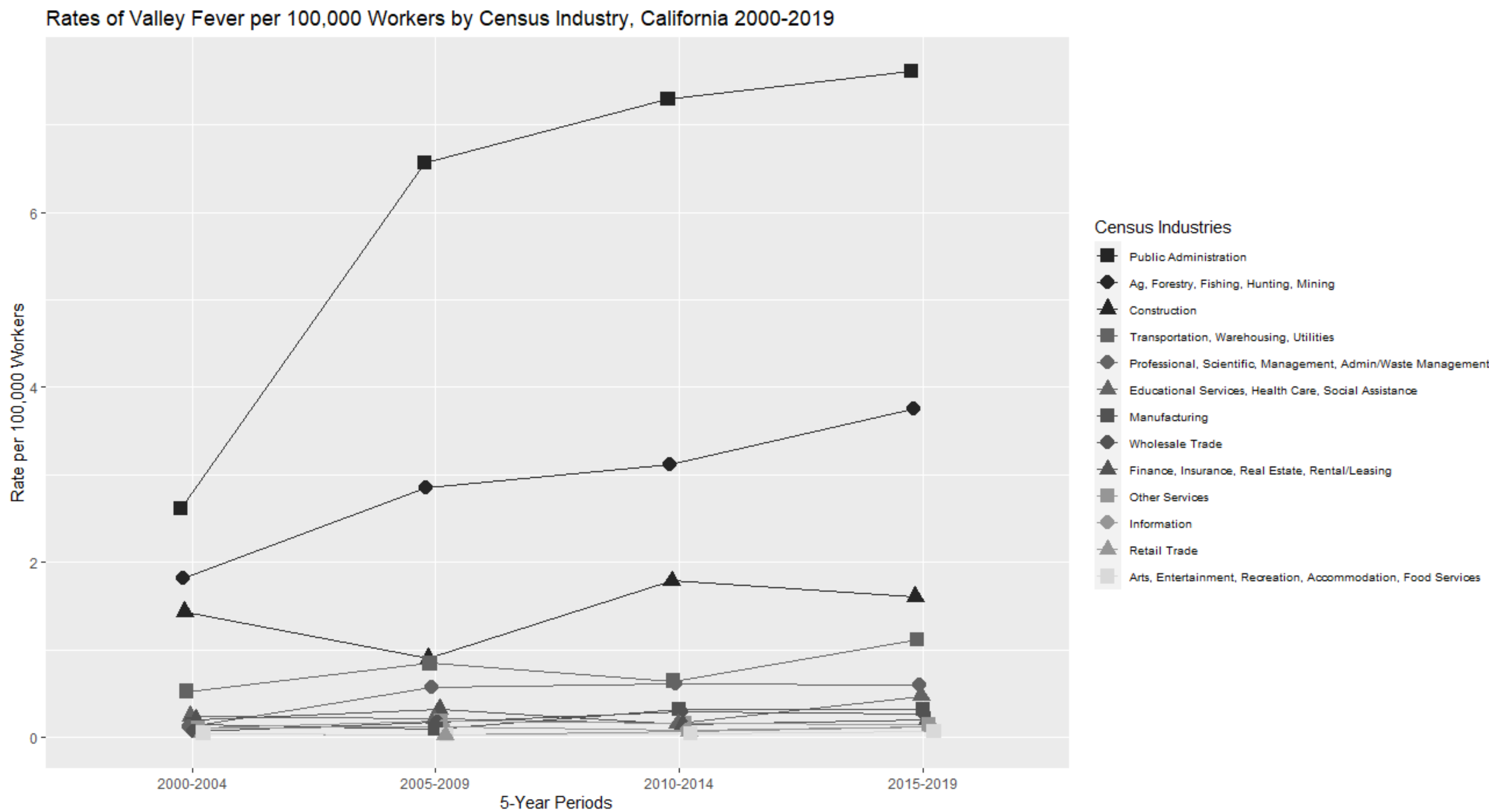

Figure 2.4 Rates of Valley Fever per 100,000 Workers by Census Industry, California 2000-2019

Sex Differences in Industry and Occupation of Claims

Claims from men outnumber claims from women. Claims from men make up approximately 82% (or 1,828) of all claims. Twelve claims involve workers whose sex is unknown, and two claims are missing sex information. Claims from men are more common than claims from women and there appear to be sex-based differences in occupations and industries claimed by men and women.

The top 5 most common Census occupations for women were: Healthcare Practitioners and Technical Occupations, Protective Service Occupations, Life, Physical, and Social Science Occupations, Office and Administrative Support Occupations, and Farming, Fishing, and Forestry Occupations (see table 2.2). The top 5 Census occupations for men were: Protective Service occupations, Construction and Extraction Occupations, Farming, Fishing, and Forestry Occupations, Installation, Maintenance, and Repair Occupations, and Transportation Occupations. Claims from women outnumber claims from men in Healthcare Practitioners and Technical Occupations (F = 135, M = 74), Office and Administrative Support Occupations (F = 38, M = 16), and Healthcare Support Occupations (F = 11, M <10). Additionally, claims from women were not common (<10) in occupations that were common for men including: Installation, Maintenance, and Repair Occupations, Transportation Occupations, Material Moving Occupations, and Production Occupations.

The top 5 most common NAICS industries for women were: Public Administration, Health Care and Social Assistance, Professional Scientific and Technical Services, Educational Services, and Agriculture (see table 2.3). The top 5 most common industries for men were Public Administration, Construction, Agriculture, Professional Scientific and Technical Services, and Administrative and Support and Waste Management and Remediation Services. Male claims outnumber female claims in almost all industries. However, claims from men and women are nearly equal in Educational Services industries (M = 29, F = 28). Additionally, women's claims outnumber claims from men in Health Care and Social Assistance industries (F = 87, M = 38). The majority of the women and men working in this industry were in Healthcare Practitioners and Technical Occupations (F = 73, M = 27).

Within the Public Administration Industry, the most common industry submitting claims, claims from women came primarily from Protective Service Occupations and Healthcare occupations, as well as, Office and Administrative Support Occupations, Community and Social Service Occupations, and Life, Physical, and Social Science Occupations (see Appendix E table E2.4). Most of the claims from men in Public Administration were in Protective Services (67%). Additionally, men had claims in occupations within this industry where women had none, including Construction and Extraction, Installation Maintenance, and Repair Occupations, Material Moving Occupations, and Production Occupations.

The above analysis highlights that sex segregation by occupation and industry may play an important role in exposure to *Coccidioides*. Occupations associated with lower levels of education and income tend to be more segregated by sex with men dominating blue collar occupations and women dominating healthcare and personal services (Blau et al. 2013). The concentration of men in policing, construction, and other outdoor and blue-collar occupations likely places men at greater risk of exposure generally compared to women. Additionally, occupational sex segregation may be linked to sex differences in types of exposures. Claims from women were most common in Healthcare Practitioners and Technical Occupations suggesting women may be at greater risk of laboratory-based exposures. Examining the injury descriptions for key words highlights these potential sex differences in exposure type (see table

2.4). Examining all claims for words related to laboratory-based exposures (e.g., “lab,” “culture,” and “specimen”) show 60 claims indicating that a worker was exposed to spores in a laboratory setting. All of these claims are from workers in healthcare occupations or industries and 73% (n = 44) are from women. While examining injury descriptions for mentions of dirt or dust, outdoor exposures, or job activities that disturb dust, claims from men outnumber claims from women.

Broader surveillance suggests men make up around 60 to 70% of known Valley fever disease (CDPH 2019; Sondermeyer Cooksey et al. 2020). Highlighting sex-based occupational and industry differences in reported disease and exposure type in workers’ compensation may provide an important structural explanation for why men have greater rates of Valley fever in broader disease surveillance overall. Additionally, current recommendations for workplace prevention strategies, like watering the soil to keep dust down and stopping work during dusty conditions, are based on previous investigations of outdoor outbreaks in which workers are engaging with soil directly. Occupational sex segregation means that these workers are more likely to be men. Laboratory-based exposures, here affecting women more than men, may need different recommendations for targeted prevention.

Table 2.2 Frequency of Valley Fever Claims by Census Occupations and Sex, California 2000-2019

Census Occupations	Frequency Female	Frequency Male	Percent Female
Healthcare Practitioners and Technical Occupations	135	74	64.59
Protective Service Occupations	54	567	8.70
Life, Physical, and Social Science Occupations	38	48	44.19
Office and Administrative Support Occupations	38	16	70.37
Farming, Fishing, and Forestry Occupations	25	146	14.62
Community and Social Service Occupations	13	21	38.24
Education, Training, and Library Occupations	12	20	37.50
Construction and Extraction Occupations	11	393	2.72
Healthcare Support Occupations	11	<10	
Management Occupations	11	29	27.50
Production Occupations	<10	61	
Food Preparation and Serving Related Occupations	<10	12	
Building and Grounds Cleaning and Maintenance Occupations	<10	58	
Transportation Occupations	<10	87	
Arts, Design, Entertainment, Sports, and Media Occupations	<10	9	
Business and Financial Operations Occupations	<10	14	
Material Moving Occupations	<10	82	
Architecture and Engineering Occupations	<10	43	
Sales and Related Occupations	<10	15	
Installation, Maintenance, and Repair Occupations	<10	92	
Insufficient Information	<10	21	

Data source: California Workers' Compensation Information System 2000-2019. Frequencies and percentages are for all workers, including prison workers and volunteers. Workers who sex is unknown or who are missing sex information are not shown (n = 2226). Occupations that have fewer than 10 claims from both men and women are not shown.

Table 2.3 Frequency of Valley Fever Claims by NAICS Industries and Sex, California 2000-2019

NAICS Industries	Frequency Female	Frequency Male	Percent Female
Public Administration	170	810	17.35
Health Care and Social Assistance	87	38	69.60
Professional, Scientific, and Technical Services	32	84	27.59
Education	28	29	49.12
Ag, Forestry, Fishing, Hunting	23	137	14.37
Construction	13	299	4.17
Manufacturing	12	60	16.67
Other Services	<10	20	
Finance and Insurance	<10	35	
Retail Trade	<10	18	
Mining	<10	46	
Admin, Support, and Waste Management and Remediation	<10	78	
Transportation and Warehousing	<10	52	
Utilities	<10	68	
Wholesale Trade	<10	18	
Information	<10	10	

Data source: California Workers' Compensation Information System 2000-2019. Frequencies and percentages are for all workers, including prison workers and volunteers. Workers who sex is unknown or who are missing sex information are not shown (n = 2226). Industries that have fewer than 10 claims from both men and women are not shown.

Table 2.4 Number of Injury Descriptions with Keywords Indicating Exposure Source by Sex, California 2000-2019

Sex	**Laboratory**	**Dirt**	**Outdoor**	**Air**	**Fire**	**Job Activities**	**Unknown**
Female	44	29	27	12	2	8	37
Male	17	214	86	35	95	59	121
Total	61	243	113	47	97	67	159
% Women	72%	12%	24%	34%	2%	12%	23%
% with description out of all claims	3%	11%	5%	2%	4%	3%	7%

Data source: California Workers' Compensation Information System 2000-2019.

Other Demographic Information

The average and median age of claimants was 43 years. Age was calculated as age at time of injury. Ages of claimants was fairly normally distributed and ranged from 16 to 88 (see figure 2.5). Two claims were missing dates of birth. Around 95% of employees lived in California and 94% of employers had location data in California. Having some employers listed as located in other states may not be surprising since employers from other states are required to have workers' compensation insurance if they have employees who regularly work in California.

Some demographic information available in the WCIS may not be reliable. The data show that 91% of workers had no dependents and the marital status of claimants is unknown for just under 70% of claims. Additionally, date of death information is only available for 33 of the claims, of these less than 10 specifically state in the injury description that the cause of death was Valley fever. It is unclear if dates of death indicate death caused by Valley fever specifically or occupational injury or illness generally, if death dates are added later for other causes of death if they become known, or if death dates may simply be missing.

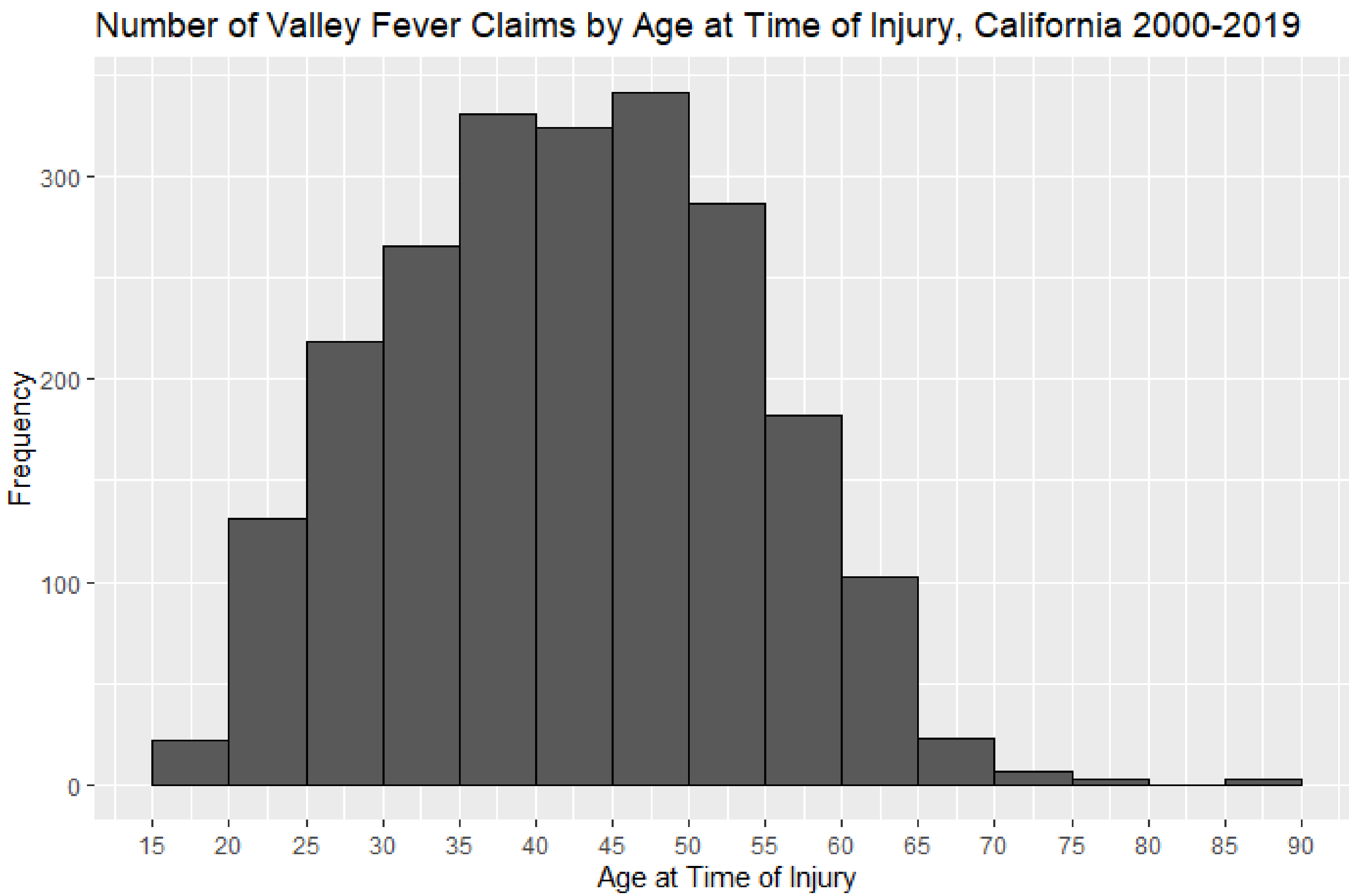

Figure 2.5 Workers' Compensation Claims for Valley Fever by Age at Time of Injury

Archival Database of Work-related Valley Fever Exposures

Analysis of the WCIS data and the archival database point to similar findings. The top three industries are Public Administration, Construction, and Agriculture, Forestry, Fishing, and Hunting. The trend in number of work-related exposures is increasing over time in both sets of data and with highs in some of the same years including 2017, 2011, and 2007. Across both datasets over 80% of exposures involve men. In line with fundamental cause theory, the occupations and industries of exposed workers suggests that workers of generally lower social class standing are more likely to be exposed to Valley fever while workers in occupations and industries requiring higher levels of education and income are better able to avoid this environmentally based exposure.

Among the 108 work-related cases, years of exposure ranged from 1933 to 2019. Most of the cases documented occurred between 2000 and 2019. Figure 2.6 provides the number of cases by decade. The clustering of cases in more recent years may reflect the availability of data rather than a sharp increase in cases. For example, newspaper data collected only extended back to 1980. OSHA as a regulatory body was not formed until 1970. Many of the documents describing work-related cases before 1980 came from workers' compensation legal cases. Figure 2.7 provides the number of cases from the last two decades. The highest number of recorded workplace cases were 10 in 2017, followed by 7 in 2007, and 6 in 2018 and 2011.

Numbers of workers reported exposed ranged from 1 to 267 (with four documents not reporting the number exposed). Total number of reported exposed workers was 696 with the mean number of workers exposed across all outbreaks at 6.8. However, the median number of workers reporting exposure was one, likely due to legal cases involving individual workers and newspaper articles where one worker's story was described. It is important to understand that the number exposed may be measured differently across or within data sources. For example, the highest reported exposed came from Sondermeyer et al. (2017) which described reported cases based on laboratory confirmed cases and survey results from construction workers building a solar farm. However, OSHA investigations list the total exposed to a potential violation relevant for Valley fever, but it is not clear that the number represent all workers who became ill.

Table 2.5 provides counts of the number of exposure events reported by NAICS industry, percent from that industry, the total number exposed, and the total number of men and women exposed. All but nine of the documents identified the sex of the worker(s) involved. However, only around 80% of the documents describe the numbers of men or women involved. Sex information is known for 440 out of 696 potentially exposed workers. Of these 13% were women and 87% were men. As with the workers' compensation claims data, reports of exposures among men outnumber reports among women. The most common industries described were Public Administration with 31 outbreaks, followed by Construction with 28, Agriculture, Forestry, Fishing, and Hunting with 15, and Professional, Scientific, and Technical Services with 7. These industries also reported the highest numbers of workers exposed.

The level of detail provided about workers' occupations varied. Appendix E table E2.5 provides a list of all occupations described. Occupations within Public Administration included: Correctional Officers, Firefighters and Forestry Workers, Prison Workers, Post Office Workers, Maintenance and Custodial Workers, and Construction Workers. The archival documents describing construction-related exposures often did not specify the specific type of occupation; however reported occupations included: Electricians, Laborers, Iron Workers, Heavy Equipment Operators, Supervisors, Painters, Water Truck Operators, Pipe Layers, and scientists such as Biologists, Paleontologists, and Archaeologists. Similarly agricultural exposures often did not report specific occupations; however, reported occupations included Managers, Sheepherders, Landscapers, and Farm Workers generally. Finally, Professional, Scientific, and Technical Services industries reported occupations including Veterinarian, Archaeologist, Soil Technician, Laborer, and Filmmaker.

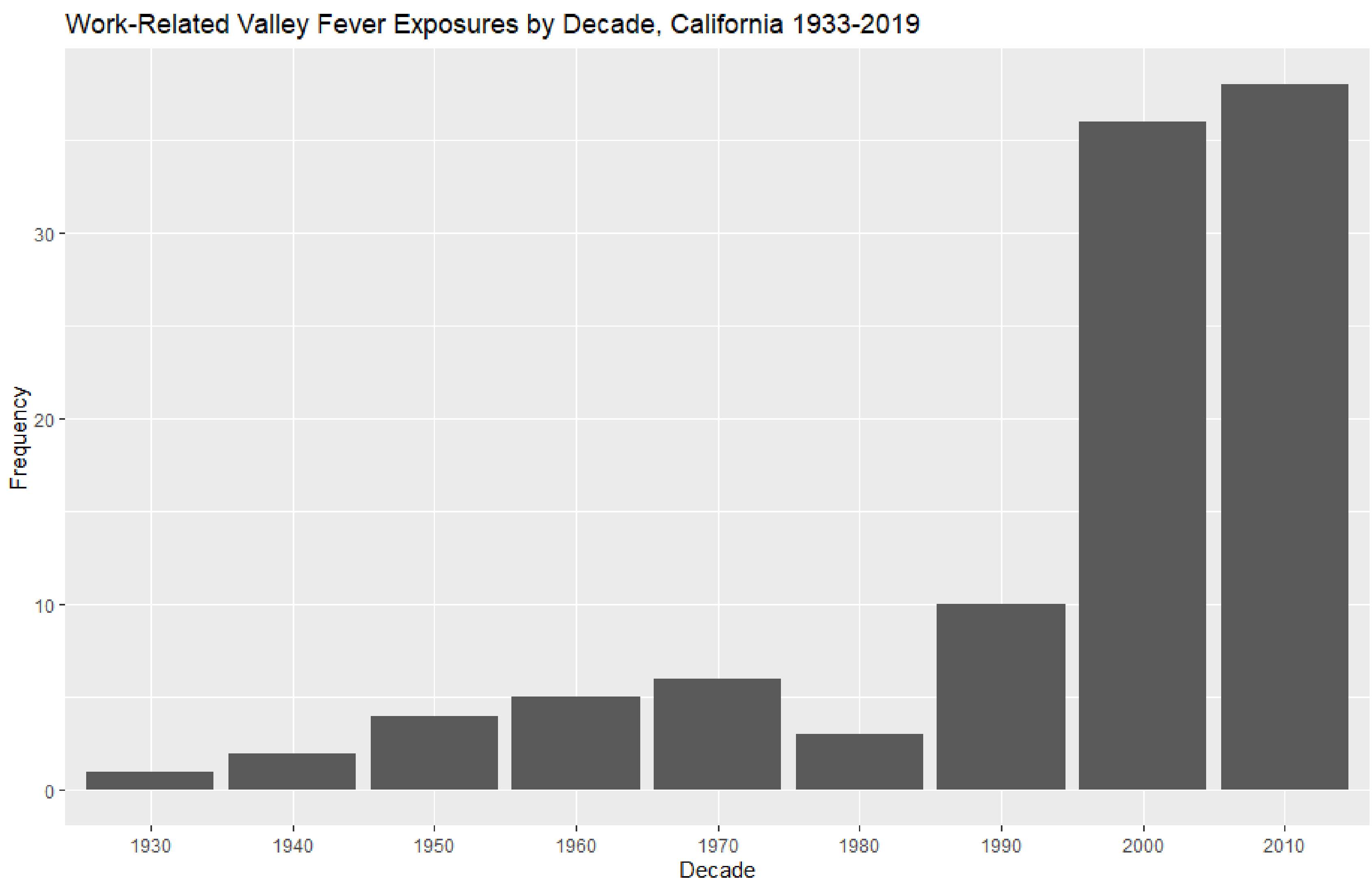

Figure 2.6 Work-Related Valley Fever Exposures in Archival Database by Decade, California 1933-2019

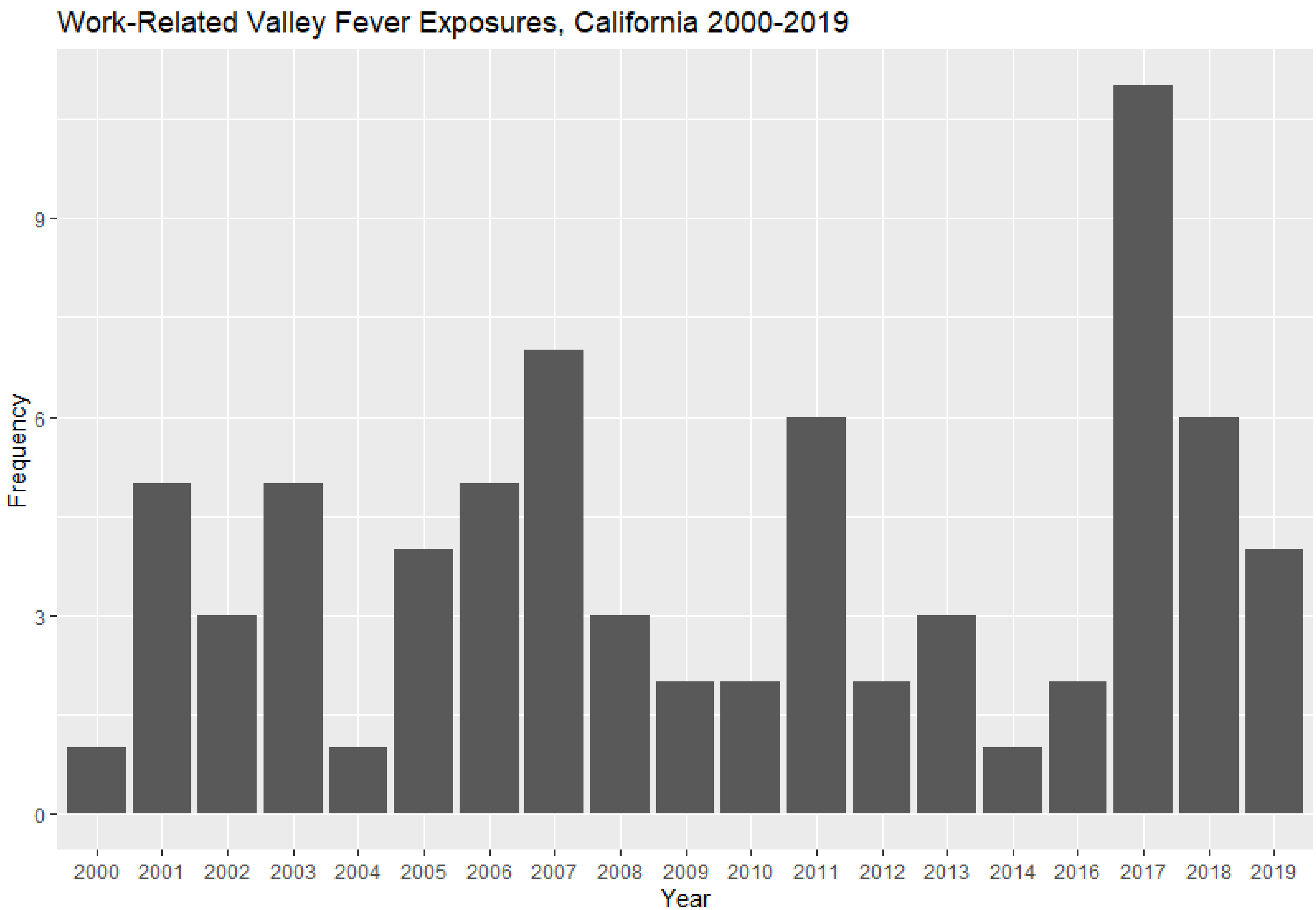

Figure 2.7 Work-Related Valley Fever Exposures in Archival Database Occurring between 2000-2019, California 1933-201

Table 2.5 NAICS Industries of Work-related Valley fever Exposures in Archival Database, California 1933-2019

NAICS INDUSTRY	Outbreaks	Percent	Total Exposed	Total Men Exposed	Total Women Exposed
Public Administration	31	0.29	180	122	22
Construction	28	0.26	381	130	14
Agriculture	15	0.14	43	8	3
Professional, Scientific, and Technical Services	7	0.07	53	4	1
Manufacturing	5	0.05	5	5	0
Transportation and Warehousing	4	0.04	4	4	0
Mining/Oil	3	0.03	4	4	0
Educational Services	2	0.02	2	2	0
Health Care and Social Assistance	2	0.02	1	0	1
Information	2	0.02	11	0	1
Retail Trade	2	0.02	2	2	0
Utilities	2	0.02	6	6	0
Administrative and Support and Waste Management and Remediation	1	0.01	1	1	0
Arts, Entertainment, and Recreation	1	0.01	1	1	0
Real Estate and Rental and Leasing	1	0.01	1	1	0

Data Source: Work-related Valley Fever Exposures Database.

Conclusion: Social Class and Valley Fever

This chapter asked: How many workers and which types of workers may be at greater risk of Valley fever disease? And how might these patterns reflect class-based or sex-based differences in exposures? Motivating this study was fundamental cause theory which predicts that individuals with greater socio-economic status possessing greater access to “flexible resources” like money, prestige, social networks, knowledge, and power are better able to avoid disease and secure better health outcomes (Link and Phelan 1995; Phelan et al. 2010). Drawing on previous research I examined occupations as a proxy for social class and conceptualized social class hierarchies as organized gradationally by level of income (Weeden and Grusky 2005, 2012). Rather than dogmatically assigning occupations as low or high social class or combining occupations into a certain number of low- or high-class groupings, I generally consider occupations as lower or higher depending on median level of income (refer back to figure 2.1). Drawing on fundamental cause theory, I hypothesized that workers in occupations that coincide with lower class status may be more highly represented in the data. Additionally, because Valley fever is an environmental exposure I hypothesized that lower paid workers employed in manual outdoor occupations would be at greater risk. I also hypothesized that because occupations associated with lower levels of income and education tend to be more highly segregated by sex, reports of Valley fever among men would be more common.

Analysis of the workers’ occupation and employer’s industry for Valley fever claims suggest that social class shapes Valley fever exposures in three ways. First, social class of the worker shapes the potential for exposure to *coccidioides*. Workers in occupations associated with lower income and education may be particularly at risk of work-related Valley fever. Second, social class likely shapes patterns in underreporting of Valley fever disease. Third, social class and sex segregation shape exposure type. Men in occupations associated with lower social class standing are likely at greater risk of work-related Valley fever. However, women in healthcare and laboratory settings may need particular attention.

First, workers' compensation claims and archival reports suggest Valley fever exposure is stratified by social class. A majority of the workers are employed in occupations and industries that involve close work with soil, manual and/or outdoor labor, and lower levels of income. I find that Public Administration, Construction, and Agricultural industries report the most work-related disease. Many of the workers in these industries are in Protective Service occupations such as correctional officers, firefighters, and police and sheriffs, Construction occupations including laborers, heavy equipment operators, electricians, and plumbers and pipefitters, and agricultural workers in Crop Production. The data also suggest a little over 10% of exposures were among workers in Transportation Occupations, Material Moving Occupations like general laborers and sanitation workers, and Production Occupations. As hypothesized these occupations generally reflect lower levels of income and education, although workers in Protective Service Occupations are most often employed in Public Administration, an industry that tends to provide better pay and benefits and is more likely to be unionized.

However, occupations associated with higher social class are also represented. Healthcare Practitioners and Technical Occupations are the third most common group of occupations in the workers' compensation data. In addition to healthcare workers, occupations associated with white-collar employment or higher education requirements including scientists, engineers, office workers, and education workers make up almost 25% of all workers' compensation claims. Additionally, the archival database and prior research highlights the potential for scientists (and their students) to become exposed on digs (Freedman et al. 2018; Petersen et al. 2004; Schmelzer and Tabershaw 1968) and laboratory workers to become exposed due to improper precautions taken in labs (Freedman et al. 2018; Stevens et al. 2009). Workers employed in occupations associated with higher social class standing are less common in the data but when working in endemic areas or in laboratory-based settings these workers still report exposure to Valley fever. However, in line with fundamental cause theory, overall workers in occupations associated with greater levels of income and education are less represented in these data and potentially better able to avoid Valley fever exposure.

One important question is whether workers of lower social class standing may be underrepresented in the dataset, particularly in the workers' compensation data. Prior research suggests that workers with more secure forms of employment and unionized workers are more likely to know their rights and file for workers' compensation (Cox and Lippel 2008; Shannon and Lowe 2002). And while underreporting of injury and illness to workers' compensation occurs in all industries and occupations, greater underreporting occurs in agriculture and construction (Fan et al. 2006; Probst et al. 2008), two industries particularly at risk for Valley fever. Workers in occupations associated with lower social class may be underrepresented in the data. Research demonstrates that workers in public service are also more to be unionized (BLS 2022b), particularly in California where 85% of public servants are covered by a collective bargaining agreement (LAO 2021). Unionized workers are more likely to exercise their rights to workers' compensation (Galizzi 2013; Hirsch, Macpherson, and Dumond 1997) and to receive compensation more quickly than non-unionized workers (Campolieti 2005).

Public Administration is the most commonly reported industry in both the workers' compensation and archival data. The high number of exposures in this industry may need to be understood within a particular context. Correctional institutions built in the Central Valley became a hotspot for Valley fever infections among employees and prisoners leading to a CDC investigation (de Perio and Burr 2014), state public health research (Wheeler et al. 2018, 2015), widespread media reporting (Plevin 2012), and several high-profile legal cases from prisoners who became exposed while serving time (Gilna 2015).[4] Finally, firefighters and prison workers employed as wildland firefighters may be at particular risk because their work involves cutting fire breaks (Laws et al. 2021). The higher number of Valley fever reports in Public Administration is likely related to increased risk of those connected to the criminal justice system (Rios 2018) and the fact that public servants are more likely to exercise their right to compensation.

Third, the data suggest important differences in potential sources of exposure for workers by social class and sex. Sources of exposure to the *coccidioides* fungus can include working outdoors directly with soil containing the fungus, working in an endemic area generally and becoming exposed to spores in the air, or working in a laboratory or clinical setting with *coccidioides* spores. While a majority of the claims from Construction, Agriculture, Utilities, and Mining industries are suggestive of traditional soil-disturbing activities as the primary source of exposure, claims from Correctional Institutions, Police Protection, Educational Services, and Trucking industries suggest potential sources of exposures as being ambient to working in an endemic area rather than engaging with soil directly. Finally, some claims are suggestive of laboratory-based exposures, particularly in healthcare occupations and industries.

Occupational sex-segregation likely structures exposure to Valley fever and source of exposure as well. Valley fever infections are reported more often among men in broader

[4] About 25% of data collected for the archival database included news media and legal cases involving prisoners. Many of these documents were not included in the final database because they did not make an explicit link between work and disease.

surveillance data (CDPH 2019; Sondermeyer Cooksey et al. 2020). I find over 80% of workers' compensation claims and archival reports involve men. Because sex segregation is greater in occupations associated with lower levels of education and income and men are more concentrated in blue collar occupations (Blau et al. 2013), Valley fever exposures at work may be a particular job hazard for men of lower social class standing. However, lab-based exposures may be of particular concern for women. Women make up 65% of workers' compensation claims from Healthcare Practitioners and Technical Support Occupations, this includes laboratory workers, nurses, and physicians. American Community Survey data from 2019 confirm that women make up approximately 71% of Healthcare Practitioners and Technical Support Occupations (DOL Women's Bureau 2019). Injury descriptions of workers' compensation claims indicate that 73% of laboratory exposures occurred among women, while only 12% of injury descriptions describing dirt or dust exposures involved women. Valley fever exposures, and the way in which workers become exposed, are likely structured by both social class and sex-based occupational segregation.

Discussion

This chapter identified work-related Valley fever in California drawing on data from California's Workers' Compensation Information System (WCIS) and archival sources from news reports, legal cases, and state agency investigation documents. Additionally, this chapter has built knowledge about Valley fever as a social, and particularly a class-based, health problem and provides critical evidence about the types of workers reporting disease. While Valley fever is considered an "orphan" disease, the data suggest reports of work-related Valley fever are increasing in the state, in line with broader surveillance findings (Sondermeyer Cooksey, Nguyen, et al. 2017). This chapter documented that workers' compensation Valley fever claims have been submitted in all major NAICS industry categories with the most work-related exposures reported in Public Administration, Construction, and Agriculture, Forestry, Fishing, and Hunting. Additionally, workers from a wide range of Census occupations have submitted claims for Valley fever with the most common being Protective Service Occupations, Construction and Extraction Occupations, Healthcare Practitioners and Technical Occupations, and Farming, Fishing, and Forestry Occupations. Finally, I pointed to the potential for both social class and sex to stratify exposure to Valley fever.

This chapter has made several empirical and methodological contributions to the literature. First, the chapter updates and extends the work of Das et al. (2012) by examining claims for Valley fever for additional years, identifying missing industry information, and by examining sex differences in industries and occupations of workers. Additionally, while Freedman et al.'s (2018) metanalysis importantly examined *coccidioides* outbreaks documented in academic literature, lack of academic literature (at that time) on agricultural outbreaks meant that none were documented. I find in the archival materials collected from news reports, state agency investigation reports, and legal cases that agricultural industry exposures are the third most common. Government, legal, and media sources of data provided greater understanding of the historical burden of work-related Valley fever in California and provide a complimentary source of data compared to workers' compensation claims.

Working with WCIS data is challenging; however, this chapter has made several methodological contributions that may serve future researchers. All R code (minus redacted confidential data) used to clean and analyze the WCIS data will be made publicly available. Of particular use to researchers may be my method for identifying Valley fever claims using injury description keywords, parts of the body, cause of injury, and nature of injury (See Appendix B).

The approach could be adapted by others for continued surveillance of this disease or modified for use with other types of injuries/illnesses. Additionally, detailed appendix materials document decision-making and method for the project. For example, researchers may find my approach to deduplicating claims useful for their own work (See Appendix C). Finally, the database of archival occupational Valley fever exposures will be made publicly available.

The data have important limitations. First, the WCIS data do not contain racial or ethnic information about the workers. Additionally, the archival documents often did not report the race or ethnicity of the workers involved. Social class, race, and work are intimately related in shaping health and safety outcomes (Burgard and Lin 2013; Lipscomb et al. 2006). However, the lack of collection of both racial, ethnic, and other identity characteristics in workplace health and safety data is a systemic problem (Ahonen et al. 2018; Dembe 2010). Without racial or ethnic information, the ability to connect social conditions to disease is restricted and prevents reporting of potentially important inequalities in health outcomes. Valley fever research is no exception. While the WCIS data and the archival documents make the link between work and health, and available surveillance and hospitalization data can make the link between race/ethnicity and health[5] there is no systematic collection of data on Valley fever linking work, race/ethnicity, and health. Continued future research on racial/ethnic inequalities in Valley fever exposures, particularly the extent to which those exposures are happening at work is desperately needed. Linking how social structure shapes disease is critical for proper prevention and without which default scientific understandings tend to locate racial/ethnic and gender disparities in individual

[5] Valley fever surveillance data are missing racial and ethnic information in about 35% of disease reports.

or biological risk factors which is often inappropriate and reifies socially constructed categories (Lipscomb et al. 2006; Phelan et al. 2010; Roberts 2011).

Additionally, the workers' compensation data are from administrative sources and thus the extent to which the data represent the population of all workers exposed to *coccidioides* on the job is not known. While workers' compensation data are a highly used and an important source of information about work-related injuries and diseases, evidence suggests that workers' compensation cases likely represent around 40 to 50% of all potential illness and injuries due to underreporting (Cox and Lippel 2008; Fan et al. 2006; Galizzi 2013; Probst et al. 2008). Additionally, this underreporting is stratified. Women, workers of color, and precarious employed workers face additional barriers to exercising their rights to compensation (Cox and Lippel 2008; Scherzer et al. 2005). The WCIS data likely underrepresent the true number of work-related Valley fever claims that could be made to workers' compensation and may do so in stratified ways (Chapter 4 considers this issue in depth).

The archival database provides a complementary source of data and an additional check from which to examine the validity of the WCIS findings. In particular I hoped the archival documents would provide an important source of counter data (D'Ignazio and Klein 2020) on work-related cases that did not end up in the workers' compensation system. State investigations into Valley fever may be prompted by individual complaints or investigated proactively if a clustering of cases is reported which does not require workers to advocate for themselves through workers' compensation. Additionally, news reports may highlight individual workers' experiences where the state never became involved. The findings from WCIS data and the archival data are consistent making the study internally valid. Additionally, the overall trend in increasing workers' compensation claims for Valley fever is similar to findings in broader surveillance work (Sondermeyer Cooksey, Nguyen, et al. 2017) suggesting that while the study likely underestimates cases it is externally valid compared to other work. Likely the WCIS and archival data represent some fraction of all work-related Valley fever disease. Despite this undercount, the data appear to be a valid reflection of experiences with work-related Valley fever. Finally, the cases in the WCIS and archival data may represent individuals who are suffering from more moderate and severe forms of the disease as previous research on workers' compensation data (Azaroff et al. 2002; Shannon and Lowe 2002) and Valley fever surveillance (Sondermeyer Cooksey et al. 2020) suggest that underreporting of milder illnesses is common.

Finally, as discussed in Chapter 3, to successfully win a workers' compensation legal case, workers and their representatives must be able to argue that their particular occupation or type of work places them at greater risk of becoming infected with Valley fever compared to the general population. This chapter documents the occupations of workers at greater risk for Valley fever potentially providing valuable data to support future workers' ability to win their rights to compensation.

Chapter 3. The Class Politics of Health and Safety: Resolving Work-related Valley Fever Legal Disputes

Introduction

Social history in the United States has often drawn attention to occupational health and safety as an issue of social class (Rosner and Markowitz 1984, 2020). In this chapter I draw on scholarship from the Marxist labor process tradition to examine how different class actors shape or constrain the ability of workers to find recompense in two regulatory contexts after becoming exposed to industrial disease. Drawing on legal cases concerning work-related Valley fever exposures litigated via California Workers' Compensation and the California Occupational Safety and Health Administration (OSHA) Appeals Boards, I examine how employers (and their insurance companies), medical doctors, workers, and state agency employees navigate the contested process of these state regulatory environments. I ask: How do employers (and their lawyers and insurance companies) try to limit their responsibility for the costs of occupational disease? What role do medical doctors and state actors play? How does uncertainty associated with Valley fever disease influence case outcomes? Who does uncertainty favor? And in what ways?

The Marxist labor process tradition conceptualizes work as a site of class conflict in which employers maximize surplus value to the detriment of worker wellbeing (Burawoy 1979; Navarro 1982, 1985; Walters 1985). In this chapter I examine conflict between workers and employers over exposures to work-related disease but also identify the role other actors, doctors and state agency employees, play in these contested processes. Marxist theory is often critical of the medical profession and the state as serving the interests of employers over workers when it comes to managing health and safety risks (Navarro 1985; Smith 1987; Walters 1985). In contrast, I find that the class position of doctors in workers' compensation cases is shaped by the institutional environment. I argue that the medical profession and state actors in OSHA cases can serve as resources for undermining employer power on the behalf of workers.

Second, I examine the types of arguments employers make to deny responsibility for occupational disease. A broad section of the literature identifies employers' attempts to shift the blame of injury and illness onto individual workers' carelessness or hypersusceptibility or the general hazard of industry (Draper 1991, 1993, 2000; Dwyer 1991b; Gray 2009; Nichols 1999; Smith 1987; Walters 1985). I find that employers blame workers, other employers, and industry around 16% of the time. Additionally, considering previous scholarship (Botsch 1993; Michaels and Monforton 2005; Smith 1987), and the invisible and endemic nature of Valley fever disease, I asked to what extent employers capitalize on disease uncertainties to avoid responsibility for exposures. In 40 to 60% of cases, employers attempt to limit their liability by arguing an inability to know the source of a workers' infection and point to gaps in scientific knowledge and regulatory practice. Finally, I identify that when in doubt employers attempt to lower their liability by disputing aspects of process over substance (around 59% overall). In fact, the opportunity to dispute process over substance is structured into the OSHA appeals process. Employers whose appeals were heard by the board were able to lower their combined penalties by 30%.

Third, I examine how successful workers and their representatives are in winning Valley fever legal cases and theorize why. Across workers' compensation cases, workers find some recompense around 70% of the time. I partially locate this success in the structure of the regulatory environment and in the role of doctors and state actors. Doctors are afforded a critical role in the workers' compensation system. They possess significant power in shaping case outcomes by pronouncing the "magic words" of medical probability. While employers question exactly where and when a worker became infected with Valley fever, doctors provide certainty by declaring that the worker was likely at greater risk than the general population. Additionally, the standard of proof requiring medical probably rather than one-hundred percent certainty is structured into the more lenient workers' compensation legal system. In contrast, OSHA's regulatory environment concerning Valley fever exposures is less well-established and requires a higher burden of proof making landing successful cases more challenging.

Theory

The Class Politics of Health and Safety

Issues of health, including occupational health, are often described as individual, biological, or environmental problems (Navarro 1982, 1985; Nichols 1999). Sociologists take a different approach locating occupational injury and illness in social relations of work under capitalism (Dwyer 1991b; Nichols 1999). Drawing on the Marxist labor process tradition in the sociology of work, theorists argue that occupational illness and injury on the job are problems of class relations between workers and their employers (Draper 1991; Dwyer 1991b; Hall 1993; Navarro 1982, 1985; Nichols 1997, 1999; Novek 1992; Rosner and Markowitz 1984; Walters 1985).

Navarro's (1982, 1985) theorizing is particularly influential in this area arguing that occupational health should be conceptualized as the "expropriation of health", health that is lost due to the appropriation of surplus value from the worker. Drawing on Marx's labor theory of value, for capitalists to make a profit they must extract more value from a workers' labor than they pay for it (Marx 1867; Navarro 1982). Successfully competing against other capitalists requires a multitude of control strategies to maximize surplus value like increasing the pace of work, implementing technologies to make work faster or more efficient, at the same time these strategies create opportunity for diminishing workers' health in a variety of ways (Burawoy 1979; Edwards 1980; Navarro 1982; Sallaz 2013). Under this theory a workers' health stands in contradiction to the accumulation of capital (Fox 1999; Navarro 1982; Walters 1985). Occupational injuries and illnesses decrease a worker's ability to labor requiring some level of protection from injury and disease; however, expenditures to safeguard worker health cuts into surplus value (Walters 1985). Completely ignoring occupational health issues is constrained by regulatory and social pressures on employers but faced with real tradeoffs between profit and protecting health employers use a variety of strategies to limit their liability for occupational health problems.

Medical doctors and state actors are also involved in the conflict over safeguarding health or profits and participate in workplace health and safety prevention, treatment, and regulation. The Marxist labor process tradition theorizes these actors as serving the interests of capital over workers. This literature theorizes that a "bourgeois ideology" in medicine and science frames health and safety issues as scientific problems, as disease shaped by natural phenomenon, like viruses or dust, rather issues of class relations that shape who is exposed (Navarro 1985; Walters 1985). Because of the, supposed, neutrality of science, medical professionals are called on to evaluate hazards and treat sick workers. Marxist scholars theorize doctors as class actors who are far from neutral. While medical treatment can benefit a worker and ease their suffering, the doctor-patient relationship reproduces class relations because doctors control access to knowledge, treatment, and, at times, compensation (Navarro 1985; Smith 1987). Additionally, doctors often occupy a very different class position than the workers they treat.

The influence of “bourgeois ideology” shapes explanations of injury and illness as outcomes of toxic substances, calls for learning more about exposure levels that are “safe”, appropriate methods for controlling hazards, and “precise understandings and statistically significant results”, that often deny evidence presented by workers and legitimizes inaction until uncertainty can be resolved through scientific study (Navarro 1980; Walters 1985). In this way, a focus on scientific understanding of disease replaces a focus on class relations that caused the worker to become exposed in the first place—leading medical doctors, intentionally or not, to serve the interest of capital over workers.

This literature has particularly highlighted the role of company doctors, physicians who work for corporations and provide health services to employees. Company doctors are integral to class conflicts over health as they both treat injured workers while helping employers to limit their costs and liability for workplace hazards (Draper 2003; Smith 1987; Walters 1985). In Smith’s (1987) classic study of black lung among Appalachian coal miners, company doctors were instrumental in denying black lung as a disease for decades, promoted coal dust as a health boosting measure to prevent tuberculous, and had ultimate authority over shaping workers’ access to disability benefits. It was only after tragedy and decades of activism that protecting workers from black lung became relevant to doctors, employers, and state actors. More recently, corporate-employed doctors continue to face conflict between their allegiance to patients and the companies that provide their paychecks (Draper 2003). This class conflict shapes the patients (workers) they see, how they treat them, how they interpret the cause of their disease, and what they will report to company leadership (Draper 2003). Additionally, threats of outsourcing and job loss further push medical professionals to be “team players” and work to contain healthcare costs by locating blame of disease in individual risk factors rather than promote increased health or environmental monitoring at work (Draper 1991, 2003).

While the Marxist tradition views doctors as class actors who primarily serve the interests of employers, their role may be significantly more complicated. The role of doctors connected to the workers’ compensation system can vary depending on who they work for and the structure of the workers’ compensation legal system in a specific jurisdiction (Lippel et al. 2016). Doctors can serve in many roles including treating injured workers, helping make determinations about a workers’ eligibility for benefits, and strategizing how to get workers back to work (Cox and Lippel 2008; Grant and Studdert 2012; Lippel et al. 2016). Additionally, doctors may be hired by employers, may serve compensation boards, or may be the worker’s treating physician (Lippel et al. 2016). Doctors’ reasons for engaging with the workers’ compensation system also vary. Some view it as a mission to help workers, others as a significant hassle and burden on their time, and still others hired by employers put aside practicing medicine to make significant income from their gatekeeping activities (Lippel et al. 2016). Doctors connected to workers’ compensation may feel uncomfortable placed in the middle of a conflict between the worker and employer while others may enjoy the challenge (Lippel et al. 2016). However, overall doctors often serve as gatekeepers to accessing workers’ compensation systems (Castillo 2018; Cox and Lippel 2008, 2008; Draper 2003; Grant and Studdert 2012; Smith 1987) but their status as a class actor may need to be understand within specific institutional contexts.

Scholars in the Marxist labor process tradition have similarly theorized that the state, through a variety of activities, is often integral to the reproduction of class relations and rarely challenges them (Navarro 1985). The state regulates health and safety at work but historically has only done so after years of activism on the part of workers and their allies (Navarro 1985; Rosner and Markowitz 2020). In this view while the state has done much to require workers be informed about potential hazards and possess the right to refuse unsafe work, the state does not fundamentally challenge employers' control over the labor process (Michaels and Barab 2020; Walters 1985). Rather than fundamentally challenge employer power, the state serves to facilitate capital accumulation while reducing conflict and the cost of occupational health (Navarro 1985; Walters 1985).

For example, the Occupational Safety and Health Administration's (OSHA) mandate is complex as they must balance the interests of both workers and employers while also considering potential impacts of health and safety regulation on the economy (Rosner and Markowitz 2020). For example, in the 1970s studies demonstrated that no level of asbestos exposure was safe; however, OSHA was unable to adopt regulation completely eliminating asbestos as it would have shut down major industries (Rosner and Markowitz 2020). Additionally, the limited capacity of the Department of Labor, uneven enforcement, and reliance on bottom-up enforcement of labor and occupational safety and health law (Alexander and Prasad 2014; Bernhardt 2012; Fine and Gordon 2010; Michaels and Barab 2020; Weil 1991; Weil and Pyles 2005) would generally serve to support this line of argument. These agencies cite employers for violations of labor law but have little power to conduct wide-spread investigations or fundamentally challenge employers. In fact, Weil (1991:20) concludes that OSHA's effectiveness as an organization is "highly dependent upon the presence of a union at the workplace" indicating that collecting organizing on the part of workers is really the key to enforcing regulation.

In summary, the Marxist labor process tradition conceptualizes workplace health and safety as a contested process, a politics, taking place along class lines. Under this theoretical framework, the conflict between profit and the promotion of health pushes employers to prioritize minimizing the costs of health and safety up front (e.g., by screening out "hypersusceptible" workers, introducing less effective safety controls) and after workers have been injured (e.g., by contesting workers' compensation cases or OSHA enforcement citations). Workers and labor groups stand in conflict with employers over the promotion of health. Doctors, relying on "bourgeoisie science" and financial connection to employers, and the state, with its limited capacity to challenge employer power, ultimately serve the interests of capital over workers.

The outcome of class conflicts over workplace health and safety are critical for shaping the regulatory framework and how health and safety risks are defined and managed in organizations. Organizations, including complex formal organizations like state agencies and industry, play a critical role in assessing, accepting, and managing risks on behalf of broader society (Beamish 2015, 2018; Perrow 1991). The results of these contested processes can shape understandings of disease risk, how exposures are managed, how exposed workers are treated, how and when compensation or fines are allocated. In this chapter I examine the contested class politics of assigning responsibility for worker disease in two regulatory contexts, workers' compensation and OSHA appeals board cases. I focus on the role actors play, arguments employers (and their insurance companies and lawyers) make regarding why they are not responsible (or not fully responsible) for the costs associated with occupational disease, and the ultimate outcomes of these cases. In the next section I provide an overview of prior literature in this area.

Limiting Employer Liability in Workplace Health and Safety

Employers engage in a variety of strategies to limit the costs associated with workplace health and safety, particularly after workers have become ill or injured. Prior to the development of safety and health regulatory frameworks workers had limited recourse for preventing or finding relief from workplace illness and injury. Over time the development of legal frameworks and programs like workers' compensation and the Occupational Safety and Health Administration pushed some of the risk of work-related injury and disease onto employers. I describe the historical development of workers' compensation and OSHA and the strategies employers utilize to contest responsibility for the health risks associated with performing work.

Workers' compensation programs are one of the oldest social programs in the United States proceeding unemployment and old-age insurance (Go 1996). A product of the Progressive Era, all states had workers' compensation programs by 1917 (Go 1996). Before workers' compensation, workers sued their employers in civil courts to try to obtain compensation for injuries sustained on the job (Kiselica, Sibson, and Green-McKenzie 2004). However, workers were often unsuccessful because they held limited power relative to their employers and the legal system favored employers. First, workers suing their employers had to overcome the doctrine of assumed risk, a legal defense stating employers' only legal duty to employees was to warn them about safety hazards (Berman 1977; Go 1996; Kiselica et al. 2004). If workers continued to work, they assumed the risk of injury. Second, the fellow-servant doctrine shielded employers if the fault for the accident could be blamed on the foreman or another employee (Berman 1977; Go 1996; Kiselica et al. 2004). And finally, contributory negligence required proof that only the employer was to blame in order to receive compensation (Go 1996; Kiselica et al. 2004). These defenses made it challenging for workers and their representatives to achieve any compensation for injuries.

Labor, civil, and professional groups called for reforming the system promoting two potential approaches: one, modifying employers' liability in law or two, establishing a workers' compensation program which would resolve workplace injuries and illnesses outside of civil courts, remove placing blame on any party, and ensure workers received timely compensation (Berman 1977; Go 1996). Unlike many social welfare programs, a broad coalition including employers, social scientists, social reform groups, and some unions supported the creation of workers' compensation systems. This support was obtained in part because work was framed as inherently risky and dangerous and thus placing liability entirely at the employers' feet was deemed inaccurate (Go 1996). This "industrialization ideology", painted industry as naturally hazardous and injury and illness unavoidable due to industrial progress, a framing that benefitted employers (Navarro 1982). Additionally, reforming law and continuing to require lawsuits as the primary path to obtaining compensation would stratify workers' ability to achieve recompense leaving many to suffer (Go 1996). Thus, the dominant discourse favored a no-fault workers' compensation system viewed as more scientifically accurate, better for ensuring equal access to compensation, and less likely to increase hostile employer-employee relations (Go 1996; Navarro 1982). Many employers supported workers' compensation because they could place liability and blame on "industry" (Go 1996). Social reform groups felt workers' compensation would limit poverty and misery and help the deserving poor (Go 1996; Katz 2013). And unions like the AFL, while initially resistant, eventually came on board, though some unions continued to question if workers' compensation was really in workers' best interests (Go 1996).

Workers' compensation has been dubbed the "Grand Bargain" as workers gave up their ability to sue employers directly for negligence in exchange for ensured compensation of injuries suffered on the job (Kiselica et al. 2004). This no-fault concept meant that employers would be held responsible for injuries and illnesses at lower levels of evidence than required in civil court proceedings (Kiselica et al. 2004). Despite the win of workers' compensation, by the 1950s the system was failing (Boden 2020). Coverage was non-existent in 19 states and the provided benefits were low, some even lower than the national poverty level (Boden 2020). Under threat of federal reform in the 1970s many states expanded coverage and protection. However, the result was a doubling of employers' workers' compensation insurance costs between 1984 and 1990 and the system overall was unprofitable from 1984 to 1992 (Boden 2020). Costs associated with workers' compensation for the system and for employers is going up (Kiselica et al. 2004). In Navarro's (1985) terms workers' compensation costs significantly cut into employers' surplus value.

In the 1990s, employers and insurance companies began a "race to the bottom" pushing legislators to reduce employer costs over reforms to make the system run better (Boden 2020). Many states passed laws making it harder for workers to receive compensation. Employers supported several "reform" strategies to keep their costs low while making it more challenging for workers' to prove their case like requiring "objective" medical evidence, using the American Medical Associations guide to determine permanent impairment, fractioning off how much disability came from work versus non-work, stigmatizing workers' compensation by running anti-fraud campaigns (although fraud among workers is low), and implementing private disability programs which offer less support (Boden 2020). Despite these challenges the "Grand

Bargain" is still in place and workers cannot go around workers' compensation and sue their employers directly.

Established in 1970, the Occupational Safety and Health Administrations' (OSHA) history is much more recent. OSHA is tasked with producing health and safety standards and enforcing compliance among employers. While initially more an activist organization under the direction of Eula Bingham, in the 1980s employer-funded studies, lawsuits, and propaganda campaigns against OSHA regulations challenged the state's ability to promote health and safety at work (Michaels and Barab 2020; Rosner and Markowitz 2020). Employers have resisted the state's attempts to control and regulate hazards arguing that regulation limits their "right to manage" (Rosner and Markowitz 2020; Walters 1985:59). Many occupations lack-up-to-date and meaningful health and safety regulations that not been updated since the 1970s (Bernhardt 2012; Michaels and Barab 2020). In addition to challenges in establishing health and safety standards, employers resist and contest citations and modest penalties leveled against them and it is OSHA that bears the burden of proving a violation (DIR 2022).

Employers engage in variety of strategies and arguments to limit their costs associated with health and safety both up front and after illness and injury have occurred. Studies show employers deny hazards exist, promote less effective and cheaper health and safety controls, and blame disease or injury on workers' lifestyles, carelessness, or "hypersusceptibility" to disease (Draper 1991, 1993, 2000; Dwyer 1991b; Gray 2009; Nichols 1999; Smith 1987; Walters 1985). Additionally, capitalizing on uncertainty may be a powerful tool for employers to limit their liability. Previous research highlights that companies will "manufacture uncertainty" by questioning the validity of science in order to avoid regulation and responsibility (Michaels and Monforton 2005). Additionally, the control of scientific funding in the hands of companies and universities means that some scientific research is systematically left “undone” allowing companies to avoid responsibility for environmental or technological hazards raised by concerned communities (Frickel et al. 2010; Ottinger 2013).

Uncertainty associated with occupational diseases, as compared to injuries, are particularly challenged by employers. As compared to an injury, proving where a worker caught a disease is more challenging, especially if the symptoms mimic other diseases (Botsch 1993; Kiselica et al. 2004). Because of this uncertainty and the fact that disease claims are often more costly than injury claims, employers are more likely to challenge a workers’ right to compensation (Botsch 1993; Kiselica et al. 2004). Botsch’s (1993) study of “brown lung”, a respiratory disease caused by breathing cotton dust, highlights that in new and rare diseases employers’ challenges are likely to be particularly common to avoid establishing precedents in the workers’ favor.

Scientific unknowns connected to work-related disease can lengthen and draw out conflicts, diffuse conflict, and limit preventive action (Botsch 1993; Navarro 1980; Smith 1987; Walters 1985). Using narratives that promote the science as uncertain creates opportunity for a wide range of actors to construct interpretations about health and safety risks and how we should think about and manage them (Fox 1999; Nelkin 1985). Unlike injuries, new and rare diseases may be particularly contested by employers. Employer’s successful denials of responsibility for work-related disease often pushes the expense onto workers and state programs like Medicare and social security disability (Boden 2020; Botsch 1993; Michaels and Barab 2020).

Motivation and Research Questions

I examine how the contested process of assigning responsibility for work-related disease plays out in two regulatory arenas: workers’ compensation and Occupational Safety and Health

Administration (OSHA) cases. I use Valley fever as a case to examine this contested terrain, the roles actors take, the types of disputes that arise over assigning responsibility for disease, and ultimately how these argument shape workers' ability to obtain workers' compensation or for the state to level penalties against employers. I ask: How do employers (and their lawyers and insurance companies) try to limit their responsibility for the cost of disease in workers' compensation and OSHA appeals board cases? What role do medical doctors and state actors play in these cases? And how do workers and their advocates fight back? Does uncertainty associated with Valley fever disease influence how workers are able to achieve their rights to compensation once exposed? Does uncertainty associated with Valley fever disease influence how OSHA is able to enforce citations for Valley fever exposures? And in what ways?

Marxist labor process theory is the ideal starting place for this work because of its explicit focus on social relations and conflict between opposing social classes (Burawoy 1979; Navarro 1982, 1985; Walters 1985). Additionally, Valley fever is an ideal vantage point from which to examine how uncertainty plays out in this contested process. Valley fever is a developing occupational health problem with a limited, but growing, regulatory framework and a small, but dedicated field of scientific research, potentially leaving space for uncertainty to shape the dispute resolution process. I describe these features of Valley fever below.

First, Valley fever is a developing occupational health problem potentially allowing opportunity for employers to contest responsibility for exposure and disease. While we have known about Valley fever as a hazard since the late 19th century (Hirschmann 2007), concerted prevention efforts regarding Valley fever as an occupational hazard started to expand in the early 2000s and into the 2010s. Valley fever, while compensable in workers' compensation in California, has a limited state-wide regulatory framework overall. The legislature required training on Valley fever for some construction workers in 2019 (Salas 2019) and some California counties require Valley fever dust management plans for proposed development projects. However, OSHA does not have specific standards for Valley fever exposure and prevention like it does for other hazards.[6] A limited, but developing, regulatory framework provides a unique opportunity to examine this contested process in action.

Second, Valley fever as a science is still developing leaving several uncertainties concerning disease prevention and infection. Particularly, the location of *coccidioides,* how the disease may progress in different bodies, and what types of prevention practices are proven to be effective. For example, the spores that cause Valley fever are invisible to the human eye creating a hazard that no one can see. Methods of current testing of the soil for *coccidioides* are challenging and the fungus can live anywhere in endemic regions within the top 2 to 12 inches of soil (Barker et al. 2012; CDPH 2013; Galgiani 1999). On large development projects it would impossible and impractical to test for *coccidioides* spores over the entire site and challenging to say with any certainty that spores are not present. Even if a worksite could be "clear" of hazard, winds in endemic regions may contain spores at any time. Whether the hazard is present is challenging to know with certainty. Additionally, questions remain around disease progression, relapse, and who and why different people may be at greater risk. These uncertainties concerning

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[6] For example, OSHA regulates Crystalline Silica, small mineral particles often generated during concrete work that when inhaled can cause silicosis an incurable and deadly lung disease, by requiring certain types of respiratory protection if working on tasks that degenerate silica dust for more than 4 hours or by requiring employers to measure and limit the amount of silica dust in the air to 50 $\mu g/m^3$ averaged over 8 hours (OSHA 2017). Unlike with silica, OSHA relies on piecemeal general standards from the California Code of Regulations, Title 8, to enforce Valley fever prevention.[6] For example: Section 342 (Reporting Work-Connected Fatalities and Serious Injuries), Section 3203 (Injury and Illness Prevention), Section 5141 (Control of Harmful Exposures), Section 5144 (Respiratory Protection) and Section 14300 (Employer Records-Log 300) (Cal/OSHA 2017).

infection and disease progression may create opportunities for employers to dispute their responsibility for worker illness and to shape the regulatory framework.

Method

I analyze the contested process of assigning responsibility for work-related disease by evaluating legal cases in two regulatory arenas: California Worker's Compensation cases and California Occupational Safety and Health Administration (OSHA) Appeals Board Cases. Chapter 1 described the method of obtaining legal cases on work-related Valley fever. From the Work-related Valley Fever Exposures Database, I subset all legal cases to include only those involving worker's compensation (heard either by the Workers' Compensation Appeals Board or by a higher court) or OSHA Appeals Board cases and citation appeals documents (n = 56). Workers' Compensation Appeals Board (WCAB) cases are those that are heard by appeals board judges after a lower workers' compensation judge has heard the case, made a decision, and either the employer or worker has filed a petition for reconsideration of some part of the decision. Forty-four cases involved workers' compensation claims (see table 3.1). The remaining documents involve OSHA citation contests or appeals board decisions. After employers are cited by OSHA (also called DOSH, the Division of Occupational Safety and Health in California, or Cal/OSHA) for a health and safety violation they may appeal the citation, settle with OSHA, or request the case be heard by the OSHA appeals board (DIR 2022).

The cases under analysis likely represent some of the most highly contested disputes between employers and workers. Several include precedential decisions in both the realm of workers' compensation and OSHA appeals board cases. Detailed case information about workers' compensation cases that were settled and accepted without the need of appeals board are not available. Additionally, my search revealed little to no publicly available documents for

OSHA disputes settled prior to appeals board hearings. The OSHA cases all involve construction projects in which hundreds of workers were potentially exposed. These cases may represent particularly egregious and high-profile circumstances. Analyzing the most highly contested and precedential cases is important for understanding how these conflicts may shape the regulatory environment and ability of workers to obtain recompense in lower court proceedings.

The workers' compensation and OSHA appeals board case documents are decisions written by judges involved with the case. The documents typically review what happened to the worker, describes the nature of the dispute, arguments raised by different parties, and concludes with a decision based on testimony and case law. The data for these cases are thus produced by judges and shaped by the evidence presented. While direct quotes are often included, at times judges paraphrase arguments raised by the parties. Unlike attendance at a trial, I can only view these data through the lens provided by the judge. Because my goal is to analyze the types of arguments made by actors, the cases work well for the analysis. However, what is likely lost in these written cases is the emotional aspect of the trials and potential the voices of workers. These conflicts involve workers who have become disabled or have died from work-related Valley fever. Compared to the severity of suffering the tone of these documents appears quite flat. Additionally, workers' voices are much less present than employers', doctors', and judges' voices. In these cases, employers dispute lower judges' findings more often than workers (around 60% of cases). Additionally, as I will describe, the significant role of doctors means they are featured prominently in many cases. However, considering the limited qualitative research on workers' experiences with Valley fever disease it is disappointing that their experiences are not captured in greater detail in these cases.

I analyzed the legal cases using inductive and deductive coding in MAXQDA. First, I read all legal cases and wrote a memo describing findings and emerging patterns across cases. Second, I read through all the cases a second time writing a detailed memo for each case describing case findings and patterns. Based on emerging inductive patterns, I deductively coded each case to identify several types of data related to the conflict including: the substance of the dispute, employers' arguments related to denial of responsibility, doctors and medical expert opinions and findings, employee assertions and arguments claiming work-related disease, OSHA investigator arguments and evidence of proof, and judges' reasoning and decisions. Finally, I reviewed all memos and codes and categorized the types of arguments made by employers, state actors, and doctors (see table 3.1).

Table 3.1 Valley Fever OSHA and Workers' Compensation Legal Case Outcomes and Argument Types Made by Disputing Employers

	OSHA Appeals Forms	OSHA Appeals Board Decisions	Workers' Compensation Cases	Total
Number of Documents	5	7	44	56
Case Outcomes				
Frequency of a win for the worker or OSHA	NA	4	31	35
Frequency of a win for the employer	NA	3	15	18
Percent favorable outcome for worker/OSHA	NA	57%	70%	62%
Argument Types (Percent)				
Uncertainty in Infection Source	2 (40%)	6 (86%)	18 (41%)	26 (46%)
Uncertainty in Science or Practice	1 (20%)	6 (86%)	26 (59%)	33 (59%)
Place the Blame Elsewhere	2 (40%)	1 (14%)	6 (14%)	9 (16%)
Dispute Process over Substance	5 (100%)	6 (86%)	22 (50%)	33 (59%)

Data Source: Work-related Valley Fever Exposures Database. Table includes OSHA citation appeals documents submitted by employers cited for Valley fever exposures, OSHA Appeals Board Decisions, and Workers' Compensation Cases decided by the Workers' Compensation Appeals Board, Writs submitted by employers for case review by a higher court, and court of appeals or supreme court decisions.

Results

Work-related Valley fever legal cases portray the class-based conflict between workers and employers. Across all cases employers and/or their insurance companies petitioned for the outcome to be reexamined 60% of the time. The state assumes two roles in these cases. First, WCAB and OSHA appeals board judges decide the ultimate outcome of the case. Second, OSHA investigators actively cite employers for violations and support their cases at trial. While in workers' compensation cases, employees are represented by their lawyers, in OSHA cases the state stands in conflict with the employer on behalf of workers.

However, contrary to theorizing in the Marxist labor process tradition (Navarro 1982, 1985; Walters 1985) doctors' class position cannot be so easily ascribed. As Lippel et al. (2016) argue doctors' roles in workers' compensation cases may vary depending on the institutional context. In California, doctors may be involved in workers' compensation cases in five different roles (DIR-DWC 2016d). Most common were qualified medical evaluators (QME) or agreed medical evaluators (AME). A QME is a physician who meets workers' compensation educational and licensing requirements and is on a state-generated list (DIR-DWC 2014). These doctors are appointed by the workers' compensation to evaluate a case involving medical disputes (DIR-DWC 2016d). An AME is not a state regulated role. An AME is a doctor that the workers' attorney (if they have one) and the insurance claims administrator jointly agree will evaluate the case (DIR-DWC 2014). In addition to these QME and AME roles, employers, workers, and OSHA investigators relied on medical professionals to serve as consultants to resolve disputes in their favor. In a way the medical profession finds itself in the middle of class conflict over the costs of health and safety. I find that medical professionals wield immense power in deciding the outcome of these cases, in particular by using the "magic words" of medical probability, by declaring that the probability was greater that the worker became infected at work as opposed to elsewhere.

Employers disputed their responsibility for the costs associated with occupational safety and health in four broad ways. First, by pointing to uncertainty in the ability to know the source of a Valley fever infection. Second, by attempting to capitalize on uncertainties in Valley fever science and existing regulatory practice. Third, employers attempted to deny responsibility by blaming others, particularly the worker, the environment, or other employers. Finally, employers sought to dispute issues of process over substance. Table 3.1 shows the number of cases that involved each argument type and the number and percentage of cases sided in the workers' favor. The sections below describe each argument type, the roles actors played, and the results of the contested disputes over the costs associated with occupational health.

Dispute the Disease as Work-related by Pointing to Uncertainty in Infection Source

One of the most common arguments employers used to try to overturn a case in their favor was to argue that the workers' disease was not work-related. If the employer can cast doubt on an illness or injury as work-related then they can undermine the validity of a worker's compensation case or an OSHA citation. Across workers' compensation and OSHA cases, employers drew on uncertainty to support their argument around 46% of the time. Specifically, employers pointed to an inability to know where and when a worker inhaled the *coccidioides* spore that caused disease. In workers' compensation cases, medical doctors, particularly QMEs and AMEs play a critical role in settling this uncertainty. In OSHA appeals board cases, doctors play a smaller role but their credibility and testimony shape how judges evaluate the danger of Valley fever as a workplace hazard.

Workers Compensation Cases

Employers capitalized on Valley fever as an invisible environmental exposure to cast doubt on the source of a worker's disease and attempted to argue that without the ability to identify where the *coccidioides* spore came from, you cannot prove "industrial causation". As the WCAB writes:

> Apparently in all seriousness, Defendant (the employer) appears to allege that unless we can positively identify the particular coccidodiomycosis [sic] spore that caused Applicant's infection and trace the guilty spore back to its point of origin to establish 'with specificity' whether it came from the work activities or the football game, Applicant should not recover…(Worker v. State of California, Department of Corrections 2015)

Disputes over the source of a workers' infection were key maneuvers attempted by employers to deny responsibility for a workers' disease.

The cases of Worker v. Harris Wolf California Almonds (2015, 2017) are representative examples of employers' attempts to point to uncertainty in infection source as well as the critical role medical doctors play in deciding the outcome of a case. The worker was a manager at an almond processing plant and was hospitalized for Valley fever. He alleged that he caught Valley fever at work because conditions at the plant were dusty and initially his claim was granted by a workers' compensation judge. However, the case made its way in front of the WCAB in 2015 because the employer filled a petition for reconsideration arguing that there was not substantial evidence to prove the disease was caused by work. As with many workers' compensation cases a medical doctor examined the case. In the 2015 case, the QME provided testimony acknowledging the uncertainty in infection source and concluded that the endemic nature of

Valley fever meant the infection could have happened outside of work.[7] Due to this uncertainty the WCAB granted the employer's petition and sent the case back to a lower workers' compensation judge to be re-evaluated.

After the re-evaluation, a workers' compensation judge again sided with the worker arguing his disease was work-related. The employer then filed a second petition for reconsideration causing the case in 2017 to be heard by the WCAB a second time. However, this time the case was granted in the worker's favor. The key that changed the outcome of the case was the testimony of a new independent medical doctor who strongly made the case that his disease was work-related:

> The exact location where he acquired the infection cannot be determined. He certainly could have acquired it at work given his exposure as described above dealing with the process of de-husking and de-shelling of the almonds. On the other hand, he also lived within the endemic area. *It is, however, more likely than not, and within medical probability, that he acquired the infection at work based on the history of work exposure in that his exposure to the potential pathogens at work is statistically more than what he described at home and away from work.* (emphasis added Worker v. Harris Wolf California Almonds 2017)

[7] According to the QME: "The patient was exposed to coccidiomycosis while he was working at Harris Woolf Ranch California, but that does not mean that he was exposed during work at that ranch. He has been working in Central Valley for a long time in various locations and various capacities, and that makes him more prone to be exposed to valley fever as this area is endemic for coccidiomycosis infection. That does not mean that it is caused, or he was exposed during work… He could be exposed because he has been living in an endemic area."

This doctor acknowledged the same uncertainty as the first. The worker could have inhaled the spore at work or home and there was no way to know for certain. However, the use of the language "medical probability" and the explicit statement that his chances of becoming infected from work were greater than at home or elsewhere operated like magic words for the WCAB. Without the use this language the WCAB had stated that in 2015 the QME's "opinion regarding causation is speculative and unclear."

The WCAB looked to doctors to determine causation of disease, to make explicit the link between work and health when that link was unclear or made out to be unclear. Doctors were called on to determine if the risk of infection at work was greater than the risk of infection elsewhere. Doctors were called on to adjudicate if the worker caught the disease at work or on vacation (Worker v. Workmen's Compensation Appeals Board 1968a), at work transporting prisoners or at a football game (Worker v. State of California, Department of Corrections 2015), at work or at home (Worker v. Hall Management Corporation 2019). As one doctor stated: "No one will ever be able to know exactly what day, what moment, what location he was exposed. All we can do is do it based upon reasonable medical probability" (ABM Industries, RSKCo, v. Workers' Compensation Appeals Board 2002). The establishment of medical probability is required by the board. In one case, a doctor was deposed to confirm that his use of the word "likely" should be interpreted specifically as reasonable medical probability (Worker v. Hall Management Corporation 2019). Employers across many cases cast doubt on employees as being at greater risk of disease at work as compared to elsewhere.[8] However, doctors wield immense

[8] (For examples see Fidelity v. Industrial Accident Commission of the State of California 1950; Interstate Brands v. Workers Compensation Appeals Board 1997; Kaiser Foundation Hospitals v. Workers Compensation Appeals Board 1982; Worker v. Harris Wolf California Almonds 2017; Worker v. KVS Transportation 2013; Worker v. Prime of California, Inc 2013; Worker v. Western Municipal Water District 2011).

power in deciding the fate of these cases, a fate that hinges on them using the “magic words” of medical probability.

Both employers and workers used doctors’ status as a strategy to make their case. For example, one worker was accused of “doctor shopping” for recruiting three different doctors to prove that he caught Valley fever during his commute (Worker v. Workers’ Compensation Appeals Board 2013). In another, the employer’s insurance company requested their own doctor to evaluate if a farm worker’s death from Valley fever could be attributed to work (Worker v. Hall Management Corporation 2019). This consultant argued the disease was not work-related. She provided evidence that *coccidioides* does not grow in cultivated soils and thus infection was impossible. However, the QME’s assessment that the “that decedent's work activities placed him *statistically greater risk of infection* based on the duration and nature of exposure, versus the risk entailed with the chance encounters outside the workplace” (emphasis added) was the argument the WCAB used to decide the case in favor of the deceased. While employers and workers brought in their own doctors to consult, the WCAB appeared to favor those whose testimony included the magic words of medical probability.

OSHA Cases

Employers seeking to avoid OSHA citations also attempted to cast uncertainty on the link between work and disease by arguing the source of infection cannot be identified. For example, First Solar Electric, Inc., a developer of a solar energy project, argued:

> At the outset, it should be noted that people can contract Valley Fever in any setting wherever spores are mobilized. Because of the multiple modes and opportunities for exposure, there is no way to connect a specific occurrence of Valley Fever with a specific exposure scenario. (First Solar Electric, Inc. 2013)

Employers attempted to delegitimize their OSHA citations by arguing an inability to link disease to exposure at work. Specifically, that the nature of Valley fever exposure means any attempt to link disease and work will be invalid, unreliable, or impossible.

Additionally, some employers in OSHA cases attempted to deny the possibility of workers' Valley fever infections by highlighting what they had done right and denying hazardous conditions existed. Employers argued that they did evaluate the potential for hazard (Bechtel Construction Company 2013; CLP Resources Inc. 2013; Papich Construction Company, Inc. 2019; U.C.I. Construction, Inc. 2021) and did provide preventative training to workers (Bechtel Construction Company 2013; Papich Construction Company, Inc. 2018). That they utilized safety prevention measures like watering the soil to keep dust down, using enclosed cabs to prevent dust exposure, and stopping work during high winds (First Solar Electric, Inc. 2013; Granite Construction Company, Inc. 2019, 2021; Papich Construction Company, Inc. 2018, 2019; U.C.I. Construction, Inc. 2021). Employers denied that hazardous conditions existed because there never were any windy conditions to cause concern (U.C.I. Construction, Inc. 2021), stated that only work involving undisturbed native topsoil is hazardous (U.C.I. Construction, Inc. 2021), and that no one became ill (First Solar Electric, Inc. 2013; Papich Construction Company, Inc. 2019) thus there was no hazard.

In conclusion, employers consistently argued that a workers' Valley fever was not work-related by pointing to uncertainty in the ability to know the exact location or moment that a worker inhaled a *coccidioides* spore. Employers also argued that workers were not at greater risk of disease because of their employment. Workers' compensation judges often turned to doctors to say the "magic words" of medical probability, to assess causation and probability of risk placing the fate of many workers' compensation cases in the hands of the medical doctor. In contrast, in OSHA cases doctors do not have a built-in role within the system. Employers hardly used doctors at all, among the OSHA cases only a couple of doctors appears prominently.[9] OSHA investigators did rely on doctors and nurses to educate the OSHA appeals board judges about the seriousness of Valley fever as a health hazard, risk factors for exposure, and attempted to make the link between the workers' disease and the workplace (Papich Construction Company, Inc. 2018, 2021; Quality Ag, Inc. 2020; U.C.I. Construction, Inc. 2021). However, unlike workers' compensation, doctors do not have a built-in role in OSHA's regulatory process and there are no magic words medical professionals can say.

Dispute Full Responsibility for Illness by Drawing on Uncertainty in Science and Gaps in Regulatory Practice

Employers also disputed full responsibility for workers' disease by capitalizing on uncertainty in science and practice. Compared to the previous strategy—appealing to uncertainty in the source of infection —this strategy attempts to undermine the case by pointing to gaps in Valley fever basic science and gaps in current regulatory practice. This strategy took several forms. In the workers' compensation cases, employers attempted to limit their costs by disputing the extent of the workers' present disability, for example by pointing to gaps in the American Medical Association Guides. Employers also debated their responsibility for potential future impairments caused by Valley fever reactivations or relapses, a situation that may or may not

[9] In Papich Construction Company, Inc. (2018) the employer's doctor attempted to locate the worker's disease in his prior prison stay rather than at the worksite. Bechtel Construction Company (2013) argued they did not have to report Valley fever disease in their OSHA 300 logs because "medical professionals did not identify the cases as work-related."

occur. While uncertainty became points of conflict, the WCAB often chose to interpret uncertainty in the workers' favor.

In the OSHA cases, employers similarly attempted to use scientific uncertainty to their advantage but in different ways and with more mixed results. While uncertainty in workers' compensation revolved around the body, the amount of impairment present or possible in the future, uncertainty in OSHA cases revolved around the soil, the hazard itself. Employers questioned the reliability of Valley fever disease and soil testing, questioned that Valley fever could be considered a hazard under existing regulation, and pointed to gaps in scientific knowledge about the effectiveness of respirators. Unlike workers' compensation which has a long regulatory history of Valley fever cases extending back to the 1940s, contested OSHA citations for Valley fever appear to be more recent. Within this newer regulatory environment initially employers successfully used arguments about uncertainty in their favor until recent push back by OSHA investigators turned the tables in two cases.

Workers Compensation

Impairment and disability is rated in workers' compensation cases by using the American Medical Association's (AMA) *Guides to the Evaluation of Permanent Impairment* (DIR-DWC 2016c). According to the AMA:

> The AMA Guides provide a reliable, repeatable measurement framework for permanent impairment in patients who have suffered an injury or illness resulting in long-term loss of a body part or reduction of body function…A properly completed impairment rating report produced using the appropriate AMA Guides content is the gold standard for documenting permanent impairment to support insurance and legal proceedings. (AMA 2021)

The use of the AMA guides again points to the power of medicine in shaping outcomes in the workers' compensation system. While the AMA website boldly states the guide provides a reliable measurement framework for determining permanent impairment, in these cases the AMA guides become both the subject of dispute and a tool for supporting arguments about what disability rating is or is not appropriate principally because Valley fever disease is not listed in the guide at all. The case of Worker v. T&W Farms (2011) is particularly striking.

The worker developed disseminated Valley fever in the course of his employment as a farm worker. He filed a petition for reconsideration with the WCAB after a lower workers' compensation judge determined his permanent disability rating was only 15%. At issue was how to assess impairment when Valley fever was not in the AMA guide and whether the employer's disability rating specialist's testimony was reliable. I include a quote from the QME's testimony at length to highlight both the uncertainty in assigning Valley fever a rating and the power doctors have in this process:

> The condition of chronic disseminated coccidioidomycosis is not a condition listed in the AMA Guides, 5th Edition. Therefore, I am instructed by the text to analogize to some other condition with similar degree of impairment… Page 50 of the Guides describes a patient with cardiomyopathy who has symptoms akin to [the worker], specifically, ability to do light housework and sedentary work, but becomes breathless upon climbing a flight of stairs. This person is assigned a level of impairment of 49% per the Guides. Elsewhere in that chapter is…impairment for coronary artery disease, and that is associated with a range of impairment between 30% and 49%… Alternatively there is in Chapter 9, which addresses the hematopoietic system…That person is assigned a level of 25%. Alternatively, there is a patient with hemoglobin of 7…That person is assigned a level of

> impairment of 65%. Looking elsewhere, we find in the pulmonary chapter, Chapter 5, Example 5–7, describing a patient with asbestosis…This person is assigned a level of impairment of a range between 26% and 50%**. Taking all of these examples into account, and considering this patient's description of his limitations of the activities of daily living, I assign him whole person impairment of 50%**. (emphasis in original, Worker v. T&W Farms 2011)

Because Valley fever is not in the AMA guides doctors are called on to determine what might be appropriate by comparing the workers' symptoms to diseases already classified. The employer attempted to take advantage of the gap in the AMA guide by offering the testimony of an AMA guide rating expert to refute the doctor's reasoning. The expert argued that he believed "the applicant's valley fever is self-limiting", that his "valley fever symptoms have abated" proposing a rating of 1% to 3% (Worker v. T&W Farms 2011). The WCAB's reliance on the evaluation of medical doctors over all others resulted in the worker being assigned a rating of 65% and not the employer's preferred 1 to 3%. A similar case involved a worker whose severe chronic pain and fatigue from Valley fever were the subject of dispute concerning how to decide his impairment rating using the AMA guide (Worker v. Bechtel Group, Inc. 2017).

Second, employers attempted to deny responsibility for Valley fever relapses or reactivations because the potential for these outcomes is unknown. Whether or not an individual might have a Valley fever reactivation, relapse, or have their disease progress cannot be known. The most common drug assigned for treatment of Valley fever, fluconazole, can help combat the fungus but it cannot actually kill it (Amaro and Wood 2012). It is possible for the fungus to lay dormant in the body indefinitely and to reactivate when the immune system is weak (Valley Fever Center for Excellence 2021a). Doctors were called to address uncertainty around Valley fever as an “insidious” disease, meaning that the workers’ condition might get worse in the future, a determination that affects the applicant’s ability to obtain future awards (Worker v. California Department of Corrections 2020; Worker v. Robert Heely Construction 2014).

For example, in Worker v. California Department of Corrections (2020), a correctional officer developed Valley fever. Her employer submitted a petition for reconsideration with the WCAB arguing that her infection did not constitute an insidious progressive disease. As with uncertainty in determining the source of infection, doctors were called on to adjudicate the uncertainty of disease relapse. While the potential for future impairment and harm cannot be known, the WCAB decided that uncertainty favored the worker. When asked to explain if the worker’s disease could progress in the future, the AME explained:

> As far as the issue whether the issue of coccidioidomycosis is a[n] insidious progressive disease in this case, I think it is in the sense that [the worker] could have relapse or reactivation of disease in the future…As indicated above it is still more likely than not that she would not relapse. Of course I cannot predict the future whether she could become immunocompromised because of senescence and/or of disease process/intake of medications. Should either relapse or reactivation occur she should be treated on an industrial basis… However, it is speculative to say that it is medically probable, which I interpret as more than 50%, that [she] could suffer a relapse/reactivation. <u>The risk however is real and significant</u> even though it is not up to 50% probability. (emphasis in original, Worker v. California Department of Corrections 2020).

Doctors cannot predict if patients will suffer a relapse of disease. In fact, the AME could not say that it was medically probable, the magic words that decided the fate of whether a case would be considered work-related and in favor of the worker. Despite this the WCAB sided in favor of the worker explaining: “that a finding of progressive insidious disease does not require a finding that applicant's Valley Fever will probably recur. It is sufficient if recurrence was a *possibility*.” (emphasis in original, Worker v. California Department of Corrections 2020). In determining if a workers’ Valley fever could relapse or get worse in the future the burden of proof appears even lower than medical probability and door to future disability compensation is open. Employers were even found responsible for dormant Valley fever infections that became reactivated after the worker became injured in some other way (Royal Indemnity Company v. Industrial Accident Commission 1951; Worker v. Workmen’s Compensation Appeals Board 1968b). Despite employers’ efforts to generally use uncertainty in their favor, here uncertainty actually favors the worker.

Finally, doctors’ significant power in shaping the outcome of cases was also reflected in employer’s arguments about their credibility. Employers argued there was not substantial medical evidence to support a particular finding (Worker v. ASR Construction 2015; Worker v. California Department of Corrections 2017; Worker v. Harris Wolf California Almonds 2015; Worker v. KVS Transportation 2013; Worker v. State of California, California Department of Corrections 2014), claimed that doctor’s medical evidence was speculative (Royal Indemnity Company v. Industrial Accident Commission 1951; Worker v. Prime of California, Inc 2013), questioned the doctor’s credibility (Worker v. KVS Transportation 2013), and refuted the doctor’s ratings offering up their own (Worker v. City of Bakersfield 2014; Worker v. T&W Farms 2011). While doctors have a lot of power to shape case outcomes, they must support their conclusions with evidence, with one case sent back to trial because a doctor did not adequately defend his proposed disability rating (Worker v. City of Bakersfield 2014).

OSHA Cases

In the OSHA cases employers attempted to capitalize on scientific uncertainty in several ways. One, by denying Valley fever is a hazard that can be identified due to limitations in soil sampling. Two, by denying that Valley fever can be classified as a hazard under existing regulation. And three, that limitations in scientific studies on respirator effectiveness resolve them of responsibilities regarding appropriate use of personal protective equipment. Scientific uncertainty concerning Valley fever was especially prominent in two recent cases heard before the OSHA appeals board twice involving Granite Construction Company, Inc. (2019, 2021) and Papich Construction Company, Inc. (2019, 2021), both construction contractors on a large solar development project. These cases provide significant insight into how employers attempt to leverage uncertainty in their favor and how an evolving regulatory environment leaves space for uncertainty to favor employers.

First, in 2019, both Granite and Papich had their citations initially waived by the OSHA appeals board after ruling that OSHA investigators had not proved Valley fever was a hazard at the job site. Specifically at issue was how to establish the presence of a hazard. The judge ruled that OSHA investigators had the burden to prove Valley fever was a hazard at the site but because "the Division maintained that there was no commercial test to detect the presence of cocci spores in soil samples or the amount of cocci spores in the air…[and] No air, soil, or other samples were taken" the hazard had not been proven to exist (Papich Construction Company, Inc. 2019).

Soil sampling for Valley fever is challenging. CDPH (2013:2) prevention guidelines state "there is no reliable way to test the soil for spores before working in a particular place." Initial procedures for identifying *coccidioides* in the soil were tedious, expensive, slow, or unreliable, although newer methods using PCR are more efficient, challenges remain such as difficulty detecting *coccidioides* in the soil and inconsistency between types of tests (Barker et al. 2012; Colson et al. 2017; Galgiani 1999). In addition to methodological issues, the scarcity of experts to conduct these tests and the cost of testing has been theorized as potential explanations as to why soil sampling has not been attempted on large development projects (Colson et al. 2017). In these cases, employers initially benefited from a lack of a scientifically reliable methods for detecting *coccidioides* in the soil.

OSHA investigators appealed these cases, and they were heard again by the OSHA appeals board in 2021. The board was tasked with evaluating the same question (with the same amount of evidence) but arrived at a different answer as to how to prove there was a hazard you cannot see and cannot reliably test for. The OSHA appeals board ruled that establishing Valley fever as a hazard was possible using a different standard called reasonable predictable access writing: “Alternatively, the Division may establish exposure by ‘showing the area of the hazard was ‘accessible’ to employees such that it is reasonably predictable by operational necessity or otherwise, including inadvertence, that employees have been, are, or will be in the zone of danger” (Papich Construction Company, Inc. 2021). Using this standard, the board ruled that the variety of evidence presented proved that the hazard was accessible to employees and that they could have been in danger. OSHA investigators’ push back resulted in the application of a different standard of proof. Uncertainty or inability to soil sample did not resolve the employers of their responsibilities for disease prevention.

Second, Papich and Granite also attempted to capitalize on uncertainty in existing regulatory practice arguing Valley fever is not a citable hazard under existing labor regulation. Both Granite (2019, 2021) and Papich (2019, 2021) were cited by OSHA for a violation of

Section 5144, subdivision (a) which requires respirators be used to "control occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors" when engineering controls are not feasible (Granite Construction Company, Inc. 2019). In both cases the employers argued that Valley fever does not count under existing regulation because it is not "foreign to the environment" as the regulation states, thus because it was not a hazard introduced by them, it was a hazard at all. The OSHA appeals board ultimately rejected this line of argument.

Finally, Granite (2019) and Papich (2019) attempted to create and capitalize on uncertainty concerning the effectiveness of masks.[10] In Papich (2019): "(The employer's safety coordinator) testified that dust suppression through water use was so effective that it eliminated the need for respirators but Employer supplied them only because of its contract with the general contractor." To which OSHA's investigator "testified that he believed some dust exposure would occur regardless of the amount of ground watering, and therefore, respirators were required" (Papich Construction Company, Inc. 2019). While watering the soil is best practice for Valley fever prevention (CDPH 2013), there is no existing scientific evidence to assert, as the employer's safety coordinator did, that watering the soil is so effective that personal protective equipment (PPE) is unnecessary. However, the uncertainty concerning respirator effectiveness led the OSHA appeals board to conclude initially in 2019 that because no studies have compared the effectiveness of respirators for preventing Valley fever the employer's violation could be

[10] Granite (2019) and Papich (2019) also initially benefited from uncertainty by arguing that mask use was voluntary on the part of workers and thus failures to properly apply respiratory protection regulation had not been violated. This issue of whether or not N95 respirators are mandatory or voluntary is an attempt to capitalize on exceptions in health and safety law to Section 5144 (DIR 1974). An issue that is also relevant to current practices during the Covid-19 Pandemic.

waived.[11] Thus uncertainty concerning the effectiveness of respirators initially benefitted the employers.

The Granite (2019, 2021) and Papich (2019, 2021) cases highlight how employers use uncertainty in science and existing regulatory practice to avoid responsibility for the costs of disease. Debates centered on uncertainty in terms of proving Valley fever is a hazard under existing regulation, how to measure the hazard, the challenges of soil sampling, and the effectiveness of respirators. In 2019, the appeals board decided that uncertainty favored employers lowering their combined penalties from $106,590 to $0. However, OSHA investigators active appeal of the cases lead to a reversal in decision in 2021. The board ruled that the definition and measurement of Valley fever as a hazard could be proven, without the requirement to sample the soil. These cases highlight that Valley fever as a hazard under existing regulation is contested and on-going. OSHA's investigation records for Granite (OSHA 2018a) and Papich (OSHA 2018b) have not been closed, potentially these cases may be pending further court hearings. The outcome of these cases will establish how Valley fever as a hazard is evaluated and whether responsibility for Valley fever disease can be successfully avoided by capitalizing on uncertainty in science and regulatory practice.

These cases also highlight the critical role the state is playing in defining Valley fever as a workplace hazard and how it should be treated at the worksite. While previous Marxist scholarship has argued the state is a passive entity that does not challenge employers' control

[11] While respirators have assigned protection factors and provide an expected level of protection against dust exposure (CDPH 2013), it has not been established how effective masks and respirators are in preventing *coccidioides* spores from becoming inhaled. This is a gap in the science but likely also a significant challenge for science to tackle. Considering the potential danger of lifelong disease, it would be unethical for studies to expose workers' to spores and test the effectiveness of various respirators.

over the labor process (Michaels and Barab 2020; Navarro 1985; Walters 1985), these cases complicate that position. Despite Papich's assertation that no workers got sick during their time working at the site, the state argues that because workers could have gotten sick due to the endemic nature of Valley fever and the work activities involved a hazard existed. Lack of ability to see or accurately test for Valley fever means the default organization of work should be one in which Valley fever is assumed to be present. Scientific uncertainty is not a reason to operate as if *coccidioides* is not there. Finally, because dust cannot be completely avoided due to work activities or wind, the state asserts in these cases that respiratory protection is required, forcing employers to have workers medically cleared to work in a respirator and have proper training on fit, cleaning, and maintenance. These recent cases challenge the idea that employers can organize the labor process however they want as long as no one gets hurt. Rather employers must protect workers at the highest level of standard.

Locate Responsibility for Disease Elsewhere

In line with previous scholarship, the third strategy employers used to attempt to deny full or partial responsibility for the costs of Valley fever disease was to locate blame elsewhere. Approximately, 16% of workers' compensation and OSHA cases involved attempts to lay blame on individual workers, other employers, industry, the environment, and even judges, lawyers, and other professionals.

Place the Blame on the Worker

Employers have long located issues of occupational injury and disease as an individual problem blaming a workers' carelessness, lifestyle, or hypersusceptibility (Draper 1991, 1993, 2000; Dwyer 1991b; Gray 2009; Nichols 1999; Smith 1987; Walters 1985). Among arguments locating blame elsewhere, blaming the worker was common. For example, CLP (2013) in their OSHA appeal form attempted to shift some blame for a solar farm outbreak on an "independent employee act", thus framing the issue as one of worker carelessness and not a problem concerning social relations at work. In fact, OSHA's citation appeal form contains a check box for employers to blame the injury on an "independent employee action" (see figure 3.1). Additionally, employers' blamed infections on workers' personal life activities or experiences (Papich Construction Company, Inc. 2018; Worker v. Hall Management Corporation 2019; Worker v. State of California, Department of Corrections 2015; Worker v. Western Municipal Water District 2011; Worker v. Workmen's Compensation Appeals Board 1968a). Or in one case attempted to lower the workers' disability payments by asking the judge to consider the employee's temporary work status and "irregular earnings history" (Worker v. ASR Construction 2015). Essentially arguing that because the worker was employed temporarily their responsibility to him was less.

Similar to Draper (1991, 2000), I find some evidence that employers use narratives about certain bodies being at greater risk (or as "hypersusceptible") as evidence to support their lack of responsibility. In the case of Worker v. Hall Management Corporation (2019) which involved a deceased farm worker who had developed meningitis, the judge remarked that the employer's insinuation that the worker obtained Valley fever because he may have been more susceptible to disease due to identified "risk factors" was incorrect. The judge argued that the doctor made the determination based on "greater risk of contracting valley fever by virtue of his employment" not his race, sex, or age. Additionally, Bechtel in their OSHA appeals documents pointed to Valley fever as a health issue for susceptible people writing:

> Valley Fever is endemic to the San Luis Obispo area. Wide-spread distribution of the spore which causes Valley Fever in *susceptible individuals* precludes any valid or reliable method of determining whether the pathology is work-related or the result of a non-occupational exposure. (emphasis added Bechtel Construction Company 2013)

While certain demographic characteristics have been identified as placing individuals at greater risk of infection, hospitalization, and death, the characterization that *coccidioides* spores cause Valley fever in “susceptible individuals” is inaccurate, anyone can become infected with Valley fever. Some have theorized that is there has been an underestimation of the risk of otherwise healthy people contracting coccidioidomycosis from dust exposure (Colson et al. 2017). Finally, as described above employers debated whether they were responsible for disease progression in potentially susceptible people, to which the answer was yes (Royal Indemnity Company v. Industrial Accident Commission 1951; Worker v. California Department of Corrections 2020; Worker v. County of Kern 2019; Worker v. Workmen’s Compensation Appeals Board 1968b). Overall employers’ attempts to lay blame on individual workers were not very successful.

Blame Other Employers

Second, employers attempted to offset responsibility onto other employers. In Livingston Concrete Products v. Workmen’s Compensation Appeals Board (1975) the dispute centered on which of three construction employers over the course of three years was responsible for a worker becoming disabled with Valley fever. Again, medical doctors played a significant role being called on to use medical evidence to determine which employer might be at fault. And twelve of the OSHA cases were focused on outbreaks on two big solar farm projects involving multiple contractors and trades. In 2013, OSHA cited six employers associated with the development of Topaz Solar Farm, one of the largest solar projects in the world (DIR 2013). The construction industry operates as project-centered production networks where development projects involve a complex array of actors that work to get a project off the ground including owners, investors, developers, architects, and many contractors performing specific aspects of the work (Beamish and Biggart 2012; Lutzenhiser et al. 2000). This structure may provide ample opportunity for employers to lay the blame elsewhere. For example, First Solar Electric, Inc. (2013), the project developer, explained that it was other contractors who were responsible for the Valley fever prevention at the site, not them. While First Solar Electric, Inc. pointed the finger at CLP, the general contractor, CLP pointed the blame at lower-level contractors. Despite these attempts to deflect blame both the developer and contractor formally settled with OSHA although their initial penalties were lowered from $15,180 to $9,240 for First Solar Electric, Inc. and from $45,740 to $10,300 for CLP.

Blame Industry and the Environment

One of the initial arguments that led to the development of workers' compensation programs was the idea that danger was inherent to industry and that fault for injury could not be entirely blamed on employers (Go 1996). This "industrialization ideology" frames injury as unavoidable and that work is naturally hazardous, a position that benefits employers (Navarro 1982). I find that employers attempted to use industrialization ideology by blaming disease on the natural environment which raises the risk for everyone and not just the employee.

Employers blamed wildfires as raising the risk of Valley fever for all residents (Worker v. Western Municipal Water District 2011), the 1994 Northridge Earthquake (ABM Industries, RSKCo, v. Workers' Compensation Appeals Board 2002; Interstate Brands v. Workers Compensation Appeals Board 1997), and an "unusual windstorm" that swept through the Bay Area (Kaiser Foundation Hospitals v. Workers Compensation Appeals Board 1982). With the exception of Kaiser v. Workers' Compensation Appeals Board (1982), the cases sided in favor of the worker. For example, despite the 1994 Northridge Earthquake which lodged spores into the air in Ventura County infecting 203 and killing three (Schneider et al. 1997), the WCAB found the worker's "employment duties required him to drive in the Fillmore area of Southern California and to arrange supplies in areas with dusty shelves, thereby exposing him to the special risk of contracting 'Valley Fever'" (Interstate Brands v. Workers Compensation Appeals Board 1997). While disasters might raise the risk of exposure for everyone, judges ruled that did not resolve employers of responsibility to protect workers from infection.

Among the OSHA cases, First Solar Electric Inc. (2013) also attempted to capitalize on "industrialization ideology" writing: "because Valley Fever spores are so ubiquitous, microscopic and easily mobilized by any dust disturbing activity, it is impossible to prevent all exposures to Valley Fever spores." Other employers made similar arguments although in less direct ways arguing that soil disturbing work creates dust and that eliminating all dust is impossible and always a problem (Papich Construction Company, Inc. 2021) or that while spores could get blown in from outside the workplace that was true everywhere in the region (Papich Construction Company, Inc. 2018). Thus, employers presented Valley fever as a problem of industry, natural disaster, and endemicity, one that is impossible to prevent.[12]

When in Doubt, Protest the Process

Finally, employers put forth a variety of arguments to limit their responsibility by pointing to issues of process over substance. In workers' compensation cases employers disputed

[12] It may be interesting to consider the parallels to Covid-19 as the United States transitions out of a pandemic to an "endemic" phase. In what ways does the use of endemicity to frame the current health crisis serve the interests of employers and political actors over workers?

that paperwork was filled out correctly (Worker v. California Department of Corrections 2017), how to calculate disability (Worker v. City of Bakersfield 2014; Worker v. Department of Food and Agriculture 2019), exact dates of injury (Worker v. BSK & Associates 2008; Worker v. Hall Management Corporation 2019; Worker v. State of California, California Department of Corrections 2014), type of injury classification (Worker v. KVS Transportation 2013), the statute of limitations for obtaining benefits (Worker v. California Department of Corrections 2017), whether a worker was barred from obtaining benefit because of their involvement in other legal cases (Worker v. California State University-Fullerton 2012), and that being an inmate entitled someone to worker compensation benefits granted to “employees” (Worker v. State of California, Department of Corrections 2019). In OSHA cases employers claimed they did not receive the paperwork via certified mail (Granite Construction Company, Inc. 2019; Papich Construction Company, Inc. 2018, 2019), that citations were barred by statute of limitations (CLP Resources Inc. 2013; Granite Construction Company, Inc. 2019), the wrong standard was cited (Quality Ag, Inc. 2020), or that the classification of the violation was not serious (Bechtel Construction Company 2013; CLP Resources Inc. 2013; First Solar Electric, Inc. 2013; Papich Construction Company, Inc. 2013, 2018, 2019, 2021; Quality Ag, Inc. 2020).

One of the most significant aspects of process that employers disputed in OSHA cases, to great effect, was that the citation assigned to them was unreasonable. In fact, the OSHA citation appeals form contains a check box for just such a purpose (see figure 3.1). OSHA investigators must defend why they have assigned a specific penalty which are based on complicated formulas involving severity, the number of employees exposed, probability of injury, illness, or disease, the size of the employer’s workforce, the employer’s history of compliance, the employer’s good faith attempts at an effective health and safety program etc. In these cases, I find that if OSHA investigators have not explicitly stated the reason for an assigned penalty across all metrics of calculation the employer can be assigned the lowest fee by default. Using this strategy, Granite (2021) lowered their penalty from $45,000 to $33,750, Papich (2021) from $58,500 to $37,125, and Quality Ag (2020) from $12,375 to $9,900.[13] Even if employers cannot get out of citations via the many arguments described in this chapter, they appear to be able to significantly reduce their OSHA citation penalties by 20 to 37 percent simply by checking the box "The proposed penalty is unreasonable" and having the judge re-examine investigators' calculations and reasoning.

[13] OSHA investigation records indicate Quality Ag Inc.'s case is still open (OSHA 2018c).

Employer: Case (Inspection) #:

Please note that you must complete page 2 of this OSHAB Appeal Form for each citation/item. Appellant must complete a separate page 2 for each citation/item being appealed.

D. APPEAL INFORMATION

1. This is an Appeal of:

☐ CITATION AND NOTIFICATION OF PENALTY
CITATION No.: _____ ITEM No.: _____

☐ NOTIFICATION OF FAILURE TO ABATE ALLEGED VIOLATION

☐ SPECIAL ORDER / ORDER TO TAKE SPECIAL ACTION

2. Specific ground(s) for this appeal are: *(Check all that apply)*

☐ The safety order was not violated.

☐ The classification (i.e. serious, willful, repeat) is incorrect.

☐ The abatement requirements are unreasonable:

☐ Required changes ☐ Time allowed to complete changes

☐ The proposed penalty is unreasonable.

3. An affirmative defense is a justification or excuse that if proved by appellant relieves the cited employer of all or some of the responsibility for the alleged violation. An affirmative defense must be raised by the appellant in a timely manner. **Affirmative defenses for this appeal are: *(Check all that apply)***

☐ Independent employee action caused the violation.

☐ A different safety order applied to the work activity that is the subject of the citation, and the appellant was in compliance with that other safety order. (The different safety order should be identified.) _________________

☐ An exception exists in the California Code of Regulations, Title 8 which allows for the action that is the subject of the citation. (The specific safety order containing the exception should be identified.) _________________

☐ The inspection that gave rise to the citation was invalid because the Division employee who inspected the appellant's worksite failed to comply with laws governing administrative searches.

☐ Another affirmative defense: other affirmative defenses may exist and can be asserted by the employer. If the appellant contends one or more affirmative defenses exist, the appellant may, but is not required to, provide a short, plain statement in writing setting forth the facts or circumstances which, if true, would prove the affirmative defense.

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Figure 3.1 Image of Occupational Health and Safety Appeal Form 100 (DIR 2020b).

Discussion

Managing health and safety at work is a contested process whereby class relations play out. Marxist labor process theory conceptualizes work as a site of class conflict in which employers maximize surplus value to the detriment of worker wellbeing (Navarro 1982, 1985; Walters 1985). I analyzed 54 legal cases involving work-related Valley fever disease in California, specifically workers' compensation and Occupational Safety and Health Administration (OSHA) appeals board cases, to examine the nature of conflict between employers and workers over the costs of occupational disease. I identified the role of other actors involved in these regulatory processes including doctors and state agency employees. I analyzed the types of arguments employers made to deny responsibility for occupational disease. Considering previous work (Botsch 1993; Michaels and Monforton 2005; Smith 1987), the invisible nature of Valley fever exposures, uncertainties in the science, and its developing regulatory environment, I asked to what extent employers might attempt to use these issues of uncertainty to shift the costs of occupational health onto workers. Finally, I examined how successful these arguments were in shaping case outcomes.

Employers contested their responsibility for the costs associated with occupational disease by using four broad arguments. First, by pointing to an inability to pinpoint the source of a workers' infection due to invisible and endemic nature of Valley fever disease. Second, by arguing that uncertainty in Valley fever science and gaps in existing regulatory practice should benefit their position. Third, in line with previous scholarship (Draper 1991, 1993, 2000; Dwyer 1991b; Gray 2009; Nichols 1999; Smith 1987; Walters 1985), I find employers sought to relocate blame onto workers, other employers, and the general hazards of industry and the natural environment. Finally, employers disputed issues of process over substance.

Favorable outcomes for workers occurred around 70% of the time in workers' compensation cases and around 57% of the time in OSHA cases. I partially locate this success in both the structure of the regulatory environment and in the role of doctors and state actors. In workers' compensation cases, doctors have significant power in shaping case outcomes, as do state judges who ultimately have authority over a case. Additionally, concerted effort by OSHA investigators to establish that Valley fever is a hazard in recent construction outbreaks cannot be discounted.

Previous scholarship is highly critical of the medical profession and the state as serving the interests of employers over workers (Draper 2003; Navarro 1985; Smith 1987; Walters 1985). In contrast, Lippel et al. (2016) argue that the institutional environment structures doctors' roles which varies by judication. I find that the medical profession has significant power in shaping the direction of workers' compensation cases in California. Workers' compensation relies on doctors to resolve disputes concerning whether a workers' disease was caused by work, to determine if their disease could get worse, and to adjudicate which of several employers might be at fault. While the weight of doctors' "objective" and scientific testimony over that of working people may indicate the strength of bourgeoisie ideology (Navarro 1985; Walters 1985), the class position of doctors cannot be so easily ascribed. Doctors in these cases work in a variety of roles on behalf of the state, employers, or workers. In many cases I find that doctors speaking the "magic words" of medical probability, that the risk of infection was greater at work as compared to elsewhere, can seal the fate of these cases in favor of the worker.

Historically, doctors have had significant power in shaping occupational health disputes often to the greater benefit of employers (Draper 2003; Smith 1987) and questions have been raised as to how much power doctors should wield in the workers' compensation system

(Castillo 2018). However, pragmatically and theoretically I find that doctors can serve as resources to undermine employer power on the behalf of workers. Although workers' ability to afford legal and medical professional assistance is likely constrained. Additionally, doctors may experience tension about being placed in the middle of these class battles (Draper 2003; Lippel et al. 2016).

While the institutional environment of workers' compensation gives doctors significant power it was also designed to be more lenient when it comes to workers' burden of proof. The "Grand Bargain" of workers' compensation removed issues of negligence from consideration in exchange for easier access to benefits for employees (Berman 1977; Go 1996). I find employers' disputes were successful less than 30% of the time. I partially locate this lack of success in the structure of workers' compensation which was designed to shift the balance of power slightly in favor of the worker. In workers' compensation claims concerning occupational diseases the employee bears the burden of proof; however, that proof is not at level of causation, rather probability (Kiselica et al. 2004; Worker v. Western Municipal Water District 2011). Testimony about the workers' job activities and the "magic words" from medical professionals can be enough to meet this burden of proof.

However, the OSHA regulatory environment is structured differently. OSHA bears the burden of proving a hazard (DIR 2022) and in some places that burden of proof can be as challenging as proving negligence (Skowron 2020). The cases make clear that OSHA investigators' burden of proof is high and OSHA investigators did struggle at times to prove all citations leveled against employers (Papich Construction Company, Inc. 2018; U.C.I. Construction, Inc. 2021). Additionally, unlike workers' compensation cases for Valley fever which extend back to at least 1942, OSHA's less well-developed regulatory environment for Valley fever appears highly contested and still developing.

Organizations are the location at which risks are created and defined for broader society (Beamish 2012; Clarke 1989; Perrow 1991). Marxist scholars have argued that the state serves the interests of employers over that of working people and does not generally challenge the control employers have over the labor process or health and safety issues (Michaels and Barab 2020; Navarro 1985; Walters 1985). However, in California I find that state has played a critical role in shaping Valley fever as a work-related hazard. The state courts played an initial role in substantiating Valley fever as a compensable disease in California unlike in Arizona (Haley 2007). Additionally, OSHA investigations pushed to establish Valley fever as a citable workplace hazard under existing regulation despite not having a specific Valley fever standard and previous losses. In fact, very much unlike Smith's (1987) classic study of the black lung movement where workers fought for decades for recognition of disease with no support from the state, in California my research indicates that hazard evaluation has become primarily the purview of the state (Cal/OSHA 2017; CDPH 2021). While state regulatory bodies may not always be effective, the history of the labor movement would suggest that it has been times when the state has actively supported workers that the power of employers has been particularly curbed (Fantasia and Voss 2004; Lichtenstein 2002).

While I find that workers and the state won these cases more often than employers, these contested processes create a significant burden on workers. Across all cases, I find that on average it takes seven years between the workers' initial exposure and the case decision date. As I describe in Chapter 4, despite the mission of workers' compensation to efficiently and broadly provide substantial income to injured and ill workers the ability to pursue workers' compensation is stratified (Boden 2020). Additionally, lack of resources and modest penalties means that OSHA suffers from significant barriers to effectively inspect and enforce health and safety law (Bernhardt 2012; Weil 1991; Weil and Pyles 2005).

This study benefits from having a complete dataset of work-related legal cases heard before workers' compensation and OSHA appeals boards. One potential limitation is that these cases likely represent the most highly contested disputes. Do employers make different arguments in lower workers' compensation or OSHA hearings? How well do employers' arguments play out in these proceedings? To what extent to do lower workers' compensation judges side with workers? To what extent do workers or employers contest the decisions of lower workers' compensation judges? And how many get heard by the Workers' Compensation Appeals Board? Arguments and decisions made in a lower workers' compensation court or with OSHA prior to an appeals board hearing are pieces of data not available to the public. It is important to ask how successful workers are in obtaining their rights to compensation in lower courts and the extent to which employers do or not deny responsibility. It is also important to ask how well OSHA performs in informal settlements where insight into the negotiations between investigators and employers is not transparent. The public only has access to basic investigation information such as the standards cited and penalty amounts. While data on lower court proceedings or OSHA conferences prior to adjudication are not available, some these of cases are considered noteworthy or precedential and likely shape the experience and outcome of lower court decisions or informal OSHA settlements (DIR 2020c).

Future research should continue to examine how structure shapes doctors' class position and power in contested disputes over workplace health and safety. Workers' compensation is not a homogenous system and the power doctors have varies by institutional context (Dembe 2010;

Draper 2003; Lippel et al. 2016). Additionally, future research could do more to understand the subjective experience of workers involved in workers' compensation and OSHA cases. The case documents analyzed were written from the perspective of judges examining the record for evidence to resolve specific areas under dispute. The experiences of workers are not central in these cases, despite being the focus of dispute and having suffered injury at work. Employers' arguments, doctors' testimony, and judges' reasoning feature most prominently. While the case documents were highly useful for this analysis focused on the types of disputes and conflict between employers and workers as they navigate these contested processes, future research could do more to understand workers' subjective experiences. Considering these lengthy and contested processes it is important to examine the extent to which these systems fail in their mission to provide timely compensation or to protect health and safety.

Finally, it is clear from analysis of these cases that in order to win workers and doctors must establish the worker was at greater risk of disease at work compared to the general population. Continued research linking work with disease may be critical for helping workers establish "greater risk." While Valley fever is considered an "orphan disease" the results of these contested disputes are important for not only setting the regulatory framework for Valley fever but for other diseases as well. During the Covid-19 Pandemic experts turned to existing ruling on work-related disease to understand how to compensate workers who became ill with Covid-19 on the job (Zoellner 2020). As with Valley fever, central to the challenge of Covid-19 related workers' compensation cases will be determining the source of infection (Zoellner 2020). Valley fever workers' compensation cases have an established a precedent of using medical probability to establish greater risk, a method of determining work-related disease that could prove valuable for workers trying to achieve compensation due to exposure to Covid-19 at work. Future research could evaluate the similarities and differences in how employers contest responsibility for work-related diseases as a result of the pandemic.

Chapter 4. What counts? How Stratification and Data Practices Shape Knowledge Construction in Health and Safety Research

Introduction

Drawing on work in critical data studies and data feminism I examine health and safety data, and workers' compensation claims for Valley fever more specifically, in a broader context. I argue that data availability and stratification processes structure our ability to know the extent of work-related injuries and illness or identify "what counts" (Martin and Lynch 2009). Drawing on theory in dispute resolution (Albiston et al. 2014; Alexander and Prasad 2014; Felstiner et al. 1980; Hirschman 1970; Miller and Sarat 1980), I organize this discussion by tracing out the social processes that shape workers' ability to access workers' compensation and thus get counted at all. I identify four barriers to getting counted in workers' compensation records or what I call getting "Data in" including: unrecognized work-related Valley fever disease, issues with accurate diagnosis, challenges to linking Valley fever disease back to the workplace, and finally how power shapes workers' ability to file a workers' compensation claim.

Second, I trace my process of making sense of messy workers' compensation data on Valley fever through data access, cleaning, and standardization steps or producing "Data Out" in the world. I show how the structure of workers' compensation data and the uncertainties surrounding Valley fever disease complicate and shape the process of determining "what counts". I analyze how data requests (or extraction) may lead to an undercount of potentially relevant claims. I describe how classifying claims as received in error reveals the production of knowledge as partial and situated (D'Ignazio and Klein 2020; Drucker 2011; Haraway 1988). I argue that removing "duplicate" claims simplifies data analysis, but potentially obscures the complex social processes related to disease outcomes and claiming compensation. Finally, I examine how standardizing employer industry and employee occupation codes and producing incidence rates conforms to standard norms of science but, if unexamined, can produce skewed results and obscure vital information about workers' jobs.

While Valley fever is considered an "orphan" or rare disease, challenges with data availability, access, and messiness reflect broader issues in our ability to know about and address many work-related health and safety issues. I conclude with a discussion of how data reporting and prevention practices can be improved.

Theory

Data are often portrayed as neutral or representative of some underlying truth. However, data are socially constructed and products of power. Realist perspectives of science view data as "mere descriptions of a priori conditions…as if the phenomenal world were self-evident…'given' able to be recorded and observed…simply given as a natural representation of pre-existing fact" (Drucker 2011:1–2). Humanistic and feminist approaches recognize that knowledge is constructed, partial, and situated (D'Ignazio and Klein 2020; Drucker 2011; Haraway 1988). Drucker (2011), for example, conceptualizes data as "capta", acknowledging data are taken and constructed by data collectors and thus only capture some partial understanding of reality. Additionally, what data is collected, and the ways in which people are categorized, are not neutral but are the, often biased, output of unequal historical, social, and economic conditions (D'Ignazio and Klein 2020). Processes of data collection and analysis reflect existing power relations in terms of who is able to collect data, who is represented in data, and who is able to use and employ data for their own ends (D'Ignazio and Klein 2020). Thus, data are cultural products that have to understood within the context of their production (Loukissas 2019; Poirier 2021).

Drawing on Collin's (2000) concept of the Matrix of Domination, D'Ignazio and Klein (2020) argue data that are not collected are often reflective of unequal power relations, that who is rendered absent is stratified by race, ethnicity, sex, gender, social class, and other status characteristics. Research devoted to studying data absences, the lack of knowledge production about a topic, show how the non-production of knowledge is often shaped by power, about who and what is considered important to study (Croissant 2014; Frickel 2014; Leonelli, Rappert, and Davies 2017; Ottinger 2013). In a world motivated by a profit-orientation, studying environmental injustice or risks of the vulnerable is rarely a priority (Ottinger 2013; Ottinger and Zurer 2011). Additionally, things that cannot be seen or heard are often subject to the non-production of knowledge (Croissant 2014).

The non-production of knowledge is a significant challenge to understanding Valley fever as a social problem. Understanding disparities in Valley fever infections is limited by the fact that 30 to 60% of state survelliance data in California and Arizona is missing racial and ethnic information about the patient (Benedict et al. 2019; Sondermeyer Cooksey et al. 2020). Additionally, while there is the option to include the occupation of the patient in these data this field is hardly collected (de Perio et al. 2019). And workers' compensation data on Valley fever do not collect race or ethnicity at all. This non-production of knowledge speaks volumes to biases in science to view diseases as a medical or biological problems rather than social ones (Link and Phelan 1995; Navarro 1985), and challenges with working with administrative data that were not designed for research (Dembe 2010; Grigoropoulou and Small 2022).

Critically, who does or does not get counted is highly consequential. Martin and Lynch (2009) describe a numero-politics of counting, which involves classifying what or who "counts" as an in-group or as an out group member. These determinations are linked to disputes and broader assumptions about what is valued in the social order. Counting is an important social process because it establishes what we know and how much of something is thought to exist (Martin and Lynch 2009). Critically, "what counts" then becomes taken for granted, produces object stability, and constructs knowledge in particular ways (Martin and Lynch 2009). However, the process of shaping "what counts" is often invisible, side-lined, and taken for granted.

Data cleaning or tidying is a critical step in which data users determine what counts. Data cleaning is an assumed necessary step to accomplishing data analysis (D'Ignazio and Klein 2020). However, the desire to clean, control, and master a dataset has roots in eugenics and the development of statistical tools (D'Ignazio and Klein 2020). It is critical to examine what may be lost in the process of data cleaning and standardizing and to recognize that showcasing diversity, messiness, and complexity are also important goals (D'Ignazio and Klein 2020).

In an era of big data, scholars call for data users to contextualize their data work by examining power, practicing reflexivity, and understanding data's historical, cultural, and political contexts (D'Ignazio and Klein 2020; Grigoropoulou and Small 2022; Loukissas 2019; Poirier 2021). With this call to action in mind, in this chapter, I examine the *data setting* of workers' compensation data. An analysis of data settings understands data as cultural artifacts created by people in particular social, cultural, and political contexts (Loukissas 2019). Evaluating data settings means considering the local or situated knowledges that produce data (Loukissas 2019). Like Bowker and Star's (1999) infrastructural inversion, I focus on workers' compensation data as a piece of infrastructure that is embedded in other social structures, arrangements, and processes. The embeddedness of data infrastructures in our everyday lives means they are often taken for granted. Studying data infrastructure or data settings requires denaturalizing data as representing empirical truths and examining how social structure, culture, and power shape data creation and analysis.

I analyze the data setting by engaging in a local reading of workers' compensation data. I examine the California Department of Industrial Relations – Division of Workers' Compensation data implementation manuals denotatively or literally to understand technical definitions of variables (Poirier 2021). I examine workers' compensation data for Valley fever (see Chapter 1) connotatively to explore changes in data definitions over time and how social processes shape data production (Poirier 2021). I also examine workers' compensation data for Valley fever denotatively seeking to identify data absences and the processes that produce missingness (Poirier 2021). Additionally, I draw on previous literature studying the limitations of workers' compensation to identify how social processes, in particular the unequal bargaining power between employers and employees, shapes undercounting of work-related injuries and illnesses in workers' compensation data. I argue that workers' compensation data are products of stratification that structure the production of non-knowledge and shape who becomes visible in data and who is rendered absent. I refer to these processes as getting "Data in", as they shape what gets counted in workers' compensation data prior to any analysis.

Finally, I engage in a reflexive analysis of my own data cleaning practices working with workers' compensation data over the course of 12 months. Similar to an ethnography, I use my hands-on experience as a way of gaining insight into social processes that are often not obvious without direct participation (Burawoy 1998; Emerson, Fretz, and Shaw 2011; Jerolmack and

Khan 2017). Reflecting on my own process, I describe how decision-making in data cleaning steps can shape research findings. The work of data cleaning, standardizing, and building classification systems is often invisible (Bowker 1998; Bowker and Star 1999; Martin and Lynch 2009). However, ethnographic studies of data cleaning practices have demonstrated how invisible technicians play a critical role in the construction of scientific knowledge (Plantin 2019). Ethnographic work has demonstrated that while finalized data categorization and coding schemes appear static and definitive, data pre-processing work is often messy, involves grappling with uncertainties in how to classify data, and reflects the needs or power of those who designed the system (Bowker and Star 1999; Goodwin 1996). However, the taken-for-granted nature of data infrastructure means that it is often not visible unless existing processes break down or until new users encountering data infrastructure begin to learn how data are created (Bowker and Star 1999).

As a new user to workers' compensation data, my hands-on experience lends insight into the uncertainties and decision-making involved in endeavoring to make workers' compensation data usable for disease surveillance efforts. My process of learning and developing data cleaning and standardization practices provide insight into processes that may be taken for granted by existing communities of practice. Through my reflexive analysis of my own data cleaning practices, I argue that data cleaning and standardization facilitate the production of important aggregate information about what types of workers are at risk of Valley fever. However, taming the messiness of the data obscures information about work activities and smooths over complexities of the data and the disease itself. The trade-offs involved between presenting data in the aggregate versus embracing nuance and complexity are common but rarely the focus of analysis (Geiger et al. 2020; Poirier 2021), although this type of decision-making is critical for shaping data products and the outcomes of research findings. I refer to this analysis as getting "Data out" into the world as it is these, often invisible, data cleaning processes that shape what future readers or data users will see.

Data In: Getting Counted in Occupational Health and Safety Data

The Context of Occupational Health and Safety Data

The United States lacks robust work-related injury and illness reporting systems. While several sources of data are available they likely underestimate the true number of hazards encountered at work. For example, the Bureau of Labor Statistics (BLS) collects the Survey of Occupational Injuries and Illnesses (SOII). The SOII is a survey of employers who are mandated by OSHA to report demographic, industry, and occupation information for work-related injuries and illnesses (BLS 2019). The SOII is the only national level surveillance system publicly available; however, the accuracy of these data are questioned and studies suggest that underestimation of work injuries and illness may range from 30 to 60% (Rappin, Wuellner, and Bonauto 2016). Additionally, these data cannot tell us specifics about the type of disease the worker experienced, a challenge the BLS faced during the Covid-19 Pandemic (BLS 2022a). In fact, despite the significant effects of Covid-19 on employment, there are no publicly available data on detailed occupations and Covid-19 infections (Lyttelton and Zang 2022). Reflecting the broader lack of robust data on work-related illnesses and injuries.

OSHA citations and violations data are another source of information about work-related injuries and illnesses. OSHA reports investigation and citation information; however, these data suffer from significant challenges. OSHA investigations are often triggered by employee complaints, or bottom-up enforcement, creating selection issues in who complains (Alexander and Prasad 2014; Weil and Pyles 2005). Data on the complaints themselves are not available, only investigations that resulted from a complaint. Like the SOII, OSHA typically does not provide specifics about diseases or injuries experienced that prompted or were uncovered by inspections. For example, in my development of the archival database of Valley fever exposures (see chapter 1) I examined OSHA Fatality and Catastrophe Investigation Summaries which are inspections that occur in response to an employee death or serious injury (OSHA n.d.). I located records associated with Valley fever by searching for keywords. However, inspection records for non-fatalities do not allow for searching text descriptions and do not contain data on specific injuries or diseases. In fact, I later came across a legal case which then pointed me to an OSHA citation for Valley fever exposure that I could not have previously located due to a lack of description about the cause of the investigation. While OSHA maintains records on investigations and citations of companies violating health and safety law, it is challenging to identify which records are the result of a specific type of hazard.

Finally, state public health systems often rely on workers' compensation claims and their associated medical billing data to examine specific injuries and their associated costs. However, these data on private employers, insurance companies, and employees are not publicly available and are state-specific (Dembe 2010). Additionally, independent contractors, who are not employees, are often not covered by workers' compensation rendering their injuries and illnesses invisible (Cox and Lippel 2008). As with SOII data, studies suggest that work injuries and illness may be underreported 40 to 60% of the time in workers' compensation data and that underreporting is likely stratified by occupation, industry, sex, race, ethnicity, immigration status, and employment status (Azaroff et al. 2002; Cox and Lippel 2008; Fan et al. 2006; Probst et al. 2008; Scherzer et al. 2005; Shannon and Lowe 2002; Stock et al. 2014). In addition to challenges to underreporting, barriers within the workers' compensation process filter out workers' ability to achieve their rights to compensation (Azaroff et al. 2002; Cox and Lippel 2008).

Getting Counted in Workers' Compensation Data

Drawing on theories of dispute resolution (Albiston et al. 2014; Alexander and Prasad 2014; Felstiner et al. 1980; Miller and Sarat 1980), I portray the process of underreporting and underclaiming work-related injuries and illnesses through workers' compensation as a pyramid (see figure 4.1). Studies on dispute resolution find that conflicts around perceived and actual harms are incredibly common but very often do not get resolved through institutional and legal systems (Albiston et al. 2014; Miller and Sarat 1980). Significant barriers prevent people from pursuing resolution of their grievances leaving many harms unaddressed, unacknowledged, and uncounted. These barriers are classically visualized as a pyramid with each step a barrier to achieving resolution at the top. In figure 4.1, I modify the pyramid metaphor. The bottom of the pyramid represents all potential work-related Valley fever disease cases and each step above identifies a significant barrier to a worker's ability to get counted as suffering from the disease.

A significant first barrier to counting the scope of work-related Valley fever involves work-related disease that goes unrecognized. Mild symptoms of Valley fever may go unnoticed by workers. Around 60% of those infected are estimated to have no to very mild symptoms (CDPH 2013) and of all potential disease it is estimated at that only around 33% of infections will progress to the point of requiring medical attention (Galgiani et al. 2016). However, of those only 20 to 40% will get diagnosed due to lack of awareness, under testing, or misdiagnosis as a disease with similar symptoms like pneumonia or Covid-19 (Galgiani et al. 2016; Hector et al.

2011; Valley Fever Center for Excellence 2020). General awareness of Valley fever appears to be low. Data from the California Behavioral Risk Factor Surveillance System from 2016-2017 revealed that less than half of respondents (42%) were aware of Valley fever (Hurd-Kundeti, Sondermeyer Cooksey, and Jain 2020). Among those considered to be at high risk of severe disease only 50.7% had heard of Valley fever (Hurd-Kundeti et al. 2020). For respondents living in high-incidence regions, only 25% knew of the disease (Hurd-Kundeti et al. 2020). Knowledge of the disease also appears to be stratified such that knowledge among Whites was significantly greater than among Hispanics and Non-Hispanic Non-Whites (Hurd-Kundeti et al. 2020). These same groups may be at higher risk of infection, hospitalization, and death (Flaherman et al. 2007; Seitz et al. 2012; Sondermeyer Cooksey et al. 2013, 2016). Mild forms of the disease, lack of awareness about Valley fever, and misdiagnosis and underdiagnosis of disease create significant and stratified barriers to getting counted.

The second barrier to counting work-related Valley fever involves "naming" or recognizing that an experience has been harmful (Albiston et al. 2014; Felstiner et al. 1980). In this case recognizing that an infection has been contracted, that the infection is Valley fever, and that the infection may have happened at work. Workers who obtain a Valley fever diagnosis may not trace the source of their infection back to their job. Studies of workers' compensation more broadly identify that workers may not enter the workers' compensation system because of a lack of recognition of the disease as work-related (Azaroff et al. 2002; Botsch 1993; Smith 1987). This may be a particular challenge for Valley fever which is caused by a pathogen that is invisible to the human eye and because symptoms of disease may not arise for one to four weeks after infection (Hector et al. 2011). A failure to link a workers' disease to the workplace not only leaves disease uncounted but externalizes costs of care to families, communities, private health insurance, and other government social programs (Boden 2020; Botsch 1993).

The third barrier involves "blaming" or holding a party responsible for the harmful experience (Albiston et al. 2014; Felstiner et al. 1980). Workers may understand that their injury or illness was caused by work but may decide not to hold the employer(s) responsible. First, workers may not know they can or how to obtain workers' compensation (Fan et al. 2006). Alexander and Prasad (2014) describe this type of barrier as requiring workers to possess substantive legal knowledge, knowing workers' compensation is available to them, and procedural legal knowledge, knowing the rules around obtaining workers' compensation. For example, knowing to talk to their supervisor within 30 days of the injury and filling out a specific form or else their claim may get thrown out (DIR-DWC 2016b). The same knowledge is required for supervisors. Studies suggest that workers do lack substantive knowledge about workers' compensation, for example believing that because their jobs lack other types of benefits they are not eligible for workers' compensation (Azaroff et al. 2002).

Additionally, vulnerable workers, workers of color, precariously or contingently employed workers, non-unionized workers, immigrant workers, and women workers, may not pursue compensation due to fears of retaliation (Azaroff et al. 2002; Fan et al. 2006). Thus even if workers' understand their disease as work-related and have substantive and procedural knowledge they may not report due to fears of disciplinary action or job loss, threat of deportation for immigrant workers, denial of opportunities like promotions or overtime, or social stigma like being labeled a complainer (Azaroff et al. 2002; Scherzer et al. 2005). Underreporting occurs in all industries and occupations, but the vulnerable labor market position of construction and agricultural workers makes them particularly likely to be undercounted in workers' compensation data (Fan et al. 2006). This may be especially problematic for undercounting Valley fever as two types of employment thought to be at greater risk of disease (CDPH 2013; McCurdy et al. 2020). Additionally, studies suggest that workers may seek care for their work-related injuries and illnesses through private health insurance (if they have it) rather than workers' compensation (Lipscomb et al. 2015). Finally, beliefs and lived experience with the lengthy, and sometimes unsatisfying, bureaucracy of the workers' compensation system may put workers off pursuing a workers' compensation claim (Azaroff et al. 2002; Scherzer et al. 2005).

The fourth barrier to identifying work-related Valley fever cases involves "claiming" or voicing the harmful experience to the employer and seeking remedy (Alexander and Prasad 2014; Felstiner et al. 1980). This step requires that workers speak up and communicate that they have been harmed by work. However, this step still may not lead to filing a workers' compensation claim. Many disputes are resolved informally which, while efficient, can be the result of power differentials between each party, reproduce inequality, and leave the worker without their guaranteed rights (Albiston et al. 2014). Workers and employers may resolve the work-related injuries and illness through informal (and potentially illegal) means such as using paid sick leave, providing time off, or using in-house first aid or medical treatments (Azaroff et al. 2002; Fan et al. 2006). For workers to start the process to receive compensation they must fill out the DWC1 form and turn it in to their employer (DIR-DWC 2016e). Employers must then acknowledges the form and submit a First Report of Injury to their workers' compensation insurance provider (DIR-DWC 2020, 2022). It at this step that work-related Valley fever can finally begin to be counted using workers' compensation data.

However, filing a claim, or getting counted, is only part the battle for successfully obtaining compensation. Cox and Lippel (2008) define three additional barriers for workers to obtain their right to compensation: diagnosing the illness or injury, meeting the threshold of evidence for the claim to be accepted, and litigating a claim. Chapter 3 identified some of the challenges workers' face in successfully litigating Valley fever claims. These steps are depicted as an off shoot on the pyramid as they are barriers to achieving compensation but not necessarily barriers to "getting counted" (see figure 4.1).

The diagnosis step requires the intervention of a doctor to successfully diagnose the injury or illness, something more challenging for diseases and chronic illnesses (Cox and Lippel 2008). Additionally, this step opens up the worker to potential biases documented in the medical field such as viewing women and people of color with less credibility (Cox and Lippel 2008). Once the worker obtains the proper diagnosis the next step involves meeting the threshold of evidence. Proving that illnesses, as opposed to injuries, are work-related is especially challenging (Botsch 1993; Cox and Lippel 2008; Kiselica et al. 2004). The analysis in Chapter 3 demonstrated the contested nature of meeting the threshold of evidence for Valley fever disease. Workers, lawyers, and doctors must prove that the workers' risk for infection was greater at work than compared to the risk of infection among the general population. Additionally, workers who are contingently employed or who work multiple jobs may face difficulties legally establishing a link between work and disease (Cox and Lippel 2008). For example, one Valley fever legal case involved the court adjudicating between which of three employers was to be held responsible for a construction workers' disease (State Compensation Insurance Fund and Livingston Concrete Products, Inc., Petitioners V. Workmens Compensation Appeals Board of the State Of California 1975).

The last step requires litigating the claim. Workers' compensation boards can accept or deny claims and employers (and workers) can file petitions for reconsideration regarding the board's decision (Cox and Lippel 2008). Cases can become subject to intense and drawn out legal battles requiring significant financial resources and perseverance on the part of workers (Azaroff et al. 2002; Cox and Lippel 2008). This process may be especially challenging for women, non-unionized workers, and other vulnerable groups who lack the means to take on these significant battles (Cox and Lippel 2008). If workers can make it this far they can find themselves achieving resolution. However, the amount of compensation they receive may be inadequate, especially for low wage workers, part-time workers, underpaid and underemployed workers (Cox and Lippel 2008; Kiselica et al. 2004).

Workers' compensation systems were designed with several goals in mind: to provide broad coverage for work-related injuries and diseases, to provide substantial income to protect the worker from lost wages, to provide adequate medical care or rehabilitation, to encourage safe practices at work, and to provide these goals within an efficient system (Boden 2020). However, workers face significant barriers to accessing workers' compensation leaving many untreated, unsupported, and uncounted. These barriers shape our ability to construct knowledge about the scope of work-related disease and significantly undercount health and safety issues more broadly. This inability to know the true extent of work-related injury and disease makes it challenging for targeting prevention efforts and likely for meeting workers' compensation goals of promoting safety at work.

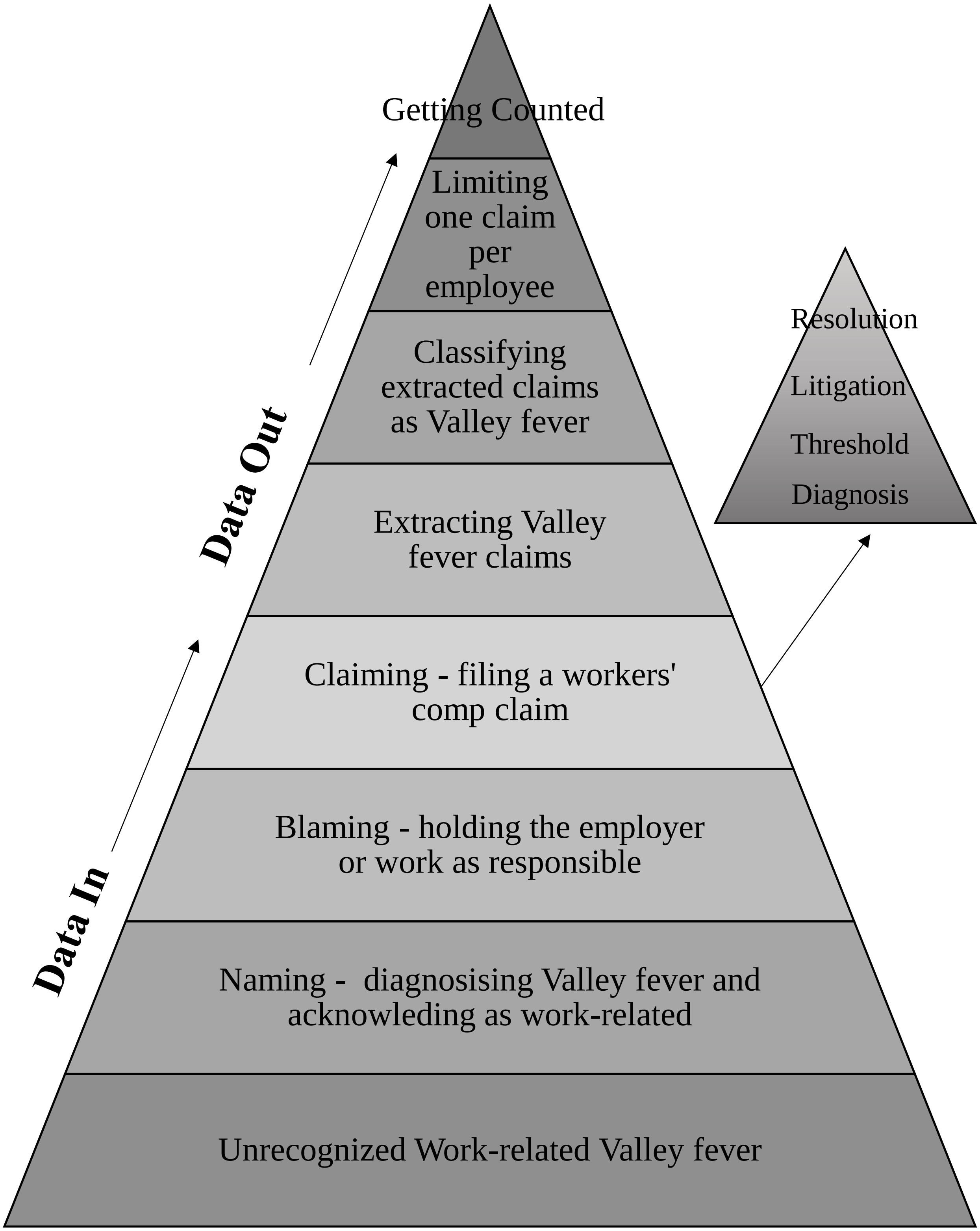

Figure 4.1 Dispute Resolution Pyramid Depicting Barriers to "Getting Counted" as a Work-related Valley Fever Case in Workers' Compensation Data. Based on Albiston et al. (2014).

Data Out: Requesting, Standardizing, and Constructing What Counts

The processes identified in "Data In" stratify workers' ability to obtain workers' compensation and get counted as a data point. In this section, I reflexively examine how my own hands-on engagement with the workers' compensation data shapes "what counts" and reveals insights into the system of workers' compensation more broadly. The processes identified in this section do not necessarily stratify what gets counted, rather they shape the ultimate presentation of data out in the world in particular ways. I analyze how data requests (or extraction) may lead to an undercount of potentially relevant claims. I describe how classifying claims as received in error reveals the production of knowledge as partial and situated (D'Ignazio and Klein 2020; Drucker 2011; Haraway 1988). Third, eliminating "duplicate" claims simplifies data analysis, but potentially obscures social processes related to disease outcomes and the claiming process. Finally, I examine how standardizing employer industry and employee occupation codes and producing incidence rates conforms to standard norms of science but, if unexamined, can produce skewed results and obscure vital information about workers' jobs.

The Data Request: Identifying Claims that Count

Requesting access to workers' compensation data to examine the scope of work-related disease is a place at which decisions begin to shape what counts. This step is shown about half-way up the pyramid in figure 4.1. Requesting confidential workers' compensation data requires submitting a 9703(e) data request with the Department of Industrial Relations – Division of Workers' Compensation (DIR-DWC) which includes a formal data request application and writing a statement of intended use (Barclays Official California Code of Regulations 1999), obtaining IRB approval, and signing a data sharing agreement with DIR-DWC lawyers. This process took approximately nine months. These steps are designed to ensure responsible use of confidential data by researchers. However, the process lengthens the time it takes to construct any knowledge about work-related injuries and illnesses.

Requesting workers' compensation data begins with a denotative reading (Poirier 2021) of what data are available to request. DIR-DWC supplies two data implementation manuals for First Report of Injury and Subsequent Report of Injury (FROI/SROI) data and Medical Billing data (DIR-DWC 2016a, 2018). Additionally, a connotative reading (Poirier 2021) of the guides, which begin with an address "Dear Claims Administrators", makes clear that the guides were designed to support insurance companies submit electronic records to the state of California. The manuals were not designed for researchers or for the public to understand what data are available and how data are defined or categorized. Rather the manual's audience is insurance companies and how they can submit data to meet California state specific guidelines. While the manuals do specify what "data elements" are required to be provided, they do not include technical information about how each data element is defined or the number of categories included.

Some data definitions appear self-explanatory, like employer zip code, but to the outsider requesting these data blindly it is unclear how data elements like "accident description" or "gender code" or "return to work qualifier" are defined or even if they are defined similarly across claims administrators. Additionally, without basic definitions of each data element, it is challenging to know what the request will include. For example, researchers desiring to evaluate how many claims were accepted or rejected for Valley fever disease will not find a straightforward data element to answer that question. Finally, because I was able to access these data in partnership with the California Department of Public Health – Occupational Health Branch (CDPH-OHB) I learned that data are available to request that are not listed in the manuals at all. I requested ten data elements not listed in the manual, one of which includes the Employee ID, a critical field to be able to examine the number of times the same individual submitted a claim. For researchers trying to avoid requesting confidential information, like the employee's name, the employee ID is critical for managing duplicate claims but is not a data element listed in the guide. Because data requests to DIR-DWC cost money and what is requested in writing is exactly what will be supplied, it is critical for researchers to understand what is available but challenging to know. Workers' compensation data systems, like many types of administrative data, were not designed to serve researchers but rather to serve employers, insurers, lawyers, and regulators (Dembe 2010; Grigoropoulou and Small 2022).

The next step requires identifying the injury or illness under study. It is at this step that researchers engaged with the data begin their own processes of determining what counts. Working with CDPH-OHB, I requested FROI/SROI claims for Valley fever by searching for keywords in the injury description including "cocci" and "valley fev". Additionally, we requested medical billing data with claims that had International Classification of Diseases (ICD) Ninth or Tenth revision codes for Valley fever (see Chapter 1). This process should, ideally, only extract claims of interest. However, two issues arise.

One is the inclusion of claims that are not desired. Searching the word "cocci" in the injury descriptions extracted claims that were misspellings or parts of names. Additionally, there appear to be errors in DIR-DWC's method of linking medical billing data to FROI/SROI reports. Medical billing data sometimes included an ICD code for Valley fever, but the injury description included in the linked FROI/SROI data indicated some other kind of injury. This type of error required a complex process of determining what counts as Valley fever (which I describe below) and resulted in removing 18% of the claims received.

The second challenge involves under extraction of relevant Valley fever claims. In my analysis of the data some injury descriptions simply said “Unknown” (~ 7%), are cut off, or describe work activities or patients’ subjective complaints. Without using the ICD codes to identify Valley fever claims, these claims would not have been extracted. Additionally, some claims extracted using the ICD codes had spellings of Valley fever in the injury descriptions that we did not anticipate such as “V.F.” or “valeyfever” or “vlly fvr”. Extracting claims using keywords alone could result in under-extracting relevant data and requires researchers to anticipate the range of ways in which employers and doctors describe Valley fever. However, using ICD codes alone to extract claims would also result in under extraction because approximately 35% of the claims only had a keyword for Valley fever and no ICD code.

Finally, lags in data reporting likely mean undercounting Valley fever claims in more recent years. In the last ten years around 20 to 25% of the data from claims administrators are submitted to DIR-DWC late although the average number of days submitted late has been declining (DIR-DWC 2021). Comparing my analysis to Das et al. (2012), I had more Valley fever claims for the same years. Additionally, my own analysis shows drops in Valley fever claims especially in 2018 and 2019 (see Chapter 2); however, broader disease surveillance from clinical and lab reports shows 2019 to be a record year for Valley fever (CDPH 2019). Only additional data requests at later points in time could help to understand whether claims have really dropped between 2018-2019 or if that finding is the result of data lags.

In summary, under extraction of claims is a key place where the messiness of workers’ compensation and decision-making can shape “what counts”. Using both ICD codes and keywords can help to extract relevant claims but also pull in irrelevant claims that have to be sorted out. And data lags might lead to undercounting in more recent years. However, the extent to which under extraction is happening is not knowable, although could be partly addressed by regular re-extraction of claims.

Classifying Claims

Irrelevant claims extracted in error either from the keyword search of injury descriptions or due to DIR-DWC's errors in linking FROI/SROI (the injury information) to the Medical Billing data (where the ICD code is located) must be sorted out in some way. Thus identifying "what counts" as Valley fever in the pool of received claims is critical but hardly straightforward. I identify this as the third to last step on the pyramid in figure 4.1. Referring to Chapter 1 and Appendix B, I kept claims that had the keywords for Valley fever. I also developed my own keywords to identify Valley fever claims (e.g., "dust", "dirt", "fung", and "spore"). I kept claims that had a keyword and an ICD code. This resulted in classifying about 78% of the claims as likely Valley fever but determining if the remaining claims were Valley fever or extracted in error was a bit more ambiguous.

Based on past CDPH-OHB practice for other work-related diseases, I next classified claims as Valley fever based on part of the body injured, cause of injury, and nature of injury (see Appendix B for documented steps). Valley fever infections most often start in the lungs but can spread to other tissues in the body including skin, bones, eyes, and the brain. Potentially, any part of the body could be relevant. Additionally, how would doctors or employers filling out the FROI on behalf of the worker describe the cause or nature of injury? These forms include open ended text boxes which once filled out is sent to workers' compensation and then categorized into standard cause and nature of injury codes. Tables 4.1 – 4.4 show the significant range of parts of the body, causes of injury, and nature of injuries that I ultimately determined could be attributed to Valley fever.

The classification process was inductive, iterative, and marked by critical decision making as to what counted and what was received in error. I initially accepted claims that had parts of body and cause and nature of injuries codes that were the same as those present in the 78% of claims already accepted. Later, I made the criteria less strict after inductively reading the injury descriptions led me to determine other combinations of part of the body and cause and nature of injury codes might be relevant. I debated which keywords in the injury descriptions should count as Valley fever. I debated about keeping claims that described symptoms like "flu" or "pnuemonia" or rashes. Decision-making on classifying ambiguous claims often came down to analyzing the content of the injury description. However, around 7% simply said "Unknown."

I examined parts of the body, cause of injury, and nature of injury codes in tandem with the injury descriptions. However, many of these codes were vague. For example, some parts of the body codes included "Whole Body" or "Multiple Body Parts and Systems". Some causes of injury codes just said "Cumulative, NOC (Not otherwise Classified)" or "Other, NOC." And some nature of injury codes said, "All other specific injuries, NOC", "All other cumulative Injuries, NOC" or "All other occupational disease injury, NOC". Finally, some claims had blank code numbers or code number for causes and nature of injury that did not appear to match any known codes which I recorded as "No Code for 38" for example in table 4.3. Deciding what counts as Valley fever in these claims often required executive case by case decision-making especially for claims with injury descriptions or codes that seemed ambiguous.

The messiness of the workers' compensation data required some method be divined to sort out non-Valley fever claims. My classification process resulted in labeling about 18% of the claims as not Valley fever. Classifying claims reveals that knowledge production is situated from the partial perspective of the data creators and data manipulators (D'Ignazio and Klein 2020;

Drucker 2011; Haraway 1988). The content of Valley fever claims are not standardized, and standardization is likely difficult to accomplish from a data collection standpoint considering the range of symptoms and parts of the body that can become infected and the number of people, workers, employers, doctors, and claims administrators, who create these data.[14] Additionally, the classification of claims opens significant space for researchers to shape what is and what is not considered Valley fever (or what is or not considered valid for describing for other types of illnesses and injuries) potentially leading to different findings and conclusions. Working with workers' compensation data means ackwnowleding the partial perspective of the data creators that shape what gets recorded in injury descriptions and other fields, as well as acknowledging that one's own perspective shapes what counts and what does not.

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[14] Standardization by these actors may also be undesirable and raise questions about who has the power to define how and in what ways Valley fever gets classified in the claiming process.

Table 4.1. Parts of Body, Cause of Injury, and Nature of Injury Claimed for Valley Fever, California 2000-2019

Part of the Body	Cause of Injury	Nature of Injury	Frequency	Percent
Lungs	Other, NOC	Contagious Disease	121	5.40
Lungs	Absorption, Ingestion, Inhalation, NOC	Respiratory Disorders	99	4.42
Lungs	Absorption, Ingestion, Inhalation, NOC	Infection	85	3.79
Lungs	Other, NOC	Infection	85	3.79
Lungs	Other, NOC	Respiratory Disorders	61	2.72
Lungs	Absorption, Ingestion, Inhalation, NOC	Contagious Disease	60	2.68
Lungs	Other, NOC	All Other Cumulative Injury, NOC	44	1.96
Lungs	Cumulative, NOC	All Other Cumulative Injury, NOC	40	1.79
Lungs	Other, NOC	All Other Specific Injuries, NOC	39	1.74
Lungs	Absorption, Ingestion, Inhalation, NOC	All Other Specific Injuries, NOC	32	1.43
Lungs	Absorption, Ingestion, Inhalation, NOC	Dust Disease, NOC	32	1.43
Lungs	Absorption, Ingestion, Inhalation, NOC	All Other Cumulative Injury, NOC	32	1.43
Lungs	Absorption, Ingestion, Inhalation, NOC	All Other Occupational Disease Injury, NOC	29	1.29
Lungs	Dust, Gases, Fumes, Vapors	Respiratory Disorders	27	1.21
Multiple Body Parts and Systems	Other, NOC	All Other Specific Injuries, NOC	27	1.21
Body Systems and Multiple Body Systems	Other, NOC	All Other Occupational Disease Injury, NOC	27	1.21
Multiple Body Parts and Systems	Cumulative, NOC	All Other Cumulative Injury, NOC	25	1.12
Lungs	Contact with NOC	Respiratory Disorders	22	0.98
Lungs	Cumulative, NOC	Respiratory Disorders	22	0.98
Lungs	Contact with NOC	Infection	21	0.94

Table 4.1. Parts of Body, Cause of Injury, and Nature of Injury Claimed for Valley Fever, California 2000-2019

Part of the Body	Cause of Injury	Nature of Injury	Frequency	Percent
Lungs	Contact with NOC	Dust Disease, NOC	21	0.94
Body Systems and Multiple Body Systems	Absorption, Ingestion, Inhalation, NOC	All Other Specific Injuries, NOC	21	0.94
Lungs	Contact with NOC	Contagious Disease	20	0.89
Internal Organs	Other, NOC	All Other Cumulative Injury, NOC	18	0.80
Lungs	Absorption, Ingestion, Inhalation, NOC	Inflammation	17	0.76
Lungs	Other, NOC	All Other Occupational Disease Injury, NOC	17	0.76
Insufficient Info	Other, NOC	All Other Specific Injuries, NOC	17	0.76
Body Systems and Multiple Body Systems	Cumulative, NOC	All Other Cumulative Injury, NOC	17	0.76
Body Systems and Multiple Body Systems	Contact with NOC	Dust Disease, NOC	16	0.71
Internal Organs	Other, NOC	Contagious Disease	15	0.67
Lungs	Not Physical, Stress, Shock, Trauma	Respiratory Disorders	15	0.67
Internal Organs	Other, NOC	Infection	14	0.62
Lungs	Dust, Gases, Fumes, Vapors	Dust Disease, NOC	14	0.62
Lungs	Cumulative, NOC	Infection	14	0.62
Lungs	Other, NOC	Dust Disease, NOC	14	0.62
Body Systems and Multiple Body Systems	Absorption, Ingestion, Inhalation, NOC	Respiratory Disorders	14	0.62
Internal Organs	Cumulative, NOC	All Other Cumulative Injury, NOC	12	0.54
Internal Organs	Other, NOC	All Other Specific Injuries, NOC	12	0.54
Lungs	Dust, Gases, Fumes, Vapors	Infection	12	0.54
Body Systems and Multiple Body Systems	Absorption, Ingestion, Inhalation, NOC	Infection	12	0.54
Lungs	Contact with NOC	All Other Cumulative Injury, NOC	11	0.49

Table 4.1. Parts of Body, Cause of Injury, and Nature of Injury Claimed for Valley Fever, California 2000-2019

Part of the Body	Cause of Injury	Nature of Injury	Frequency	Percent
Lungs	Other, NOC	Inflammation	11	0.49
No Physical Injury, Mental	Other, NOC	No Physical Injury	11	0.49
No Physical Injury, Mental	Other, NOC	Contagious Disease	11	0.49
Body Systems and Multiple Body Systems	Absorption, Ingestion, Inhalation, NOC	Contagious Disease	11	0.49
Lungs	Other, NOC	Foreign Body	10	0.45
Multiple Body Parts and Systems	Absorption, Ingestion, Inhalation, NOC	Infection	10	0.45
Multiple Body Parts and Systems	Absorption, Ingestion, Inhalation, NOC	All Other Specific Injuries, NOC	10	0.45
Multiple Body Parts and Systems	Other, NOC	Infection	10	0.45
Multiple Body Parts and Systems	Other, NOC	Respiratory Disorders	10	0.45
Body Systems and Multiple Body Systems	Other, NOC	All Other Specific Injuries, NOC	10	0.45
Body Systems and Multiple Body Systems	Other, NOC	Respiratory Disorders	10	0.45

Data source: California Workers' Compensation Information System 2000-2019. Frequencies and percentages include all workers, including prison workers and volunteers (n = 2240). Combinations of Parts of the Body, Cause of Injury, and Nature of Injury with fewer than 10 are not shown.

Table 4.2 Parts of Body Claimed for Valley Fever, California 2000-2019

Part of the Body	Frequency	Percent
Lungs	1,191	53.17
Body Systems and Multiple Body Systems	273	12.19
Multiple Body Parts and Systems	236	10.54
Internal Organs	193	8.62
Insufficient Info	75	3.35
No Physical Injury, Mental	62	2.77
Chest	53	2.37
Whole Body	51	2.28
Soft Tissue	8	0.36
NA	8	0.36
Multiple Head Injury	7	0.31
Brain	7	0.31
Heart	7	0.31
Knee	7	0.31
Fingers	5	0.22
Lower Back	5	0.22
Eyes	4	0.18
Multiple Lower Extremities	4	0.18
Lower Leg	4	0.18
Abdomen Including Groin	4	0.18
Skull	3	0.13
Multiple Neck Injury	3	0.13
Multiple Upper Extremities	3	0.13
Lower Arm	3	0.13
Hand	3	0.13
Multiple Trunk	3	0.13
Wrist	2	0.09
Shoulders	2	0.09
Disc	2	0.09
Foot	2	0.09
Nose	1	0.04
Mouth	1	0.04
Larynx	1	0.04
Upper Arm	1	0.04
Wrist and Hands	1	0.04
Upper Back	1	0.04
Spinal Cord	1	0.04
Upper Leg	1	0.04
Ankle	1	0.04
Lumbar and/or Sacral Vertebrae	1	0.04

Data source: California Workers' Compensation Information System 2000-2019. Frequencies and percentages include all workers, including prison workers and volunteers (n = 2240).

Table 4.3 Cause of Injury Claimed for Valley Fever, California 2000-2019

Cause of Injury	Frequency	Percent
Other, NOC	783	34.96
Absorption, Ingestion, Inhalation, NOC	645	28.79
Cumulative, NOC	224	10.00
Contact with NOC	185	8.26
Dust, Gases, Fumes, Vapors	129	5.76
Not Physical, Stress, Shock, Trauma	103	4.60
Strain or Injury by NOC	40	1.79
Chemicals	17	0.76
Animal or Insect	14	0.62
Mold	11	0.49
Temperature Extremes	10	0.45
Foreign Matter in Eyes	9	0.40
Strain by Repetitive Motion	9	0.40
Caught in Object Handled	7	0.31
Injured by Fellow Worker, Patient, Other	6	0.27
Fall, Slip, Trip, NOC	4	0.18
Welding Operation	3	0.13
Fall on Ice or Snow	3	0.13
NO CODE FOR 38	3	0.13
NO CODE FOR 44	3	0.13
Cut by Hand Tool Not Powered	2	0.09
Cut, Puncture, Scrape, NOC	2	0.09
Pushing or Pulling	2	0.09
Striking against or Stepping on, NOC	2	0.09
Struck or Injured, NOC	2	0.09
Natural Disasters	2	0.09
Person in Act of Crime	2	0.09
Rubbed or Abraded, NOC	2	0.09
Hot Object/Substance	1	0.04
Fire or Flame	1	0.04
Radiation	1	0.04
Caught In, Under, Between, NOC	1	0.04
Abnormal Air Pressure	1	0.04
Fall from Different Level	1	0.04
Slip or Trip, Did Not Fall	1	0.04
NO CODE FOR 43	1	0.04
Vehicle Collision	1	0.04
Motor Vehicle, NOC	1	0.04
Striking against Stationary Object	1	0.04
Injured by Object Being Lifted or Handled	1	0.04
Injured by Object Handled by Others	1	0.04
Electrical Current	1	0.04
Explosion or Flare Back	1	0.04

Table 4.3 Cause of Injury Claimed for Valley Fever, California 2000-2019

Cause of Injury	Frequency	Percent
“ ”	1	0.04

Data source: California Workers' Compensation Information System 2000-2019. Frequencies and percentages include all workers, including prison workers and volunteers (n = 2240).

Table 4.4 Nature of Injury Claimed for Valley Fever, California 2000-2019

Nature of Injury	Frequency	Percent
Respiratory Disorders	365	16.29
Infection	340	15.18
Contagious Disease	338	15.09
All Other Specific Injuries, NOC	306	13.66
All Other Cumulative Injury, NOC	287	12.81
All Other Occupational Disease Injury, NOC	163	7.28
Dust Disease, NOC	151	6.74
Inflammation	73	3.26
No Physical Injury	52	2.32
Strain or Tear	34	1.52
Foreign Body	32	1.43
Multiple Physical Injuries Only	27	1.21
Dermatitis	16	0.71
Multiple Injuries Physical and Psychological	9	0.40
Poisoning - General	8	0.36
Poisoning - Chemical	4	0.18
Mental Disorder	4	0.18
“ ”	4	0.18
Puncture	3	0.13
Mental Stress	3	0.13
Amputation	2	0.09
Contusion	2	0.09
Asphyxiation	2	0.09
Angina Pectoris	1	0.04
Dislocation	1	0.04
Heat Prostration	1	0.04
Hernia	1	0.04
Laceration	1	0.04
Severance	1	0.04
Sprain or Tear	1	0.04
Syncope	1	0.04
Vascular	1	0.04
NO CODE FOR 56	1	0.04
Vision Loss	1	0.04
Asbestosis	1	0.04
Cancer	1	0.04
Hepatitis C	1	0.04
NO CODE FOR 99	1	0.04

Data source: California Workers' Compensation Information System 2000-2019. Frequencies and percentages include all workers, including prison workers and volunteers (n = 2240).

Dealing with Duplicates

About 16% (n = 478) of claims received involved the same employee two or more times. I determined about 21% (n = 104) were the result of errors received from the medical billing data, where the employee's medical bills for Valley fever became linked to an FROI/SROI report for some other kind of injury. However, the significance of remaining 374 claims from the same employee and what to do with them was ambiguous. Leaving them in the dataset might mean inflating the count of work-related disease. Not including them also carries meaning and potentially obscures the complexity of multiple Valley fever exposures or lengthy and complicated disease and claiming processes. This step of de-duplicating claims is shown as the second to last step on the pyramid in figure 4.1.

I began to de-duplicate claims by examining the number of days between submitted claims, as well as other fields, to check if the claims were identical. While many of the claims were submitted within a short number of days of one another, about 35% were submitted over 120 days later (see Appendix C). Some claims were even submitted years later, figure 4.2 shows the length of time in years between the newest and oldest submitted claims. It became clear that most of the claims were not completely identical. However, trying to understand why there were multiple claims for the same employee in the dataset and attempting to classify them according to reasons for duplication was challenging.

First, most of the information available is limited to the injury description (which contains varying levels and types of information shaped by employers, doctors, and others), various dates including injury, when claim statuses changed, dates paid, when disability began, and when the injury was reported to the employer or claims administrator. However, certain patterns emerged. One, some of the claims for the same employee had differences in data fields like employer name, payment amounts (or any payment), and various reported dates. However, the reasons for these changes were not transparent. Second, reading the injury descriptions of claims suggested potential changes in diagnosis from flu or pnuemonia to identification of their illness as Valley fever. Misdiagnosis is a challenge documented in research (Hector et al. 2011). Third, some of the claims suggested a progression of disease symptoms describing first a diagnosis of Valley fever and later descriptions of hospitalization, development of disseminated disease, meningitis, and even death for several claims. Finally, some of the claims suggested new exposures to Valley fever at work.

For the analysis in Chapter 2, I de-duplicated the claims leaving only one claim per employee. Chapter 1 and Appendix C document my process of de-duplicating the claims. However, while the process of de-duplicating claims and presenting descriptive statistics for only one claim simplified some of the messiness of these data, examining multiple claims submitted by employees provided important insight into the complexity of Valley fever disease and the claiming process. Initially, these insights did not become clear to me until after I had begun to analyze the workers' compensation legal cases involving Valley fever in Chapter 3. Multiple claims for the same worker reveal some of the complexities of claiming and coping with Valley fever disease like the potential for multiple employers to be involved and the potential for lifelong suffering and disease progression. In a way removing duplicated claims is serviceable for strangers in the dataset (D'Ignazio and Klein 2020) and simplifies the process of data analysis but it also leaves out the possibility of making meaning from the messiness by understanding that both the process of claiming and the process of coping with Valley fever disease is complex and taxing. Finally, de-duplicating claims obscures that exposures to Valley fever may be happening for workers more than once.

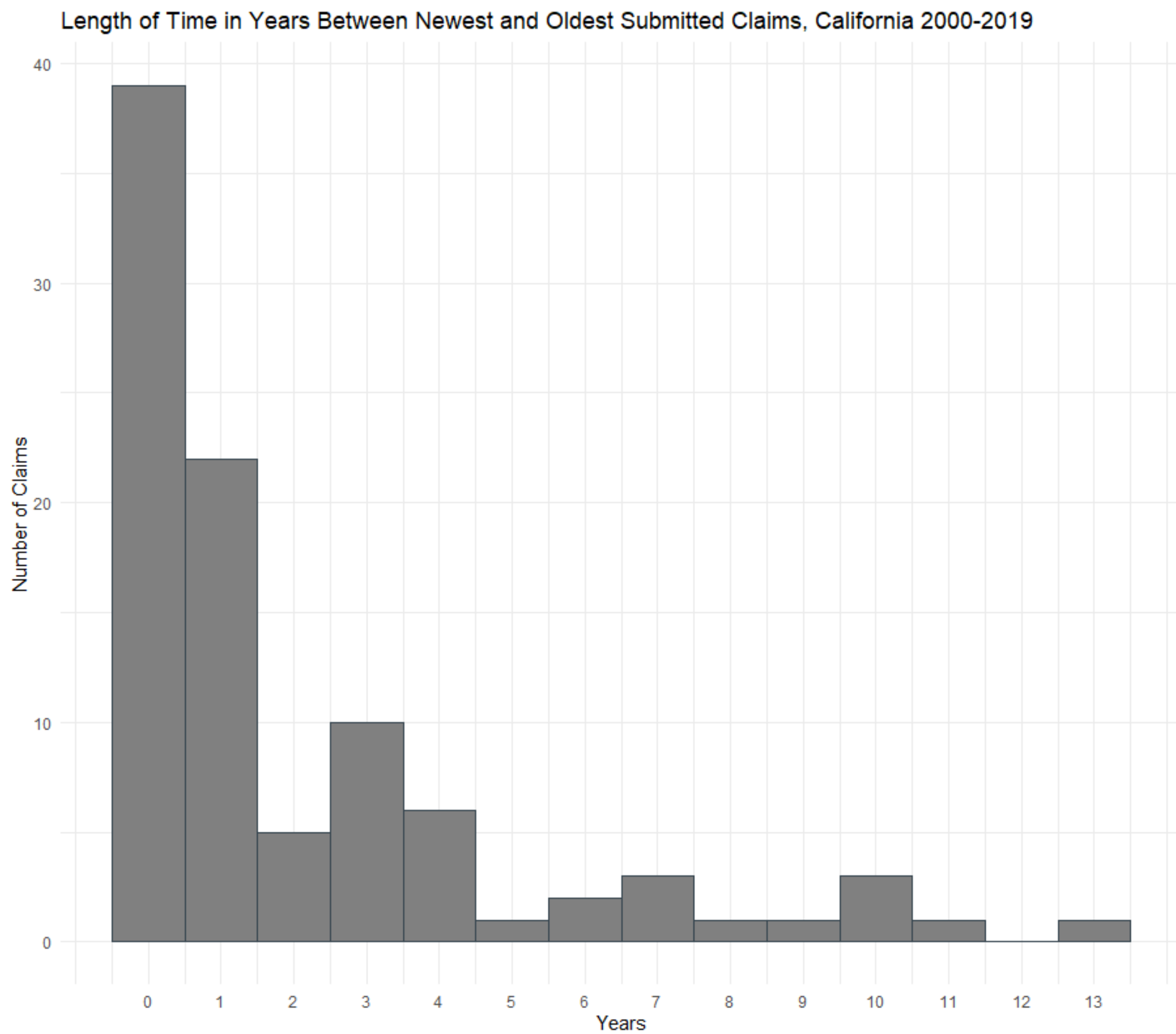

Figure 4.2 Length of Time in Years Between the Newest and Oldest Claims for Workers with Multiple Claims Submitted to Workers' Compensation for Valley fever, California 2000-2019.

Standardizing the Dataset and Conforming to Scientific Practice

Extracting, classifying, and de-duplicating Valley fever claims left a final dataset of claims from which to begin producing knowledge about the types of workers at risk of work-related Valley fever – shown at the top of the pyramid as “Getting Counted” (see figure 4.1). In this section I describe the final steps to constructing knowledge about work-related Valley fever. I argue that the process of cleaning and standardizing industry and occupation information reveals important insights about the data creators. Additionally, messiness and lack of standardization of data encourages use of machine learning tools to assist with data cleaning but, if unexamined, can shape the results in misleading ways. Additionally, the messiness encourages the presentation of data in the aggregate which can obscure information about workers’ job activities.

As described in Chapter 1, the workers’ compensation data included two different types of industry codes in the same column, Standard Industrial Classification (SIC) codes and North American Industry Classification System (NAICS) codes. The NAICS codes included different lengths (ranging from 2-dignits to 6-digits) which varies the level of specificity across claims. Around 15% were missing the most detailed 6-digit NAICS code. Examining the data in this form demonstrates both that standards have changed from submitting SIC codes to NAICS codes over time and that the level of specificity reported to and collected by claims administrators is not standardized. Additionally, working with the data revealed that claims administrators do not always consistency assign the same NAICS codes for the same employer, may use some NAICS codes as a general catch-all category, or may include an insurance company as the employer instead.

Converting all SIC codes to NAICS codes requires a judgment call – as one SIC code can be cross walked to many different NAICS codes (NAICS Associations 2018). To manage this, I used other contextual information in the data to help decide which NAICS code might be most appropriate (like the employers' name and their class code). However, some employers' business activities can span multiple NAICS codes or may simply be difficult to determine based on the available information. I assigned as detailed of NAICS codes as I could reasonably determine but this process meant that, like claims administrators, I also assigned NAICS codes ranging in specificity from 2-digits to 6-digits. It is also important to acknowledge that NAICS codes also change over time. I converted SIC codes to NAICS 2017 codes and assigned NAICS 2017 codes to employers' missing industry information, but the NAICS standard used by claims administrators is not known.

These kinds of challenges encourage presenting industry data at higher aggregate levels to avoid the uncertainty in how accurate smaller industry groupings might be and to not exclude claims missing more detailed codes. However, it also creates tension about potentially losing valuable information about the types of industries where workers may be placed at greater risk. For example, knowing around 14% of the Valley fever claims are from the 2-digit NAICS code for the construction industry (code 23) is helpful and appears to circumvent uncertainties related to presenting detailed industry codes information; however, it tells us very little about the types of work employees performed.

I also standardized employee occupation information which are provided in workers' compensation data as free-form text descriptions. Standard CDC-NIOSH and occupational health practice is to convert occupation text descriptions to Standard Occupational Classification codes (SOC) or Census Occupation Codes using the NIOSH Industry and Occupation Computerized

Coding System or NIOCCS (CDC NIOSH n.d.). I describe my approach to using NIOCCS in Chapter 1. Using this tool facilitates converting occupation descriptions to standard codes within a dataset and encourages standardization across studies. Standardizing occupation descriptions into Census occupation groupings helps to aggregate the findings and facilitates the production of incidence rates using nationally representative data. NIOCCS uses machine learning to predict occupation codes by examining the industry and occupation description. While I was able to find some studies evaluating NIOCCS as a tool (Buckner-Petty, Dale, and Evanoff 2019; Freeman et al. 2017; Schmitz and Forst 2016), information on how the machine learning algorithm works "under the hood" or what test set was used to train the algorithm was not apparent. In fact, the tool appeared to over assign agricultural occupations to management occupations. If left uncorrected this would have placed many agricultural workers claims into an entirely different social class. Additionally, the algorithm's rigidity in assigning only certain occupation codes within each industry category created strange errors. For example, some of the claims listed the employers' industry code as an insurance company. Despite having a complete occupation description, the tool would assign an occupation associated with insurance companies - like Claims adjuster - even when that assignment to human eyes made no sense. Appendix F provides documentation on the frequency of Census occupation codes returned by NIOCCS and the number changed manually. I manually corrected around 23% of the codes returned by NIOCCS.

Converting messy occupation test descriptions to standardized codes supports presenting aggregate categories but also means failing to highlight potentially relevant information about the employee's work. For example, consider agricultural occupations. Standard Census Occupation Codes for Farming, Fishing, and Forestry Occupations (6005-6130) includes only four categories for agricultural workers: Agricultural Inspectors (6010), Animal Breeders (6020), Graders and Sorters (6040), and Miscellaneous Agricultural Workers (6050). Around 90% of the Farming, Fishing, and Forestry Occupations became classified by NIOCCS, or assigned by me manually, as Miscellaneous Agricultural Workers (See Appendix E, Table E2.1). For a disease like Valley fever which may place agricultural workers at particular risk (McCurdy et al. 2020; Rios 2018), knowing specifics about the type of work the employee performed is valuable information for designing prevention efforts or targeting enforcement activities. However, standardized Census occupations lumps most agricultural workers into a miscellaneous category. I analyzed the occupation descriptions of agricultural workers inductively categorizing their work. Around 43% of the occupation descriptions simply say the worker was a laborer but 21% described the worker using machinery like tractors or working on site preparation activities, around 13% mentioned specific crops, and 10% described working with animals (see figure 4.3). These are key pieces of information for targeting potential prevention efforts that become obscured by using standardized Census occupation codes. Relying on standard Census occupations codes to represent the occupation of workers means potentially obscuring more complex and nuanced understanding of workers' jobs.

Finally, standardizing industry and occupation codes facilitated the production of disease incidence rates, standard practice in health research. However, considering the constraints I described in the "Data In" section I was hesitant to produce incidence rates. Incidence rates provide an estimate of the number of new cases of a medical condition during a specific period of time (Krug and McNutt 2008). How well do these data represent new work-related cases over time? And to what extent does calculating a point estimate reify these data as presenting an empirical truth? Additionally, incidence rates are generally presented with corresponding confidence intervals to help the viewer understand the level of potential error in the estimate.

However, how should error be demonstrated considering the role stratification plays in selection error? While I could have provided confidence intervals based on standard errors in the American Community Survey (ACS) data, that would only have accounted for sampling error in the ACS and not the selection error of who ends up claiming workers' compensation and who does not. I decided not to produce any confidence intervals to, hopefully, provoke conversation about who "gets counted" and who does not and how we can think about and present error in workers' compensation data more broadly.

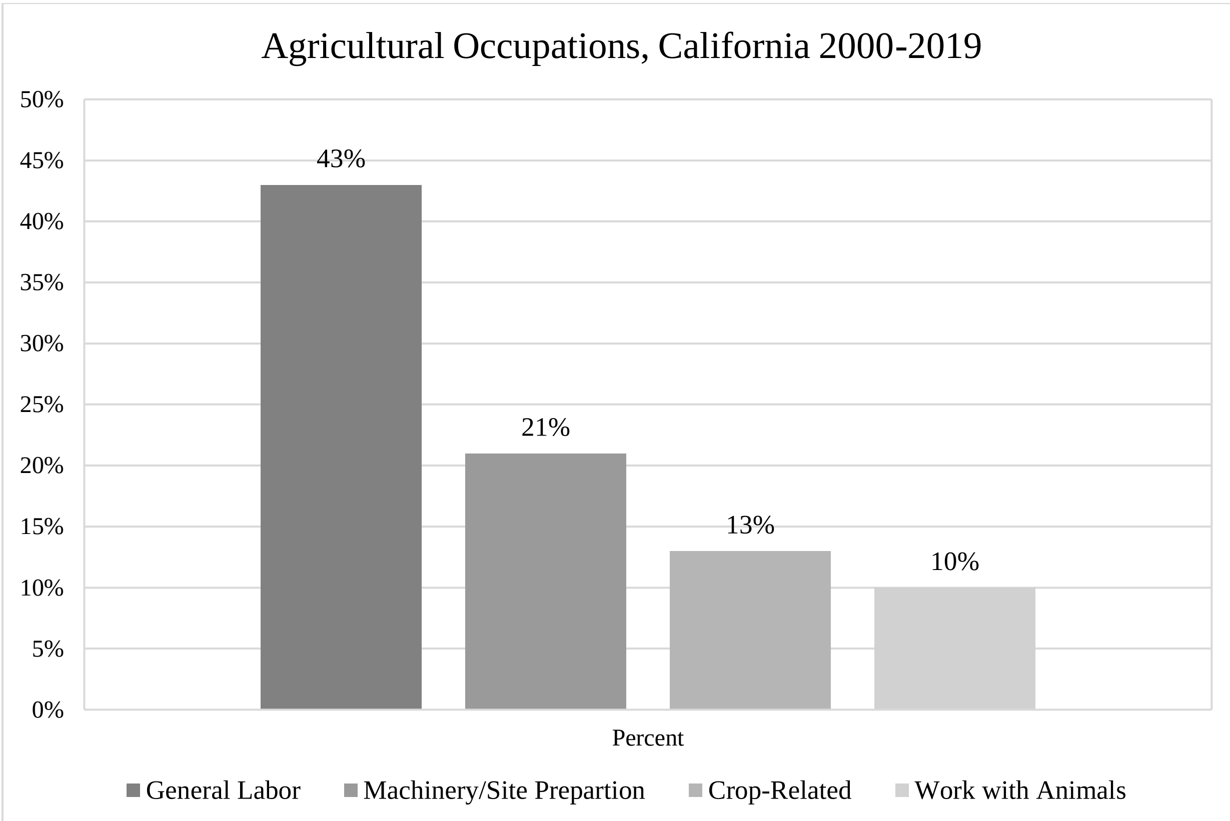

Figure 4.3 Classification of Agricultural Occupation Descriptions from Workers' Compensation Claims Data for Valley Fever, California 2000-2019

Discussion

Like many sources of administrative data (Grigoropoulou and Small 2022), workers' compensation data were not designed with research in mind. Feminist and critical data studies scholars recognize that data are not neutral representations of fact but are constructed, partial, and situated (D'Ignazio and Klein 2020; Drucker 2011; Haraway 1988). Stratification processes shape data collection efforts or the lack thereof (Croissant 2014; Frickel 2014; Leonelli et al. 2017; Martin and Lynch 2009; Ottinger 2013). Thus, data are cultural artifacts and products of power that must be understood within their social, cultural, and political contexts (D'Ignazio and Klein 2020; Grigoropoulou and Small 2022; Loukissas 2019; Poirier 2021). Failure to do so can reifying data as representing objective empirical truths and potentially lead to inaccurate conclusions.

To that end, this chapter examined the data setting (Loukissas 2019) of workers' compensation data and the processes that shape data in, data out, and our ability to construct knowledge. Workers' compensation data are a primary source of surveillance for understanding many work-related injuries and illnesses (Cox and Lippel 2008) and thus are critical sources of knowledge construction about many health and safety issues. However, these data reflect existing power structures that stratify workers' ability to achieve their rights to compensation and who and how much of work-related disease "gets counted" (Martin and Lynch 2009). Drawing on theories of dispute resolution (Albiston et al. 2014; Alexander and Prasad 2014; Felstiner et al. 1980; Miller and Sarat 1980), I identified processes of underreporting and underclaiming work-related injuries and illnesses through workers' compensation using a pyramid as a metaphor, with each step a barrier to getting counted in disease surveillance efforts (see figure 4.1). First, I identified four steps to getting counted in workers' compensation records or what I call getting “Data in” including: unrecognized work-related Valley fever disease, issues with accurate diagnosis, challenges to linking Valley fever disease back to the workplace, and finally how issues of power shape workers’ ability to file a workers’ compensation claim. Second, reflexively analyzing my hands-on engagement with workers’ compensation data I identified how data extraction of workers’ compensation claims, classifying claims as received in error, de-duplicating claims, and standardizing data shapes what gets counted as work-related Valley fever or as I call getting “Data out” into the world.

Additionally, my interaction with the messy workers’ compensation data reveal insights into the workers’ compensation system. For example, the lengthy data request process and the availability of knowledge about what data is available reflect a system designed to serve employers and insurance companies over researchers or the general public. Additionally, the messiness and lack of standardization of the data are shaped by the influence of multiple parties involved in this process (including employers, doctors, claims administrators, and state workers’ compensation agency employees) but also reflects the challenges of Valley fever disease which is subject to misdiagnosis and can present a range of possible symptoms and physical ailments. The messiness of the data reveals critical insights into both the system of workers’ compensation as a piece of data infrastructure (Bowker and Star 1999) but also the interaction of Valley fever through that system.

Understanding the processes that shape “Data In” and “Data out” can help to place these data in context and raise important questions about the counterfactual. How might the analysis change if these barriers were not in place? While the counterfactual is impossible to know, the analysis of this chapter provides us with some clues. If all work-related disease was knowable, potentially the number of claims submitted could be anywhere from 40 to 60% greater (Azaroff et al. 2002;

Cox and Lippel 2008). Considering public sector workers are better able to access their rights to compensation (Fan et al. 2006), perhaps I would find workers in public administration to be overrepresented in Chapter 2 and workers in construction, agriculture, mining, utilities, and other occupations requiring outdoor work to be underrepresented. If linking infection caused by an invisible pathogen back to the workplace was not so challenging, perhaps the number of claims from workers exposed due to simply working in endemic places would be greater. Workers submitted claims in Chapter 2 from all major industry and occupation groups suggesting that potentially any workplace in an endemic area could find itself infiltrated by *coccidioides* spores in the air. Considering underclaiming by women (Cox and Lippel 2008), and that the percentage of workers' compensation claims received from men (82%) is greater than the percentage of men identified as positive for Valley fever in broader surveillance data (around 59%, see CDPH 2019), perhaps claims among women would be greater.

The challenge to constructing knowledge about work-related injuries and diseases using workers' compensation data that I have identified in this chapter likely present significant hurdles for transparent, accurate, routine and up-to-date health and safety surveillance for researchers and state public health experts. Many of the processes that restrict what gets counted as Valley fever are likely challenges across many types of work-related injuries and illnesses. Valley fever likely amplifies these challenges as an invisible pathogen, with low public awareness of the disease, latent symptoms, and challenges with misdiagnosis and underdiagnosis rendering many work-related Valley fever illness absent from available data.

The results of analyses of workers' compensation data often shape prevention priorities (Cox and Lippel 2008). Understanding and mapping out the barriers to accessing workers' compensation is critical not only to provide greater context to the data that we do have but also to point to places of needed intervention. These significant challenges require significant public investment in increasing awareness of Valley fever prevention strategies and symptoms among workers, especially those most likely to be rendered absent from data including workers in agriculture and construction occupations, workers of color, immigrant workers, and irregularly and contingently employed workers.[15] It requires interventions in the medical field to get regular and wide-spread testing for Valley fever among patients experiencing symptoms and to systematically document the racial/ethnic identity and occupations of patients for statewide reporting. Not only will this help with data gaps but can help identify outbreaks for state investigation and prevention.

Prevention-based interventions must also be targeted at employers. The state required mandatory training on Valley fever prevention in the construction industry in 2019 (Salas 2019) but no similar law exists for other industries. Similar legislation should be passed for other industries employing outdoor workers in endemic places including agriculture, transportation and warehousing, utilities, mining and extraction, and protective service. Additionally, considering the gender-based disparities in Valley fever infections, interventions need to be designed with men in mind and be prepared to tackle gender-specific issues, like masculinity contests, that discourage men from wearing respiratory protection or encourage men to take risks (Berdahl et al. 2018; Desmond 2007; Ness 2012; Paap 2006).

Studies suggests that drought conditions, and potentially wildfire conditions, linked to climate change may cause Valley fever disease to increase in the coming years (Gorris et al. 2018; Lauer 2017) signifying that Valley fever as a social, and work-related problem is unlikely

[15] The California Department of Public Health received $2 million in 2018 to conduct an awareness campaign (Klein 2018).

to go away. Unlike in Arizona, California workers who get Valley fever on the job can obtain workers' compensation payments and medical care coverage (Haley 2007). Use of this system is critical to avoid passing the costs of disease, which is estimated to be somewhere around $700 million dollars a year (Wilson et al. 2019), onto workers themselves, their families, and other public social programs.

However, raising awareness of Valley fever will not be enough to ensure workers' disease gets counted and that they obtain the benefits they are due. The employment relationship is characterized by unequal bargaining power between employers and workers (Jacoby 1985). Workers need support to increase their power relative to employers and assistance to help them navigate workers' compensation. Unfortunately, the state's ability to be proactive in enforcement of workers' rights has repeatedly been identified as limited (Alexander and Prasad 2014; Bernhardt 2012; Weil and Pyles 2005). However, one beacon of hope is the significant community around Valley fever research including scientists, medical doctors and patients, public health experts, state agency employees, and awareness groups (Coccidioidomycosis Study Group 2022; UC Merced Center for Valley Fever Research 2022; Valley Fever Center for Excellence 2021b; Valley Fever Institute 2021; WCAHS 2017). Targeted interventions to improve occupational Valley fever data reporting and prevention strategies among these groups could be a productive path forward. Civil society can play a critical role in improving the conditions of working people (Fine and Gordon 2010; Teran 2012).

Appendix A. Workers' Compensation Information System Requested Data Elements

Table A1. FROI/SROI Data Elements Requested

Data Number	Data Element Name
5	Agency Claim Number/Jurisdiction Claim Number
53	Gender Code
54	Marital Status Code
55	Number of Dependents
52	Employee Date of Birth
57	Employee Date of Death
31	Date of Injury
38	Accident Description/Cause
36	Part of Body Injured Code
37	Cause of Injury Code
35	Nature of Injury Code
33	Postal Code of Injury Site
39	Initial Treatment Code
FROI 56	Date Disability Began
68	Date of Return to Work
41	Date Reported to Claims Administrator
40	Date Reported to Employer
48	Employee City
49	Employee State Code
50	Employee Postal Code
60	Occupation Description
59	Class Code
25	Industry Code
18	Employer Name
16	Employer FEIN
19	Employer Address Line 1
20	Employer Address Line 2
21	Employer City
22	Employer State Code
23	Employer Postal Code
62	Wage
63	Wage Period Code
67	Salary Continued Indicator
61	Date of Hire

58	Employment Status Code
SROI 56	Date Disability Began
65	Date Last Day Worked
72	Date of Return/Release to Work
72	Date of Return/Release to Work
71	Return to Work Qualifier
74	Claim Type Code
73	Claim Status Code
83	Permanent Impairment Body Part Code
84	Permanent Impairment Percentage
2	Maintenance Type Code
3	Maintenance Type Code Date
86	Payment/Adjustment Paid to Date
95	Paid to Date/Reduced Earnings/Recoveries Code
96	Paid to Date/Reduced Earnings/Recoveries Amount
85	Payment/Adjustment Code
88	Payment/Adjustment Start Date
89	Payment/Adjustment End Date
90	Payment/Adjustment Weeks Paid
91	Payment/Adjustment Days Paid
87	Payment/Adjustment Weekly Amount
77	Late Reason Code
92	Benefit Adjustment Code
94	Benefit Adjustment Start Date
93	Benefit Adjustment Weekly Amount
EMPLOYEE_ID	
DATE_CLAIM_STATUS_CHANGED-	
OTHER_BENEFIT_TYPE_CODE	
DATE_OF_CREATION	
DATE_OF_MODIFICATION	
SETTLEMENT_AMOUNT_PAID	
MEDICAL_AMOUNT_PAID	
OTHER_CATEGORIES_AMOUNT_PAID	
PERM_DISABILITY_AMOUNT_PAID	
TEMP_DISABILITY_AMOUNT_PAID	

Table A2. Medical Billing Data Elements Requested

Data Number	Data Element Name
0500	Unique Bill ID Number
0513	Admission Date
0514	Discharge Date
0510	Date of Bill
0504	Facility Code
0501	Total Charge Per Bill
0516	Total Amount Paid per Bill
0508	Service Bill Date(s) Range
0508	Service Bill Date(s) Range
0521	Principle Diagnosis Code
0535	Admitting Diagnosis Code

Appendix B. Coccidioidomycosis Workers' Compensation Classification Scheme

Before classifying programmatically, I read all the injury descriptions and manually marked if I thought the claim was likely Valley fever (Y), Unknown or Unclear (U), or Not likely Valley fever (N). I used this to help me define each of the steps below. Each step in the classifier only examines and classifies claims that have not already been classified in an earlier step. The classifier goes through four main steps: keeps likely claims, removes obvious errors, and then keep claims with less precise classifying criteria, and finally removes any last claims that have not been classified or got classified earlier but on evaluation are likely not Valley fever. Likely some of these steps could be combined. Initially I prioritized smaller steps to keep track of my decision-making.

STEP 1 – KEEP CRITERIA

1. Keep Criteria Based on Keywords and Diagnosis

Keep all claims that have a keyword for Valley fever in the injury description AND that have a diagnosis. Some keywords were defined as part of the extraction criteria and include the following words: "cocci" and "valley fev". Additionally, I also included other keywords for various alternate spellings of Valley fever including: "Vally fev", "valeyfever", "vlly fvr", "V.F."

Classified as VF	Classified as Not VF	Unclassified
612	0	2367

Keep all claims that have a keyword for Valley fever but no diagnosis. However, claims with the following words in the injury description are removed: "Coccix", "Scocci", "diplococci", "menigococcimia", "meningicoccimia", "meningococc", "enterococci", "coccidymia", "lumbcoccigeal", "MRSA".

Classifed as VF	Classified as Not VF	Unclassified
1645	17	1317

Keep all claims that have a diagnosis and an alternate keyword in the injury description. Alternate keywords include: "dirt", "dust", "fung", "spore".

Classified as VF	Classified as Not VF	Unclassified
1780	17	1182

2. Keep Criteria Based on Combo of Part of the Body, Cause of Injury, and Nature of Injury

Keep claims that match some combination of Part of the Body, Cause of Injury, and Nature of Injury. These claims must have one from each of the categories.

Part of the Body	Cause of Injury	Nature of the Injury
Lungs	Dust, Gases, Fumes, Vapors	Dust Disease, NOC
Body Systems and Multiple Body Systems	Cumulative, NOC	Respiratory Disorders
Brain	Other, NOC	All other Specific Injuries, NOC
Chest	Strain or Injury by NOC	All other Occupational Disease Injury, NOC
Internal Organs	Contact with NOC	All other Cumulative Injury, NOC
Whole Body	Not Physical, Stress, Shock, Trauma	Foreign Body
Insufficient Info	Foreign Matter in the Eyes	Inflammation
Multiple Body Parts and Systems	Absorption, Ingestion, Inhalation, NOC	Infection
No Physical Injury, Mental	Animal or Insect	Dermatitis
Soft Tissue		No Physical Injury
NA		Contagious Disease

Classified as VF	Classified as Not VF	Unclassified
2370	17	592

3. Keep claims that suggest rash symptoms.

First, like part 4 classifies based on combo of Part of the Body, Cause of Injury, and Nature of Injury. Must have one from each category.

Part of body	Cause of Injury	Nature of Injury
Foot	Absorption, Ingestion, Inhalation, NOC	Contagious Disease
Hand	Other, NOC	Dermatitis
Lower Leg		All Other Cumulative Diseases Injury, NOC
Multiple Upper Extremities		All Other Cumulative Injury, NOC
Multiple Lower Extremities		
Upper Leg		
Wrist		

Second, classifies based on part of body with either a specific cause of injury OR nature of injury AND have a keyword in the injury description suggesting a rash. Keywords include: “rash”, “dermatitis”, “welt”, “boil sore”.

Part of body	Cause of Injury (OR)	Nature of Injury
Multiple Lower Extremities	Absorption, Ingestion, Inhalation, NOC	Foreign Body
Multiple Body Parts and Systems	Other, NOC	Inflammation
Soft Tissue	Contact with NOC	All other Specific Injuries, NOC
Whole Body	Rubbed or Abraded, NOC	Dermatitis
Disc		

Classified as VF	Classified as Not VF	Unclassified
2384	17	578

4. Keep claims that suggest other Valley fever symptoms.

Classifies based on part of body with either a specific cause of injury OR nature of injury AND have a keyword in the injury description suggesting a symptom(s) or the injury involved outdoor work. Keywords include: “fever”, “headache”, “bodyache”, “body ache”, “sweat”, “fatigue”, “flu”, “breath”, “tired”, “cough”, “chest pain”, “lung”, “respiratory”, “pneumonia” (and various misspellings), “spore”, “exposure” (with various spellings), “outdoor”, “field”, “yard”, “outside”, “habitat”, “burrows”. The claims are not classified as Valley fever if they include a nature of injury that is asbestosis or cancer.

Part of Body	Cause of Injury (OR)	Nature of Injury
Internal Organs	Absorption, Ingestion, Inhalation, NOC	Asphyxiation
Lungs	Mold	Infection
Chest	Other, NOC	Respiratory Disorders
Multiple Body Parts and Systems	Cumulative, NOC	All other specific injuries, NOC
Multiple Head Injury	Contact with NOC	Inflammation
Body Systems and Multiple Body Systems		Infection
Eyes		All other cumulative Injuries, NOC
		All other occupational disease injury, NOC
		Vision loss
		Stain or tear

Classified as VF	Classified as Not VF	Unclassified
2414	17	548

5. Keep specific claims for a combination of part of the body, cause of injury, and nature of injury based on existing matches made during the earlier steps.

These include the following body parts: internal organs, and fingers.

Part of the Body	Cause of Injury	Nature of Injury
Internal Organs	Caught in Object Handled	All other specific injuries, NOC
	Cumulative, NOC	
	Other, NOC	

Part of the Body	Cause of Injury	Nature of Injury
Fingers	Other, NOC	Infection

Classified as VF	Classified as Not VF	Unclassified
2416	17	546

STEP 2 – REMOVE OBVIOUS ERRORS

1. Remove claims that suggest acute injuries.

This step removes claims that match some combination of Part of the Body and Nature of Injury. These claims must have one from each of the categories.

Part of the Body	Nature of Injury
Abdomen including groin	Amputation
Ankle	Burn
Brain	Cancer
Disc	Carpal Tunnel Syndrome
Elbow	Contusion
Eyes	Crushing
Facial Bones	Dislocation
Fingers	Fracture
Foot	Hearing Loss
Great Toe	Heat Prostration
Hand	Hernia
Hip	Laceration
Internal Organs	Multiple Physical Injuries only
Knee	Puncture
Lower Arm	Rupture
Lower Back	Sprain or Tear
Lower Leg	Strain or Tear
Lumbar/Sacral Vertebrae	
Mouth	
Multiple Lower Extremities	
Multiple Trunk	
Multiple Upper Extremities	
NA	
Sacrum and coccyx	
Shoulders	
Skull	
Soft Tissue	
Thumb	
Toes	

Upper Arm	
Upper Back	
Upper Leg	
Vertebrae	
Wrist	
Wrist and Hands	

Classified as VF	Classified as Not VF	Unclassified
2416	345	218

This step removes claims that match some combination of Part of the Body and Cause of Injury. These claims must have one from each of the categories.

Part of the Body	Cause of Injury
Abdomen including groin	Animal or Insect
Ankle	Caught in object handled
Brain	Caught in, under, between, noc
Disc	Cut by powered hand tool, appliance
Ears	Cut, puncture, scrape, NOC
Elbow	Cut by object being lifted or handled
Eyes	Fall from different level
Facial Bones	Fall from ladder or scaffolding
Fingers	Fall from liquid or grease spills
Foot	Fall on same level
Great Toe	Fall on stairs
Hand	Fall, slip, trip, NOC
Heart	Holding or carrying
Hip	Injured by falling or flying machine
Insufficient Info	Injured by hand tool or machine
Internal Organs	Injured by motor vehicle
Knee	Injured by object being lifted or handled
Lower Arm	Lifting
Lower Back	Motor vehicle, NOC
Lower Leg	Pushing or pulling
Lumbar/Sacral Vertebrae	Reaching

Mouth	Slip or trip, did not fall
Multiple Head Injury	Strain by repetitive motion
Multiple Lower Extremities	Strain or injury by NOC
Multiple Trunk	Struck or injured, NOC
Multiple Upper Extremities	Temperature extremes
NA	Twisting
Sacrum and coccyx	Using tool or machinery
Shoulders	Vehicle collision
Soft Tissue	
Thumb	
Toes	
Upper Arm	
Upper Back	
Upper Leg	
Vertebrae	
Wrist	
Wrist and Hands	

Classified as VF	Classified as Not VF	Unclassified
2416	409	154

2. Remove specific parts of the body that might suggest Valley fever (most appear in step 1 part 4) but are either acute injuries or suggest other exposures like asbestos, chemicals, or cancer.

These claims must have a combination of part of body, cause of injury, AND nature of injury to be removed. This step is run in several parts typically individually for each body part. I do not include all code/categories here for brevity.

Body parts include chest, lungs, eyes, skull, spinal cord, multiple body parts and systems, body systems and multiple body systems, multiple upper extremities.

Part of the Body	Cause of Injury	Nature of Injury
Chest	Fall from different level	Contusion
	Fall from ladder or scaffolding	Fracture
	Fall from liquid or grease spills	Strain or Tear
	Fall on same level	

	Fall on stairs	
	Fall, slip, trip, NOC	
	Injured by object being lifted or handled	
	Lifting	
	Motor vehicle, NOC	
	Other, NOC	
	Pushing or pulling	
	Reaching	
	Striking against object being lifted or handled	
	Striking against or stepping on, NOC	
	Striking against stationary object	

Part of the Body	**Cause of Injury**	**Nature of Injury**
Multiple Body Parts and Systems	Cut, Puncture, Scrape, NOC	All other cumulative injury, NOC
Body Systems and Multiple Body Systems	Fall from different level	All other occupational disease injury, NOC
	Fall on same level	All other specific injuries, NOC
	Fall on stairs	Burn
	Fall, slip, trip, NOC	Contusion
	Fire or Flame	Enucleation
	Injured by falling or flying object	Heat prostration
	Injured by fellow worker, patient, other	Inflammation
	Injured by motor vehicle	Laceration
	Lifting	Multiple injuries physical and psychological
	Not physical, stress, shock, trauma	Multiple physical injuries
	Other, NOC	Rupture
	Rubbed or abraded by repetitive motion	Sprain or tear
	Strain or injury by NOC	Strain or tear
	Struck or Injured, NOC	
	Temperature Extremes	
	Using Tool or Machinery	

3. Remove claims where nature of injury is inflammation, cumulative, or specific injury but the part of the body is unlikely Valley fever.

Body parts include: facial bones, fingers, foot, hip, knee, lower arm, lower back, pelvis, and shoulders.

Part of the Body	Nature of Injury
Facial Bones	Inflammation
Fingers	All other cumulative injury, noc
Foot	All other specific injuries, noc
Hip	
Knee	
Lower Arm	
Lower Back	
Pelvis	
Shoulders	

Classified as VF	Classified as Not VF	Unclassified
2416	499	64

STEP 3 – KEEP CLAIMS WITH LESS PRECISE CRITERIA

This section works to identify claims that could be Valley fever but are harder to determine because they do not have clear keywords and remain unclassified after the above two steps.

Many claims classified in this step have either very specific (and sometimes odd) combinations of part of body, cause of injury, or nature of injury, OR they have one or two of the required part of body, cause of injury, or nature of injury used in step 1, part 4 earlier but not all three. I also use some alternate keywords I used above like rash and symptoms to help classify. I do not include the code/categories here for brevity.

Classified as VF	Classified as Not VF	Unclassified
2444	499	36

STEP 4 – REMOVE ANY LAST CLAIMS

This step removes any remaining claims that have a nature of injury of cancer, heat prostration, mental stress, lower back, heart, lumbar.

Removes one very specific claim that had cocci in the injury description and thus got classified earlier but is actually an acute lifting injury.

Classified as VF	Classified as Not VF	Unclassified
2443	536	0

Appendix C. Workflow Diagram for De-duplicating Workers' Compensation Claims

The workflow diagram provides an overview of how I approached de-duplicating the workers' compensation claims (see figure C1). The light gray boxes indicate claims that were kept in the dataset. The medium gray boxes indicate claims that were removed from the dataset. Within each box in paratheses is the name of the dataframe and the number of claims within that dataframe.

I first removed claims that were identified as likely not Valley fever. Then claims were separated based on whether or not the duplicated claims were within 120 days of each other. 120 days was chosen because the majority of claims that appeared to be identical (they had same employer or the injury description described similar circumstances) were submitted within 120 days of each other. Among those, claims were kept if they had been de-duplicated (such that their duplicate claim was one of the 104 identified as not Valley fever). Among those with dates within 120 days of one another, the oldest claim was kept. The same rule was true for those greater than 120 days. Claims that had the same dates were de-duplicated by examining the date the claim status was changed. The claim with the newer claim status changed date was kept as these claims tended to be more up-to-date and have more complete information than the older claim status changed dates.

Some claims had to be manually removed by using the employee's JCN number. These are indicated by the medium gray color as well. Additionally, not shown eight claims were removed as a final step to de-duplicate the data. Manual removal of some claims was necessary because some of the claims did not fall neatly into the above rules. For example, some employees had more than two duplicated claims making them fall outside of the code which compares two dates. Some employees had one or more sets of duplicated claims where some of the claims ended up on one side of the workflow and one or more on the other and upon recombining the data frames were duplicated again. Initially the 120 days criteria was selected as a curiosity on my part to try to identify claims that may have been from the same exposure and others that were repeat exposures or prolonged illness. While this workflow was helpful for identifying those claims, it did make the de-duplicated process more challenging. An alternative workflow might simply select the oldest date from all duplicated Valley fever claims and then follow the same steps for the claims with the exact same date. Some claims with more than two duplicates would likely still have to be manually removed.

The light gray boxes of kept claims were ultimately recombined into one dataframe. The medium gray boxes of removed claims were also recombined to form one dataframe. The de-duplicated Valley fever claims were recombined with the claims that did not have any duplicates.

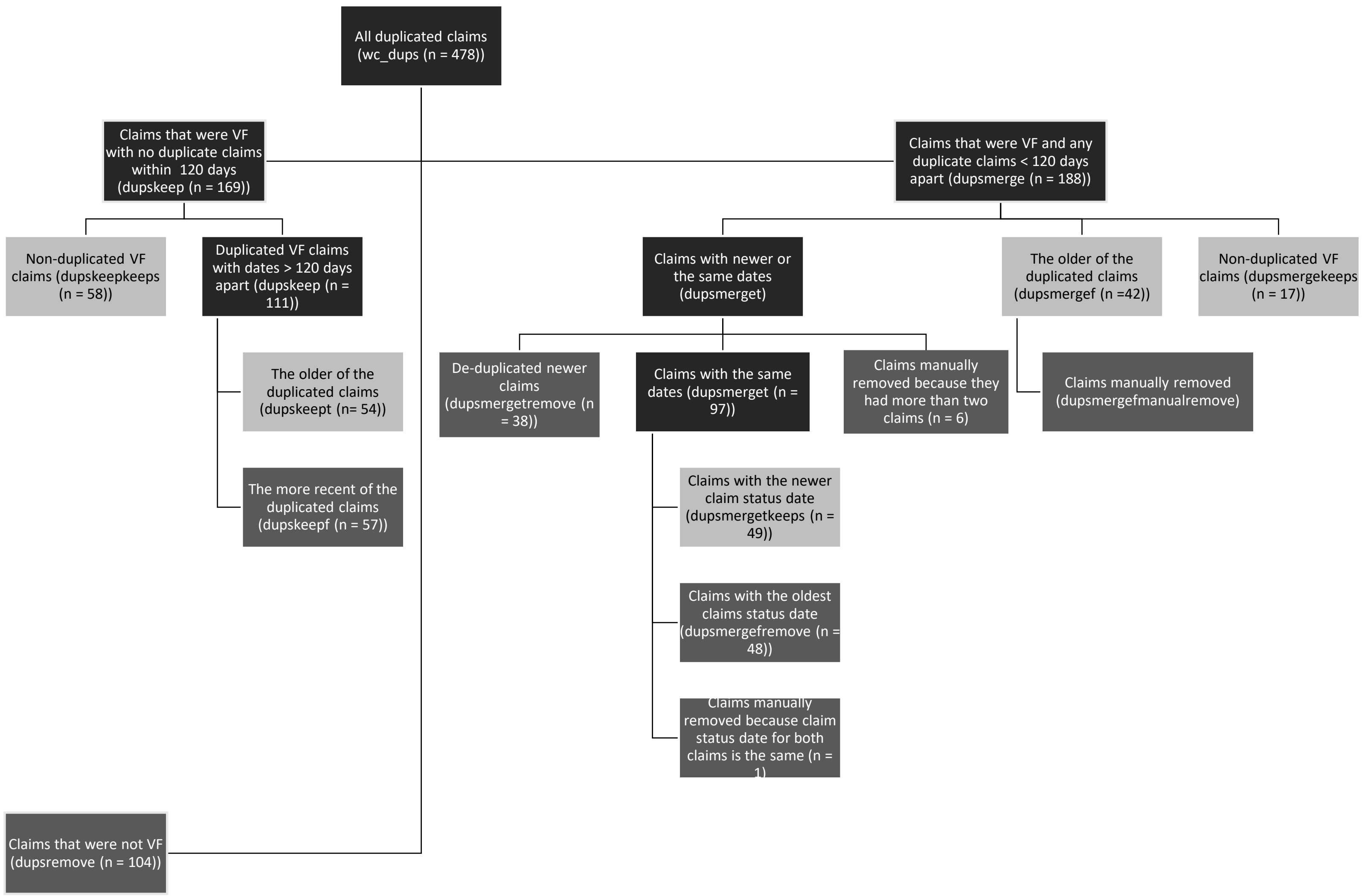

Figure C1. Workflow Diagram for De-duplicating Workers' Compensation Claims for Valley Fever

Appendix D. Newspapers Searched for Work-related Valley Fever Exposures Database

Table E1. Newspapers Searched for Work-related Valley Fever Exposures Database

Database	Newspaper	Years (Start - End)	
California Newspapers [Via Newsbank Access World News] (269 Available Papers)	Acorn, The (Agoura Hills, CA)	2000	2021
	Alameda Times-Star (CA)	2001	2016
	Argus, The (Fremont-Newark, CA)	2001	2021
	Avenal Progress (CA)	2003	2008
	Bakersfield Californian, The (CA)	2003	2021
	Camarillo Acorn (CA)	2006	2021
	Chico Enterprise-Record (CA)	1999	2021
	Coalinga Record (CA)	2003	2009
	Comptom Bulletin, The (CA)	2005	2021
	Contra Costa Times (Walnut Creek, CA)	1995	2016
	Daily Breeze (Torrance, CA)	1984	2021
	Daily Democrat, The (Woodland, CA)	2004	2021
	Daily News of Los Angeles (CA)	1985	2021
	Daily Press (Victorville, CA)	2007	2021
	Daily Review, The (Hayward, CA)	2001	2021
	Davis Enterprise, The (CA)	1997	2021
	East Bay Times (CA)	2016	2021
	East County Times (Antioch, CA)	2005	2012
	Eastern Group Publications (Los Angeles County, CA)	2003	2018
	Excelsior: Orange County Register weekly (Santa Ana, CA)	2002	2021
	Fountain Valley View, The: Orange County Register weekly (CA)	2004	2018
	Fresno Bee, The	1986	2021
	Hi-Desert Star (Yucca Valley, CA)	2003	2021
	Inland Valley Daily Bulletin (Ontario, CA)	2002	2021
	Irvine World News: Orange County Register weekly (CA)	2003	2021
	Jewish Journal of Greater Los Angeles, The (CA)	2004	2021
	Kingsburg Recorder (CA)	2003	2020
	La Opinion (Los Angeles, CA)	2000	2021
	La Prensa - El D (Riverside, CA)	2005	2016
	LA Weekly (CA)	2005	2021

Lake County Record Bee (Lakeport, CA)	2003	2021
Ledger Dispatch (CA)	1997	2005
Lemoore Advance (CA)	2003	2009
Lodi News-Sentinel (CA)	2000	2021
Lompoc Record	2005	2021
Long Beach Press Telegram (CA)	1990	2021
Los Banos Enterprise, The (CA)	2002	2021
Madera Tribune (CA)	2002	2021
Marin Independent Journal (San Rafael, CA)	2002	2021
Merced Sun-Star, The (CA)	2001	2021
Mercury News, The (San Jose, CA)	1985	2021
Modesto Bee, The (CA)	1989	2021
Monterey County Herald, The (CA)	2002	2021
Moorpark Acorn (CA)	2003	2021
Mountain Democrat (Placerville, CA)	2000	2021
Needles Desert Star (CA)	2006	2021
Oakland Tribune, The (CA)	2001	2021
Ojai Valley News (CA)	2000	2018
Orange City News: Orange County Register weekly (CA)	2004	2018
Orange County Register, the (Santa Ana, CA)	2004	2018
Oroville Mercury-Register (CA)	2003	2021
Our Weekly (Los Angeles, CA)	2005	2021
Pasadena Star News (CA)	2001	2021
Press Democrat, The (Santa Rosa, CA)	1995	2021
Press Enterprise, The (Riverside, CA)	1992	2021
Red Bluff Daily News (CA)	2003	2021
Redding Record Searchlight (CA)	1991	2021
Redlands Daily Facts	2002	2021
Reporter, The (Vacaville, CA)	1998	2021
Riverside County Record, The	2005	2015
Sacramento Bee, The	1984	2021
San Diego Union-Tribune, The (CA)	1983	2021
San Fernando Valley Sun, The	2004	2021
San Francisco Chronicle (CA)	1985	2021
San Gabriel Valley Tribune (West Covina, CA)	2001	2021
San Mateo County Times (CA)	2001	2016
San Ramon Valley Times (CA)	1995	2011
Santa Maria Times (CA)	2004	2021
Santa Monica Daily Press (CA)	2006	2021
Selma Enterprise (CA)	2003	2020

	Sentinel, The (Hanford, CA)	2003	2021
	Sierra Star, The (Oakhurst, CA)	2001	2021
	Signal, The (Santa Clarita, CA)	2005	2021
	Simi Valley Acorn (CA)	2004	2021
	Sisikiyou Daily News (Ykeka, CA)	1999	2021
	Sun, The (San Bernadino, CA)	2001	2021
	Thousand Oaks Acorn (CA)	2002	2021
	Times Press Recorder (Arroyo Grande, CA)	2005	2016
	Times-Herald (Vallejo, CA)	2001	2021
	Times-Standard (Eureka, CA)	2001	2021
	Tri-Valley Herald (Pleasanton, CA)	2001	2016
	Tribune, The (San Luis Obispo, CA)	2001	2021
	Tustin News, The: Orange County Register weekly (CA)	2004	2018
	Ukiah Daily Journal (CA)	2003	2021
	Valley Times (Pleasanton, CA)	1995	2011
	Ventura County Star (CA)	1997	2021
	Vida en el Valle (Fresno, CA) (Spanish Version)	2008	2018
	Whittier Daily News	2001	2021
Acceda Noticias [Via Newsbank]	Eastern Group Publications (Los Angeles County, CA)	2003	2018
	Excelsior: Orange County Register weekly (Santa Ana, CA)	2002	2021
	La Opinion (Los Angeles, CA)	2000	2021
	La Prensa - El D (Riverside, CA)	2005	2016
	Vida en el Valle (Fresno, CA) (Spanish Version)	2008	2018
Los Angeles Times (1985-Current) [Via Proquest Current Newspapers]	Los Angeles Times (1985-current)	1985	2021
Los Angeles Times (1934-2005) [Via Proquest Historical Newspapers]	Los Angeles Sentinel	1980	2005

Appendix E. Chapter 2 Appendix Tables

Table E2.1. Frequency of Valley Fever Claims by Major and Detailed Census Occupations, California 2000-2019

Census Occupation Groups	Frequency	Percent
Protective Service Occupations (3700-3955)	**622**	**27.77**
Bailiffs, correctional officers, and jailers	305	13.62
Firefighters	119	5.31
Police and sheriff's patrol officers	91	4.06
First-line supervisors of fire fighting and prevention workers	62	2.77
First-line supervisors of police and detectives	19	0.85
Security guards and gaming surveillance officers	11	0.49
Construction and Extraction Occupations (6200-6940)	**407**	**18.17**
Construction laborers	98	4.38
Operating engineers and other construction equipment operators	76	3.39
Electricians	43	1.92
First-line supervisors of construction trades and extraction workers	41	1.83
Pipelayers, plumbers, pipefitters, and steamfitters	37	1.65
Derrick, rotary drill, and service unit operators, oil, gas, and mining	18	0.80
Carpenters	16	0.71
Roustabouts, oil and gas	10	0.45
Healthcare Practitioners and Technical Occupations (3000-3540)	**209**	**9.33**

Table E2.1. Frequency of Valley Fever Claims by Major and Detailed Census Occupations, California 2000-2019

Census Occupation Groups	Frequency	Percent
Clinical laboratory technologists and technicians	90	4.02
Registered nurses	38	1.70
Health practitioner support technologists and technicians	32	1.43
Physicians and surgeons	13	0.58
Licensed practical and licensed vocational nurses	11	0.49
Farming, Fishing, and Forestry Occupations (6005-6130)	**171**	**7.63**
Miscellaneous agricultural workers	154	6.88
Transportation Occupations (9000-9420)	**95**	**4.24**
Driver/sales workers and truck drivers	80	3.57
Installation, Maintenance, and Repair Occupations (7000-7630)	**94**	**4.20**
Electrical power-line installers and repairers	31	1.38
Maintenance and repair workers, general	23	1.03
Material Moving Occupations (9500-9750)	**87**	**3.88**
Laborers and freight, stock, and material movers, hand	63	2.81
Refuse and recyclable material collectors	12	0.54
Life, Physical, and Social Science Occupations (1600-1965)	**86**	**3.84**
Biological scientists	18	0.80
Miscellaneous social scientists and related workers	18	0.80
Miscellaneous life, physical, and social science technicians	16	0.71

Table E2.1. Frequency of Valley Fever Claims by Major and Detailed Census Occupations, California 2000-2019

Census Occupation Groups	Frequency	Percent
Environmental scientists and geoscientists	15	0.67
Production Occupations (7700-8965)	**71**	**3.17**
Water and wastewater treatment plant and system operators	14	0.62
Welding, soldering, and brazing workers	11	0.49
Building and Grounds Cleaning and Maintenance Occupations (4200-4250)	**65**	**2.90**
Grounds maintenance workers	40	1.79
Janitors and building cleaners	23	1.03
Office and Administrative Support Occupations (5000-5940)	**55**	**2.46**
Office clerks, general	17	0.76
Architecture and Engineering Occupations (1300-1560)	**46**	**2.05**
Civil engineers	11	0.49
Management Occupations (0010-0430)	**40**	**1.79**
Managers, all other	10	0.45
Community and Social Service Occupations (2000-2060)	**34**	**1.52**
Counselors	16	0.71
Education, Training, and Library Occupations (2200-2550)	**32**	**1.43**
Insufficient Information	**23**	**1.03**
Food Preparation and Serving Related Occupations (4000-4160)	**19**	**0.85**

Table E2.1. Frequency of Valley Fever Claims by Major and Detailed Census Occupations, California 2000-2019

Census Occupation Groups	Frequency	Percent
Cooks	14	0.62
Business and Financial Operations Occupations (0500-0950)	**18**	**0.80**
Healthcare Support Occupations (3600-3655)	**18**	**0.80**
Phlebotomists	10	0.45
Sales and Related Occupations (4700-4965)	**18**	**0.80**
Arts, Design, Entertainment, Sports, and Media Occupations (2600-2960)	**14**	**0.63**

Data source: California Workers' Compensation Information System 2000 to 2019. Table shows frequencies and percentages for Census Occupations for all workers, including prison workers and volunteers (n = 2240). Major census groups are in bold and gray. Detailed Census Occupation categories are provided below their corresponding major Census groups for any with 10 or more employees. Frequencies and percentages for detailed Census occupations may not add up to the total because occupations with fewer than 10 employees are not shown. Percentages for detailed Census Occupations were calculated as the number of employees in that detailed occupation divided by the total number of employees.

Table E2.2. Frequency of Valley Fever Claims by NAICS Industries, California 2000-2019

NAICS Industries	Frequency	Percent
<u>Public Administration</u> (92)	**982**	**43.84**
Justice, Public Order, and Safety Activities (9221)	544	24.29
Correctional Institutions (922140)	481	21.47
Fire Protection (922160)	32	1.43
Police Protection (922120)	23	1.03
Executive, Legislative, and Other General Government Support (9211)	225	10.04
Other General Government Support (921190)	136	6.07
Executive Offices (921110)	71	3.17
Executive and Legislative Offices, Combined (921140)	10	0.45
Administration of Human Resource Programs (9231)	79	3.53
Administration of Public Health Programs (923120)	79	3.53
Administration of Environmental Quality Programs (9241)	75	3.35
Administration of Conservation Programs (924120)	68	3.04
Administration of Economic Programs (9261)	37	1.65
Regulation and Administration of Transportation Programs (926120)	32	1.43
<u>Construction</u> (23)	**313**	**14.00**
Specialty Trade Contractors (238)	**135**	**6.03**
Building Equipment Contractors (2382)	54	2.41
Electrical Contractors and Other Wiring Installation Contractors (238210)	32	1.43
Plumbing, Heating, and Air-Conditioning Contractors (238220)	11	0.49

Table E2.2. Frequency of Valley Fever Claims by NAICS Industries, California 2000-2019

NAICS Industries	Frequency	Percent
Other Specialty Trade Contractors (2389)	36	1.61
All Other Specialty Trade Contractors (238990)	15	0.67
Site Preparation Contractors (238910)	12	0.54
Foundation, Structure, and Building Exterior Contractors (2381)	21	0.94
Building Finishing Contractors (2383)	13	0.58
Heavy and Civil Engineering Construction (237)	**118**	**5.27**
Highway, Street, and Bridge Construction (2373)	49	2.19
Highway, Street, and Bridge Construction (237310)	39	1.74
Utility System Construction (2371)	43	1.92
Water and Sewer Line and Related Structures Construction (237110)	18	0.80
Other Heavy and Civil Engineering Construction (2379)	25	1.12
Other Heavy and Civil Engineering Construction (237990)	25	1.12
Construction of Buildings (236)	**40**	**1.79**
Nonresidential Building Construction (2362)	40	1.79
Commercial and Institutional Building Construction (236220)	26	1.16
Industrial Building Construction (236210)	12	0.54
Ag, Forestry, Fishing, Hunting (11)	**160**	**7.14**
Crop Production (111)	**102**	**4.56**
Fruit and Tree Nut Farming (1113)	51	2.28
Grape Vineyards (111332)	23	1.03

Table E2.2. Frequency of Valley Fever Claims by NAICS Industries, California 2000-2019

NAICS Industries	Frequency	Percent
Other Crop Farming (1119)	16	0.71
All Other Miscellaneous Crop Farming (111998)	12	0.54
Vegetable and Melon Farming (1112)	16	0.71
Other Vegetable (except Potato) and Melon Farming (111219)	12	0.54
Support Activities for Agriculture and Forestry (115)	**42**	**1.88**
Support Activities for Crop Production (1151)	41	1.83
Farm Labor Contractors and Crew Leaders (115115)	29	1.29
Animal Production and Aquaculture (112)	**12**	**0.54**
Health Care and Social Assistance (62)	**125**	**5.58**
Ambulatory Health Care Services (621)	**67**	**2.99**
Medical and Diagnostic Laboratories (6215)	59	2.63
Diagnostic Imaging Centers (621512)	*47*	*2.10*
Medical Laboratories (621511)	*12*	*0.54*
Hospitals (622)	**51**	**2.28**
General Medical and Surgical Hospitals (6221)	51	2.28
Professional, Scientific, and Technical Services (54)	**116**	**5.18**
Architectural, Engineering, and Related Services (5413)	68	3.04
Engineering Services (541330)	*38*	*1.70*
Geophysical Surveying and Mapping Services (541360)	*12*	*0.54*
Scientific Research and Development Services (5417)	23	1.03
Accounting, Tax Preparation, Bookkeeping, and Payroll Services (5412)	12	0.54
Offices of Certified Public Accountants (541211)	*10*	*0.45*

Table E2.2. Frequency of Valley Fever Claims by NAICS Industries, California 2000-2019

NAICS Industries	Frequency	Percent
Admin, Support, and Waste Management and Remediation (56)	**81**	**3.62**
Administrative and Support Services (561)	**62**	**2.77**
Employment Services (5613)	28	1.25
Temporary Help Services (561320)	*25*	*1.12*
Services to Buildings and Dwellings (5617)	15	0.67
Waste Management and Remediation Services (562)	**19**	**0.85**
Manufacturing (31-33)	**76**	**3.39**
Food Manufacturing (311)	**23**	**1.03**
Utilities (22)	**71**	**3.17**
Electric Power Generation, Transmission and Distribution (2211)	25	1.12
Natural Gas Distribution (2212)	17	0.76
Natural Gas Distribution (221210)	*15*	*0.67*
Water, Sewage and Other Systems (2213)	12	0.54
Water Supply and Irrigation Systems (221310)	*11*	*0.49*
Educational Services (61)	**58**	**2.59**
Colleges, Universities, and Professional Schools (6113)	26	1.16
Elementary and Secondary Schools (6111)	24	1.07
Transportation and Warehousing (48-49)	**56**	**2.50**
Truck Transportation (484)	**36**	**1.61**
General Freight Trucking (4841)	18	0.80
Mining (21)	**52**	**2.32**

Table E2.2. Frequency of Valley Fever Claims by NAICS Industries, California 2000-2019

NAICS Industries	Frequency	Percent
Support Activities for Mining (2131)	42	1.88
Support Activities for Oil and Gas Operations (213112)	*24*	*1.07*
Finance and Insurance (52)	**40**	**1.79**
Funds, Trusts, and Other Financial Vehicles (525)	**19**	**0.85**
Insurance and Employee Benefit Funds (5251)	19	0.85
Insurance Carriers and Related Activities (524)	**16**	**0.71**
Other Services (81)	**26**	**1.16**
Religious, Grantmaking, Civic, Professional, and Similar Organizations (813)	**16**	**0.71**
Business, Professional, Labor, Political, and Similar Organizations (8139)	11	0.49
Retail Trade (44-45)	**23**	**1.03**
Wholesale Trade (42)	**22**	**0.98**
Merchant Wholesalers, Nondurable Goods (424)	11	0.49
Information (51)	**11**	**0.49**
All other industries	**28**	**1.25**

Data source: California Workers' Compensation Information System 2000 to 2019. Frequencies and percentages are for all workers, including prison workers and volunteers (n = 2240). All claims have a 2-digit NAICS code but about 5% are missing 4-digit NAICS codes and 15% are missing 6-digit NAICS codes. Industries with fewer than 10 reported claims are not shown.

Table E2.3 Frequency of Valley Fever Claims by Major Census Occupation and NAICS Industry, California 2000-2019

Major Census Occupation	NAICS Industry	Freq
Architecture and Engineering Occupations	Professional, Scientific, and Technical Services	13
Architecture and Engineering Occupations	Public Administration	15
Building and Grounds Cleaning and Maintenance Occupations	Public Administration	21
Business and Financial Operations Occupations	Public Administration	10
Community and Social Service Occupations	Public Administration	31
Construction and Extraction Occupations	Admin, Support, and Waste Management and Remediation	16
Construction and Extraction Occupations	Construction	226
Construction and Extraction Occupations	Mining	38
Construction and Extraction Occupations	Public Administration	32
Construction and Extraction Occupations	Utilities	12
Education, Training, and Library Occupations	Education	15
Education, Training, and Library Occupations	Public Administration	11
Farming, Fishing, and Forestry Occupations	Ag, Forestry, Fishing, Hunting	120
Food Preparation and Serving Related Occupations	Public Administration	15

Table E2.3 Frequency of Valley Fever Claims by Major Census Occupation and NAICS Industry, California 2000-2019

Major Census Occupation	NAICS Industry	Freq
Healthcare Practitioners and Technical Occupations	Health Care and Social Assistance	86
Healthcare Practitioners and Technical Occupations	Public Administration	93
Healthcare Support Occupations	Health Care and Social Assistance	11
Installation, Maintenance, and Repair Occupations	Public Administration	13
Installation, Maintenance, and Repair Occupations	Utilities	35
Life, Physical, and Social Science Occupations	Professional, Scientific, and Technical Services	38
Life, Physical, and Social Science Occupations	Public Administration	19
Management Occupations	Public Administration	14
Material Moving Occupations	Admin, Support, and Waste Management and Remediation	15
Material Moving Occupations	Public Administration	37
Office and Administrative Support Occupations	Public Administration	22
Production Occupations	Manufacturing	18
Production Occupations	Public Administration	15
Protective Service Occupations	Public Administration	579
Transportation Occupations	Construction	11
Transportation Occupations	Transportation and Warehousing	38

Data source: California Workers' Compensation Information System 2000 to 2019. Two-way table shows the number of workers (including prison workers and volunteers) in Major Census

Occupations by NAICS 2-digit industry codes (n = 2240). Any occupation-industry combinations with fewer than 10 workers is not shown.

Table E2.4. Frequency of Valley Fever Claims by Occupation and Sex for the Public Administration Industry, California 2000-2019

Census Occupations	Frequency Female	Frequency Male	Percent Female
Protective Service Occupations	53	541	8.92
Healthcare Practitioners and Technical Occupations	49	44	52.69
Office and Administrative Support Occupations	21	<10	
Community and Social Service Occupations	11	20	35.48
Life, Physical, and Social Science Occupations	10	<10	
Food Preparation and Serving Related Occupations	<10	10	
Building and Grounds Cleaning and Maintenance Occupations	<10	20	
Architecture and Engineering Occupations	<10	14	
Construction and Extraction Occupations	0	35	0.00
Installation, Maintenance, and Repair Occupations	0	13	0.00
Material Moving Occupations	0	39	0.00
Production Occupations	0	16	0.00

Data source: California Workers' Compensation Information System 2000 to 2019. Table shows the number of men and women (including prison workers and volunteers) in Major Census Occupations for the Public Administration Industry. Occupations with fewer than 10 men or women have been identified with "<10".

Table E2.5. Occupations Described in Archival Database of Work-related Valley Fever Exposures, California 1933-2019

Occupations	Frequency
Actors, camera, sound, set operators, construction manager	1
Agricultural technician	1
Auto dismantler	1
Biologist, paleontologist, electrician, driver, laborer, iron	1
Building engineer	1
Captain police officer	1
Combine harvester/tractor driver	1
Construction inspector	1
Construction laborer	4
Construction worker	4
Correctional officer	4
Crane operator	1
Delivery worker	1
Distribution process supervisor	1
Distribution process worker	1
Electricians, HEO, laborer, archaeologist, supers, metal/wood	1
Electrician	1
Electrician and power transmission installer	1
Elevator mechanic and foreman	1
Farm laborer	1
Farm worker	3
Farmer	2

Table E2.5. Occupations Described in Archival Database of Work-related Valley Fever Exposures, California 1933-2019

Occupations	Frequency
Field engineering manager	1
Filmmaker	1
Fire control aide	1
Firefighter	6
Forestry technician	1
Forklift operator	1
Fuel service technician	1
Heavy equipment operator	5
In-home health care worker	1
Inmate kitchen worker	1
Janitor	1
Juvenile institutions officer	1
Juvenile ward firefighter	1
Laborer	3
Laborer/picker/planter	1
Landscaper	1
Letter carrier	1
Locksmith	1
Maintenance electrician	1
Maintenance man	1
Manager	1
Mechanic	1

Table E2.5. Occupations Described in Archival Database of Work-related Valley Fever Exposures, California 1933-2019

Occupations	Frequency
Meter reader	1
Miner	1
Oil field worker and heavy equipment operator	1
Outdoor painter	1
Painter	1
Painters, construction and maintenance	1
Petroleum engineer	1
Pipe layers, laborers, heavy equipment operators, water truck	1
Police officer	1
Prison employees	2
Rural route letter carrier	1
Safety coordinator	1
Seized property specialist	1
Senior information tech systems analyst supervisor	1
Senior Operation Tech II	1
Sheepherder	1
Soil technician	1
Student archaeologist	1
Surveyors and mapping scientists	1
Tile setter	1
Traveling salesman	1
Truck driver	2

Table E2.5. Occupations Described in Archival Database of Work-related Valley Fever Exposures, California 1933-2019

Occupations	Frequency
Vacuum truck driver	1
Veterinarian	1
Vineyard manager	1
Welder	1
Wildland firefighters	1

Data Source: Work-related Valley Fever Exposures Database. Occupations are listed as described in the archival database as closely as possible and in alphabetical order.

Appendix F. Census Occupation Codes Returned by NIOCCS and Changed Manually

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Bailiffs, correctional officers, and jailers	393	377	-16
Miscellaneous agricultural workers	163	162	-1
Firefighters	97	142	45
Driver/sales workers and truck drivers	124	128	4
Construction laborers	105	122	17
Police and sheriff's patrol officers	103	112	9
Operating engineers and other construction equipment operators	78	94	16
Clinical laboratory technologists and technicians	39	93	54
Laborers and freight, stock, and material movers, hand	114	92	-22
First-line supervisors of fire fighting and prevention workers	67	81	14
Electricians	43	53	10
Grounds maintenance workers	25	49	24
Registered nurses	54	47	-7
First-line supervisors of construction trades and extraction workers	56	45	-11

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Pipelayers, plumbers, pipefitters, and steamfitters	44	44	0
Janitors and building cleaners	50	42	-8
Electrical power-line installers and repairers	31	40	9
Insufficient information	179	40	-139
Health practitioner support technologists and technicians	35	37	2
Maintenance and repair workers, general	23	27	4
First-line supervisors of police and detectives	25	26	1
Cooks	11	22	11
Carpenters	28	21	-7
Derrick, rotary drill, and service unit operators, oil, gas, and mining	9	21	12
Miscellaneous life, physical, and social science technicians	7	21	14
Office clerks, general	18	20	2
Biological scientists	13	19	6
Counselors	16	19	3
Miscellaneous social scientists and related workers	8	19	11
Environmental scientists and geoscientists	11	18	7

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Security guards and gaming surveillance officers	18	17	-1
Welding, soldering, and brazing workers	14	17	3
Refuse and recyclable material collectors	8	16	8
Water and wastewater treatment plant and system operators	8	16	8
Heavy vehicle and mobile equipment service technicians and mechanics	8	15	7
Licensed practical and licensed vocational nurses	8	15	7
Physicians and surgeons	40	15	-25
Bus drivers	14	14	0
Customer service representatives	11	13	2
Civil engineers	11	12	1
First-line supervisors of production and operating workers	13	12	-1
Managers, all other	25	12	-13
Production workers, all other	18	12	-6
Retail salespersons	14	12	-2
Roustabouts, oil and gas	3	12	9
Detectives and criminal investigators	10	11	1
Other teachers and instructors	8	11	3

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Secretaries and administrative assistants	19	11	-8
Compliance officers	5	10	5
Engineering technicians, except drafters	15	10	-5
Phlebotomists	9	10	1
Probation officers and correctional treatment specialists	10	10	0
First-line supervisors of office and administrative support workers	12	9	-3
Highway maintenance workers	11	9	-2
Medical and health services managers	9	9	0
Nursing, psychiatric, and home health aides	7	9	2
Painters, construction and maintenance	9	9	0
Sales representatives, wholesale and manufacturing	8	9	1
Structural iron and steel workers	5	9	4
Automotive service technicians and mechanics	6	8	2
Cashiers	8	8	0
Elementary and middle school teachers	10	8	-2
First-line supervisors of farming, fishing, and forestry workers	7	8	1

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Inspectors, testers, sorters, samplers, and weighers	10	8	-2
Other extraction workers	9	8	-1
Teacher assistants	7	8	1
Helpers, construction trades	6	7	1
Industrial truck and tractor operators	5	7	2
Psychologists	7	7	0
Surveying and mapping technicians	6	7	1
Telecommunications line installers and repairers	3	7	4
Construction managers	7	6	-1
Control and valve installers and repairers	2	6	4
Emergency medical technicians and paramedics	7	6	-1
First-line supervisors of mechanics, installers, and repairers	3	6	3
Office and administrative support workers, all other	9	6	-3
Personal care aides	5	6	1
Postsecondary teachers	8	6	-2
Stationary engineers and boiler operators	14	6	-8
Couriers and messengers	5	5	0

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Did not work	8	5	-3
Dishwashers	5	5	0
Fence erectors	2	5	3
File clerks	1	5	4
Food preparation workers	5	5	0
Miscellaneous entertainment attendants and related workers	6	5	-1
Miscellaneous health technologists and technicians	5	5	0
Sheet metal workers	5	5	0
Social workers	10	5	-5
Stock clerks and order fillers	5	5	0
Architects, except naval	2	4	2
Butchers and other meat, poultry, and fish processing workers	6	4	-2
Cement masons, concrete finishers, and terrazzo workers	3	4	1
Combined food preparation and serving workers, including fast food	3	4	1
Farmers, ranchers, and other agricultural managers	19	4	-15
First-line supervisors of correctional officers	5	4	-1

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
First-line supervisors of food preparation and serving workers	2	4	2
Food processing workers, all other	6	4	-2
Geological and petroleum technicians	2	4	2
Medical scientists	13	4	-9
Packers and packagers, hand	1	4	3
Pest control workers	3	4	1
Power plant operators, distributors, and dispatchers	7	4	-3
Private detectives and investigators	3	4	1
Secondary school teachers	2	4	2
Athletes, coaches, umpires, and related workers	3	3	0
Bakers	3	3	0
Broadcast and sound engineering technicians and radio operators	1	3	2
Carpet, floor, and tile installers and finishers	2	3	1
Chemical processing machine setters, operators, and tenders	2	3	1
Chief executives	5	3	-2
Claims adjusters, appraisers, examiners, and investigators	8	3	-5

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Clergy	3	3	0
Computer support specialists	3	3	0
Construction and building inspectors	1	3	2
Dental assistants	1	3	2
Diagnostic related technologists and technicians	3	3	0
Dredge, excavating, and loading machine operators	3	3	0
Earth drillers, except oil and gas	5	3	-2
Engineers, all other	14	3	-11
Environmental engineers	4	3	-1
Financial managers	3	3	0
First-line supervisors of retail sales workers	8	3	-5
General and operations managers	12	3	-9
Graders and sorters, agricultural products	6	3	-3
Laundry and dry-cleaning workers	6	3	-3
Maids and housekeeping cleaners	2	3	1
Medical assistants	2	3	1
Meter readers, utilities	3	3	0
Miscellaneous plant and system operators	4	3	-1

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Nonfarm animal caretakers	3	3	0
Other installation, maintenance, and repair workers	9	3	-6
Packaging and filling machine operators and tenders	5	3	-2
Painting workers	2	3	1
Petroleum engineers	1	3	2
Pharmacists	1	3	2
Pile-driver operators	2	3	1
Producers and directors	1	3	2
Sales representatives, services, all other	1	3	2
Securities, commodities, and financial services sales agents	4	3	-1
Septic tank servicers and sewer pipe cleaners	1	3	2
Taxi drivers and chauffeurs	6	3	-3
Therapists, all other	3	3	0
Accountants and auditors	4	2	-2
Agricultural and food science technicians	2	2	0
Aircraft pilots and flight engineers	1	2	1
Boilermakers	2	2	0
Bookkeeping, accounting, and auditing clerks	2	2	0

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Bus and truck mechanics and diesel engine specialists	2	2	0
Business operations specialists, all other	4	2	-2
Cleaners of vehicles and equipment	3	2	-1
Computer systems analysts	2	2	0
Crushing, grinding, polishing, mixing, and blending workers	7	2	-5
Designers	1	2	1
Dining room and cafeteria attendants and bartender helpers	1	2	1
Drywall installers, ceiling tile installers, and tapers	1	2	1
Education administrators	10	2	-8
Electrical and electronics engineers	3	2	-1
Electrical, electronics, and electromechanical assemblers	2	2	0
First-line supervisors of housekeeping and janitorial workers	2	2	0
Glaziers	1	2	1
Heating, air conditioning, and refrigeration mechanics and installers	3	2	-1
Human resources workers	3	2	-1

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Industrial and refractory machinery mechanics	5	2	-3
Insurance claims and policy processing clerks	2	2	0
Lifeguards and other recreational, and all other protective service workers	2	2	0
Logisticians	2	2	0
Metal workers and plastic workers, all other	8	2	-6
Miscellaneous assemblers and fabricators	1	2	1
Miscellaneous vehicle and mobile equipment mechanics, installers, and repairers	2	2	0
Other healthcare practitioners and technical occupations	2	2	0
Printing press operators	1	2	1
Radio and telecommunications equipment installers and repairers	2	2	0
Security and fire alarm systems installers	1	2	1
Shipping, receiving, and traffic clerks	3	2	-1
Social and human service assistants	4	2	-2
Special education teachers	2	2	0
Students	6	2	-4
Supervisors of transportation and material moving workers	5	2	-3

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Surveyors, cartographers, and photogrammetrists	7	2	-5
Transportation, storage, and distribution managers	1	2	1
Administrative services managers	1	1	0
Advertising sales agents	1	1	0
Brickmasons, blockmasons, and stonemasons	3	1	-2
Cabinetmakers and bench carpenters	1	1	0
Chemical technicians	5	1	-4
Conservation scientists and foresters	1	1	0
Court, municipal, and license clerks	1	1	0
Crane and tower operators	1	1	0
Crossing guards	1	1	0
Electrical and electronics repairers, industrial and utility	2	1	-1
Eligibility interviewers, government programs	1	1	0
Extruding and drawing machine setters, operators, and tenders, metal and plastic	1	1	0
First-line supervisors of protective service workers, all other	1	1	0
Fish and game wardens	1	1	0
Food service managers	1	1	0

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Gaming services workers	1	1	0
Industrial production managers	1	1	0
Lawyers	1	1	0
Library assistants, clerical	2	1	-1
Locksmiths and safe repairers	1	1	0
Machinists	1	1	0
Management analysts	3	1	-2
Marketing and sales managers	2	1	-1
Materials engineers	1	1	0
Mechanical engineers	1	1	0
Medical records and health information technicians	4	1	-3
Medical transcriptionists	1	1	0
Mining machine operators	7	1	-6
Miscellaneous community and social service specialists, including health educators and community health workers	1	1	0
Miscellaneous personal appearance workers	1	1	0
Nurse practitioners	1	1	0
Other transportation workers	1	1	0
Parts salespersons	1	1	0

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Photographers	1	1	0
Physical scientists, all other	3	1	-2
Physical therapist assistants and aides	1	1	0
Print binding and finishing workers	1	1	0
Property, real estate, and community association managers	2	1	-1
Receptionists and information clerks	3	1	-2
Recreational therapists	1	1	0
Sewing machine operators	1	1	0
Structural metal fabricators and fitters	1	1	0
Volunteers	3	1	-2
Word processors and typists	1	1	0
Ambulance drivers and attendants, except emergency medical technicians	1		
Announcers	1		
Armed forces, military, non-commissioned officers and other enlisted personnel	4		
Automotive and watercraft service attendants	1		
Baggage porters, bellhops, and concierges	1		
Buyers and purchasing agents, farm products	1		
Childcare workers	2		

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Computer occupations, all other	8		
Conveyor operators and tenders	1		
Cutting, punching, and press machine setters, operators, and tenders, metal and plastic	2		
Drafters	1		
Electronic home entertainment equipment installers and repairers	2		
Extruding, forming, pressing, and compacting machine setters, operators, and tenders	1		
First-line supervisors of non-retail sales workers	2		
Fishers and related fishing workers	1		
Forging machine setters, operators, and tenders, metal and plastic	1		
Grinding, lapping, polishing, and buffing machine tool setters, operators, and tenders, metal and plastic	1		
Helpers--production workers	2		
Home appliance repairers	1		
Insurance sales agents	1		
Library technicians	2		
Metal furnace operators, tenders, pourers, and casters	1		

Table F4.1. Frequency of Census Occupation Codes Returned from the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) Compared to Frequency of Census Occupation Codes Changed Manually

Census Occupations	Frequency of Initial NIOCCS Returned Codes	Frequency of Codes After Manual Changes	Frequency Changed
Military, rank not specified	4		
Millwrights	1		
Network and computer systems administrators	2		
Physician assistants	1		
Plasterers and stucco masons	1		
Plating and coating machine setters, operators, and tenders, metal and plastic	1		
Postal service mail carriers	1		
Public relations specialists	1		
Recreation and fitness workers	1		
Residential advisors	1		
Rolling machine setters, operators, and tenders, metal and plastic	3		
Sawing machine setters, operators, and tenders, wood	1		
Subway, streetcar, and other rail transportation workers	1		
Tailors, dressmakers, and sewers	1		

Data source: California Workers' Compensation Information System 2000 to 2019. Table shows frequencies for Census Occupations for all workers, including prison workers and volunteers (n = 2240) returned by the NIOSH Industry and Occupation Computerized Coding System (NIOCCS) and includes the frequency of Census Occupation codes changed manually. Approximately, 23% of Census Occupations codes were changed manually.

References

ABM Industries, RSKCo, v. Workers' Compensation Appeals Board. 2002. *ABM Industries, RSKCo, Petitioners v. Workers' Compensation Appeals Board, Terry Wilson, Respondents. 67 Cal. Comp. Cases 922.*

Ahonen, Emily Quinn, Kaori Fujishiro, Thomas Cunningham, and Michael Flynn. 2018. "Work as an Inclusive Part of Population Health Inequities Research and Prevention." *American Journal of Public Health* 108(3):306–11.

Albiston, Catherine R., Lauren B. Edelman, and Joy Milligan. 2014. "The Dispute Tree and the Legal Forest." *Annual Review of Law and Social Science* 10(1):105–31. doi: 10.1146/annurev-lawsocsci-110413-030826.

Alexander, Charlotte S., and Arthi Prasad. 2014. "Bottom-Up Workplace Law Enforcement: An Empirical Analysis." *Indiana Law Journal* 89(3):1069–1132.

AMA. 2021. "AMA Guides® to the Evaluation of Permanent Impairment: An Overview." *American Medical Association*. Retrieved January 17, 2022 (https://www.ama-assn.org/delivering-care/ama-guides/ama-guides-evaluation-permanent-impairment-overview).

Amaro, Yesenia, and Tracy Wood. 2012. "Just One Breath: Valley Fever Treatments Can Do Harm as They Heal." *Center for Health Journalism*. Retrieved January 18, 2022 (https://centerforhealthjournalism.org/valleyfever/just-one-breath-valley-fever-treatments-can-do-harm-they-heal).

Azaroff, Lenore S., Charles Levenstein, and David H. Wegman. 2002. "Occupational Injury and Illness Surveillance: Conceptual Filters Explain Underreporting." *American Journal of Public Health; Washington* 92(9):1421–29.

Barclays Official California Code of Regulations. 1999. *Title 8. Division 1. Chapter 4.5 Subchapter 1. Article 1.1. 9703. Access to Individually Identifiable Information.*

Barker, Bridget M., Joseph A. Tabor, Lisa F. Shubitz, Robert Perrill, and Marc J. Orbach. 2012. "Detection and Phylogenetic Analysis of Coccidioides Posadasii in Arizona Soil Samples." *Fungal Ecology* 5(2):163–76. doi: 10.1016/j.funeco.2011.07.010.

Beamish, Thomas D. 2012. "Calculating Risk: Status Quo Is the Enemy." *UC Davis Executive Education*.

Beamish, Thomas D. 2018. "Risk, Crisis and Organizational Failure: Toward a Post-Rationalist View." P. 25 in *The Routledge Companion to Risk, Crisis, and Emergency Management*, edited by R. P. Gephardt Jr, K. Svedberg Helgesson, and M. Ganzin.

Beamish, Thomas D., and Nicole Woolsey Biggart. 2012. "The Role of Social Heuristics in Project-Centred Production Networks: Insights from the Commercial Construction

Industry." *Engineering Project Organization Journal* 2(1–2):57–70. doi: 10.1080/21573727.2011.637192.

Beamish, Tom D. 2015. *Community at Risk Biodefense and the Collective Search for Security*. Stanford University Press.

Bechtel Construction Company. 2013. "Bechtel Construction Company. Occupational Safety and Health Appeals Boards Appeal Form."

Bendix, Reinhard. 1974. "Inequality and Social Structure: A Comparison of Marx and Weber." *American Sociological Review* 39(2):149–61. doi: 10.2307/2094228.

Benedict, Kaitlin, Orion Z. McCotter, Shane Brady, Kenneth Komatsu, Gail L. Sondermeyer Cooksey, Alyssa Nguyen, Seema Jain, Duc J. Vugia, and Brendan R. Jackson. 2019. "Surveillance for Coccidioidomycosis -- United States, 2011-2017." *MMWR Surveillance Summaries* 68(7):1–17.

Berdahl, Jennifer L., Marianne Cooper, Peter Glick, Robert W. Livingston, and Joan C. Williams. 2018. "Work as a Masculinity Contest." *Journal of Social Issues* 74(3):422–48. doi: 10.1111/josi.12289.

Berdahl, Terceira A. 2008. "Racial/Ethnic and Gender Differences in Individual Workplace Injury Risk Trajectories: 1988-1998." *American Journal of Public Health; Washington* 98(12):2258–63.

Berman, Daniel M. 1977. "Why Work Kills a Brief History of Occupational Safety and Health in the United States." *International Journal of Health Services* 7(1):63–87. doi: 10.2190/8M31-316B-GUEJ-FRCW.

Bernhardt, Annette. 2012. "The Role of Labor Market Regulation in Rebuilding Economic Opportunity in the United States." *Work and Occupations* 39(4):354–75. doi: 10.1177/0730888412445644.

Blau, Francine, Peter Brummund, and Albert Liu. 2013. "Trends in Occupational Segregation by Gender 1970-2009: Adjusting for the Impact of Changes in the Occupational Coding System." *Demography (Springer Nature)* 50(2):471–92. doi: 10.1007/s13524-012-0151-7.

BLS. 2019. "Survey of Occupational Injuries and Illnesses (SOII) Respondents Home Page." Retrieved March 27, 2022 (https://www.bls.gov/respondents/iif/).

BLS. 2021. "Injuries, Illnesses, and Fatalities." *U.S. Bureau of Labor Statistics*. Retrieved January 11, 2022 (https://www.bls.gov/iif/).

BLS. 2022a. "How COVID-19 Is Reflected in the SOII Data." Retrieved March 27, 2022 (https://www.bls.gov/iif/how-covid-19-is-reflected-in-the-soii-data.htm).

BLS. 2022b. *Union Members - 2021*. *News Release*. Bureau of Labor Statistics.

Boden, Leslie I. 2020. "The Occupational Safety and Health Administration at 50-the Failure to Improve Workers' Compensation." *American Journal of Public Health* 110(5):638–39. doi: http://dx.doi.org/10.2105/AJPH.2019.305549.

Botsch, Robert E. 1993. *Organizing the Breathless: Cotton Dust, Southern Politics, and the Brown Lung Association*. The University Press of Kentucky.

Bowker, Geoffrey C. 1998. "The Kindness of Strangers: Kinds and Politics in Classification Systems." *Library Trends* 47(2):255.

Bowker, Geoffrey C., and Susan Leigh Star. 1999. *Sorting Things Out: Classification and Its Consequences*. Cambridge, MA, USA: MIT Press.

Buckner-Petty, Skye, Ann Marie Dale, and Bradley A. Evanoff. 2019. "Efficiency of Autocoding Programs for Converting Job Descriptors into Standard Occupational Classification (SOC) Codes." *American Journal of Industrial Medicine* 62(1):59–68. doi: 10.1002/ajim.22928.

Burawoy, Michael. 1979. "Manufacturing Consent: Changes in the Labor Process under Monopoly Capitalism."

Burawoy, Michael. 1998. "The Extended Case Method." *American Sociological Association* 16(1):4–33.

Burgard, Sarah A., and Katherine Y. Lin. 2013. "Bad Jobs, Bad Health? How Work and Working Conditions Contribute to Health Disparities." *The American Behavioral Scientist* 57(8). doi: 10.1177/0002764213487347.

CA Labor Code 3351. 1937. *CA Labor Code 3351. Division 4. Workers' Compensation and Insurance [3200 - 6002]. Part 1. Scope And Operation. Chapter 2. Employers, Employees, and Dependents [3300 - 3553]. Article 2. Employees [3350 - 3371.1].*

Cal/OSHA. 2017. "Valley Fever Prevention and Information." Retrieved December 21, 2021 (https://www.dir.ca.gov/dosh/valley-fever-home.html).

Campolieti, Michele. 2005. "Unions and the Duration of Workers' Compensation Claims." *Industrial Relations* 44(4):625–53. doi: 10.1111/j.1468-232X.2005.00405.x.

Castillo, Carla G. 2018. "What the Doctors Don't See: Physicians as Gatekeepers, Injured Latino Immigrants, and Workers' Compensation System." *Anthropology of Work Review* 39(2):94–104. doi: 10.1111/awr.12149.

CDC NIOSH. 2020. "Collecting Occupation and Industry Data in Public Health Surveillance Systems for COVID-19 | Blogs | CDC." *NIOSH Science Blog*. Retrieved January 11, 2022 (https://blogs.cdc.gov/niosh-science-blog/2020/06/11/covid-surveillance/).

CDC NIOSH. n.d. "CDC - NIOSH Industry and Occupation Computerized Coding System (NIOCCS) - NIOSH." Retrieved May 13, 2021 (https://csams.cdc.gov/nioccs/).

CDPH. 2013. *Preventing Work-Related Coccidioidomycosis (Valley Fever)*. California Department of Public Health Occupational Health Branch California Department of Industrial Relations.

CDPH. 2019. *Epidemiologic Summary of Valley Fever (Coccidioidomycosis) in California, 2019*.

CDPH. 2021. "Preventing Work-Related Valley Fever." *Preventing Work-Related Valley Fever*. Retrieved (https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/Pages/Cocci.aspx#).

Clarke, Lee Ben. 1989. *Acceptable Risk? Making Decisions in a Toxic Environment*. Berkeley: University of California Press.

Clouston, Sean A. P., and Bruce G. Link. 2021. "A Retrospective on Fundamental Cause Theory: State of the Literature and Goals for the Future." *Annual Review of Sociology* 47(1):131–56. doi: 10.1146/annurev-soc-090320-094912.

CLP Resources Inc. 2013. "CLP Resources Inc. Occupational Safety and Health Appeals Boards Appeal Form."

Coccidioidomycosis Study Group. 2022. "Coccidioidomycosis Study Group." Retrieved April 11, 2022 (http://coccistudygroup.com/).

Collins, Patricia Hill. 2000. *Black Feminist Thought: Knowledge, Consciousness and the Politics of Empowerment*. 2nd ed. New York: Routledge.

Collins, Patricia Hill. 2015. "Intersectionality's Definitional Dilemmas." *Annual Review of Sociology* 41(1):1–20. doi: 10.1146/annurev-soc-073014-112142.

Colson, Aaron J., Larry Vredenburgh, Ramon E. Guevara, Natalia P. Rangel, Carl T. Kloock, and Antje Lauer. 2017. "Large-Scale Land Development, Fugitive Dust, and Increased Coccidioidomycosis Incidence in the Antelope Valley of California, 1999–2014." *Mycopathologia* 182(5–6):439–58. doi: 10.1007/s11046-016-0105-5.

Cox, Rachel, and Katherine Lippel. 2008. "Falling through the Legal Cracks: The Pitfalls of Using Workers' Compensation Data as Indicators of Work-Related Injuries and Illnesses." *Policy and Practice in Health and Safety; Wigston* 6(2):9–30.

Croissant, Jennifer L. 2014. "Agnotology: Ignorance and Absence or Towards a Sociology of Things That Aren't There." *Social Epistemology* 28(1):4–25. doi: 10.1080/02691728.2013.862880.

Das, Rupali, Jennifer McNary, Kathleen Fitzsimmons, Dina Dobraca, Kate Cummings, Janet Mohle-Boetani, Charlotte Wheeler, Ann McDowell, Yulia Iossifova, Rachel Bailey, Kathleen Kreiss, and Barbara Materna. 2012. "Occupational Coccidioidomycosis in California: Outbreak Investigation, Respirator Recommendations, and Surveillance

Findings." *Journal of Occupational and Environmental Medicine* 54(5):564–71. doi: 10.1097/JOM.0b013e3182480556.

Davis, Burt L. 1942. "An Epidemic of Coccidioidal Infection (Coccidioidomycosis)." *JAMA: The Journal of the American Medical Association* 118(14):1182. doi: 10.1001/jama.1942.02830140012004.

Dembe, Allard E. 2010. "How Historical Factors Have Affected the Application of Workers' Compensation Data to Public Health." *Journal of Public Health Policy* 31(2):227–43. doi: http://dx.doi.org/10.1057/jphp.2010.6.

Desmond, Matthew. 2007. *On the Fireline*. University of Chicago Press.

Deterding, Nicole M., and Mary C. Waters. 2018. "Flexible Coding of In-Depth Interviews:A Twenty-First-Century Approach." *Sociological Methods & Research* 0(0):0049124118799377. doi: 10.1177/0049124118799377.

D'Ignazio, Catherine, and Lauren Klein. 2020. *Data Feminism*. MIT Press.

DIR. 1974. *California Code of Regulations, Title 8, Section 5144. Respiratory Protective Equipment.*

DIR. 2013. "News Release: Cal/OSHA Reminds Employers of Risks of Valley Fever, Urges Employers to Take Preventative Measures." *DIR Press Release*, October 31.

DIR. 2020a. "DWC Employer Information." Retrieved December 2, 2021 (https://www.dir.ca.gov/dwc/employer.htm).

DIR. 2020b. "OSHAB Appeal Form." *State of California, Department of Industrial Relations, Occupational Safety and Health Appeals Board*. Retrieved January 24, 2022 (https://www.dir.ca.gov/oshab/appealform.pdf).

DIR. 2020c. "Precedential Decisions of the Appeals Board." *State of California, Department of Industrial Relations, Occupational Safety and Health Appeals Board*. Retrieved April 16, 2022 (https://www.dir.ca.gov/oshab/Precedential_Decisions.html).

DIR. 2022. "Overview of Appeal Process." Retrieved February 21, 2022 (https://www.dir.ca.gov/oshab/oshabappealpro.html).

DIR-DWC. 2014. "DWC Answers to Frequently Asked Questions about Qualified Medical Evaluators (QMEs) for Injured Workers." Retrieved December 21, 2021 (https://www.dir.ca.gov/dwc/medicalunit/faqiw.html).

DIR-DWC. 2016a. *California Electronic Data Interchange (EDI) Implementation Guide for Medical Bill Payment Records*. Version 2.0. California Department of Industrial Relations - Division of Workers' Compensation.

DIR-DWC. 2016b. "DWC FAQs for Employees." Retrieved March 29, 2022 (https://www.dir.ca.gov/dwc/wcfaqiw.html).

DIR-DWC. 2016c. "DWC FAQs on the PDRS for Practitioners." *Answers to Workers' Compensation Practitioners' Questions about Applying the Permanent Disability Rating Schedule (PDRS)*. Retrieved January 17, 2022 (https://www.dir.ca.gov/dwc/faq/deu_faq.html).

DIR-DWC. 2016d. "Physician's Guide to Medical Practice in the California Workers' Compensation System." Retrieved April 16, 2022 (https://www.dir.ca.gov/dwc/MedicalUnit/toc.pdf).

DIR-DWC. 2016e. "Workers' Compensation Claim Form (DWC 1) & Notice of Potential Eligibility." Retrieved April 1, 2022 (https://www.dir.ca.gov/dwc/DWCForm1.pdf).

DIR-DWC. 2018. *Workers' Compensation Information System (WCIS) California EDI Implementation Guide for First and Subsequent Reports of Injury (FROI/SROI)*. Version 3.1. California Department of Industrial Relations Division of Workers' Compensation.

DIR-DWC. 2020. "DWC Electronic Reporting System for Doctor's First Report of Injury." Retrieved April 1, 2022 (https://www.dir.ca.gov/dwc/Electronic-Reporting-System-for-DFR/Index.htm).

DIR-DWC. 2021. "DWC Workers' Compensation Information System (WCIS) - Timeliness of FROI Reporting." Retrieved April 1, 2022 (https://www.dir.ca.gov/dwc/wcis/WCIS_tables/TABLE-15/WCIS_Reports-Table15.html).

DIR-DWC. 2022. "DWC Forms - Employer Forms." Retrieved April 1, 2022 (https://www.dir.ca.gov/dwc/forms.html#Employer).

DOL Women's Bureau. 2019. "Employment and Earnings by Occupation 2019." Retrieved January 31, 2022 (https://www.dol.gov/agencies/wb/data/occupations).

Draper, Elaine. 1991. *Risky Business: Genetic Testing and Exclusionary Practices in the Hazardous Workplace*. Cambridge University Press.

Draper, Elaine. 1993. "Fetal Exclusion Policies and Gendered Constructions of Suitable Work." *Social Problems* 40(1):90–107. doi: 10.2307/3097028.

Draper, Elaine. 2000. "Competing Conceptions of Safety: High-Risk Workers or High-Risk Work?" in *Illness and the Environment*.

Draper, Elaine. 2003. *The Company Doctor: Risk, Responsibility, and Corporate Professionalism*. New York: Russell Sage Foundation.

Drucker, Johanna. 2011. “Humanities Approaches to Graphical Display.” *Digital Humanities Quarterly* 005(1).

Dwyer, Tom. 1991a. “A Sociological Theory of Industrial Accidents.” in *Life and Death at Work: Industrial Accidents as a Case of Socially Produced Error*. Plenum Press.

Dwyer, Tom. 1991b. *Life and Death at Work: Industrial Accidents as a Case of Socially Produced Error*. Plenum Press.

Edwards, Richard. 1980. *Contested Terrain: The Transformation of the Workplace in the Twentieth Century*. Basic Books.

Emerson, Robert M., Rachel I. Fretz, and Linda L. Shaw. 2011. *Writing Ethnographic Fieldnotes*. 2nd ed. Chicago: The University of Chicago Press.

Erikson, Robert, John H. Goldthorpe, and Lucienne Portocarero. 1979. “Intergenerational Class Mobility in Three Western European Societies: England, France and Sweden.” *The British Journal of Sociology* 30(4):415–41. doi: 10.2307/589632.

Eyles, Emily, David Manley, and Kelvyn Jones. 2019. “Occupied with Classification: Which Occupational Classification Scheme Better Predicts Health Outcomes?” *Social Science & Medicine* 227:56–62. doi: 10.1016/j.socscimed.2018.09.020.

Fan, Z. Joyce, David K. Bonauto, Michael P. Foley, and Barbara A. Silverstein. 2006. “Underreporting of Work-Related Injury or Illness to Workers’ Compensation: Individual and Industry Factors.” *Journal of Occupational and Environmental Medicine* 48(9):914–22. doi: 10.1097/01.jom.0000226253.54138.1e.

Fantasia, Rick, and Kim Voss. 2004. *Hard Work: Remarking the American Labor Movement*. Berkeley, CA: University of California Press.

Felstiner, William L. F., Richard L. Abel, and Austin Sarat. 1980. “The Emergence and Transformation of Disputes: Naming, Blaming, Claiming...” *Law & Society Review* 15(3):631–54.

Fidelity v. Industrial Accident Commission of the State of California. 1950. *Fidelity and Casualty Company of New York And Travers and Sons, Petitioners v. Industrial Accident Commission of the State of California, and Fred J. Lemen, Respondents. 15 Cal. Comp. Cases 209.*

Filip, David, and Sharon Filip. 2008. *Valley Fever Epidemic: Everything Tourists, Residents, and YOU Need to Know About This Incurable, Debilitating, and Deadly Disease.* Golden Phoenix Books.

Fine, Janice, and Jennifer Gordon. 2010. “Strengthening Labor Standards Enforcement through Partnerships with Workers’ Organizations.” *Politics & Society* 38(4):552–85.

First Solar Electric, Inc. 2013. “First Solar Electric, Inc. Occupational Safety and Health Appeals Boards Appeal Form.”

Flaherman, Valerie J., Richard Hector, and George W. Rutherford. 2007. “Estimating Severe Coccidioidomycosis in California.” *Emerging Infectious Diseases* 13(7):1087–90. doi: 10.3201/eid1307.061480.

Fox, Nick J. 1999. “Postmodern Reflections: Deconstructing ‘Risk’, ‘Health’, and ‘Work.’” Pp. 198–219 in *Health and Work: Critical Perspectives*, edited by N. Daykin and L. Doyal. Basingstoke: Macmillan.

Freedman, Michael, Brendan R. Jackson, Orion McCotter, and Kaitlin Benedict. 2018. “Coccidioidomycosis Outbreaks, United States and Worldwide, 1940–2015.” *Emerging Infectious Diseases* 24(3):417–23. doi: 10.3201/eid2403.170623.

Freeman, MaryBeth B., Lori A. Pollack, Judy R. Rees, Christopher J. Johnson, Randi K. Rycroft, David L. Rousseau, and Mei-Chin Hsieh. 2017. “Capture and Coding of Industry and Occupation Measures: Findings from Eight National Program of Cancer Registries States.” *American Journal of Industrial Medicine* 60(8):689–95. doi: 10.1002/ajim.22739.

Frickel, Scott. 2014. “Absences: Methodological Note about Nothing, in Particular.” *Social Epistemology* 28(1):86–95. doi: 10.1080/02691728.2013.862881.

Frickel, Scott, Sahra Gibbon, Jeff Howard, Joanna Kempner, Gwen Ottinger, and David J. Hess. 2010. “Undone Science: Charting Social Movement and Civil Society Challenges to Research Agenda Setting.” *Science, Technology, & Human Values* 35(4):444–73. doi: 10.1177/0162243909345836.

Galgiani, John N. 1999. “Coccidioidomycosis: A Regional Disease of National Importance Rethinking Approaches for Control.” *Annals of Internal Medicine* 130:293–300.

Galgiani, John N., Neil M. Ampel, Janis E. Blair, Antonino Catanzaro, Francesca Geertsma, Susan E. Hoover, Royce H. Johnson, Shimon Kusne, Jeffrey Lisse, Joel D. MacDonald, Shari L. Meyerson, Patricia B. Raksin, John Siever, David A. Stevens, Rebecca Sunenshine, and Nicholas Theodore. 2016. “2016 Infectious Diseases Society of America (IDSA) Clinical Practice Guideline for the Treatment of Coccidioidomycosis.” *Clinical Infectious Diseases* 63(6):e112–46. doi: 10.1093/cid/ciw360.

Galizzi, Monica. 2013. “On the Recurrence of Occupational Injuries and Workers’ Compensation Claims.” *Health Economics* 22(5):582–99. doi: 10.1002/hec.2829.

Garrett, Ashley L., Yu-Hui H. Chang, Kathleen Ganley, and Janis E. Blair. 2016. “Uphill Both Ways: Fatigue and Quality of Life in Valley Fever.” *Medical Mycology* 54(3):310–17. doi: 10.1093/mmy/myv097.

Geiger, R. Stuart, Kevin Yu, Yanlai Yang, Mindy Dai, Jie Qiu, Rebekah Tang, and Jenny Huang. 2020. “Garbage in, Garbage out?: Do Machine Learning Application Papers in Social

Computing Report Where Human-Labeled Training Data Comes From?" Pp. 325–36 in *Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency*. Barcelona Spain: ACM.

Gilna, Derek. 2015. "California Tests State Prisoners for Valley Fever Amid Lawsuits, Deaths." *Prison Legal News*. Retrieved February 5, 2022 (https://www.prisonlegalnews.org/news/2015/jun/3/california-tests-state-prisoners-valley-fever-amid-lawsuits-deaths/).

Go, Julian. 1996. "Inventing Industrial Accidents and Their Insurance: Discourse and Workers' Compensation in the United States, 1880s-1910s." *Social Science History* 20(3):401–38. doi: 10.2307/1171408.

Goodwin, Charles. 1996. "Practices of Color Classification." *Cognitive Studies: Bulletin of the Japanese Cognitive Science Society* 3(2):62–82.

Goodyear, Dana. 2014. "Death Dust." *The New Yorker*. Retrieved May 21, 2020 (https://www.newyorker.com/magazine/2014/01/20/death-dust).

Gorris, M. E., L. A. Cat, C. S. Zender, K. K. Treseder, and J. T. Randerson. 2018. "Coccidioidomycosis Dynamics in Relation to Climate in the Southwestern United States: Cocci. and Climate in the SW U.S." *GeoHealth* 2(1):6–24. doi: 10.1002/2017GH000095.

Granite Construction Company, Inc. 2019. *In The Matter of The Appeal of: Granite Construction Company, Inc. / Granite Industrial, Inc., Employer. 2019 CA OSHA APP. BD. LEXIS 92.*

Granite Construction Company, Inc. 2021. *In The Matter of The Appeal of: Granite Construction Company, Inc. / Granite Industrial, Inc., Employer. 2021 CA OSHA APP. BD. LEXIS 21.*

Grant, Genevieve, and David M. Studdert. 2012. "The Injury Brokers: An Empirical Profile of Medical Expert Witnesses in Personal Injury Litigation." *Melbourne University Law Review* 36(3):831–70.

Gray, Garry C. 2009. "The Responsibilization Strategy of Health and Safety: Neo-Liberalism And The Reconfiguration of Individual Responsibility For Risk." *The British Journal of Criminology* 49(3):326–42.

Grigoropoulou, Nikolitsa, and Mario L. Small. 2022. "The Data Revolution in Social Science Needs Qualitative Research." *Nature Human Behaviour* 1–3. doi: 10.1038/s41562-022-01333-7.

Grusky, David B., and Jesper B. Sørensen. 1998. "Can Class Analysis Be Salvaged?" *American Journal of Sociology* 103(5):1187–1234. doi: 10.1086/231351.

Haley, L. 2007. "Compensability of, and Legal Issues Related to, Coccidioidomycosis." *Annals of the New York Academy of Sciences* 1111(1):129–32. doi: 10.1196/annals.1406.002.

Hall, Alan. 1993. “The Corporate Construction of Occupational Health and Safety: A Labour Process Analysis.” *The Canadian Journal of Sociology / Cahiers Canadiens de Sociologie* 18(1):1–20. doi: 10.2307/3340836.

Haraway, Donna. 1988. “Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective.” *Feminist Studies* 14(3):575–99.

Hector, Richard F., George W. Rutherford, Clarisse A. Tsang, Laura M. Erhart, Orion McCotter, Shoana M. Anderson, Kenneth Komatsu, Farzaneh Tabnak, Duc J. Vugia, Ying Yang, and John N. Galgiani. 2011. “The Public Health Impact of Coccidioidomycosis in Arizona and California.” *International Journal of Environmental Research and Public Health* 8(4):1150–73. doi: 10.3390/ijerph8041150.

Hirsch, Barry T., David A. Macpherson, and J. Michael Dumond. 1997. “Workers’ Compensation Recipiency in Union and Nonunion Workplaces.” *ILR Review* 50(2):213–36. doi: 10.2307/2525083.

Hirsch, Barry T., and Edward J. Schumacher. 1992. “Labor Earnings, Discrimination, and the Racial Composition of Jobs.” *The Journal of Human Resources* 27(4):602–28. doi: 10.2307/146077.

Hirschman, Albert O. 1970. *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*. Cambridge, Mass: Harvard University Press.

Hirschmann, Jan V. 2007. “The Early History of Coccidioidomycosis: 1892–1945.” *Clinical Infectious Diseases* 44(9):1202–7. doi: 10.1086/513202.

Hodson, Randy. 2001. *Dignity at Work*. Cambridge University Press.

Huffman, M. L., and P. N. Cohen. 2004. “Racial Wage Inequality: Job Segregation and Devaluation across US Labor Markets’.” *American Journal of Sociology* 109(4):902–36. doi: 10.1086/378928.

Hurd-Kundeti, Glorietta, Gail L. Sondermeyer Cooksey, and Seema Jain. 2020. “Valley Fever (Coccidioidomycosis) Awareness — California, 2016–2017.” *MMWR. Morbidity and Mortality Weekly Report* 69. doi: 10.15585/mmwr.mm6942a2.

Interstate Brands v. Workers Compensation Appeals Board. 1997. *Interstate Brands, Petitioner v. Workers Compensation Appeals Board, Donne Ledbetter, Respondents. 62 Cal. Comp. Cases 692.*

Jacoby, Sanford M. 1985. *Employing Bureaucracy: Managers, Unions, and the Transformation of Work in the 20th Century*. New Jersey: Lawrence Erlbaum Associates Inc.

Jerolmack, Colin, and Shamus Khan. 2017. “The Analytic Lenses of Ethnography.” *Socius* 3:2378023117735256. doi: 10.1177/2378023117735256.

Kaiser Foundation Hospitals v. Workers Compensation Appeals Board. 1982. *Kaiser Foundation Hospitals/Permanente Medical Group, Petitioner v. Workers Compensation Appeals Board of The State of California; Adams Property Management; And Pacific Employers Insurance, Respondents. 47 Cal. Comp. Cases 872.*

Kalleberg, Arne L. 1983. "Work and Stratification: Structural Perspectives." *Work and Occupations* 10(3):251–59. doi: 10.1177/0730888483010003001.

Kalleberg, Arne L., and Ted Mouw. 2018. "Occupations, Organizations, and Intragenerational Career Mobility." *Annual Review of Sociology* 44(1):283–303. doi: 10.1146/annurev-soc-073117-041249.

Katz, Michael B. 2013. *The Undeserving Poor: America's Enduring Confrontation with Poverty: Fully Updated and Revised*. 2nd edition. Oxford: Oxford University Press.

Kiselica, Daria, Bruce Sibson, and Judith Green-McKenzie. 2004. "Workers' Compensation: A Historical Review and Description of a Legal and Social Insurance System." *Clinics in Occupational and Environmental Medicine* 4(2):v, 237–47. doi: 10.1016/j.coem.2004.02.003.

Klein, Kerry. 2018. "California Budget Boosts Funding for Valley Fever." *Center for Health Journalism*. Retrieved November 27, 2019 (https://www.centerforhealthjournalism.org/valleyfever/california-budget-boosts-funding-valley-fever).

Krug, Allison, and Louise-Anne McNutt. 2008. "Incidence." in *Encyclopedia of Epidemiology*, edited by S. Boslaugh. 2455 Teller Road, Thousand Oaks California 91320 United States: SAGE Publications, Inc.

LAO. 2021. "Public Sector Unions and Collective Bargaining." *Legislative Analyst's Office - A.G. File No. 2021-008*. Retrieved February 5, 2022 (https://lao.ca.gov/BallotAnalysis/Initiative/2021-008).

Lauer, Antje. 2017. "Coccidioidomycosis: Increasing Incidence of an 'Orphan' Disease in Response to Environmental Changes." Pp. 151–85 in *Modeling the Transmission and Prevention of Infectious Disease*, *Advances in Environmental Microbiology*, edited by C. J. Hurst. Cham: Springer International Publishing.

Laws, Rebecca L. 2018. "Coccidioidomycosis Outbreak Among Workers Constructing a Solar Power Farm — Monterey County, California, 2016–2017." *MMWR. Morbidity and Mortality Weekly Report* 67. doi: 10.15585/mmwr.mm6733a4.

Laws, Rebecca L., Seema Jain, Gail Sondermeyer Cooksey, Janet Mohle-Boetani, Jennifer McNary, Jason Wilken, Robert Harrison, Bruce Leistikow, Duc J. Vugia, Gayle C. Windham, and Barbara L. Materna. 2021. "Coccidioidomycosis Outbreak among Inmate Wildland Firefighters: California, 2017." *American Journal of Industrial Medicine* 64(4):266–73. doi: 10.1002/ajim.23218.

Leonelli, Sabina, Brian Rappert, and Gail Davies. 2017. "Data Shadows: Knowledge, Openness, and Absence." *Science, Technology, & Human Values* 42(2):191–202. doi: 10.1177/0162243916687039.

Lichtenstein, Nelson. 2002. *State of the Union*. Princeton University Press.

Link, Bruce G., and Jo Phelan. 1995. "Social Conditions As Fundamental Causes of Disease." *Journal of Health and Social Behavior* 80–94. doi: 10.2307/2626958.

Lippel, Katherine, Joan M. Eakin, D. Linn Holness, and Dana Howse. 2016. "The Structure and Process of Workers' Compensation Systems and the Role of Doctors: A Comparison of Ontario and Québec." *American Journal of Industrial Medicine* 59(12):1070–86. doi: 10.1002/ajim.22651.

Lipscomb, Hester J., Dana Loomis, Mary Anne McDonald, Robin A. Argue, and Steve Wing. 2006. "A Conceptual Model of Work and Health Disparities in the United States." *International Journal of Health Services* 36(1):25–50. doi: 10.2190/BRED-NRJ7-3LV7-2QCG.

Lipscomb, Hester J., Ashley L. Schoenfisch, Wilfrid Cameron, Kristen L. Kucera, Darrin Adams, and Barbara A. Silverstein. 2015. "Contrasting Patterns of Care for Musculoskeletal Disorders and Injuries of the Upper Extremity and Knee through Workers' Compensation and Private Health Care Insurance among Union Carpenters in Washington State, 1989 to 2008." *American Journal of Industrial Medicine* 58(9):955–63. doi: 10.1002/ajim.22455.

Livingston Concrete Products v. Workmens Compensation Appeals Board. 1975. *State Compensation Insurance Fund and Livingston Concrete Products, Inc., Petitioners v. Workmens Compensation Appeals Board of The State of California, et al., Respondents. Southern California Edison Company, Petitioner v. Workmens Compensation Appeals Board of The State of California, et al., Respondents. 40 Cal. Comp. Cases 119.*

Loukissas, Yanni Alexander. 2019. *All Data Are Local: Thinking Critically in a Data-Driven Society*. MIT Press.

Lutzenhiser, Loren, Nicole Woolsey Biggart, Thomas D. Beamish, Thomas Burr, and Richard Kunkle. 2000. *Market Structure and Energy Efficiency: The Case of New Commerical Buildings*.

Lyttelton, Thomas, and Emma Zang. 2022. "Occupations and Sickness-Related Absences during the COVID-19 Pandemic." *Journal of Health and Social Behavior* 00221465211053615. doi: 10.1177/00221465211053615.

Martin, Aryn, and Michael Lynch. 2009. "Counting Things and People: The Practices and Politics of Counting." *Social Problems* 56(2):243–66. doi: 10.1525/sp.2009.56.2.243.

Marx, Karl. 1847. "Wage, Labour and Capital." Pp. 203–17 in *The Marx-Engels Reader,* edited by R. C. Tucker. W. W. Norton & Company.

Marx, Karl. 1867. "Capital, Volume One." Pp. 294–442 in *The Marx-Engels Reader*, edited by R. C. Tucker. W. W. Norton & Company.

McCurdy, Stephen A., Catherine Portillo-Silva, Carol L. Sipan, Heejung Bang, and Kirt W. Emery. 2020. "Risk for Coccidioidomycosis among Hispanic Farm Workers, California, USA, 2018." *Emerging Infectious Diseases* 26(7):1430–37. doi: 10.3201/eid2607.200024.

Michaels, David, and Jordan Barab. 2020. "The Occupational Safety and Health Administration at 50: Protecting Workers in a Changing Economy." *American Journal of Public Health* 110(5):631–35. doi: http://dx.doi.org/10.2105/AJPH.2020.305597.

Michaels, David, and Celeste Monforton. 2005. "Manufacturing Uncertainty: Contested Science and the Protection of the Public's Health and Environment." *American Journal of Public Health* 95(S1):S39–48. doi: 10.2105/AJPH.2004.043059.

Miller, Richard E., and Austin Sarat. 1980. "Grievances, Claims, and Disputes: Assessing the Adversary Culture Special Issue on Dispute Processing and Civil Litigation: Part Two - The Civil Litigation Research Project: A Dispute-Focused Approach: Surveying Disputes." *Law & Society Review* 15(3):525–66.

Mouw, Ted, and Arne L. Kalleberg. 2010. "Occupations and the Structure of Wage Inequality in the United States, 1980s to 2000s." *American Sociological Review* 75(3):402–31. doi: 10.1177/0003122410363564.

NAICS Associations. 2018. "NAICS & SIC Crosswalks." *NAICS Association*. Retrieved February 9, 2022 (https://www.naics.com/naics-to-sic-sic-to-naics-crosswalks/).

Navarro, Vicente. 1980. "Work, Ideology, and Science." *Social Science & Medicine* 14:191–205.

Navarro, Vicente. 1982. "The Labor Process and Health: A Historical Materialist Interpretation." *International Journal of Health Services* 12(1):5–29. doi: 10.2190/MVRB-XD8G-RTM6-05KP.

Navarro, Vicente. 1985. "U.S. Marxist Scholarship in the Analysis of Health and Medicine." *International Journal of Health Services* 15(4):525–45. doi: 10.2190/F2L6-TKY2-KJLX-WYMB.

Nelkin, Dorothy, ed. 1985. *The Language of Risk: Conflicting Perspectives on Occupational Health*. SAGE Publications Ltd.

Ness, Kate. 2012. "Constructing Masculinity in the Building Trades: 'Most Jobs in the Construction Industry Can Be Done by Women.'" *Gender, Work & Organization* 19(6):654–76. doi: 10.1111/j.1468-0432.2010.00551.x.

Nichols, Theo. 1997. *The Sociology of Industrial Injury*. London: Herndon, VA: Mansell.

Nichols, Theo. 1999. "Death and Injury at Work: A Sociological Approach." Pp. 86–106 in *Health and Work: Critical Perspectives*, edited by N. Daykin and L. Doyal. Macmillan Press LTD.

Novek, Joel. 1992. "The Labour Process and Workplace Injuries in the Canadian Meat Packing Industry." *Canadian Review of Sociology/Revue Canadienne de Sociologie* 29(1):17–37. doi: 10.1111/j.1755-618X.1992.tb02423.x.

Omi, Michael, and Howard Winant. 2014. *Racial Formation in the United States*. Routledge.

OSHA. 2017. "OSHA's Respirable Crystalline Silica Standard for Construction." *OSHA Fact Sheet* 2.

OSHA. 2018a. "Granite Construction Company, Inc. OSHA Inspection Report #1235643.015." Retrieved April 16, 2022 (https://www.osha.gov/pls/imis/establishment.inspection_detail?id=1235643.015).

OSHA. 2018b. "Papich Construction Company, Inc. OSHA Inspection Report #1236440.015." Retrieved April 16, 2022 (https://www.osha.gov/pls/imis/establishment.inspection_detail?id=1236440.015).

OSHA. 2018c. "Quality Ag, Inc. OSHA Inspection Report #1275087.015." Retrieved December 8, 2021 (https://www.osha.gov/pls/imis/establishment.inspection_detail?id=1275087.015).

OSHA. n.d. "Fatality and Catastrophe Investigation Summaries | Occupational Safety and Health Administration." Retrieved April 1, 2022 (https://www.osha.gov/pls/imis/accidentsearch.html).

Ottinger, Gwen. 2013. "The Winds of Change: Environmental Justice in Energy Transitions." *Science as Culture* 22(2):222–29. doi: 10.1080/09505431.2013.786996.

Ottinger, Gwen, and Rachel Zurer. 2011. "New Voices, New Approaches: Drowning in Data." *Issues in Science and Technology*. Retrieved October 25, 2021 (https://issues.org/ottinger/).

Paap, Kris. 2006. *Working Construction: Why White Working-Class Men Put Themselves - and the Labor Movement - in Harm's Way.* Cornell University Press.

Pakulski, Jan, and Malcolm Waters. 1996a. *The Death of Class*. SAGE Publications, Ltd.

Pakulski, Jan, and Malcolm Waters. 1996b. "The Reshaping and Dissolution of Social Class in Advanced Society." *Theory and Society* 25(5). doi: 10.1007/BF00188101.

Pakulski, Jan, and Malcolm Waters. 1997. "The Death of Class." *Capital & Class* 21(2):192–93. doi: 10.1177/030981689706200114.

Papich Construction Company, Inc. 2013. “Papich Construction Company, Inc. Occupational Safety and Health Appeals Boards Appeal Form.”

Papich Construction Company, Inc. 2018. *In the Matter of the Appeal of: Papich Construction Company, Inc. Employer*. *2018 CA OSHA App. Bd. LEXIS 89.*

Papich Construction Company, Inc. 2019. *In the Matter of the Appeal of: Papich Construction Company, Inc. Employer*. *2019 CA OSHA APP. BD. LEXIS 94.*

Papich Construction Company, Inc. 2021. *In the Matter of the Appeal of: Papich Construction Company, Inc. Employer*. *2021 CA OSHA APP. BD. LEXIS 23.*

de Perio, Marie A., and Gregory A. Burr. 2014. *Evaluation of Coccidioides Exposures and Coccidioidomycosis Infections among Prison Employees*. 2013-0113–3198. U.S. Department of Health and Human Services Centers for Disease Control and Prevention National Institute for Occupational Safety and Health.

de Perio, Marie A., Barbara L. Materna, Gail L. Sondermeyer Cooksey, Duc J. Vugia, Chia-ping Su, Sara E. Luckhaupt, Jennifer McNary, and Jason A. Wilken. 2019. “Occupational Coccidioidomycosis Surveillance and Recent Outbreaks in California.” *Medical Mycology* 57(Supplement_1):S41–45. doi: 10.1093/mmy/myy031.

Perrow, Charles. 1991. “A Society of Organizations.” *Theory and Society* 20(6):725–62. doi: 10.1007/BF00678095.

Petersen, Lyle R., Stacie L. Marshall, Christine Barton, Rana A. Hajjeh, Mark D. Lindsley, David W. Warnock, Anil A. Panackal, Joseph B. Shaffer, Maryam B. Haddad, Frederick S. Fisher, David T. Dennis, and Juliette Morgan. 2004. “Coccidioidomycosis among Workers at an Archeological Site, Northeastern Utah.” *Emerging Infectious Diseases* 10(4):637–42. doi: 10.3201/eid1004.030446.

Phelan, Jo C., and Bruce G. Link. 2015. “Is Racism a Fundamental Cause of Inequalities in Health?” *Annual Review of Sociology* 41(1):311–30. doi: 10.1146/annurev-soc-073014-112305.

Phelan, Jo C., Bruce G. Link, and Parisa Tehranifar. 2010. “Social Conditions as Fundamental Causes of Health Inequalities: Theory, Evidence, and Policy Implications.” *Journal of Health and Social Behavior* 51(S):S28–40. doi: 10.1177/0022146510383498.

Plantin, Jean-Christophe. 2019. “Data Cleaners for Pristine Datasets: Visibility and Invisibility of Data Processors in Social Science.” *Science, Technology, & Human Values* 44(1):52–73. doi: 10.1177/0162243918781268.

Plevin, Rebecca. 2012. “For Some California Prisoners, Valley Fever Becomes A Life Sentence.” *KVPR Valley Public Radio*. Retrieved February 5, 2022 (https://www.kvpr.org/health/2012-11-26/for-some-california-prisoners-valley-fever-becomes-a-life-sentence).

Poirier, Lindsay. 2021. "Reading Datasets: Strategies for Interpreting the Politics of Data Signification." *Big Data & Society* 8(2):20539517211029320. doi: 10.1177/20539517211029322.

Probst, Tahira M., Ty L. Brubaker, and Anthony Barsotti. 2008. "Organizational Injury Rate Underreporting: The Moderating Effect of Organizational Safety Climate." *Journal of Applied Psychology* 93(5):1147–54. doi: http://dx.doi.org/10.1037/0021-9010.93.5.1147.

Quality Ag, Inc. 2020. *In The Matter of The Appeal of: Quality Ag, Inc., P.O. Box 989, Fillmore, Ca 93016, Employer. 2020 CA OSHA APP. BD. LEXIS 59.*

Rappin, Christina L., Sara E. Wuellner, and David K. Bonauto. 2016. "Employer Reasons for Failing to Report Eligible Workers' Compensation Claims in the BLS Survey of Occupational Injuries and Illnesses." *American Journal of Industrial Medicine* 59(5):343–56. doi: http://dx.doi.org/10.1002/ajim.22582.

Reskin, Barbara F., Debra B. McBrier, and Julie A. Kmec. 1999. "The Determinants and Consequences of Workplace Sex and Race Composition." *Annual Review of Sociology* 25(1):335–61. doi: 10.1146/annurev.soc.25.1.335.

Reynolds, Megan M., and David Brady. 2012. "Bringing You More Than the Weekend: Union Membership and Self-Rated Health in the United States." *Social Forces* 90(3):1023–49. doi: 10.1093/sf/sor023.

Ridgeway, Cecilia L. 2011. *Framed by Gender: How Gender Inequality Persists in the Modern World*. Oxford University Press.

Rios, Sarah M. 2015. *Reducing the Impact of Valley Fever in Low-Income Communities*. 3(6). Center for Poverty Research.

Rios, Sarah M. 2018. "Valley Fever: Environmental Racism and Health Justice." Dissertation, University of California, Santa Barbara, United States -- California.

Rios, Sarah M. 2021. "Poverty, Prisons, Pollution, and Valley Fever." in *Lessons in environmental justice: from civil rights to Black Lives Matter and Idle No More*, edited by M. Mascarenhas. Los Angeles: Sage.

Roberts, Dorothy E. 2011. *Fatal Invention: How Science, Politics, and Big Business Re-Create Race in the Twenty-First Century*. New York: New Press.

Rosner, David, and Gerald Markowitz. 1984. "Safety and Health on the Job as a Class Issue: The Workers' Health Bureau of America in the 1920s." *Science & Society* 48(4):466–82.

Rosner, David, and Gerald Markowitz. 2020. "A Short History of Occupational Safety and Health in the United States." *American Journal of Public Health* 110(5):622–28. doi: 10.2105/AJPH.2020.305581.

Royal Indemnity Company v. Industrial Accident Commission. 1951. *Royal Indemnity Company, Petitioner v. Industrial Accident Commission of The State of California and Woodrow C. Burgess, Respondents. 16 Cal. Comp. Cases 3.*

Salas, Rudy. 2019. *Bill Text - AB-203 Occupational Safety and Health: Valley Fever.*

Sallaz, Jeffrey J. 2013. *Labor, Economy, and Society*. John Wiley & Sons.

Scherzer, Teresa, Reiner Rugulies, and Niklas Krause. 2005. "Work-Related Pain and Injury and Barriers to Workers' Compensation Among Las Vegas Hotel Room Cleaners." *American Journal of Public Health; Washington* 95(3):483–88.

Schmelzer, L. L., and I. R. Tabershaw. 1968. "Exposure Factors in Occupational Coccidioidomycosis." *American Journal of Public Health and the Nations Health* 58(1):107–13. doi: 10.2105/AJPH.58.1.107.

Schmitz, Matthew, and Linda Forst. 2016. "Industry and Occupation in the Electronic Health Record: An Investigation of the National Institute for Occupational Safety and Health Industry and Occupation Computerized Coding System." *Jmir Medical Informatics* 4(1):e5. doi: 10.2196/medinform.4839.

Schneider, Eileen, Rana A. Hajjeh, Richard A. Spiegel, Randall W. Jibson, Edwin L. Harp, Grant A. Marshall, Robert A. Gunn, Michael M. McNeil, Robert W. Pinner, Roy C. Baron, Ronald C. Burger, Lori C. Hutwagner, Casey Crump, Leo Kaufman, Susan E. Reef, Gary M. Feldman, Demosthenes Pappagianis, and S. Benson Werner. 1997. "A Coccidioidomycosis Outbreak Following the Northridge, Calif, Earthquake." *JAMA* 277(11):904–8. doi: 10.1001/jama.1997.03540350054033.

Seitz, Amy E., D. Rebecca Prevots, and Steven M. Holland. 2012. "Hospitalizations Associated with Disseminated Coccidioidomycosis, Arizona and California, USA." *Emerging Infectious Diseases* 18(9):1476–79. doi: 10.3201/eid1809.120151.

Shannon, Harry S., and Graham S. Lowe. 2002. "How Many Injured Workers Do Not File Claims for Workers' Compensation Benefits?" *American Journal of Industrial Medicine* 42(6):467–73. doi: 10.1002/ajim.10142.

Shelton, Robert M. 1942. "A Survey of Cocciodiomycosis at Camp Roberts, California." *Journal of the American Medical Association* 118(14):1186–90.

Skowron, Rory Thomas. 2020. "Treating OSHA Violations as Negligence Per Se." *Boston College Law Review* 61(8):31.

Smith, Barbara Ellen. 1987. *Digging Our Own Graves: Coal Miners and the Struggle over Black Lung Disease*. Philadelphia: Temple University Press.

Social Explorer. 2021. "Data Dictionary - Complete List." *Social Explorer*. Retrieved December 2, 2021 (https://www.socialexplorer.com/data/metadata/).

Sondermeyer Cooksey, Gail L., Lauren A. Lee, Debra Gilliss, and Duc J. Vugia. 2016. "Coccidioidomycosis-Associated Deaths in California, 2000–2013." *Public Health Reports* 131(4):531–35. doi: 10.1177/0033354916662210.

Sondermeyer Cooksey, Gail L., Lauren Lee, Debra Gilliss, Farzaneh Tabnak, and Duc Vugia. 2013. "Coccidioidomycosis-Associated Hospitalizations, California, USA, 2000–2011." *Emerging Infectious Diseases* 19(10). doi: 10.3201/eid1910.130427.

Sondermeyer Cooksey, Gail L., Alyssa Nguyen, Kirsten Knutson, Farzaneh Tabnak, Kaitlin Benedict, Orion McCotter, Seema Jain, and Duc Vugia. 2017. "Notes from the Field: Increase in Coccidioidomycosis — California, 2016." *MMWR. Morbidity and Mortality Weekly Report* 66. doi: 10.15585/mmwr.mm6631a4.

Sondermeyer Cooksey, Gail L., Jason A. Wilken, Jennifer McNary, Debra Gilliss, Dennis Shusterman, Barbara L. Materna, and Duc J. Vugia. 2017. "Dust Exposure and Coccidioidomycosis Prevention Among Solar Power Farm Construction Workers in California." *American Journal of Public Health* 107(8):1296–1303. doi: 10.2105/AJPH.2017.303820.

Sondermeyer Cooksey, Gail, Alyssa Nguyen, Duc Vugia, and Seema Jain. 2020. "Regional Analysis of Coccidioidomycosis Incidence — California, 2000–2018." *MMWR* 69(48):1817–21.

Sorensen, Aage B. 2005. "Foundations of a Rent-Based Class Analysis." Pp. 119–206 in *Approaches to Class Analysis*, edited by E. O. Wright. Cambridge University Press.

State Compensation Insurance Fund and Livingston Concrete Products, Inc., Petitioners V. Workmens Compensation Appeals Board of the State Of California. 1975. *40 Cal. Comp. Cases 119*.

Stevens, David A., Karl V. Clemons, Hillel B. Levine, Demosthenes Pappagianis, Ellen Jo Baron, John R. Hamilton, Stanley C. Deresinski, and Nancy Johnson. 2009. "Expert Opinion: What To Do When There Is Coccidioides Exposure in a Laboratory." *Clinical Infectious Diseases* 49(6):919–23. doi: 10.1086/605441.

Stock, Susan, Nektaria Nicolakakis, Hicham Raïq, Karen Messing, Katherine Lippel, and Alice Turcot. 2014. "Underreporting Work Absences for Nontraumatic Work-Related Musculoskeletal Disorders to Workers' Compensation: Results of a 2007-2008 Survey of the Québec Working Population." *American Journal of Public Health* 104(3):e94–101. doi: http://dx.doi.org/10.2105/AJPH.2013.301562.

Teran, Suzanne. 2012. *California Heat Illness Prevention Campaign Final Performance and Evaluation Report*. Labor Occupational Health Program UC Berkeley.

Tomaskovic-Devey, Donald. 2014. "The Relational Generation of Workplace Inequalities." *Social Currents* 1(1):51–73. doi: 10.1177/2329496513514032.

Torche, Florencia. 2015. "Analyses of Intergenerational Mobility: An Interdisciplinary Review" edited by D. B. Grusky, T. M. Smeeding, and C. M. Snipp. *The ANNALS of the American Academy of Political and Social Science* 657(1):37–62. doi: 10.1177/0002716214547476.

UC Merced Center for Valley Fever Research. 2022. "Support Group Websites | UC Merced Center for Valley Fever Research." Retrieved April 11, 2022 (https://valleyfever.ucmerced.edu/research-advocacy-news/advocacy-and-support-group-websites).

U.C.I. Construction, Inc. 2021. *In The Matter of The Appeal of: U.C.I. Construction, Inc. 3900 Fruitvale Avenue Bakersfield, CA 93308. 2021 CA OSHA APP. BD. LEXIS 12.*

US Census Bureau. 2021a. "American Community Survey 5-Year Data (2009-2019)." *Census.Gov*. Retrieved December 2, 2021 (https://www.census.gov/data/developers/data-sets/acs-5year.html).

US Census Bureau. 2021b. "Archive Files for 2000-2004." *Census.Gov*. Retrieved December 2, 2021 (https://www.census.gov/programs-surveys/acs/technical-documentation/user-notes/2004-01.html).

US Census Bureau. 2021c. "Industry and Occupation Code Lists & Crosswalks." *Census.Gov*. Retrieved December 2, 2021 (https://www.census.gov/topics/employment/industry-occupation/guidance/code-lists.html).

US Census Bureau. 2021d. "Industry and Occupation Indexes." *Census.Gov*. Retrieved December 2, 2021 (https://www.census.gov/topics/employment/industry-occupation/guidance/indexes.html).

Valley Fever Center for Excellence. 2020. "How Can You Tell Valley Fever and COVID-19 Apart? | Valley Fever Center for Excellence." Retrieved April 1, 2022 (https://vfce.arizona.edu/faq/how-can-you-tell-valley-fever-and-covid-19-apart).

Valley Fever Center for Excellence. 2021a. "FAQs | Valley Fever Center for Excellence." *Valley Fever in People | FAQS*. Retrieved January 18, 2022 (https://vfce.arizona.edu/valley-fever-people/faqs).

Valley Fever Center for Excellence. 2021b. "Home Page | Valley Fever Center for Excellence." Retrieved April 11, 2022 (https://vfce.arizona.edu/).

Valley Fever Institute. 2021. "Valley Fever Institute at Kern Medical." *Valley Fever Institute*. Retrieved April 11, 2022 (http://valleyfeverinstitute.com).

Walker, Kyle, and Matt Herman. 2021. "Load US Census Boundary and Attribute Data as Tidyverse and Sf-Ready Data Frames." Retrieved December 2, 2021 (https://walker-data.com/tidycensus/ ; https://cloud.r-project.org/web/packages/tidycensus/index.html).

Walters, Vivienne. 1985. "The Politics of Occupational Health and Safety: Interviews with Workers' Health and Safety Representatives and Company Doctors." *La Revue*

Canadienne de Sociologie et d'Anthropologie/The Canadian Review of Sociology and Anthropology 22(1):57–79.

WCAHS. 2017. "Valley Fever Awareness: Outdoor Workers at Risk." *Western Center for Agricultural Health and Safety*. Retrieved April 18, 2022 (https://aghealth.ucdavis.edu/news/valley-fever-awareness-outdoor-workers-risk).

Weber, Max. 1946. "Class, Status, and Party." Pp. 180–95 in *From Max Weber: Essays in Sociology,* edited by H. H. Gerth and C. W. Mills. Oxford University Press.

Weeden, Kim A., and David B. Grusky. 2005. "The Case for a New Class Map." *American Journal of Sociology* 111(1):141–212. doi: 10.1086/428815.

Weeden, Kim A., and David B. Grusky. 2012. "The Three Worlds of Inequality." *American Journal of Sociology* 117(6):1723–85. doi: 10.1086/665035.

Weil, David. 1991. "Enforcing OSHA: The Role of Labor Unions." *Industrial Relations* 30(1):20. doi: 10.1111/j.1468-232X.1991.tb00773.x.

Weil, David, and Amanda Pyles. 2005. "Why Complain? Complaints, Compliance, and the Problem of Enforcement in the U.S. Workplace." *Comparative Labor Law & Policy Journal* 27(1):59–92.

Wheeler, Charlotte, Kimberley D. Lucas, Gordana Derado, Orion McCotter, R. Steven Tharratt, Tom Chiller, and Janet C. Mohle-Boetani. 2018. "Risk Stratification With Coccidioidal Skin Test to Prevent Valley Fever Among Inmates, California, 2015." *Journal of Correctional Health Care* 24(4):342–51. doi: 10.1177/1078345818792679.

Wheeler, Charlotte, Kimberley D. Lucas, and Janet C. Mohle-Boetani. 2015. "Rates and Risk Factors for Coccidioidomycosis among Prison Inmates, California, USA, 2011." *Emerging Infectious Diseases* 21(1):70–75. doi: 10.3201/eid2101.140836.

Wilken, Jason A., Gail L. Sondermeyer, Dennis Shusterman, Jennifer McNary, Duc J. Vugia, Ann McDowell, Penny Borenstein, Debra Gilliss, Benedict Ancock, Janice Prudhomme, Deborah Gold, Gayle C. Windham, Lauren Lee, and Barbara L. Materna. 2015. "Coccidioidomycosis among Workers Constructing Solar Power Farms, California, USA, 2011–2014." *Emerging Infectious Diseases* 21(11):1997–2005. doi: 10.3201/eid2111.150129.

Wilson, Leslie, Jie Ting, Harold Lin, Rahil Shah, Michael MacLean, Michael W. Peterson, Nathan Stockamp, Robert Libke, and Paul Brown. 2019. "The Rise of Valley Fever: Prevalence and Cost Burden of Coccidioidomycosis Infection in California." *International Journal of Environmental Research and Public Health* 16(7). doi: 10.3390/ijerph16071113.

Wilson, William Julius. 1987. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. The University of Chicago Press.

Worker v. ASR Construction. 2015. *Wayne Davis, Applicant v. ASR Construction, Companion Property & Casualty Insurance Company, Defendants. 2015 Cal. Wrk. Comp. P.D. LEXIS 586.*

Worker v. Bechtel Group, Inc. 2017. *Deric Hobson, Applicant v. Bechtel Group, Inc., PSI, Adjusted by AIG, Defendants. 2017 Cal. Wrk. Comp. P.D. LEXIS 539.*

Worker v. BSK & Associates. 2008. *Arry Luckett, Applicant v. BSK & Associates, California Insurance Guarantee Association, Administered By Cambridge, For Fremont Compensation Insurance Company, In Liquidation, Defendants. 2008 Cal. Wrk. Comp. P.D. LEXIS 785.*

Worker v. California Department of Corrections. 2017. *Sir Walters (Dec'd), Amorn Walters (Widow), Applicant v. California Department of Corrections, State Compensation Insurance Fund, Defendants. 2017 Cal. Wrk. Comp. P.D. LEXIS 401.*

Worker v. California Department of Corrections. 2020. *Veronica Orozco, Applicant v. California Department of Corrections, Legally Uninsured, State Compensation Insurance Fund, Defendants. 2020 Cal. Wrk. Comp. P.D. LEXIS 175.*

Worker v. California State University-Fullerton. 2012. *Rudy Miranda, Applicant v. California State University-Fullerton, Legally Insured, Sedgwick Claims Management Services, Defendants. 2012 Cal. Wrk. Comp. P.D. LEXIS 92.*

Worker v. City of Bakersfield. 2014. *Ted Martinez, Applicant v. City of Bakersfield, PSI, Defendant. 2014 Cal. Wrk. Comp. P.D. LEXIS 172.*

Worker v. County of Kern. 2019. *Charles Haney, Applicant v. County of Kern, Defendant. 2019 Cal. Wrk. Comp. P.D. LEXIS 101.*

Worker v. Department of Food and Agriculture. 2019. *Kimberly Barry, Applicant v. Department of Food and Agriculture, State Compensation Insurance Fund, Defendants. 2019 Cal. Wrk. Comp. P.D. LEXIS 165.*

Worker v. Hall Management Corporation. 2019. *Ranulfo Cruz (Deceased), Applicant v. Hall Management Corporation, Everest National Insurance, Administered by American Claims Management, and Companion Property and Casualty Insurance, Defendants. 2019 Cal. Wrk. Comp. P.D. LEXIS 29.*

Worker v. Harris Wolf California Almonds. 2015. *Tim Abernathy, Applicant v. Harris Wolf California Almonds, Zenith Insurance Company, Defendants. 2015 Cal. Wrk. Comp. P.D. LEXIS 547.*

Worker v. Harris Wolf California Almonds. 2017. *Tim Abernathy, Applicant v. Harris Woolf California Almonds, Zenith Insurance Company, Defendants. 2017 Cal. Wrk. Comp. P.D. LEXIS 231.*

Worker v. KVS Transportation. 2013. *Pablo Gonzales, Applicant v. KVS Transportation, Inc., Seabright Insurance Company, Defendants. 2013 Cal. Wrk. Comp. P.D. LEXIS 547.*

Worker v. Prime of California, Inc. 2013. *Luis Morales (Dec'd), Arlene Morales (Widow), Applicant v. Prime of California, Inc., State Compensation Insurance Fund, Defendants. 2013 Cal. Wrk. Comp. P.D. LEXIS 389.*

Worker v. Robert Heely Construction. 2014. *Luis Gonzales, Applicant v. Robert Heely Construction, Travelers Insurance Company, Defendants. 2014 Cal. Wrk. Comp. P.D. LEXIS 497.*

Worker v. State of California, California Department of Corrections. 2014. *Adrian Manns, Applicant v. State of California, California Department of Corrections and Rehabilitation, Legally Uninsured, State Compensation Insurance Fund/State Contract Services, Adjusting Agency, Defendants. 2014 Cal. Wrk. Comp. P.D. LEXIS 67.*

Worker v. State of California, Department of Corrections. 2015. *Armando Robles, Applicant v. State of California, Department of Corrections & Rehabilitation, State Transportation, Legally Uninsured, Administered by State Compensation Insurance Fund, Defendants. 2015 Cal. Wrk. Comp. P.D. LEXIS 697.*

Worker v. State of California, Department of Corrections. 2019. *Glen Dudley, Applicant v. State of California, Department of Corrections and Rehabilitation Inmate Claims, State Compensation Insurance Fund, Defendants. 2019 Cal. Wrk. Comp. P.D. LEXIS 520.*

Worker v. T&W Farms. 2011. *Griseldo Nunez, Applicant v. T&W Farms, Zenith National Insurance Company, Defendants. 2011 Cal. Wrk. Comp. P.D. LEXIS 177.*

Worker v. Western Municipal Water District. 2011. *Daniel Jacobs, Applicant v. Western Municipal Water District, PSI, Administered by ACWA Joint Powers Insurance Authority, Defendants. 2011 Cal. Wrk. Comp. P.D. LEXIS 74.*

Worker v. Workers' Compensation Appeals Board. 2013. *Larry Wiacek, Petitioner v. Workers' Compensation Appeals Board, Fujitec America, Inc., Travelers Insurance Company, Respondents. 78 Cal. Comp. Cases 256.*

Worker v. Workmen's Compensation Appeals Board. 1968a. *Douglas F. Hunter, Petitioner v. Workmen's Compensation Appeals Board of The State of California; Berkley, Randall & Harvey; and Industrial Indemnity Company, Respondents. 33 Cal. Comp. Cases 446.*

Worker v. Workmen's Compensation Appeals Board. 1968b. *William Berry, Petitioner, v. Workmen's Compensation Appeals Board, Florence Furniture Company, Inc. et al., Respondents. 33 Cal. Comp. Cases 352.*

Wright, Erik Olin. 1984. "A General Framework for the Analysis of Class Structure." *Politics & Society* 13(4):383–423. doi: 10.1177/003232928401300402.

Wuellner, Sara E., Darrin A. Adams, and David K. Bonauto. 2016. "Unreported Workers' Compensation Claims to the BLS Survey of Occupational Injuries and Illnesses: Establishment Factors." *American Journal of Industrial Medicine* 59(4):274–89. doi: 10.1002/ajim.22563.

Zhou, Xiang, and Geoffrey T. Wodtke. 2019. "Income Stratification among Occupational Classes in the United States." *Social Forces* 97(3):945–72. doi: 10.1093/sf/soy074.

Zoellner, Jim L. 2020. "Feature: California Workers' Compensation in The Age of Coronavirus." *Orange County Lawyer* 62(37):3.