Worker Right-to-Know Laws: Ineffectiveness of Current Policy-Making and a Proposed Legislative Solution

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I. INTRODUCTION

The concern over the effect of toxic chemicals in the workplace has generated interest in systems to compensate workers harmed by exposure to chemical hazards, and to provide incentives to alleviate exposures to such hazards. One state regulatory response to this concern has been the enactment of right-to-know laws. These

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laws, coupled with the establishment of the OSHA Hazard Communication Standard, the Emergency Planning and Community Right-to-Know Act and other federal legislation and regulation, have created systems whereby workers are given the right to be apprised of the existence of chemicals and materials which may create a health risk upon exposure.

This Article discusses these right-to-know laws in the following ways. The Article begins by discussing the scope and purposes of these laws and regulations. Next, this Article analyzes the costs and benefits of right-to-know laws to both industry and workers generally. In Section IV, the Article discusses the fundamental behavior assumption upon which these laws are primarily based—that is, that dissemination of information regarding chemical hazards will allow the worker to make a proper assessment of risk. This Article argues that workers do not assess risk properly based on the type of information available under existing right-to-know laws. This leads to the conclusion that worker right-to-know laws are ineffective as a medium to create the appropriate decisionmaking by workers exposed to hazardous substances. Section V analyzes the moral and ethical mandates of such laws, showing that right-to-know laws are an unnecessary duplication of existing mandates. Next, based on the conclusion that right-to-know information is ineffective in assisting workers in assessing risks properly, and given that there are continued risks of latent occupational disease, Section VI analyzes the tort and common law systems as ineffective ways to compensate workers. The additional phenomenon of corporate divestiture, whereby firms "protect" themselves from potential occupational disease liabilities is discussed in Section VII. Finally, in response to concerns for worker health and safety, corporate divestiture, and the ineffectiveness of right-to-know laws, a federal program to compensate workers who have latent occupational diseases is proposed in Section VIII.

II. RIGHT-TO-KNOW LAWS

A. Scope of the Problem

The right-to-know laws are the outgrowth of concerns about occupational disease.¹ Statistics of 100,000 work-related deaths each

¹ An occupational disease may be defined as a disease that is a result of one's condition of employment. Examples such as asbestosis (a respiratory disease which results from the inhalation of asbestos fibers) and liver cancer angiosarcoma (which results from exposure to vinyl chloride) are often cited.
year, and 390,000 new cases of illness traced to occupation exposures bring home the depth of the problem in the United States. According to the National Occupational Hazards Survey (NOHS) conducted by the National Institute for Occupational Safety and Health (NIOSH), approximately 25 million workers in America (or one out of four) are exposed to one or more of the 8,000 hazards which NIOSH identifies. Furthermore, it estimates that 40 to 50 million Americans (23 percent of the U.S. population at the time of the survey) had been exposed at one point during their lifetimes to one or more hazardous chemicals which the Occupational Safety and Health Administration (OSHA) regulates. In 1983, the Bureau of Labor Statistics cited that approximately 126,000 occupational illnesses were documented each year. Furthermore, the Department of Labor statistics indicate that 700,000 people have long-term total disability related to occupational disease, and that approximately 2 million people are severely or partially disabled. Based on these concerns over occupational disease problems in America, OSHA and several states and cities have promulgated laws and standards that

2 U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE, THE PRESIDENT'S REPORT ON OCCUPATIONAL SAFETY AND HEALTH 111 (1972) [hereinafter PRESIDENT'S REPORT]. See also D. Berman, Death on the Job, 44-46 (1978); Note, Compensating Victims of Occupational Disease, 93 HARV. L. REV. 916, 916 n.2 (1980). Both sources discuss the difficulty of accuracy in estimates of occupational disease and the probability that present estimates are conservative.

3 NIOSH has a file of over 200,000 chemical products, sometimes known only by trade names. Control of Toxic Substances in the Workplace: Hearings Before the Subcomm. on Manpower and Housing of the House Comm. on Government Operations, 94th Cong., 2d Sess. 3 (1971) (testimony of Dr. John F. Finklea, then director of NIOSH). The actual chemical compositions are not always known. NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, THE RIGHT TO KNOW 7 (1977).


6 INTERIM REPORT, supra note 5, at 39.
they believe assist workers in assessing the risks of occupational disease.\textsuperscript{7} These laws and standards are called generically right-to-know laws.

\textbf{B. Right-To-Know Laws Defined}

Right-to-know laws may be defined generally as "compulsory chemical ingredient identity legislation."\textsuperscript{8} Right-to-know laws require private firms, state agencies, some universities and other organizations to provide information identifying chemicals to which their workers are exposed (see Tables 1 and 2) and the effects of those substances on health and safety. The moral implication in the naming of these laws "right-to-know" is that workers have an inherent right to understand the risk of their daily exposure to certain chemicals in the workplace.

Federal, state, and municipal legislation have created right-to-know mandates.\textsuperscript{9} The federal government's efforts have resulted in regulation through four statutes: the Occupational Safety and Health Act of 1972 (OSH Act)\textsuperscript{10} which is administered by the Occupational Safety and Health Administration (OSHA); the Toxic Substances Control Act of 1976 (TSCA),\textsuperscript{11} which is administered by the Environmental Protection Agency (EPA); the National Labor Relations Act (NLRA),\textsuperscript{12} which is administered by the National Labor Relations Board (NLRB); and the Emergency Planning and Community Right-To-Know Act, enacted at Title III of the Superfund Amendments and Reauthorization Act,\textsuperscript{13} which is administered by the EPA as well.

\textsuperscript{7} Not all research supports these figures. One former American Cancer Society researcher stated that evidence is not conclusive regarding the causation for cancer related to occupational exposures. Dr. B. Hoogstraten, Testimony before Cincinnati City Council hearings regarding adoption of Cincinnati Ordinance for Worker's Right to Know (Oct. 31, 1981). Other evidence suggests that there is no more than an 8% relationship between cancer deaths and exposures in the workplace. Doll & Peto, Avoidable Risks of Cancer in the United States, 66 J. NAT'L CANCER INST. 1259 (1981) (studies concerning the epidemiology of occupational cancer).

\textsuperscript{8} O'Reilley, Right to Know: Cincinnati's More Righteous, Less Knowing Experiment, 52 U. CIN. L. REV. 337, 337 n.2 (1983).

\textsuperscript{9} For a discussion of typical provisions in right to know laws and ordinances, see id. at 343–44.


\textsuperscript{13} 42 U.S.C. § 11,023 (Supp. IV 1986).
Section 6 (b)(5) of the OSH Act outlines the underlying concerns for safety in the workplace. Within that section, the Act focuses on setting maximum exposure standards for specific substances. Additionally, section 6(b)(7) of the Act requires that warnings be made to employees exposed to hazardous substances for which an exposure standard has been set. OSHA created a Hazard Communication Standard, intended to create uniform requirements in the manufacturing sector regarding availability of information to workers about toxic and hazardous substances in the workplace. The purpose of the standard is to “establish the framework for future regulation, if necessary,” and to “ensure disclosure of hazard information to employees in the manufacturing sector. More recently,
Congress passed the Emergency Planning and Community Right-To-Know Act\(^\text{21}\) requiring disclosure of more information than was previously necessary under the Toxic Substances Control Act.\(^\text{22}\) Companies manufacturing, storing or using chemicals must report their inventories to local agencies in order to aid in emergency planning procedures concerning hazardous substances.\(^\text{23}\) These companies must also file annual reports with the EPA.\(^\text{24}\) However, after congressional criticism, the $16 million Superfund appropriation was withdrawn as funding to the Title III program, though the present EPA regulatory activities were to have continued into the summer of 1987 under present interim financial arrangements.\(^\text{25}\)

Simultaneously with the federal government’s efforts, states and municipalities also became involved in right-to-know legislation. Fearing that the federal process would be too slow to effect immediate change, or that the federal guidelines would not be sufficiently stringent, states and a few counties and municipalities enacted right-to-know laws.\(^\text{26}\) Although state right-to-know laws vary consider-
bly, there are certain trends in the requirements of several laws.27

Typically, a right-to-know law will require a defined firm or institution to identify hazardous substances28 and to create a record designating substances that are hazardous;29 set procedures for the safe handling of any given substance;30 disclose (through routine filings with state officials or by fulfillment of employee or union requests) certain information concerning hazardous substances in a given workplace;31 post information regarding the use of and exposure to hazardous substances in a workplace;32 initiate worker education programs;33 enforce compliance and find violations through the traditional procedural devices of state agencies;34 create administrative procedures and general rights of both workers and industries;35 and insure protection of industry trade secrets.36

The result of the federal, state, and municipal right-to-know laws is a multiplicity of statutes with which industries must comply. Depending on a given industry’s location and scope of operations, it

28 This usually comes in the form of a state list. The firm may also incorporate by reference the official registries of listings by such organizations as NIOSH, the Environmental Protection Agency and the International Agency for Research on Cancer. Supra note 26.
29 Feitshans, supra note 27; McGarity, supra note 27.
30 The safe handling procedures also may be generally regulated through OSHA requirements. Supra note 26.
31 This often pertains to manufacturers, employees or both. Id.
32 The requirements to label, to post hazardous substances, to educate workers and to initiate training programs differ greatly among states. Feitshans, supra note 27; McGarity, supra note 27.
33 Id.
34 Enforcement procedures vary greatly among different states. Procedures may include penalties for violations, administrative hearings and exclusive reviews of alleged violators, and time given to the violator for compliance. Supra note 26.
35 Id. See also Feitshans, supra note 27; McGarity, supra note 27.
36 For a discussion of the difficulty of the trade secret provisions and balancing the rights of industries and workers, see Feitshans, supra note 27 and Baram, The Right to Know and the Duty to Disclose Hazard Information, 74 AM. J. PUB. HEALTH 385 (1984).
may have to comply with federal statutes, one or possibly several state statutes, and at times municipal or county statutes as well.

C. Purpose of Right-To-Know Laws

In setting out the purpose of its Hazard Communication Standard, OSHA stated that the standard was intended to "inform . . . employees properly, and to design and implement employee protection programs . . . so that they [employees] can meaningfully participate in, and support the protective measures instituted in their workplaces . . . to reduce the incidence of chemical source illnesses and injuries in the manufacturing division."37 The Agency stated that such a standard was necessary in order to reduce the risk of chemically-related disease occurring as a result of the present lack of communication standard.38 The actual OSH Act was passed to "assure that each employer furnishes to each employee a place of employment free from recognized hazards likely to cause death or serious physical harm."39 The underlying premise is that informing workers of the effects of work-related hazardous chemical exposure will enable "workers to play a meaningful role in their own health management."40 Workers will thus understand the health problems that are caused or aggravated by chemicals in the workplace. The expected result of such knowledge is that employees will be able to make informed decisions about which jobs they should select.41

State laws have mirrored this federal conviction. Four state laws have stated that "employees have an inherent right to know the dangers to which they are . . . exposed in the workplace" so that they may make informed decisions regarding possible health effects resulting from exposure at work.42 Massachusetts and New Jersey extended these basic rights beyond the workplace to the communi-

38 Id. at 53,283–84.
ties located near firms and institutions where hazardous substances are produced, stored, or studied. The usual methods state laws use to assure the industries’ actual disclosure to employees about hazardous substances used in the workplace are the labelling of hazardous substances and the use of Material Safety Data Sheets (MSDS) available upon an employee’s request. The MSDS usually states the trade and chemical name of the substance, the hazardous components, physical characteristics, data concerning fire and explosion hazards, health hazard information, the data concerning the substance’s stability or reactivity, procedures in case of spillage or leakage, safety and handling precautions, and other personal protection data.

Laws of states such as Alaska, New Jersey, Wisconsin and New Hampshire impose an obligation upon employers to train workers concerning safe use, handling, and emergency procedures for hazardous or toxic substances. Such laws shift the burden and costs of warning and protecting workers against occupation health hazards from the state to the private sector or public organization in which such hazards are located. Furthermore, such programs aim to reduce costs in administering payment of workers’ compensation claims.

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44 For example, the Illinois Toxic Substances Disclosure To Employees Act imposes requirements to post information concerning toxic substances and to communicate to workers their statutory rights. ILL. ANN. STAT. ch. 48, para. 1401–1420 (Smith-Hurd 1986).
45 Material Safety Data Sheets (MSDS) are a part of the OSHA Hazard Communication Standard requirement that many states have echoed. The MSDS is a vehicle to provide workers with information concerning substances to which they are being exposed within the workplace. 29 C.F.R. § 1910.1200 (1986). See also Access to Employee Exposure and Medical Records, 29 C.F.R. § 1910.20 (1986).
46 See, e.g., CAL. LAB. CODE § 6391 (West Supp. 1987); N.Y. LAB. LAW § 876 (McKinney Supp. 1987); see also supra note 42.
48 See Feltshans, supra note 27, at 703.
Commentators have stated other implicit public policy concerns underlying the laws, such as the respect for the autonomy of individuals in making basic life decisions,\(^{50}\) and the distribution of risk and enhancement of efficiency in risk-reducing efforts.\(^{51}\) It is generally asserted under these theories that "[w]ithout full knowledge of the hidden but discoverable health risks that result from exposure to toxic substances, workers cannot be said to have accepted the risks voluntarily."\(^{52}\) Furthermore, the belief is that an informed worker has the freedom to either assume or not assume the health risks associated with employment in hazardous working conditions.\(^{53}\) The crucial assumption underlying those theories is that if information is disclosed to workers, they will make decisions that will reduce workplace health risks.\(^{54}\) Advocates of such right-to-know laws believe that information concerning chemical exposure will assist workers in their assessment of risk of occupational disease.\(^{55}\) Others refer to this right as "informed consent," and place on such laws an ethical mandate that an individual’s consent to assume a given risk must be an "informed" consent.\(^{56}\)

In addition to public policy and legislative purposes of right-to-know laws, there is an economic rationale for the laws as well. If workers are provided with information regarding hazards, they will respond by taking steps to protect themselves from risk. This rationale is based on the belief that rational people, when given information, will act in their self-interest. The economic argument is that under the ideal conditions\(^{57}\) of complete information and job alternatives, a worker will demand and receive a premium wage for a risky job.\(^{58}\) The underlying premise is that, for the worker at the

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\(^{50}\) For a general discussion, see Occupational Health Risks and the Worker's Right To Know, 90 YALE L.J. 1792 (1981) [hereinafter Occupational Health Risks].

\(^{51}\) Id.

\(^{52}\) Id. at 1800.

\(^{53}\) Id. at 1801. The Note further states: "By providing standardized information, occupational health impact statements would enable employees to compare the health risks posed by alternative workplaces and work positions." Id. at 1808.

\(^{54}\) See id. at 1809.


\(^{56}\) See generally McGarity, supra note 27. See also 45 C.F.R. §§ 46.109–46.124 (1982).

\(^{57}\) The concept of ideal conditions in the workplace may be challenged since unless detailed information is received and understood one may question whether conditions are "ideal" in the purest sense.

\(^{58}\) W. VISCUSI, RISK BY CHOICE 38–42 (1983).
margin, this premium wage for taking a risk would offset the worker's valuation of the actual risk of the job. If the premium wage for taking the risk is not high enough, the worker would not accept the job. Conversely, if the wage premium is too high, applicants would compete to fill such "risky" positions and drive the premium wage down. Use of such wage premiums for risks would induce firms to reach some socially optimal level of workplace hazards.59

The economic rationale of right-to-know laws as well as the legislative purposes for such laws are fairly well defined. The underlying premise is that information will be properly disseminated through right-to-know mandates. The hoped-for result is that fulfillment of the laws' purposes will justify the laws' costs.

III. COSTS AND BENEFITS OF WORKER RIGHT-TO-KNOW LAWS

Proponents and opponents of the right-to-know laws have outlined the costs and benefits of programs implemented as a result of the passage of right-to-know laws. Unions and public interest groups have been some of the strongest proponents of federal and especially state and municipal right-to-know laws. Again, underlying these laws is the belief that disclosure of occupational hazards in the workplace is necessary if workers are to make informed "life choices" about their health and about the risks of exposure.60

Clearly, important benefits to the public can be expected from a law designed to make workers more aware of workplace hazards and to require the prohibition of worker exposures to substances likely to cause serious injuries. Simultaneously, such actions can also generate huge costs, which the worker will bear in many cases. For example, a law that forces expensive complexity on manufacturers for both relatively safe and unsafe workplaces will impose huge costs on those working in the relatively safe environments as the increased cost reduces employment. A cost-benefit analysis of a law and its implementing regulations will serve not only to understand the policymaking behind the laws, but also to eliminate those actions whose net benefits are negative. Thus, seeking out the most economical and efficient ways of achieving safety and health objectives maximizes the workers' total welfare.

A. Benefits

Supporters of the right-to-know laws often espouse moral and equitable—though largely unquantifiable—benefits to workers from reduced workplace hazards. The general assertion is that a moral and equitable mandate exists for lawmakers to create laws whereby workers understand and accept risks voluntarily within occupational environments. As stated above, discussions of ethical considerations often focus on the right to be informed and the general mandate of "informed consent." The underlying belief is that society as a whole can benefit only so long as an individual assumes risk voluntarily and with knowledge.

Other proponents of right-to-know laws assert that benefits are more tangible. Documented evidence of training given to an injured employee under a required employee training program may counter an employee's claim of employer negligence. Laws passed to aid in the prevention of accidents, injuries, or diseases in the occupational setting are alleged to reduce health care and workers' compensation costs. Similarly, it is asserted that to the extent training and education reduce occupational disease and injury, society benefits through reduced social welfare health benefit burdens when such systems as workers' compensation do not compensate the employee. It is estimated that occupational disease-related costs and social security and welfare systems costs—costs rejected by workers' compensation—are approximately $2.2 billion annually.

61 Tepper, The Right to Know; the Duty to Inform, 22 J. OCCUPATIONAL MEDICINE, 433, 434 (1980).
62 See supra notes 50–56 and accompanying text.
64 Musselman, Having Answers For Right-To-Know Compliance, NATIONAL SAFETY NEWS (June, 1984). The ability to counter an employee's claim of negligence through documented evidence of worker training programs would be relevant only to those chemicals which are known or assumed hazardous. For those chemicals to which the latent results of exposure are yet unknown, training about use and handling can only be conjectured, and therefore may not aid an employer's negligence defense.
65 Id. at 41.
66 Occupational Health Risks, supra note 50.
67 McGarity, supra note 27, at 39.
68 See 48 Fed. Reg. 53,328 (1983). It is conceded, however, that this benefit only accrues to acute safety hazards, and there is little an employee can do concerning chronic health hazards, short of such extreme conduct as wearing often ineffective and certainly uncomfortable respirators. McGarity, supra note 27, at 39.
69 TOXIC SUBSTANCES STRATEGY COMMITTEE, TOXIC CHEMICALS AND PUBLIC PROTECTION 120 (1980); Occupational Health Risks, supra note 50.
OSHA has stated that the largest category of benefits attributable to reduction in chemical source injuries and illnesses would be a reduction in the social costs associated with cancer illnesses. OSHA estimates that through enactment of laws that would aid in preventing workplace disease and illness, the present value of the benefits for a 40 year period is approximately $1.05 billion from increased productivity and $393.3 million from medical cost savings. The second category of benefits that OSHA outlines is reduction in the incidence of disabling illnesses attributed to exposure to toxic chemicals in the work environment. OSHA estimates the present value of the cost savings to be over $302 million for a 40 year period. Similarly, the present discounted value of production benefits from reduction in lost workdays due to chemically induced injuries or illnesses involving the loss of one or more workdays was expected to be $25.49 million. Other estimated benefits in reductions were non-lost workday injury and illness cases, turnover costs, and costs related to property loss due to chemical fires. OSHA estimates the present discounted values over a 40 year period at $9.86 million, $16.4 million, and $13.7 million respectively.

**B. Costs**

OSHA has thoroughly outlined and estimated the costs of programs set up to comply with its Hazard Communication Standard. The dollar amounts of these costs are staggering, and include both start-up and maintenance costs of programs to comply with OSHA’s mandate. As large as these costs are, they still do not include the additional expenses of industry compliance with state worker right-to-know mandates. The start-up expenditures of the OSHA proposal in excessive costs and paperwork burdens were estimated at between $2.6 and $3 billion, depending on the testing conducted by industry to meet certification requirements. The total annual cost

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71 Id.
72 Id.
73 Id.
74 Id.
75 Id. These cost estimations are based on the underlying assumption that right-to-know law information will create positive decisionmaking by workers and employers which in turn will divest the present social and private costs related to hazards in the workplace. Other additional reductions in costs outlined by OSHA are a reduction in search costs for chemical information and redundancy of those searches as having a present value of $3,092,445 million. For a detailed discussion of related costs and methodology, see id. at 53,327–329.
was expected to be approximately $1.25 billion.\textsuperscript{76} The initial cost for the start-up of the program was to be over $603.9 million or $43 per employee, with a total annual cost of approximately $158.9 million or $11 per employee. The present value of the cost was estimated at almost $3.4 billion.\textsuperscript{77} Recordkeeping expenses, including storage and handling costs of paper and data, were estimated at $14.7 million for all companies combined.\textsuperscript{78} Implementation of the proposals would be $581.9 million initially and $227.9 million each year thereafter.\textsuperscript{79} Hazard evaluation would cost industry approximately $230 million.\textsuperscript{80} Labelling would be an additional $177.8 million to start, with annual expenditures of $69.8 million.\textsuperscript{81} Start-up education programs would cost approximately $125 million.\textsuperscript{82} Opponents of worker right-to-know laws outline multiple social and industry costs created by the laws. Master Chemical Corporation voiced the concern that the laws "take away from those companies that are socially responsible, which we believe to be by far the majority of business, the competitive advantage that they have worked for and earned by responding to the demands of the market."\textsuperscript{83}

Furthermore, for many well-managed companies, the OSHA

\textsuperscript{76} Id. at 53,325.
\textsuperscript{77} Id. at 53,327. These figures were estimates by OSHA for start-up costs for January, 1981 and March, 1982 proposals and the final standard that OSHA outlines. For a general summary of the analysis of costs outlined by OSHA, see id. at 53,323–33. Start-up costs for state programs have been substantial. When California enacted its right-to-know law, it earmarked $500,000 in its 1982–83 state budget to fund local hearings on communities' access to information concerning chemical exposure. This is outside the costs to industry itself.
\textsuperscript{78} Id. at 53,325–33.
\textsuperscript{79} Id.
\textsuperscript{80} Id.
\textsuperscript{81} Id. Compiling MSDSs is very involved, even for a single substance. This fact is complicated when a company has varied product lines. For instance, according to a corporate director, Rohm & Haas of Philadelphia has spent ten years compiling MSDSs on 6,700 different materials. Bluestone, Chemical Companies Face Up to Hazard Communication, CHEMICAL WEEK 56, 57 (Nov. 20, 1985). Du Pont Industries has 25,000 MSDSs according to its worker safety specialist in their legal department. Id. Even the storing, filing and printing of the Data Sheets are expensive. The president of Solulol Chemical of West Warwick, R.I. states that his firm, whose sales range from $5–6 million per year, uses a $15,000 combined hardware and software program to organize the data. Id. at 60.
\textsuperscript{82} 48 Fed. Reg. 53,328–29 (1983). It is estimated that costs will be particularly high for smaller companies, with up to 2,000 substances about which MSDS forms must be filled out. Even large companies consider these costs unwieldy. The Right to Know: Industry Presses For a National Standard, CHEMICAL WEEK, 36, 40 (June 30, 1982).
\textsuperscript{83} 48 Fed. Reg. 53,284 (1983). Testimony went on to state that the OSHA regulation "interferes with the natural preferences of the marketplace, thereby interfering with the weeding out of those companies that refuse to comply with its demands." Id. The rationale is that with the regulations in place, companies that do not create maximum benefits to the market may still be in existence since the market responses will be interfered with by the
standard is a costly redundancy that forces companies to repack­
age their present strong hazardous chemical communication programs to
fit federal and state rules. Undoubtedly these costs will be passed
on to consumers. 84

In addition to the monetary costs of compliance, there are psy­
chological impacts and socioeconomic consequences in need of con­
sideration. Many analysts describe the costly impacts of labeling, catego­
rizing, or stigmatizing workers who are at high risk in their
employment.85 Labeling a worker as ill or potentially ill or contam­
ninated may result in increased absenteeism regardless of whether or
not the worker is actually ill. Research is underway to attempt to
measure the effects that notification of health risks may have on
workers and, in turn, on their productivity.86

The socioeconomic consequences of notification laws are also likely
to be severe. Data analyzing associations among work history, ex­
posure, severity of risk, and disability and medical claims reveals
that there is a "chilling impact on economic opportunities available
to members of high-risk groups."87 The placement of "injury prone"
workers in low risk-of-injury jobs; denial of equal opportunity to
workers who have filed claims or have been in high-risk jobs previ­
ously; "tainting" of high-risk workers by fellow employees and by
employers; difficulty in insurability; and cessation of insurance and
worker compensation programs are just a few of the costly conse­
quences of health notification laws.88

Some analysts contend that all right-to-know compliance costs
cannot be estimated adequately. Questions have arisen concerning
additional foreseeable costs not outlined by the OSHA studies prior
to the enactment of the Hazard Communication Standard. An ex­
ample of one conjectured cost lies in the compiling of lists for com­
pliance. There appears to be no ready-made list appropriate for
compliance to the average right-to-know law. The task of compiling
the list is extremely complex and time-consuming, and the idea of a
simple listing is not possible in the short run, or possibly even the

law, thus not allowing rewards to those companies that provide the most complete information.

Id.

85 Sands, Newby & Greenberg, Labeling of Health Risk in Industrial Populations, 17 JOB
SCIENCE 359 (1981); Haynes & Sackett, Increased Absenteeism From Work After Detection
86 Haynes & Sackett, supra note 85, at 41.
87 Schulte & Ringen, Notification of Workers at High Risk: An Emerging Public Health
88 Id. at 490.
long run. Part of the expenditures for compliance to right-to-know laws and regulations comes in the addition of new employees to handle required paperwork. Such expenses, though not yet estimated, continue to be costs associated with compliance.

In addition to the direct costs of compliance there are important indirect costs associated with right-to-know laws. Enforcement is difficult and often expensive. Even routine scheduled inspection by administrative officials will not be cost-free. Protection of trade secrets will pose significant costs to some industries. Requiring companies to divulge information regarding processes and chemical ingredients runs the risk that competitors will appropriate valuable trade secrets. Although most right-to-know laws have some protection for companies in this regard, the cost to any given company resulting from the loss of a trade secret would be difficult to estimate. Additionally, under OSHA regulations, special medical examinations (including genetic testing) must be performed when workers are exposed to certain regulated toxins. Still another cost concerning
information to employees would be a demand by workers for higher wages or safer working conditions. These costs are dependent upon the present industry wage and safety standards and the increases that result from effects of right-to-know laws.\textsuperscript{96}

Industry will not bear the ultimate compliance costs of right-to-know laws alone. Rather, industries will offset additional financial burdens of compliance by passing costs on to consumers.\textsuperscript{97} However, no matter who bears the ultimate burden of these costs, the primary beneficiaries of compliance to right-to-know laws are the workers themselves. The legislatures, in weighing the program's costs and benefits have set policies based on the assumption that right-to-know type information will assist workers in their decisionmaking about working around or near hazardous chemicals. Whether this assumption is correct, however, is a major point of controversy. If the underlying assumption is false concerning the assistance this kind of information will give to workers in assessing work-related risks, the policy-making suppositions are unfulfilled. The end result is that the programs incur huge costs without realizing effective benefits that policymakers want to achieve.

employee in a situation where exposure would take place. The OSHA regulations, however, do not specify the specific genetic factors to be examined. As a result, the employer and examining physician must determine which genetic traits are appropriate for testing. A 1982 survey of Fortune 500 companies indicated that some companies already used genetic screening programs and that almost one in seven considered using genetic screening in the future—either in the form of cytogenetic testing (which looks for the number of damaged or broken chromosomes in somatic cells) or in the form of genetic screening (which searches for specific genetic traits in workers that indicate a genetically based significantly greater risk than average of occupational disease from job exposure).

Because of the worker right-to-know mandate, courts may find that chemical suppliers and employers have a duty to warn workers of hypersusceptibility due to genetic traits prior to worker exposure. The problem is complicated by the Rehabilitation Act, 29 U.S.C. § 794 (1973), and Title VII which arguably bars employers from refusing work to an applicant or dismissing an employee due to genetic factors discussed in OSHA required examinations or other industry related medical testing. The result is that it may be impossible to remove the hypersusceptible worker from exposure if the worker, in fact, insists on his right to work in an environment that gives the worker an increased risk from exposure. The potential costs, then, of litigation due to exposure make some industries fearful, since they have in a sense, given the worker information that will aid in the industry's future liability. This phenomenon is compounded by the present workers' compensation and occupational disease laws which prevent the assumption of risk defense by the employer. The doctrine of comparative negligence may also act as an impediment to the assumption of risk defense by chemical manufacturer suppliers. For a general discussion of the problems with the competing regulations, see Genetic Testing's Conflict with Discrimination Laws, 9 Nat'l L.J., Feb. 9, 1987, at 14.

\textsuperscript{96} See McGarity, supra note 27, at 38.

\textsuperscript{97} The alternative will be not to do anything despite the regulatory mandate. Katz, supra note 84.
IV. INEFFECTIVENESS OF POLICY MAKING IN THE WORKER RIGHT-TO-KNOW LAWS

In enacting worker right-to-know laws, policy makers have proffered the rationale that by providing information regarding workplace exposures to hazardous substances to workers, they will take steps to properly assess the risks of that exposure.98 Such an assessment's outcome is asserted to be twofold. First, at the economic level, workers will demand and receive a premium wage for jobs in which they incur more risk.99 Second, at the health level, workers will make rational informed choices as to whether they wish to assume the health risk by working with or near toxic chemicals.100 Unfortunately, the basis of that rationale is inaccurate.

The accumulated evidence indicates that employees are poor targets for policymaking based on proper risk assessment. Furthermore, studies demonstrate that workers do not assess risk appropriately when provided the kind of information required from worker right-to-know laws. Thus, given the inaccuracy of their underlying behavior assumption, worker right-to-know laws will merely create all the costs of compliance associated with these types of laws, with little or no likelihood of generating the anticipated benefits.

A. Employees as a Poor Target for Public Policy in the Occupational Disease Area

According to economic theory, workers, when provided with appropriate information, will demand and receive a wage premium for jobs involving more risk than alternative employment.101 In the area of occupational disease, however, this is not the case. One expert states that employees are a poor target for public policy designed to reduce the incidence of occupational disease.

First, employees have relatively poor information about workplace risks and little control over them. Most workers facing toxic exposures do not understand the risks or the manner in which their own behavior can affect those risks. Furthermore, because of the nature of the employer-employee relationship, the worker may have little control over work practices or the types of materials or safety equipment used in his plant.102

98 See supra notes 40–41 and accompanying text.
99 See supra notes 57–59 and accompanying text.
100 See supra notes 40–41.
101 See supra notes 57–59 and accompanying text.
Moreover, even when hazards are known, workers may have insufficient bargaining power to obtain wage premiums. In addition, if other employment is unavailable or limited, workers may not have the true option of quitting a "risky" job.

Policy makers' current solution is to create incentives for employers to reduce employee risk through the enactment of right-to-know laws. The principal difficulty with such laws, however, is that they shift the assessment of risk and the choice as to whether or not to take that risk fully onto the employee. This structuring of the law is based on the belief that the worker will understand and use the limited information provided from labeling containers filled with hazardous chemicals, read and comprehend the health ramifications of the Material Safety Data Sheets, and request additional information and evidence of effects of working in a toxic chemical environment. The basis for this belief is unrealistic for the average worker. In fact, employees are "a poor target" for public policy designed to reduce occupational disease.

B. Improper Assessment of Risk by Workers

The second error in policy making in the area of right-to-know laws is the assumption that, given limited information on safety data and training programs, the worker will make a rational choice regarding the assumption of the health risks associated with working near a particular toxic chemical. Studies show that this assumption


Repairmen for nuclear power plants can receive up to an equivalent of 150 chest x-rays in a three month period of radiation exposure. Williams, Ten Minutes' Work for 12 Hours Pay? What's the Catch?, Wall St. J., Oct. 12, 1983, at 1, col. 4. These individuals overlook the risks for the steady work and the wage premium. For a discussion concerning risk assumption and avoidance, see generally North, Employees' Assumption of Risk: Real or Illusory Choice?, 52 Tenn. L. Rev. 35 (1984).

105 See supra notes 101–104 and accompanying text.
106 Some industries have extensive training programs, even though they are not required to under state and federal laws. This practice leads to the conclusion that the market will create the proper environment for work safety and is already adjusting itself in some instances without the aid of legislation.
is erroneous. Workers ignore the information,107 are not rational in their decisionmaking due to personal biases and heuristics,108 and each worker may evaluate the information differently. In addition, research indicates that uniform outcomes from a given set of information may not be possible,109 and that a given set of information (such as that required under right-to-know laws) does not necessarily lead to proper risk assessment.110

Workers commonly ignore information provided to them, rendering inoperative the notion that information will lead to proper risk assessment of workplace hazards.111 The younger, more mobile workers are a group particularly likely to ignore or underestimate the risk of contracting occupational disease.112

In addition to those workers who ignore the information, some workers who receive the information will not evaluate it rationally.113 Studies show that the mere presence of knowledge does not lead to rational decisionmaking; some workers may use biased decisionmaking processes to sometimes irreversible degrees. Tversky and Kahneman are two leading experts who have researched how individuals use heuristic principles114 in decisionmaking. These experts undertook an extensive study to determine how people view uncertain events, among which may be categorized events such as toxic substance exposure in the workplace.115 In discussing the role of heuristic principles, the Tversky and Kahneman article states that:

110 See Arnould & Grabowski, Auto Safety Regulation: An Analysis of Market Failure, 12 BELL J. ECONOMICS 27 (1978).
111 See supra note 107 and accompanying text. Studies also show that information contained in advertising campaigns is unsuccessful in maximizing choice. The effectiveness of increased public information is conjecture at best. Some researchers conclude that information must be innovative in terms of presentation of probabilistic events in order to be effective. Arnould & Grabowski, supra note 110, at 45; Slovic, Fischoff & Lichtenstein, Accident Probabilities and Seat Belt Usage: A Psychological Perspective (Dec. 1977)(Eugene, Oregon: Decision Research). This kind of innovation concerning disclosure will unlikely be attained through required labeling and MSDS. Certainly the right-to-know laws have not been promulgated with the idea that knowledge given to workers must be presented in “innovative” forms.
112 See Williams, supra note 104.
113 See supra note 108 and accompanying text.
114 A heuristic principle is generally defined as the methodology that provides aid or direction in problem solving which is otherwise unjustified or incapable of justification. WEBSTER'S NEW COLLEGIATE DICTIONARY (1984).
115 See Tversky & Kahneman, supra note 108.
"people rely on a limited number of heuristic principles which reduce
the complex tasks of assessing probabilities and predicting values to
simpler judgmental operations." \cite{116} These heuristics sometimes lead
to severe and systematic errors. \cite{117} Biases are also found in the
intuitive judgment of probability. \cite{118} These biases often interfere with
rational decisionmaking. \cite{119}

Individuals err in decisionmaking through the use of stereotypes
or representativeness as general truths which may or may not in
fact be accurate assessments of probable outcomes. \cite{120} As a conse­
quence, individuals create an insensitivity to prior probable out­
comes. For example, if the individual has seen (inaccurately) a prior
probability of outcome based on reported frequency to that individ­
ual, then he or she may generalize as to future probable outcomes
inaccurately. \cite{121}

The use of statistical data does not aid in accurate decisionmaking
either. The information often given on MSDS and other recorded
information is statistical in nature, showing the ratio between toxic
exposure and likelihood of injury. However, the fundamental notion
of statistics is not a part of individuals' intuitive processes through
which they make decisions regarding risk. \cite{122} When the result is an
underestimation of impact of evidence it is labeled "conservatism." \cite{123}
Furthermore, the Tversky-Kahneman study shows that individuals
have misconceptions with regard to chance, \cite{124} and are insensitive to,
or show little or no consideration for, predictability. \cite{125} Often there
is unwarranted confidence derived from limited information (such as
MSDS data sheets). If the new information received is consistent
with a pattern or process (though erroneous) that an individual uses

\footnotesize
\begin{itemize}
    \item \cite{116} Id. at 1124.
    \item \cite{117} Id.
    \item \cite{118} Id.
    \item \cite{119} Id.
    \item \cite{120} See generally id. at 1124–31.
    \item \cite{121} See id. at 1125. If, for instance, the individual has not seen resulting harms from past
worker exposure, then he may generalize that there will not be any future resulting harms.
This becomes important when recognized in relation to the latency issue in chemical exposure.
The individual may indeed not have seen prior probability of harms to past workers exposed
to toxics because the injury is latent. See generally id.
    \item \cite{122} See id. at 1125.
    \item \cite{123} The limited ability of individuals to capably attend to rare events is called by some
theorists "bounded rationality." H. Simon, MODELS OF MAN (1957); Arnould & Grabowski,
supra note 110, at 35.
    \item \cite{124} Tversky & Kahneman, supra note 108, at 1125–26.
    \item \cite{125} "Several studies of numerical prediction have demonstrated that . . . subjects show little
or no regard for considerations of predictability." Id. at 1126.
\end{itemize}
to assess a probable outcome of an existing event, the individual will "lock" onto the existing pattern or process with little analysis of external differences in the subject matter. Tversky and Kahneman refer to these occurrences as aiding in the "illusion of validity." 126

In relation to assessment of probabilities, a study by other experts indicates that individuals are insensitive to those events capable of causing serious injury or death that have very low probabilities of occurrence. 127 Furthermore, studies indicate that even where the perceived probabilities of an injury or death resulting from a given occurrence is relatively high, 128 individuals underestimate the probabilities of their own risk and overestimate their ability to personally control the hazardous situation. 129

Still, there are those individuals who ignore probabilities altogether in spite of available information. Instead, they base the probability of an outcome on the instances or occurrences which can be "brought to mind," or the available recollection or imagination that an individual may possess on a given subject. 130 If the individual bases an assessment of an event's frequency of occurrence on one's "available" recollection or imagination, the individual will ignore relevant factors that will influence probability. This is highlighted by the fact that severe losses occur with relatively low frequency. As a result, individuals may not appreciate fully or not even want to consider the consequences of certain behavior and will ignore protective measures they may take to reduce or eliminate potential losses. 131 Analogously, individuals may assess the risk of occupational disease among their coworkers by recalling such occurrences among acquaintances. This does not account for the factor of latency, that

126 Id.
127 Arnould & Grabowski, supra note 110, at 29. This hypothesis was tested in relation to seat belt usage where there are very low absolute probabilities (around $10^{-4}$ and $10^{-5}$) of the expected reduction in annual risk from wearing seat belts. Id. at 31.
128 This "perceived" probability was taken from responses to questionnaires concerning the likelihood of the respondent to be involved in an automobile accident. The probabilities assessed by the majority of respondents was one in 100 or greater, with 23% choosing 1 in 10. This leads to the conclusion that the average respondent did not understand the statistical ramifications of his or her response. Id. See supra note 121 and accompanying text discussing inaccuracies in decisionmaking based on statistical data.
129 Arnould & Grabowski, supra note 110, at 34.
130 "For example, one may assess the risk of heart attack among middle-aged people by recalling such occurrences among one's acquaintances." Tversky & Kahneman, supra note 108, at 1127.
131 The collection of detailed information that is understandable by the individual enhances the problem. Kunreuther, Limited Knowledge and Insurance Protection, 24 PUB. POL'

(227 (Spring 1976).
workers are mobile and the individual may not witness the onset of the disease, and that the individual is not acquainted with all individuals who were potentially exposed to the toxic chemical within the workplace.

Another error in risk assessment may result from an oversensitivity to the probability of a given outcome that is not rational—that is, the worker will over-assess risk and deny himself employment. This may occur when a salient event has an impact upon the individual. 132 If the event is salient, people place a higher probability on the likelihood of its occurrence. 133 Imaginability can also play an important role in distorting one's assessment of the probability of an outcome. Some individuals are simply more imaginative than others, constructing instances of frequency of outcome that do not always reflect actual frequencies. 134 The problem with imaginability is that it may cause gross errors in risk assessment in either direction:

Imaginability plays an important role in the evaluation of probabilities in real-life situations. The risk involved in an adventurous expedition, for example, is evaluated by imagining contingencies with which the expedition is not equipped to cope. . . . Conversely, the risk involved in an undertaking may be grossly underestimated if some possible dangers are either difficult to conceive of or simply do not come to mind. 135

Clearly, imaginability could affect adversely the assessment of probabilities associated with toxic risks, as individuals may receive limited information and either imagine and/or ignore probable outcomes.

Inaccurate assessments of risky events may also occur when an individual makes a false assumption based on a correlation between two or more events, one of which is the risky event. 136 For example, a worker may understand that there are toxic chemicals in the workplace that may result in harm upon exposure. This worker also understands that right-to-know laws require the employer to inform him or her of such chemicals' content and toxicity and provide MSDS sheets for study and analysis. Training programs tell the worker to undertake appropriate precautions in using and handling the chem-

132 Tversky & Kahneman, supra note 108, at 1127.
133 Id. An example is seen in the subjective (not objective) belief that there is a higher probability of a traffic accident which arises temporarily when one sees a car overturned by the side of the road. There is, of course, no higher probability at that point. Id.
134 Id. at 1128.
135 Id.
136 Id.
icals. As a result, the worker may create an illusory correlation between the right-to-know training and workplace safety, thereby underestimating the risks of working in the environment. 137 Tversky and Kahneman conclude:

Lifelong experience has taught us that, in general, instances of large classes are recalled better and faster than instances of less frequent classes; that likely occurrences are easier to imagine than unlikely ones; and that the associative connections between the events are strengthened when the events frequently co-occur. As a result, man has at his disposal a procedure (the availability heuristic) for estimating the numerosity of a class, the likelihood of an event, or the frequency of co-occurrences, by the ease with which the relevant mental operations of retrieval, construction, or association can be performed. However, as the preceding examples have demonstrated, this valuable estimation procedure results in systematic errors. 138

There are other approaches to decisionmaking that create inaccuracies in assessing risk. Individuals often make incomplete computations and do not start off at the proper point to assess information. 139 Furthermore, individuals have biases in evaluating conjunctive and disjunctive events. 140 In addition naive or unsophisticated individuals may base their confidences on a narrow set of knowledge or information and categorize new information in the already established means of assessment. This common phenomenon is called “anchoring.” 141 The result may be that upon receiving new information, instead of evaluating the probability or possible effects of toxic exposure in the workplace properly, workers may “anchor” in their present assessment of risk, and merely add the new infor-

137 "The judgment of how frequently two events co-occur could be based on the strength of the associative bond between them. When the association is strong, one is likely to conclude that the events have been frequently paired." Id. A contextual example would be the compliance with right-to-know laws and safety in the workplace.

138 Id. at 1128. This concept is expanded in a later study by the same researchers. Tversky & Kahneman, Availability: A Heuristic for Judging Frequency and Probability, 5 COGNITIVE PSYCHOLOGY 207 (1973). They discuss “availability,” in which individuals “compare the essential features of the event to those of the structure from which it originates. In this manner one estimates probability by assessing similarity or connotative distance.” Id. The availability heuristic uses strength of association as a basis for judging the frequency of occurrence of a given outcome of incidence. Id. The researchers expand on the factors which effect this notion in decisionmaking. Id.

139 Tversky and Kahneman call this insufficient adjustment. Tversky & Kahneman, supra note 108, at 1128.

140 Id. at 1128–29.

141 Id. at 1129.
information to their properly or improperly preconceived assessments of the risk.

Although some of the tendencies and biases occur more frequently with the naive and unsophisticated, laymen and researchers alike make errors in relying on heuristics and biases. These phenomena occur in such intuitive judgments as, "Am I harmed by this chemical? Can I get a job elsewhere? Is there immediate or long run danger by working in a given workplace?"

The study by Tversky and Kahneman leads to the conclusion that the probability's inherently subjective nature will lead many individuals to assess the risks improperly based on a given set of information. Since there are systematic and predictable errors that most people make in their risk assessment, a policy directive requiring employers to inform the worker of occupational risks through disclosure under right-to-know laws will have a minimal impact. The result is the creation of a costly regulatory scheme that is incapable of fulfilling its intended purposes.

Other studies have undertaken a simpler approach in evaluating improper risk assessment. It may be, for instance, that each worker may evaluate information differently, and that in fact each worker may not be affected by an exposure in the same way. Even though information may be consistent, in reality there may not be uniformity in actual outcomes. For instance, cancer susceptibility differs among individuals. The information given by most right-to-know laws does not reveal these differences explicitly. Whether the de-

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142 See supra notes 107, 108, 111, 112 and accompanying text.
143 "The reliance on heuristics and the prevalence of biases are not restricted to laymen. Experienced researchers are also prone to the same biases—when they think intuitively." Tversky & Kahneman, supra note 108, at 1130.
144 See supra notes 102–104 and accompanying text.
145 The only validity to such a policy is the moral conviction that workers have the "RIGHT" to know. But the understanding must follow that this right may have no legitimate effect on an individual's assessment of risk. Thus, even the moral implications may be subject to new analysis.
146 For a general discussion concerning risk of high-level and low-level exposure to certain individuals, see supra note 109, at 712.
148 See Cancer Susceptibility, supra note 109.
termination of significance is accurate is often based on the worker’s experience.\textsuperscript{149} For instance, the most powerful determinant in a worker’s assessment of risk is the worker’s own injury experience.\textsuperscript{150} This anecdotal approach to risk assessment is laden with inaccuracies in assessing probabilities of future injury.\textsuperscript{151}

Finally, the hope that individuals will act rationally given important information is not realistic. For instance, studies prove that seat belts are highly effective in preventing injuries and death.\textsuperscript{152} Despite these findings, statistics show that when given the choice, individuals use seatbelts only between 10 and 20 percent of the time.\textsuperscript{153} The traditional assumption made by both economists and policy makers is that if individuals and firms have sufficient (perfect) information concerning the probability distribution of personal injuries, and if there are no externalities, competitive market forces will lead to optimal protective choices.\textsuperscript{154} The problems with the right-to-know laws are that information is not sufficient,\textsuperscript{155} that there are many externalities within the market, and that the behavior assumption of rational decisionmaking does not hold.\textsuperscript{156} In addition, in the case of latent chronic diseases, risk evaluation becomes even more difficult:

\textsuperscript{149} For instance, the risk of cancer which may be created by environmental factors is dose related. Although one may generate data demonstrating the significance of the risk based on high levels of exposure, it is more difficult to estimate the risk at low levels of exposure, since it requires the extrapolation from the data obtained at higher exposure levels. As a result these extrapolations may be unreliable. See W. Lowrance, supra note 147, at 38–39. See also McGarity, Substantive and Procedural Discretion in Administrative Resolution of Science Policy Questions: Regulating Carcinogens in EPA and OSHA, 67 GEO. L.J. 729, 735 n.27 (1979).

\textsuperscript{150} W. Viscusi, Risk by Choice 65 (1983).

\textsuperscript{151} Id. at 66. An even more interesting phenomenon is that one-third of all workers who had experienced previous injuries did not view their jobs as hazardous. Viscusi concludes that the “aberrational result” appears to center on illnesses and injuries that occurred on the job but were not “an intrinsic part of it.” Id. at 65. Tversky and Kahneman would most likely analyze the phenomenon in relation to heuristic biases. See supra notes 106–144 and accompanying text.

\textsuperscript{152} See Arnould & Grabowski, supra note 110.

\textsuperscript{153} Robertson, Estimates of Motor Vehicle Seat Belt Effectiveness and Use, 66 Amer. J. Pub. Health 859, 861 (1976). A report by the Department of Transportation indicates that the mean safety belt usage rate was 14.1% in 1978. This phenomenon is referred to as a classic example of market failure, and led to moves toward regulations which required new cars to be equipped with passive restraint systems. Arnould & Grabowski, supra note 110, at 28.

\textsuperscript{154} Oi, The Economics of Product Safety, 4 Bell J. Econ. & Mgmt. Sci. 3 (1973).

\textsuperscript{155} See supra notes 105–106 (discussion regarding limited information required to be disclosed by right-to-know laws).

\textsuperscript{156} See supra notes 145–53 and accompanying text (discussion regarding how different people will be affected differently by cancer risks, and that individuals are not always rational in their decisionmaking).
For many chronic diseases, it may be difficult for a worker to make any reliable causal inferences that would improve future job decisions. One cannot be confident of the efficiency of... [the] learning process until one first ascertains whether [the] learning will occur and, if it does, whether it will enable those now incurring the hazards to make sounder job decisions.157

Empirical evidence has established that in this kind of decisionmaking, individuals will likely err on the side of too little, rather than too much, protection.158 This raises serious doubts about laws that assume that workers will make rational decisions in considering means to protect themselves from risks of harm. Further, empirical studies demonstrate that increased levels of protection create negative externalities—that is, individuals will view their environment as being safer than it really is, and therefore feel less need to take actions necessary to protect themselves adequately.159

Along these lines, studies show that increasing the use of safety information and protection often will work to increase accidents.160 These studies also analyzed public information programs and their effects on decisionmaking in relation to their abilities to change behavioral patterns. Advertising campaigns, for instance, encouraging the use and safety of seat belts were unsuccessful in changing patterns of behavior that would decrease the risk of accidents.161

These studies establish clearly that right-to-know legislation targeted at workers is a poor conduit for managing occupational disease; that individuals do not make rational assessments of risk based on information they receive; and that investments in safety and safety precautions may in fact result in decreased rather than increased safety oriented behavior by individuals.

157 W. VISCUSI, supra note 150, at 64.
158 See supra notes 112, 122, 127–29 and accompanying text.
159 "There is a growing literature, drawn from a variety of actual and experimental situations, which indicates that when probabilities drop to very low values, many individuals become insensitive to large potential losses from an unprotected outcome. Instead, their behavior is governed mainly by the unlikelihood of the event's occurrence." Arnould & Grabowski, supra note 110, at 29. See also Thaler, Toward A Positive Theory of Consumer Behavior (1978) (unpublished manuscript); Tversky & Kahneman, supra note 108.
160 For example, increased use of seat belts tends to be a disincentive to safe driving and thereby increases the likelihood of accidents and injuries to others not similarly protected, such as pedestrians. The evidence is subject to differing interpretations, but the occurrence of this phenomenon does have its logic. Nelson, Comments on Peltzman's Paper on Automobile Safety Regulation, in AUTO SAFETY REGULATION 63–70 (H. Manne & R. Miller eds. 1976); MacAvoy, The Regulations of Accidents, in AUTO SAFETY REGULATION 83–89 (H. Manne & R. Miller eds. 1976); Arnould & Grabowski, supra note 110, at 30.
161 See generally Arnould & Grabowski, supra note 110, at 30; Slovic, Fischhoff & Lichtenstein, supra note 111.
C. Economic Inefficiencies of Right-to-Know Laws

The political community's expectation is that the passage of any law will create some increased marketplace efficiency. However, in the case of right-to-know laws, not only will they be ineffective in relation to the legislative policy goals, but they also will create economic inefficiencies. When analyzing the inefficiencies of the statutes, economists focus on marketplace reactions to right-to-know laws. 162 The notion is that the market will adjust when new and relevant information becomes available. The mere passage of laws, however, does not necessarily hasten or perfect that availability. "Once the information is disclosed, then rest assured that the marketplace will, in due course, make the necessary economic adjustments, and in this way the total overall utility of the community will be optimized." 163 The argument is that as the market is apprised, it will adjust. In the case of hazardous workplaces, workers informed of the employment risks will seek a market adjustment in the form of increased wages in compensation for taking those risks.

In the area of latent hazards, however, the market is constrained from making such adjustments. This is due to the fact that the latency factor inhibits the flow of information into the marketplace. Where information is either not available or slow in coming forth, proper evaluation is constrained. In analyzing the problem in terms of risk assessment, Tversky and Kahneman go one step further and indicate that workers will not fully assess hazards, since they will not assess information "perfectly" even if the information provided were "perfect." 164 As a consequence, the marketplace does not reflect hazardous workplace risks, and worker right-to-know laws will not enhance market efficiency.

V. THE MORAL AND ETHICAL MANDATE OF RIGHT-TO-KNOW LAWS

Despite the ineffectiveness of right-to-know laws, some proponents assert that these laws should remain in place as a moral or ethical legislative mandate to industry. The rationale is that industry should want to provide workers with sufficient information to make an informed choice as to whether to work or not to work in a given

162 See C. Wang, Nat'l Inst. of Safety & Health, Testimony before Cincinnati City Council hearings regarding passage of Cincinnati's right-to-know law (Feb. 17, 1982).

163 Id. (emphasis added).

164 See Tversky & Kahneman, supra note 138.
occupational environment, and to protect the worker's decision-making process. This mandate, however, already exists in other laws. Both the Labor Management Relations Act and the National Labor Relations Act, for example, protect workers in this manner. Section 502 of the Labor Management Relations Act states:

Nothing in this Chapter shall be construed to require an individual employee to render labor or service without his consent, nor shall anything in this Act be construed to make the quitting of his labor by an individual employee an illegal act; nor shall any court issue any process to compel the performance by an individual employee of such labor or service without his consent; nor shall the quitting of labor by an employee or employees in good faith because of abnormally dangerous conditions for work at the place of employment of such employee or employees be deemed a strike under this Chapter.

In addition, Section 7 of the National Labor Relations Act protects acts by employees who respond to perceived concerns over health and safety in the workplace through the right "to self organization, to form, join, or assist labor organizations, to bargain collectively ... and to engage in other concerted activities ... [for the purpose of] mutual aid and protection." The Supreme Court expanded on these rights in the \textit{NLRB v. Washington Aluminum Co.} The Court stated that the concerted activities by the employees for the purpose of trying to protect themselves from adverse conditions in the workplace were unquestionably activities initiated in an effort to correct conditions that modern labor management legislation treats as intolerable in a "humane and civilized society like ours."

Policymaking is sometimes premised on moral and ethical considerations. In addition, the concern for morals and ethics in corporate decisionmaking is a popular point of discussion concerning corporate

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165 The common law gives workers the right to be protected from workplace hazards and to be apprised of latent or concealed dangers. See infra notes 173–211 and accompanying text.
169 This section applies to both union and nonunion workers.
171 370 U.S. 9 (1962). Nonunion members refused to work in a machine shop which was too cold. \textit{Id.} These minimal protections add credence to the concept that such protections as those against working near or around hazardous conditions will fall within the parameters of the \textit{NLRA}.
policies that affect worker health and general welfare. Although such moral and ethical considerations are laudable, duplication of efforts either by the legislature or the industry to the point of inefficiency is unnecessary. The worker right-to-know laws represent such a duplication of effort based on ethical considerations. The moral and ethical mandate to allow workers to choose their work environment has existed prior to the passage of right-to-know laws. The right-to-know laws expensively and unnecessarily duplicate an existing mandate, and add nothing to the total welfare of the worker.

VI. INEFFECTIVENESS OF TORT LAW AND STATE WORKERS’ COMPENSATION SYSTEMS

Despite the presence of any right-to-know legislation, employees must still find a means to be compensated for occupational disease injuries. Prior to the enactment of right-to-know laws, employees have relied on the common law right to work in a reasonably safe workplace,173 to be assessed of discoverable concealed or latent dangers within the workplace by their employers, and to be given damages resulting from an employer’s failure in these duties.174 The general requirement that employers make dangerous conditions known to employees enhanced these common law rights in the workplace.175 Employees’ rights to be informed were extended to encompass occupational diseases, with employers having the duty to warn of discoverable dangers of occupational disease risks.176 This duty to

\[\text{\footnotesize 173 See, e.g., Brown v. Sharp-Hauser Contracting Company, 159 Cal. 89, 112 P. 874 (1910) (employer held liable for failure to prevent a cave-in); Foreman v. Dorsey Trailers, Inc., 256 Ala. 253, 54 So.2d 499 (1951) (employer liable for failure to provide proper ventilation which caused plaintiff's lead poisoning); Nichols v. Harvey Hubbell, Inc., 92 Conn. 611, 103 A. 885 (1918) (employer liable for negligent design of a structure in which plaintiff worked).}\]

\[\text{\footnotesize 174 See, e.g., Fort Smith & W.R.R. v. Holcombe, 59 Okla. 54, 158 P. 633 (1916) (employer duty to discover defects in tools used at work site); Rio Grande S.R.R. v. Campbell, 65 Colo. 217, 176 P. 275 (1918) (employer duty to discover tool defects); Lemon v. Lonker, 97 Pa. Super. 240 (1929) (employer duty to warn of a defective stepladder that servant would otherwise not know was defective).}\]

\[\text{\footnotesize 175 See, e.g., Clayton v. Ainsworth, 122 N.J.L. 160, 4 A.2d 274 (1939) (employer failed to warn of the danger of falling coal); Tedford v. L. A. Elec. Co., 134 Cal. 76, 66 P. 76 (1901) (employer negligent for failure to warn of the danger of handling wires); Hume v. Fort Halifax Power Co., 106 Me. 78, 75 A. 300 (1909) (employer liable in negligence action for failure to warn of the risk of a rockslide at a construction site).}\]

\[\text{\footnotesize In addition to common law rights of employees, statutory attempts have been made to notify workers of chronic disease risk. The history of previous statutory notification efforts will not be covered in this Article, but may be found in Schulte & Ringen, supra note 87, at 485–90.}\]

\[\text{\footnotesize 176 See, e.g., Davis v. N. J. Zinc Co., 116 N.J.L. 103, 182 A. 850 (1936) (employer negligent for failure to warn and protect employee from dangerous condition caused by manganese.}\]
warn also requires the employer to know about the characteristics of substances used in the workplace and to have a scientific understanding of the risks involved in using such substances. Injured employees have used the common law tort of negligence as well as the tort of "failure to warn" in occupational disease cases to compensate workers' injuries.

The emergence of workers' compensation laws has, in many instances, taken the place of the common law tort system as an avenue for relief for plaintiffs. Barriers to workers' compensation claims, however, are inherent in the workers' compensation system, especially in regard to latent occupational disease. Studies have concluded that the present workers' compensation systems largely compensate only those injured by traumatic injury, but not those

poisoning); Galeota v. United States Gypsum Co., 123 F.2d 947 (2d Cir. 1941), cert. denied, 315 U.S. 813 (1942) (employer duty to instruct worker that inhalation of silica dust might result in serious harm); Wiseman v. Carter White Lead Co., 100 Neb. 584, 160 N.W. 985 (1916) (providing an employee with a mask in order to minimize danger did not fulfill employer's duty to warn); Pigeon v. W.P. Fuller & Co., 156 Cal. 691, 105 P. 976 (1909) (employer required to warn of possibility of lead poisoning due to inhalation of fumes). See also Bohlen, The Common Law Right of Action for Occupational Disease in Pennsylvania, 63 U. PA. L. REV. 183 (1915) (discussion concerning the employer's duty to warn of risk of occupational disease if employer's knowledge is greater than employee's expected knowledge of risks in the workplace); Occupational Health Risks, supra note 50, at 1803-05 (general discussion of common law duties placed on employers concerning occupational disease). See also Schroeder & Shapiro, supra note 107, at 1250-56.


178 Annotation, Liability of Employer at Common Law, or Apart from Workmen's Compensation or Specific Occupational Diseases Statutes, for Occupational Disease Contracted By Employee, 105 A.L.R. 80, 96 (1936).

179 However, common law rights to safe working conditions sometimes exist in addition to the mandates of the Occupational Safety and Health Act. Relying on section 4(b)(4) of the Occupational Safety and Health Act, 29 U.S.C. § 653(b)(4) (1976), the New Jersey court held that OSHA did not preempt state legislative or judicial action concerning occupational safety and health in the workplace. The relevant statute states:

Nothing in this chapter shall be construed to supersede or in any manner affect any workmen's compensation law or to enlarge or diminish or affect in any other manner the common law or statutory rights, duties, or liabilities of employers and employees under any law with respect to injuries, diseases, or death of employees arising out of, or in the course of, employment.

suffering from latent occupational disease injuries. The system cannot cope with issues of latency, multiple causation, and the like.\textsuperscript{180} Several reports have analyzed barriers to recovery under workers' compensation systems.\textsuperscript{181} In nearly 40 states, the compensation of an "injury is attached to the 'by accident' requirement."\textsuperscript{182} For latent occupational disease victims, the disease’s onset will not be a sudden, unexpected and unforeseen event, which would allow compensation under the accident requirement. Furthermore, compensation laws do not compensate for every disease; worker's compensation laws cover only those injuries suffered in the workplace.\textsuperscript{183} Because the state workers' compensation systems necessitate protection against claim excesses and funding coverage, barriers have been placed within the systems to bar compensation of latent diseases requiring large awards.\textsuperscript{184} Among these barriers are:

1. The statutes' definitions restrict the compensation of occupational diseases. One example of such a restriction is found in the requirement that the compensable disease be "peculiar to" the employee's trade or employment. Other examples are the exclusions from compensation of "ordinary diseases of life," or diseases to which the general public is exposed, and diseases that are beyond the usual hazards of employment.
2. Statutes require that the disease must manifest itself, create disability or be contracted within a given period after the last injurious exposure or the last day of work of the employee. Similar limitations occur in compensable death cases. (See Table 4.)
3. The time limits in which an injured worker may make a claim create problems with uniformity of compensation. Different states have different time limits within which a worker's claim may be filed. Such a filing will, in many cases, be closely related to the time in which the disease manifests itself. (See Table 4.)
4. Many states bar occupational disease claims unless there is proof that the exposure to a hazard in the workplace occurred over some specified amount of time.\textsuperscript{185}

\textsuperscript{180} See infra note 211.
\textsuperscript{181} See, e.g., CRUM & FORSTER'S OCCUPATIONAL DISEASE TASK FORCE, ROLE OF THE STATE WORKER'S COMPENSATION SYSTEM IN COMPENSATING OCCUPATIONAL DISEASE VICTIMS (June 1983) [hereinafter CRUM & FORSTER]; U.S. CHAMBER OF COMMERCE, ANALYSIS OF WORKERS' COMPENSATION LAWS (1985). See infra Table 4.
\textsuperscript{182} CRUM & FORSTER, supra note 181, at 25.
\textsuperscript{183} Id. at 26.
\textsuperscript{184} Id. at 27.
\textsuperscript{185} For example, Idaho and Maine bar claims of workers who have been employed less than sixty days with the company where the disease was contracted. Some states, such as Georgia, Iowa, Kansas and Utah, require that in silicosis and/or asbestos claims, the worker must prove exposure for a substantial period of time, usually 5 years. In Louisiana, the law
5. Many states have a "recent exposure" rule. This rule bars claims for diseases caused by exposure to hazards by claimants more than a specified number of years earlier.\textsuperscript{186}

6. Difficulties arise when the female applicant is pregnant. The child born of such an applicant is not covered by workers' compensation laws.\textsuperscript{187}

7. Several states specify a minimum time in which the worker must have been employed within the state. During that period the worker must also have been exposed to the workplace hazard allegedly responsible for the manifested (or manifesting) injury.\textsuperscript{188}

8. The system's notification requirement creates a procedural barrier for many claimants. States usually require that the injured worker notify his employer of any claim within a specified period of time. If the notification is not carried out effectively, the claim is barred.\textsuperscript{189}

In addition to the substantive barriers of workers' compensation systems, these systems often create limitations on applicants by precluding any tort remedies outside the system.\textsuperscript{190} While there are increasing examples where courts are allowing remedies outside a worker compensation claim,\textsuperscript{191} the basic limitation to these systems

\textsuperscript{186} Crum and Forster's Occupational Disease Task Force Report states that many of these rules are aimed at silicosis and asbestosis claims, although they may apply to other diseases. CRUM \& FORSTER, supra note 181, at 28. For instance, in the cases of silicosis and asbestosis, there is a requirement by many statutes of a combination of "minimum and recent exposure rules." Id. at 28. An example would be that a minimum exposure took place at least five out of the past ten years. Id.

\textsuperscript{187} Neither is the child covered by occupational disease laws. See McConnell, Genetic Testing's Conflict with Discrimination Laws, 9 Nat'l L.J. 14 (1987).

\textsuperscript{188} For example, in Utah a person claiming compensation for silicosis must have worked within the state for at least five years. UTAH CODE ANN. § 78-15-3 (1953).

\textsuperscript{189} For a discussion concerning barriers to compensation under state tort systems, see CRUM \& FORSTER, supra note 181, at 21-29.

\textsuperscript{190} Workers' compensation statutes usually are formulated as the worker's exclusive remedy against the employer for injuries sustained in the workplace. See Weisgall, Product Liability in the Workplace: The Effects of Workers' Compensation on the Rights and Liabilities of Third Parties, 1977 Wis. L. REV. 1035, 1039. Worker compensation statutes provide that "[t]he compensation remedy is exclusive of all other remedies by the employee or his dependents against the employer and insurance carrier for the same injury if the injury falls within the coverage formula of the Act." 2A A. LARSON, WORKMEN'S COMPENSATION LAW § 65.00 (1976).

\textsuperscript{191} Because workers' compensation systems are generally ineffective and inefficient in providing full compensation for occupational health injuries, some courts have held that state workers' compensation laws did not preclude injunctive relief by plaintiffs. See Shimp v. N.J. Bell Tel. Co., 145 N.J. Super. 516, 524, 368 A.2d 408, 412 (1976). See also Schroeder \& Shapiro, supra note 107.

In Johns-Manville Prods. Corp. v. Superior Court of Contra Costa, 27 Cal.3d 465, 612 P.2d
still remains an underlying barrier to full relief for an injured employee.\textsuperscript{192}

In states that do not preclude tort claims under a workers’ compensation system, injured employees are still constrained from receiving adequate compensation. Generally speaking, workers’ compensation and common law tort remedies rarely compensate adequately for disabilities that occur as a result of occupational disease, especially in the case of latent injuries. For instance, it is estimated that only five percent of workers severely disabled by an occupational disease receive workers’ compensation.\textsuperscript{193}

There are several fundamental reasons for this failure of workers’ compensation and state tort systems. First, many workers are (rationally) ignorant about the causal relationship between exposure in the workplace and latent illness.\textsuperscript{194} Second, the employer may be protected from tort actions through the exclusive remedy provided by workers’ compensation systems.\textsuperscript{195} Furthermore, even if there is no recovery under a given workers’ compensation claim, exclusivity may apply.\textsuperscript{196}

Third, state statutes of limitations create specific time frames in which the employee must initiate an action. Theoretically, the statutes of limitations run from the time the cause of action “accrues.” However, in a latent injury case, where a substantial period of time will elapse between exposure to a hazardous substance and injury

\textsuperscript{192}See generally Viscusi, supra note 59, at 62–65.

\textsuperscript{193}INTERIM REPORT, supra note 5, at 411–16; PRESIDENT’S REPORT, supra note 2, at 111.

\textsuperscript{194}I. SELIKOFF, DISABILITY COMPENSATION FOR ASBESTOS-ASSOCIATED DISEASE IN THE UNITED STATES 577 (1981). The study found that only 16% of eligible survivors filed third-party tort suits on behalf of relatives who died from asbestos exposures. Id.

\textsuperscript{195}See Schroeder & Shapiro, supra note 107, at 1251.

manifestation, the determination of "accrual" of the action may prove difficult. Defining the time the action "accrues" has been a subject of differing opinion by state courts. Some states use the "last exposure rule," which dictates that the cause accrues at the time the last exposure to the harmful substance took place. The majority of states are turning to the use of the "discovery rule," which provides that the statute of limitations begins to run when the injured party knows or reasonably should have known of the injury. However, other states use the formula that the statute begins to run when the plaintiff knew or should have known that injury existed, while still other courts hold that the cause of action accrues when there is a manifestation of the disease. Statutes of limitations, therefore, can present a substantive barrier to employee compensation, depending on a given court's interpretation. Certainly, the differing state interpretations placed on the use of statutes of limitations create a lack of uniformity in compensation under existing laws.

A fourth reason for the ineffectiveness of the present compensation systems is plaintiffs' difficulty in meeting the burden of proof in occupational disease cases. Plaintiffs often have difficulty in proving a direct causal connection between the hazardous substance in the workplace and the injury or disease. This is especially true where

198 Also called the "occurrence" rule by some courts.
202 Statistical information concerning the number of occupational disease claims contested by industry indicates the difficulty of establishing a causal connection between exposure and resulting injury. Only 10% of accident claims are contested, while 60% of all occupational disease claims and 90% of dust disease claims are contested. INTERIM REPORT, supra note 5, at 69. The large majority of contested cases base defenses on the issue of causality. Id.
In a report by the National Medical Advisory Service, it was stated:
Inferences about the relationship between causal factors and human disease are the result of a composite of laboratory and human data. Animal (and in some cases bacteriological) data provide preliminary inferences. Human epidemiological data, particularly high quality studies, such as randomized, controlled, prospective studies or observational cohort studies and last, and least effective (commonly used studies today), the case controlled studies are essential. When statistical correlations are
the injury is latent and where evidence in such cases often involves the very frontiers of science. Further, the causal connection issue is difficult when the workplace exposure is only one of several exposures having the potential for causing the injury. Substantive medical evidence that will create a "probable" causal connection between exposure and injury is often viewed differently (if viewed at all) by different courts. The manufacturer-defendant's "state of the art" defense makes a plaintiff's burden of proof more onerous. This defense allows the defendant to assert that the most appropriate means of handling and using the hazardous substance were undertaken during the time period in question. The defendant is then relieved of liability despite later scientific evidence showing the hazard to be more formidable than scientific data indicated at the time of the defendant's use.

very strong and compounding variables well-controlled, we have the best human evidence.

In occupational disease cases, even if these inferences are made, the more important question asked is whether the exposure was the actual cause of the specific injury claimed. Gots, Medical/Scientific Decision-Making In Occupational Disease Compensation, in CRUM & FORSTER, supra note 181.

In cases in which toxic exposure can cause cancer, the injury may not manifest itself until one or more decades after exposure. See generally Archer & Livingston, Environmental Carcinogenesis and Mutagenesis, in ENVIRONMENTAL AND OCCUPATIONAL MEDICINE (Rom ed. 1983). Furthermore, chemical substances that seem harmless today may in the future be found to pose health risks. An example is the asbestos industry, and the resulting asbestos substitutes. Recent health studies now indicate that some insulation products used as substitutes for asbestos may threaten lung cancer to thousands of workers. Such materials as glass fibers, ceramic-based fibers and mineral wool are being studied as those which cause possible worker health hazards. Wall St. J., May 12, 1987, at 1, col. 6.

Contribution of independent factors to injury is a complication in the causality issues surrounding toxic torts. These independent factors may or may not be linked to environmental or even workplace impairments. See, e.g., Diamond v. General Motors Corp., 20 Cal. App. 3d 374, 97 Cal. Rptr. 639 (1971). Issues of dormancy and contributing factors are discussed in Hagy v. Allied Chemical & Dye Corp., 122 Cal. App. 2d 361, 265 P.2d 86 (1953). In Hagy, the plaintiff who was already suffering from cancer of the larynx alleged that cancer had been dormant and was brought to an acute stage by the effect of sulfuric fumes emitted by defendant corporation. Id.

For a discussion of multiple causation factors, see Gots, supra note 202, at 17-21.

For example, courts often criticize the imprecision of probabilities associated with the introduction of epidemiologic proof to show causal relationships. The medical field defends that medical science is rarely, if ever, a precise science and that any diagnosis based on epidemiologic probabilities or other bases of research is adequate if properly introduced in court. See generally McElveen & Eddy, Cancer and Toxic Substances: The Problem of Causation and the Use of Epidemiology, 33 CLEV. ST. L. REV. 29 (1984-85).

A fifth source of difficulty under the present tort system involves problems associated with delay. Because of the length of time that a lawsuit may take to be resolved, plaintiffs, in need of immediate relief, often choose to accept low settlements rather than face the uncertainty of lengthy litigation.\textsuperscript{207} Closely linked with the delay issue is the expense that plaintiffs must be able to bear to pursue such a lengthy lawsuit.\textsuperscript{208}

Outside the procedural barriers, state statutes sometimes bar explicitly, or limit a given plaintiff’s relief in occupational disease cases. Over twenty-five states have passed statutes barring latent disease claims.\textsuperscript{209} Furthermore, there have been proposals at the federal level, such as the proposed Federal Products Liability Act, which would create a twenty-five year statute of repose for claims that involve capital goods.\textsuperscript{210} Other proposed legislation has attempted similar limitations.\textsuperscript{211}

As discussed in Section IV above, worker right-to-know laws result in some workers assessing workplace risks inadequately. As a result of the limitations of most workers’ compensation systems, workers injured by latent occupational disease find inadequate compensation for their claims. In addition, when claimants are not barred from seeking relief under tort law, the tort system provides only limited relief because of serious substantive and procedural limitations.

\textbf{VII. Escape From Liability Through Corporate Divestiture}

Given that workers are poor targets for right-to-know legislation, and that they do not assess workplace risk adequately, analysts have

\textsuperscript{207} One study shows that tort suits often settle for approximately half of the wages lost. The average settlement was $72,000 compared to the average after tax wage loss of $127,151. I. SELIKOFF, supra note 194, at 11.

\textsuperscript{208} The lawsuits are equally expensive and difficult for industry. The Chapter 11 bankruptcy filing of the Manville Corporation indicated that Manville spent $24.5 million in legal fees for its asbestos case defense, compared to $24 million paid on health injury claims. Rotbard, \textit{Manville Filing Expected to Have Great Effects}, Wall St. J., Aug. 30, 1982, at 3, col. 1.

\textsuperscript{209} See, e.g., UTAH CODE ANN. § 78-15-3 ("No action shall be brought for the recovery of damages for personal injury [or] death . . . ten years after the date of manufacture of a product, where that action is based upon . . . failure to warn . . . .") Some claims that are barred involve capital goods; others do not.


\textsuperscript{211} An example was the proposed Occupational Disease Compensation Act, which would have created limitations on workers' actions in asbestos related injuries to damages consisting of lost wages and medical expenses from a federal compensation fund. Schroeder & Shapiro, supra note 107, at 1256; S. 44, 98th Cong., 1st Sess. § 11 (1982). See also S. 1643, 97th Cong., 1st Sess. (1981); H.R. 5224, 97th Cong., 1st Sess. (1981).
looked to existing compensation systems to compensate workers for losses resulting from their poor risk assessment. As seen in Section VI, however, the present tort law and state workers' compensation systems do not compensate workers adequately for losses resulting from hazardous exposures.\textsuperscript{212} This is especially true of the problems posed by cancer and other long latency occupational diseases. There have been, however, cases in which workers have been successful in their suits against employers. An example is the Johns-Manville litigation in which the corporation, deluged with asbestos litigation, sought protection under Chapter 11 bankruptcy.\textsuperscript{213} The Johns-Manville case is an excellent example of the ultimate detriment to both business and the individual litigants of the present system. The business will suffer serious financial setbacks, and the litigants may not be compensated adequately if the business is under Chapter 11 protection.

Because of concern about the possibility of an outcome similar to Johns-Manville's, firms that suspect they may incur such liabilities in the future are seeking measures to avoid those liabilities. While several strategic alternatives are available, one approach found to be successful is to divest the potential liability resulting from man-

\textsuperscript{212} For documentation regarding deficiencies in workers' compensation program in occupational disease, see CRUM & FORSTER supra note 181; Kutchins, The Most Exclusive Remedy of All: Workers' Compensation Coverage for Occupational Disease, 32 LAB. L.J. 212 (1981); Larson, Occupational Diseases Under Workmen's Compensation Laws, 9 U. RICH. L. REV. 87 (1974); Robblee, The Dark Side of Workers' Compensation: Burdens and Benefits in Occupational Disease Coverage, 2 INDUS. REL. L.J. 596 (1978). These studies conclude that the present system compensates well only those injured by traumatic injury, but not those claiming complicated latent occupational disease injuries. The system simply cannot cope with issues of latency, multiple causation, and the like.

\textsuperscript{213} The discounted cost of all the expected claims to the Manville Corporation is estimated in excess of $2 billion, which vastly exceeds Manville's $1.2 billion net worth. The company cost per claim is estimated at $40,000, with the discounted cost of all present expected claims ($16,500) and future claims ($500 per month) in excess of $2 billion. Under the Chapter 11 reorganization, two entities were created: the Manville Operating Company (which will conduct the regular business of the corporation) and the Manville Asbestos Personal Injury Trust and Settlement Vehicle (which will handle all claims of asbestos disease). Barney, infra note 214, at 27 n.1. During its first four years, the Trust will receive funding by insurance proceeds and cash and receivables from Manville. \textit{Id.} During the next 24 years, $75 million plus, up to a maximum of 20% of the net per year operating profit, will be paid into the fund by Manville. \textit{Id.} In addition, the Trust will hold a sizable amount of Manville preferred stock and 50% of the common stock of the operating company. \textit{Id.} The reorganization plans allow Manville to continue operations if it can do so by contributing to the Trust. \textit{Id.} However, Trust holdings may be sold, if necessary, to pay claims. \textit{Id.} See also Epstein, Manville: The Bankruptcy of Product Liability Law, \textit{REGULATION} 8, 14 (Sept./Oct. 1982). Riley estimates the total average costs per claim (including legal fees, expenses and compensation) at $101,000. Riley, Asbestos: New Approaches, 6 Nat'l L.J. May 7, 1984 at 25.
ufacturing processes involving toxic chemicals by passing down or contracting away liability to other and often smaller industries. These smaller industries often do not remain in existence long enough for latent-disease liability to catch up with them, or they do not have the assets to cover any substantial claims against them if sued by workers harmed by hazardous exposure in the workplace.

The benefit of divestiture is obvious. If there is a likelihood that a substance will ultimately (or even potentially) create a significant health hazard, the firm benefits by divesting itself of the malignant process that utilizes that substance. The use of divestiture is based on the assumption that, when the liability imposed by worker lawsuits will be limited by the size of the smaller corporation's assets, the larger the corporate assets, the larger the liability exposure.


215 The rationale for such a divestiture is simple. The objective of any profit maximizing firm is to obtain an aftertax stream of returns, the present value of which exceeds the cost of investment. In making corporate decisions, management will undertake first those projects which exemplify the greatest difference between present value and cost, resulting in the firm's maximum possible profit. In the area of hazardous substances, if costs associated with those hazards (especially latent health costs) were either unknown or unanticipated in the initial assessment, the actual cost of a given project might have been substantially underestimated. A study by Ringleb and Wiggins states that the expected liability associated with the use of hazardous substances in the workplace is a function of the "number of workers exposed, the intensity of the exposure, the toxicity of the substance, and the substance's incubation or latency period." A. Ringleb & S. Wiggins, Liability and Mass Latent Occupational Disease: An Analysis of Comparable Institutional Arrangements (1987) (unpublished article). See also infra Table 1 and Table 2. As the latency period nears the point at which it will manifest liability to a firm, the difference between the anticipated cost of liability will be from near zero to levels up to and possibly in excess of the firm's assets. A. Ringleb & S. Wiggins, supra. In deciding whether to continue in business, the firm will face the maximum expected liability, not only from present employees' exposures, but also in new workers adding to the pool of possible litigants. Id. One way to avoid this anticipated liability is to divest the firm of its liability producing operations. Id. Some firms make the decision to switch to less hazardous substances, adding to the cost of manufacturing a given product. For example, dye manufacturers in most countries have voluntarily stopped producing beta-naphthylamine, a known carcinogen, after finding new ways of developing the same products without its use. W. HUEPER, OCCUPATIONAL CANCERS OF THE URINARY SYSTEM (1969). Other companies, concerned with liabilities for prenatal injuries, exclude women of child-bearing potential from certain jobs. McGarity & Schroeder, Risk-Oriented Employment Screening, 59 TEX. L. REV. 999 (1981); Rothstein, Employee Selection Based on Susceptibility to Occupational Illnesses, 81 MICH. L. REV. 1379 (1983). The Olin Corporation went so far as to develop a policy entitled "Female Employment and Fetal Vulnerability." Krause, Pregnant Women in the Workplace: A Company Program to Control Toxic Exposures, 119 NAT'L SAFETY NEWS 59 (1979). The other way to avoid anticipated liability is to divest the process to smaller firms. In essence, the management decides to divest the firm of the use of hazardous processes and the potential future liabilities that continuation with such processes assures.
Therefore, in the absence of mandatory insurance coverage, the process is passed down to smaller corporate entities. All costs considered (taking into account both production and liability costs), the process can then be undertaken much less expensively by a small corporation. Empirical evidence of this phenomenon substantiates the existence of the practice.

The effect of this corporate divestiture is staggering to the worker. As discussed above, tort and state worker compensation systems are not always satisfactory media for compensation. Moreover, in those cases in which the tort system could be used and could be at least partially successful in compensating, workers are likely to find that their chances of recovery will be slight against small firms with limited assets. The end result of the phenomenon is a debilitating impact on compensation considerations to workers exposed to hazardous substances.

To summarize, given certain information about hazards in the workplace, workers do not assess risk properly. At the time workers are confronted with the reality of toxic exposure in the workplace, they find avenues of compensation through the tort system and the state workers compensation systems filled with procedural and sub-

216 The Allied Chemical Corporation (Allied) case provides a good example. Moore v. Allied Chemical Corp., 480 F. Supp. 364 (E.D. Va. 1969). In the late 1940s, a chemist for Allied invented a compound commonly known as Kepone in the manufacture of various insecticides and pesticides. Id. at 367. Virtually all Kepone produced in the United States was exported because the Food and Drug Administration prohibited its use on food crops in the United States in the early 1960s. Id. For several years, several independent companies produced most of the Kepone for Allied. Id. However, in 1966 Allied decided to produce Kepone in its "Semi-Works" facility at Hopewell, Virginia. Id. Production commenced in that year and continued until 1974. Id.

For reasons which were in dispute, Allied eventually decided to terminate its production of Kepone and "go outside" for its Kepone requirements. Id. at 367–68. On November 30, 1973, Allied executed an agreement with Life Science Products Company (LSP) for the production of Kepone. Id. at 368. Under the agreement, Allied agreed to provide LSP with all the necessary raw materials which LSP would process and convert into Kepone. Id. Allied agreed to receive the finished product in drums supplied by Allied at LSP's plant and to pay for certain quantities of the Kepone as produced. Id. Title to all raw materials and to the Kepone produced by LSP remained at all times in Allied. Id. The case resulted in the court piercing the corporate veil and finding Allied liable for injuries sustained by workers in the LSP plant. Had the court been unable to pierce the veil, the workers would have had their recovery limited to the assets of LSP rather than Allied. See id.

217 See infra Table 3; Barney, Edwards & Ringleb, supra note 214. This phenomenon was substantiated in empirical results of a multiple regression analysis. Id. at 17. Those manufacturing industries experiencing the largest exposure to hazardous substances are also experiencing the fastest growth in small corporate entities. Preliminary evidence appears to be that in order to limit potential liability and eventually eliminate their liability through the use of hazardous substances, businesses are passing liability down to smaller entities. For a detailed analysis of the divestiture phenomenon, see id.
stantive barriers. Ultimately, if they are able to surmount procedural and substantive obstacles, they may find themselves in many instances confronted with seeking to obtain compensation from a small corporation with limited funds and little or no insurance. Against such odds, workers will increasingly find relief from latent injuries associated with hazardous substance exposure in the workplace only from social security, medicare, food stamps, welfare, and family funds.

VIII. PROPOSAL FOR FEDERAL COMPENSATION PROGRAM FOR LATENT OCCUPATIONAL DISEASE

The ineffectiveness of the right-to-know laws, the failure of compensation systems, and the phenomenon of divestiture of malignant manufacturing processes seriously undermine a worker’s ability to gain compensation for latent workplace injuries. Further, no present legislation meets the need for a compensation system both to compensate injured employees and to create incentives for large firms not to divest themselves of liabilities. Even if workers could assess information properly and make choices based on that information, the problem of corporate divestiture in the face of uncertain liability all but ensures that no remedy awaits workers who have suffered an occupational exposure and have yet to manifest injury. In addition, some products, now considered to be safe, may be found unsafe in the future, while the harm to the exposed workers will already exist. Further, two safe substances may interact to create a third, unsafe substance or reaction. The need for a compensation system, therefore, is clear. Workers need some kind of system of compensation when they do not assess risk properly, when they are exposed despite the relevant information available to the public or private sector, or when important scientific information concerning a hazard emerges after the harmful exposure.

Proposed legislation has attempted to remedy the problem. Proposals to set increased informational guidelines, however, will be ineffective given the discussion in Section IV concerning improper risk assessment by employees. On the other hand, proposed legislation to create enhanced safety performance levels in the workplace, though helpful concerning substances about which exposure effects are at least reasonably well known and understood, is not helpful at all concerning substances about which exposure effects are not known. The conclusion, therefore, is that one simply cannot regulate what one does not know. Furthermore, it is naive to assume that
there will be no future hazardous exposure in the workplace. Even under the most optimistic analysis that there will be no new discoveries of latent injuries concerning chemicals that manufacturers have heretofore assumed safe, there still remain the problems of technical malfunctions and worker error that result in harmful exposure to workers. A better compensation system than those under existence or presently under legislative consideration is needed.

The proposed Federal Compensation Program for Latent Occupational Disease herein will remedy many of the present system's failures. Under this program, a payroll tax will establish a compensation system fund from which workers may find relief for injuries due to hazardous workplace exposure. System regulation will be closely tied with the National Institute of Occupational Safety and Health Administration (NIOSH). NIOSH may consider taxation of those businesses whose present operations provide "more risk" to employee health than usual business activities.

The federal compensation system proposed would handle only latent occupational disease. Since latent occupational diseases are those which pose the largest evidentiary and procedural issues under state tort and workers' compensation systems, this is the area of compensation that the proposed federal program would address.

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218 Other alternatives to a proposed federal workers' compensation system have inherent problems similar to those of the present system. The alternatives often presented are bonding, corporate officer liability, director liability, managerial liability, injury taxes, mandatory insurance, increased informational systems, and increased safety regulation. Bonding, injury taxes, mandatory insurance and increased safety regulation as alternative systems present problems inherent in latency of occupational disease. Because it is impossible to determine the extent of the harm to the worker, it is impossible to anticipate the extent to which a firm should be bonded or taxed, or should obtain insurance or increase safety. Corporate liability creates the divestiture problems discussed in Section VII of this Article. Director and managerial liability create similar problems that divestiture presents. When injuries are latent, often the directors or managers have died, are difficult to find for jurisdictional purposes, or have inadequate assets to handle the large sums asked for in occupational disease lawsuits. The alternative of using increased informational systems has two problems. One is outlined in the discussion in Section IV of this Article concerning improper risk assessment. Another problem rests in the latency issue—it is impossible to inform about that which is unknown.

219 The use of NIOSH is preferred to OSHA in this role. NIOSH was established by the Occupational Safety and Health Act, Pub. L. No. 91-596, 84 Stat. 1590 (codified as 29 U.S.C. §§ 651–678 (1976)), in conjunction with the Occupational Safety and Health Administration (OSHA). Id. § 651 (1982). The role of OSHA was regulatory in nature and was to create uniform federal rules for safer workplace conditions. Id. § 655. OSHA was given the power to enforce civil penalties and initiate court actions where necessary. Id. §§ 655–659. NIOSH was to complement regulation by OSHA through the development of standards for industrial safety and hygiene. Id. §§ 669, 671. The development of standards to prevent occupational disease was to be accomplished through research and education programs set up by NIOSH. Id.
The funding of the proposed system would be similar to the present social security system in which both employees and employers share the program's costs. The proposed legislation will take the present burden of occupational disease away from the private sector (i.e., through worker-provided payment) and the public sector (i.e., through social security, welfare and the like). NIOSH will be closely tied to the system, since evidentiary and other procedural requirements concerning occupational disease are closely related to information which NIOSH either possesses or has the potential for developing.

The advantages of the federal compensation program are multiple. First, there will be a fund set aside for the sole purpose of compensating occupational latent diseases, an area that is not being handled satisfactorily by present compensation systems. Second, the procedural and substantive barriers of existing systems will not be present, since compensation will accrue at the time the disease manifests itself. Third, NIOSH will administer the program. Arguably NIOSH is in a better position to understand latent disease issues because its time is spent researching and developing standards for industrial safety and hygiene problems, and preventing occupational disease. Fourth, the federal compensation program will hasten the compensation of injured applicants—an inherent strength of regulatory compensation systems outside state tort systems. Fifth, it will take much

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220 In cases in which occupational diseases are not covered by the industry or workers' compensation, public programs have carried the burden of their costs. Such public programs include Social Security, welfare, food stamps, Medicare, Medicaid or private programs set up by workers and their families. An indication of the expense of these public programs is that during a ten month period in 1980, the Social Security system paid $11 billion in worker disability payments. Effects of OASDI Benefit Increase, December, 1984, 48 SOC. SECURITY BULL. 45 (July 1985) (Social Security Administration, U.S. Dept. of Health and Human Services). Worker disability outlays were reported to cost the Social Security system approximately 17% of total 1980 trust fund expenditures. Occupational Disease Compensation and Social Security: Hearings Before the Subcomm. on Labor Standards of the House Comm. on Education and Labor, 97th Cong., 1st Sess. 90 (1981) (statement of Warren J. Smith, Secretary-Treasurer, Ohio AFL-CIO, and Chairman of the Board, Workers' Institute for Safety and Health).

As far as private costs borne by workers and their families, research indicates that the average loss in productive output per worker was $380,000 (1981) for 515 asbestos-associated disability deaths among insulation workers. JOHNSON & HELLER, THE ECONOMIC CONSEQUENCES OF ASBESTOS-ASSOCIATED OCCUPATIONAL DISEASES 365–40 (1981). The average replacement of the costs by compensation or other transfer of payments was estimated to be only 40% of the average private costs, calculated to be $190,000 per family. The public and private burden of the costs was estimated to be approximately $500,000 per worker. Id. at 73.

221 29 U.S.C. §§ 669, 671 (1982); see also supra note 219 (the use of NIOSH).
of the compensation burden away from the public and private sector (now handled through federal social security, welfare programs and the like) and place the costs on those involved directly with occupational disease—industries that manufacture or use hazardous substances and individuals working within those industries. Sixth, because they will know that a federal system will handle the present uncertainty of latent occupational disease, firms will no longer have incentive to divest themselves of liability. The placement of the costs of doing business, once anticipated, will rest in the hands of larger firms who have greater incentives to handle hazardous substances appropriately.

Like any compensation system, the proposed system will not be without limitations. These limitations are twofold—compensation limits and exclusion of remedies under the tort system. NIOSH will set monetary limitations based on available funds and scientific data concerning the nature and extent of the occupational disease. The necessity is obvious. Without a limitation, an unanticipated disease could deplete the fund quickly, thereby depriving future recipients of any compensation. The exclusion of remedies under tort systems creates certainty in business, which will in turn create disincentives to the unfavorable consequences of divestiture. The advantage again will encourage large firms to handle hazardous manufacturing processes, which is preferable to handling by small firms.

IX. Conclusion

Under the present system of use of chemicals in U.S. manufacturing processes, legislatures must attempt to regulate industries and create compensation systems to workers injured by hazardous substances in the workplace. Given the fact that present policy and economic considerations run counter to sweeping legislation that would take chemicals out of the workplace, it is the responsibility of legislatures to create the best system of compensation and regulation concerning the use and manufacture of such chemicals.

222 See supra note 220 and accompanying text, regarding the placement of the present costs of uncompensated latent diseases on the private and public sector as a whole.

223 In regard to reasons for corporate divestiture, see discussion in Section VII of this Article. Some analysts believe that larger firms are a better receptacle for technology that would create safer working conditions. Larger firms have the capital for research concerning safety conditions in the workplace. Further, they have incentives to create an injury-free workplace in order to protect the corporate goodwill and solidify the corporation’s longevity. Ringleb & Wiggins, supra note 215.

224 See supra note 215 and accompanying text.
Worker right-to-know laws are based on traditional policies of informed consent and informed decisionmaking. Though these premises make sense in an ideal workplace, they are erroneous as to actual outcome. The result is costly compliance without the benefit of attaining the policy-setting goals of the laws. Furthermore, present workers' compensation and tort law systems present procedural and substantive barriers that prevent adequate compensation, especially in the area of latent occupational disease. The phenomenon of corporate divestiture in the face of uncertain occupational disease liability serves to complicate a worker's ability to be compensated.

A reevaluation of the value of worker right-to-know laws is necessary by federal, state, and municipal legislatures, and by regulatory agencies in order to correct these errors in policymaking. The right-to-know laws and present compensation systems are ineffective in dealing with the problems of latent occupational disease. The need for federal legislation as proposed herein is therefore paramount in effecting maximum benefits to workers and industry with minimum costs under the present uncertainties of latent occupational disease.
### TABLE 1.
Substances for which there is evidence of carcinogenicity in man derived from occupational settings

<table>
<thead>
<tr>
<th>Substance</th>
<th>Category of evidence and site</th>
<th>Occupations²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. ORGANIC SUBSTANCES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Aromatic hydrocarbons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal soot</td>
<td>Lungs, skin, scrotum, urine bladder</td>
<td>Gashouse workers; asphalt, coal tar, and pitch workers; coke-oven workers; miners; still cleaners; chimney sweeps</td>
</tr>
<tr>
<td>Coal tar</td>
<td>scrotum, urine bladder</td>
<td></td>
</tr>
<tr>
<td>Other products of other combustion</td>
<td>Larynx, kidney</td>
<td></td>
</tr>
<tr>
<td>Petroleum</td>
<td>Lungs, skin, scrotum</td>
<td>Contact with lubricating, cooling, or fuel oils, or with paraffin, wax, coke or fillers</td>
</tr>
<tr>
<td>Petroleum coke</td>
<td>scrotum</td>
<td>retortmen; textile weavers; diesel and jet testers</td>
</tr>
<tr>
<td>Wax</td>
<td>nasal cavity, larynx</td>
<td></td>
</tr>
<tr>
<td>Creosote</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anthracene</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paraffin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shale oils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral oils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soots, tars and oils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>Hematopoietic tissues (leukemia)</td>
<td>Explosives, rubber cement workers; distillers; dye users; painters; shoemakers; furniture finishers; glue makers; linoleum makers; petrochemical workers; styrene makers</td>
</tr>
<tr>
<td>Auramine</td>
<td>Urine bladder</td>
<td>Dyestuffs manufacturers and users; rubber workers (pressmen, filtermen, laborers); textile dyers; paint manufacturers</td>
</tr>
<tr>
<td>Benzidine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-naphthylamine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>x-napthylamine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magenta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-aminodiphenyl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Alkylating agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mustard gas</td>
<td>Lung</td>
<td>Mustard gas workers</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>Liver (angiosarcoma)</td>
<td>Producers and polymer producers</td>
</tr>
<tr>
<td></td>
<td>Central nervous system, lung</td>
<td></td>
</tr>
</tbody>
</table>

¹: sufficient
²: limited
³: inadequate
### TABLE 1.  Continued

<table>
<thead>
<tr>
<th>Substance</th>
<th>Category of evidence and site</th>
<th>Occupations*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bis(chloromethyl) ether</td>
<td>Lung</td>
<td>Lon-exchange resin makers; organic chemical syntheses; polymer makers</td>
</tr>
<tr>
<td>Chloromethyl methyl ether</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3. Others</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isopropyl oils</td>
<td>Nasal sinuses</td>
<td>Producers</td>
</tr>
<tr>
<td>Wood dusts</td>
<td>Nasal cavity and sinuses</td>
<td>Lumbermen; workers with wood</td>
</tr>
<tr>
<td>Leather dusts</td>
<td>Nasal cavity and sinuses,</td>
<td>Leather and shoe workers</td>
</tr>
<tr>
<td></td>
<td>urine bladder</td>
<td></td>
</tr>
</tbody>
</table>

B. INORGANIC SUBSTANCES

1. Minerals and metals

<table>
<thead>
<tr>
<th>Substance</th>
<th>Category of evidence and site</th>
<th>Hematopoietic tissues</th>
<th>Occupations*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>Lungs, skin</td>
<td>Liver (angiosarcoma)</td>
<td>Miners; smelters; insecticide and herbicide makers and sprayers; tanners; chemical workers; oil refining workers; vinters; alloy makers; aniline color makers; ceramic makers; copper smelters; textile printers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hematopoietic tissues (leukemia)</td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td>Lung</td>
<td></td>
<td>Aerospace industry, gyroscopes and nuclear reactor workers; beryllium refining and alloy workers; cathode ray tube makers; electric equipment makers; electronic workers</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Prostate, kidney, lung</td>
<td></td>
<td>Alloy makers; battery makers; pesticide workers; textile printers; welders; zinc refiners; electroplaters</td>
</tr>
<tr>
<td>Chromium</td>
<td>Lung</td>
<td>Nasal cavity and sinuases, larynx</td>
<td>Producers and processors; acetylene and aniline workers; bleachers; glass, pottery and linoleum workers; battery makers; anodizers; electroplaters; glass workers; lithographers; photoengravers</td>
</tr>
<tr>
<td>Substance</td>
<td>Category of evidence and site</td>
<td>Occupations(^2)</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sufficient(^1)</td>
<td>limited</td>
<td>inadequate</td>
</tr>
<tr>
<td>Hematite</td>
<td>Lung</td>
<td>Larynx</td>
<td>Iron ore (hematite) miners; metal grinders and polishers; iron foundry workers</td>
</tr>
<tr>
<td>Nickel</td>
<td>Lungs, nasal</td>
<td></td>
<td>Nickel smelters; mixers and roasters; electrolysis workers</td>
</tr>
<tr>
<td>Asbestos</td>
<td>Lung, pleura and peritoneum (mesothelioma)</td>
<td>Larynx, colon</td>
<td>Miners; millers; textile, insulations, and shipyard workers; brake linings workers</td>
</tr>
</tbody>
</table>


\(^1\) "Sufficient" refers to the fact that human data are considered persuasive of carcinogenicity in humans; "limited," evidence exists for humans but is too limited to be persuasive; and, "inadequate," human data is not sufficient to allow a reliable conclusion.

\(^2\) Represents only a partial list.
<table>
<thead>
<tr>
<th>SIC</th>
<th>Industry</th>
<th>Worker Exposures to Carcinogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Food and Kindred Products</td>
<td>2,874</td>
</tr>
<tr>
<td>21</td>
<td>Tobacco Manufacturers</td>
<td>13,385</td>
</tr>
<tr>
<td>22</td>
<td>Textile Mills</td>
<td>2,607</td>
</tr>
<tr>
<td>23</td>
<td>Apparel</td>
<td>7,591</td>
</tr>
<tr>
<td>24</td>
<td>Lumber and Wood Products</td>
<td>5,588</td>
</tr>
<tr>
<td>25</td>
<td>Furniture and Fixtures</td>
<td>4,309</td>
</tr>
<tr>
<td>26</td>
<td>Paper and Allied Products</td>
<td>14,205</td>
</tr>
<tr>
<td>27</td>
<td>Printing and Publishing</td>
<td>19,625</td>
</tr>
<tr>
<td>28</td>
<td>Chemical and Allied Products</td>
<td>25,984</td>
</tr>
<tr>
<td>29</td>
<td>Petroleum and Coal Products</td>
<td>38,398</td>
</tr>
<tr>
<td>30</td>
<td>Rubber and Plastics</td>
<td>16,987</td>
</tr>
<tr>
<td>31</td>
<td>Leather and Leather Products</td>
<td>40,599</td>
</tr>
<tr>
<td>32</td>
<td>Stone, Clay, and Glass</td>
<td>11,985</td>
</tr>
<tr>
<td>33</td>
<td>Primary Metals</td>
<td>24,367</td>
</tr>
<tr>
<td>34</td>
<td>Fabricated Metal</td>
<td>90,428</td>
</tr>
<tr>
<td>35</td>
<td>Machinery (Except Elect.)</td>
<td>51,927</td>
</tr>
<tr>
<td>36</td>
<td>Electrical Machinery</td>
<td>81,533</td>
</tr>
<tr>
<td>37</td>
<td>Transportation Equipment</td>
<td>53,574</td>
</tr>
<tr>
<td>38</td>
<td>Instruments</td>
<td>107,023</td>
</tr>
<tr>
<td>39</td>
<td>Miscellaneous Manufacturing</td>
<td>27,459</td>
</tr>
</tbody>
</table>

Source:
### TABLE 3.
The Determinants of Small Firm Entry (SFE): Results of Regression Analysis.  
(N = 17).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>T-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-27.80872</td>
<td>29.00323</td>
<td>-0.9588</td>
</tr>
<tr>
<td>Expected Occupational Disease Liability (EODL)</td>
<td>.00072</td>
<td>.00026</td>
<td>2.7698***</td>
</tr>
<tr>
<td>Industry Concentration Ratio (CR)</td>
<td>6.95435</td>
<td>48.40869</td>
<td>.1437</td>
</tr>
<tr>
<td>Product Differentiation (PD)</td>
<td>5.28965</td>
<td>9.44547</td>
<td>.5600</td>
</tr>
<tr>
<td>Industry Growth (IG)</td>
<td>.60150</td>
<td>.26440</td>
<td>2.2750**</td>
</tr>
<tr>
<td>Regional Markets (RM)</td>
<td>-.05219</td>
<td>.05228</td>
<td>-.09983</td>
</tr>
<tr>
<td>Energy Costs (EC)</td>
<td>39.97950</td>
<td>21.74551</td>
<td>1.8385*</td>
</tr>
</tbody>
</table>

R = .7262; d.f. = .10; F = 4.42***

*p < .1  
**p < .05  
***p < .01  

### TABLE 4.
Coverage of Occupational Diseases*  
January 1, 1985

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Onset of Disability or Death</th>
<th>Time Limit on Claim Filing</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALABAMA</td>
<td>Death—within 3 years after last exposure or last payment. Radiation or occupational pneumoconiosis*—exposure must occur in at least 12 months over 5 years prior to last exposure.</td>
<td>Disability—within 2 years after last exposure or last payment (radiation—within 2 years and claimant knows/should know relation to employment). Death—within 2 years after death or last payment. Coal miner’s pneumoconiosis—within 3 years after total disability or death and claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>ALASKA</td>
<td>2 years after knowledge of relation to employment. Within 1 year after death.</td>
<td></td>
</tr>
<tr>
<td>AMERICAN SAMOA</td>
<td>Within 1 year after claimant knows/should know relation to employment.</td>
<td></td>
</tr>
<tr>
<td>ARIZONA</td>
<td>Silicosis or asbestosis—employer liable only if exposure during 2 years.</td>
<td>Within 1 year after disability or accrual of right; excusable.*</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Onset of Disability or Death</td>
<td>Time Limit on Claim Filing</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ARKANSAS</td>
<td>Disability or death—within 1 year after last exposure (3 years for silicosis or asbestosis), or 7 years for death following continuous disability.* Does not apply to radiation. Silicosis or asbestosis presumed nonoccupational absent exposure in 5 years over 10 years prior to disability (2 of 5 years in-state unless same employer).</td>
<td>Disability—within 2 years after last exposure (silicosis or asbestosis—within 1 year from disablement; radiation—within 2 years from diagnosis). Death—within 2 years.</td>
</tr>
<tr>
<td>CALIFORNIA</td>
<td>Disability—within 5 years after injury (no limit for radiation, asbestosis, silicosis, or anthracosis). Silicosis or asbestosis—employer liable only if exposure lasts 60 days.</td>
<td>Disability—within 1 year from injury or last payment. Death—within 1 year after death (for death within 1 year after injury); 1 year after last medical payment; or 1 year after death if compensation paid; no proceedings more than 240 weeks after injury except for claims based on asbestos exposure.*</td>
</tr>
<tr>
<td>COLORADO</td>
<td>Disability—within 5 years after injury (no limit for radiation, asbestosis, silicosis, or anthracosis). Silicosis or asbestosis—employer liable only if exposure lasts 60 days.</td>
<td>Within 3 years after disability or death (5 years in case of ionizing radiation, asbestosis, silicosis, or anthracosis or if reasonable excuse).</td>
</tr>
<tr>
<td>CONNECTICUT</td>
<td>Within 3 years after first manifestation of disease (within 2 years if death occurs within 2 years after first manifestation of disease, or 1 year after death, whichever is later).</td>
<td>Disability or death—within 1 year after claimant knows relation to employment.</td>
</tr>
<tr>
<td>DELAWARE</td>
<td>Disability or death—within 1 year after claimant knows relation to employment.</td>
<td>Within 1 year after injury, death, last payment, or knowledge of relation to employment.</td>
</tr>
<tr>
<td>DISTRICT OF COLUMBIA</td>
<td>Death—following continuous disability and within 350 weeks after last exposure. Employer liable for dust disease only if exposure lasts 60 days.</td>
<td>Within 2 years after disablement, death, or last payment.</td>
</tr>
<tr>
<td>FLORIDA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Onset of Disability or Death</td>
<td>Time Limit on Claim Filing</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>GEORGIA</td>
<td>Within 1 year after last exposure (3 years for byssinosis, silicosis, or asbestosis; 7 years for death following continuous disability). Employer liable for silicosis or asbestosis only if exposure lasts 60 days; presumed nonoccupational absent exposure in 5 years over 10 years prior to disability (2 years in-state unless same employer).**</td>
<td>Within 1 year after disablement, death, or medical care, or 2 years after last payment.* Radiation—within 1 year after onset of disability and claimant knows/should know relation to employment.*</td>
</tr>
<tr>
<td>GUAM</td>
<td><strong>Within 1 year after injury, death, or last payment.</strong></td>
<td><strong>Within 2 years after claimant knows relation to employment.</strong></td>
</tr>
<tr>
<td>HAWAII</td>
<td><strong>Within 1 year after manifestation or death. Silicosis—within 4 years after last exposure. Radiation or unusual disease—within 1 year after incapacity, disability, or death and claimant knows/should know relation to employment.</strong></td>
<td><strong>Within 1 year after disablement or death, or medical care, or 2 years after last payment. Death—within 3 years after death or last payment. Coalminer's pneumoconiosis—within 5 years after last exposure or last payment. Radiation or asbestosis—within 25 years after last exposure.</strong></td>
</tr>
<tr>
<td>IDAHO</td>
<td>Within 1 year after last exposure (4 years for silicosis; 7 years for death following continuous disability). Employer liable for nonacute disease only if exposure lasts 60 days. Silicosis—exposure must occur in 5 years during 10 years prior to disablement (last 2 in-state unless same employer).</td>
<td><strong>Within 1 year after disability or death.</strong></td>
</tr>
<tr>
<td>ILLINOIS</td>
<td>Disability—within 2 years after last exposure (3 years for berylliosis or silicosis, 25 years for asbestosis or radiation).</td>
<td>Disability—within 3 years after disablement or 2 years after last payment. Death—within 3 years after death or last payment. Coalminer's pneumoconiosis—within 5 years after last exposure or last payment. Radiation or asbestosis—within 25 years after last exposure.</td>
</tr>
<tr>
<td>INDIANA</td>
<td>Disablement—within 2 years after last exposure (3 years if caused by asbestos, coal, or silica dust); radiation—within 2 years after claimant knows/should know relation to employment. Death—within 2 years after disablement or during pendency of disability claim filed within that period; within 2 years after fixed disability expires but no later than 300 weeks after disablement. Employer liable for silicosis or asbestosis only if exposure lasts 60 days.</td>
<td>Within 2 years after disablement or death.</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Onset of Disability or Death</td>
<td>Time Limit on Claim Filing</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>IOWA</td>
<td>Disability or death—within 1 year after last exposure (3 years for pneumoconiosis; 7 years for death following continuous disability). Pneumoconiosis presumed nonoccupational absent exposure in 5 years over 10 years prior to disability (2 of 5 years in-state); employer liable only if exposure lasts 60 days.</td>
<td>Within 2 years after death or disablement or 3 years after last payment.* Radiation—within 90 days after disablement or death and claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>KANSAS</td>
<td>Disability or death—within 1 year after last exposure (3 years for death from silicosis, 7 years for death following continuous disability). Does not apply to radiation. Silicosis presumed nonoccupational absent exposure in 5 years over 10 years prior to disability (2 of 5 years in-state unless same employer); employer liable only if exposure lasts 60 days.</td>
<td>Within 1 year after disablement, death, or last payment (2 years after last payment in case of silicosis). Radiation—within 1 year after claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>KENTUCKY</td>
<td>Disability—within 3 years after last exposure or first manifestation. Death—within 3 years, if it occurs within 3 years after last exposure or first manifestation. Limit waived where voluntary payment or employer knows of disease and cause. No claim more than 5 years after last exposure (20 years in case of radiation), except for death within 20 years after continuous disability begins in cases where there is award or timely claim for disability.**</td>
<td></td>
</tr>
<tr>
<td>LOUISIANA</td>
<td>Diseases contracted in less than 1 year presumed to be nonoccupational. Presumption is rebuttable by &quot;overwhelming preponderance of evidence.&quot;</td>
<td>Disability—within 6 months after manifestation, occurrence of disability, or worker knows/should know relation to employment. Death—within 6 months, or within 6 months after worker knows/should know relation to employment.</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Onset of Disability or Death</td>
<td>Time Limit on Claim Filing</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>MAINE</td>
<td>Incapacity—within 3 years after last exposure (does not apply to asbestos-related disease). Employer liable only if exposure lasts 60 days (except for radiation and asbestos-related disease). Silicosis presumed nonoccupational absent in-state exposure in 2 years during 15 years preceding disability (part of exposure may be out of state if same employer).</td>
<td>Within 2 years after incapacity or 1 year after death or last payment (40 years after last payment for asbestos-related disease).* If mistake of fact, within reasonable time but no later than 10 years after last payment. Radiation—limit runs from date of incapacity and claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>MARYLAND</td>
<td></td>
<td>Within 2 years after disablement, death, or actual knowledge of relation to employment; excusable (3 years for pulmonary dust disease).</td>
</tr>
<tr>
<td>MASSACHUSETTS</td>
<td></td>
<td>Within 1 year after injury, or death; excusable.</td>
</tr>
<tr>
<td>MICHIGAN</td>
<td></td>
<td>Within 2 years after claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>MINNESOTA</td>
<td></td>
<td>Within 3 years after employee’s knowledge of cause of injury or disability.</td>
</tr>
<tr>
<td>MISSISSIPPI</td>
<td></td>
<td>Within 2 years after injury* or death.</td>
</tr>
<tr>
<td>MISSOURI</td>
<td>Last employer liable for silicosis, asbestosis and radiation if exposure lasts 90 days.*</td>
<td>Within 2 years after injury, death, or last payment (3 years if no injury report filed); limitation runs from date injury is reasonably apparent.</td>
</tr>
<tr>
<td>MONTANA</td>
<td>Death—within 3 years after last employment unless continuous total disability (does not apply to radiation). Silicosis—total disability or death must occur within 3 years after last employment (except for death following continuous total disability), and employer is liable only if exposure lasts 90 workshifts.*</td>
<td>Within 1 year after disability and claimant knows/should know relation to employment; may be extended 2 more years. No claim more than 3 years after last employment (except for radiation or death after continuous total disability).**</td>
</tr>
<tr>
<td>NEBRASKA</td>
<td></td>
<td>Within 2 years after knew/should have known of injury and relation to employment.</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Onset of Disability or Death</td>
<td>Time Limit on Claim Filing</td>
</tr>
<tr>
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</tr>
<tr>
<td>NEVADA</td>
<td>Silicosis or respiratory dust disease is noncompensable absent in-state exposure in 3 years during 10 years preceding disability or death.</td>
<td>Within 90 days after knowledge of disability and relation to employment or 1 year after death. Silicosis or respiratory dust disease—within 1 year after temporary or total disability or death.</td>
</tr>
<tr>
<td>NEW HAMPSHIRE</td>
<td></td>
<td>Within 2 years after injury or death and claimant knows/should know of injury and relation to employment.*</td>
</tr>
<tr>
<td>NEW JERSEY</td>
<td></td>
<td>Within 2 years after claimant knows relation to employment or last payment.</td>
</tr>
<tr>
<td>NEW MEXICO</td>
<td>Death—within 1 year after last employment (3 years for death following continuous disability), and death must follow disability within 2 years. Silicosis or asbestosis—disability or death within 2 years after last employment (5 years for death following continuous disability); employer is liable only if exposure lasts 60 days; noncompensable absent in-state exposure in 1250 workshifts during 10 years preceding disability. Radiation—disability or death within 10 years after last employment.</td>
<td>Within 1 year after disability or death of 1 year 31 days after last voluntary payment. Radiation—within 1 year after disability begins or death and claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>NEW YORK</td>
<td></td>
<td>Within 2 years after disablement or death, or two years after claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>NORTH CAROLINA</td>
<td>Death within 2 years after injury; if totally disabled 6 years after injury or 2 years after final determination. Asbestosis—disability or death within 10 years after last exposure; for death following continuous disability, disability must occur within 10 years after last exposure.* Lead poisoning—disability or death within 2 years after last exposure; for death following continuous disability, disability must occur within 2 years after last exposure.</td>
<td>Within 2 years after disablement, death, or last payment, or within 2 years of notification by competent medical authority, whichever last occurs. Radiation—within 2 years after incapacity and claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>Jurisdiction</td>
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<td>Time Limit on Claim Filing</td>
</tr>
<tr>
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</tr>
<tr>
<td>NORTH DAKOTA</td>
<td>Death—within 1 year after injury if no disability, or 1 year after cessation of disability, or 6 years after injury if disability is continuous.</td>
<td>Within 1 year after injury; within 2 years after death (2 years after injury if no claim prior to death). *</td>
</tr>
<tr>
<td>OHIO</td>
<td></td>
<td>Within 2 years after disability or death or within 6 months after diagnosis (whichever is later).</td>
</tr>
<tr>
<td>OKLAHOMA</td>
<td>Employer liable for silicosis or asbestosis only if exposure lasts 60 days.</td>
<td>Within 18 months after last exposure or manifestation and diagnosis by a physician, or within 3 months after disablement.</td>
</tr>
<tr>
<td>OREGON</td>
<td></td>
<td>Within 5 years after last exposure and within 180 days after disablement or physician informs claimant of disablement. 10 years after last exposure for radiation disease.*</td>
</tr>
<tr>
<td>PENNSYLVANIA</td>
<td>Within 300 weeks after last exposure (except death following disability that occurs within 300 weeks after last exposure). Silicosis, anthracosilicosis, or coalminer’s pneumoconiosis—noncompensable absent in-state exposure in 2 years during 10 years preceding disability.*</td>
<td>Within 3 years after disablement, death, or last payment. Radiation—within 3 years after the employee knows/should know relation to employment.</td>
</tr>
<tr>
<td>PUERTO RICO</td>
<td>Disability—within 1 year after last exposure, except diseases with longer latency periods.</td>
<td>Within 3 years from time employee learns nature of disability.</td>
</tr>
<tr>
<td>RHODE ISLAND</td>
<td></td>
<td>Within 3 years after disability or death. Radiation—within 1 year after claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>SOUTH CAROLINA</td>
<td>Disease must be contracted within 1 year after last exposure (2 years for pulmonary dust disease); except radiation. Byssinosis is noncompensable absent exposure for 7 years.</td>
<td>Within 2 years after definitive diagnosis or 1 year after death. Radiation—limitation runs from date of disability and claimant knows/should know relation to employment.</td>
</tr>
<tr>
<td>SOUTH DAKOTA</td>
<td>Silicosis—noncompensable absent in-state exposure in 2 years (in-state requirement waived if same employer); employer liable only if exposure lasts 60 days.</td>
<td>Within 2 years after disability or death. Radiation—within 1 year after disability and claimant knows relation to employment.</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Onset of Disability or Death</td>
<td>Time Limit on Claim Filing</td>
</tr>
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</tr>
<tr>
<td>TENNESSEE</td>
<td>Partial disability—within 2 years after last exposure. Total disability—within 1 year after last employment; for silicosis, 3 years (uncomplicated) or 5 years (complicated). Death—within 3 years after last employment (5 years for complicated silicosis or death following continuous total disability). Not applicable to radiation. Silicosis—noncompensable absent 5 years in-state exposure in 15 years preceding disability; employer liable only if exposure lasts 30 days.</td>
<td>Within 1 year after incapacity or death and claimant knows/should know relation to employment, but no later than 3 years after death. Permanent partial disability—within 2 years.</td>
</tr>
<tr>
<td>TEXAS</td>
<td>Disablement—within 5 years after last exposure. Death—during employment or after continuous disability beginning within 5 years after last exposure, but no later than 12 years after last exposure. Does not apply to radiation.</td>
<td>Within 1 year after discovery, death, or last payment. Radiation—within 1 year after first incapacity and worker knew/should have known relation to employment.</td>
</tr>
<tr>
<td>UTAH</td>
<td>Exposure in 90 workshifts conclusively presumed injurious exposure.</td>
<td>Within 2 years after diagnosis is first communicated to worker, or within 5 years after last exposure, whichever is first.* Within 3 years after death occurring within periods for disability.</td>
</tr>
<tr>
<td>VERMONT</td>
<td></td>
<td>Within 2 years after physician's written notice to claimant.</td>
</tr>
<tr>
<td>VIRGIN ISLANDS</td>
<td></td>
<td>Within 60 days after disability.</td>
</tr>
<tr>
<td>VIRGINIA</td>
<td></td>
<td>Within 2 years after diagnosis is first communicated to worker, or within 5 years after last exposure, whichever is first.* Within 3 years after death occurring within periods for disability.</td>
</tr>
</tbody>
</table>

Ala. *Radiation illness caused by gradual exposure.
Ariz. *Limit on filing runs from when injury is manifest or when claimant knows/should know relation to employment; tolled during incapacity.
Ark. *Silicosis or asbestosis—worker who is affected but not disabled may leave work and receive up to 26 weeks of benefits plus up to $400 for retraining.
Cal. *Date of injury is date of disability and claimant knows/should know relation to employment.
**Year is 200 days exposure over 12 months.
Iowa *Death from respiratory disease of coalminer employed 10 years presumed due to pneumoconiosis.

**Effective 7/1/84, 33% threshold requirement repealed; benefits now payable are prospective only.

Ky. *Black lung claimant must file under state and federal law.

Me. *Claim for asbestos-related disease contracted between 11/30/67 and 10/1/83 must be filed by 1/1/85.

Md. *Disease or injury compensable under federal law (other than Social Security Disability Insurance) is not compensable.

Miss. *For radiation, date of disablement is date of injury.


Mont. *Silicosis is noncompensable absent in-state exposure in 1,000 workshifts during 8 years preceding total disability; claimant who is discharged to avoid liability may receive compensation when totally disabled if employed 700 workshifts.

N.H. *Date of injury is last date of exposure or first date worker knows/should know relation to employment.

N.Y. *Disability or death due to silicosis or dust disease reimbursed from special fund for all payments over 104 weeks.

N.C. *Asbestosis or silicosis is noncompensable absent in-state exposure in 2 years during 10 years preceding last exposure or if exposure is less than 30 working days in 7 consecutive months.

N.D. *Date of injury is date on which a reasonable person knows/should know relation to employment.

Or. *Asbestos-related disease—within 40 years after last exposure and 180 days after disability or knowledge of disability.

Pa. *Under Occupational Disease Act, state pays $125 monthly for total disability or death caused by silicosis, anthracosilicosis, coalminer’s pneumoconiosis, or asbestosis, provided there has been 2 years of in-state exposure, in cases where the claim is barred by the statute of limitations and the last exposure occurred before 1965 or where exposure occurred under several employers.

Va. *5-year limitation does not apply to cataract of the eyes, skin cancer, radium disability, ulceration, undulant fever, angiosarcoma of the liver due to vinyl chloride exposure, or mesothelioma; byssinosis—within 7 years after last exposure; coalminer’s pneumoconiosis—within 3 years after diagnosis; asbestosis—within 2 years after diagnosis (if based on changed condition, within 2 years after diagnosis of advanced stage).