

THE RIGHT TO KNOW

PRACTICAL PROBLEMS AND POLICY ISSUES ARISING  
FROM EXPOSURES TO HAZARDOUS CHEMICAL AND PHYSICAL  
AGENTS IN THE WORKPLACE

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Occupational Safety and Health,  
Center for Disease Control,  
Public Health Service,  
U.S. Department of Health, Education, and Welfare

July 1977

This report was prepared at the request of the  
Subcommittee on Labor,  
Committee on Human Resources,  
and the  
U.S. Senate.

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| <b>REPORT DOCUMENTATION PAGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>1. REPORT NO.</b><br>NA | <b>2.</b><br>NA                               | <b>3. Recipient's Accession No.</b><br>NA                         |
| <b>4. Title and Subtitle</b><br>Practical Problems And Policy Issues Arising From Exposures To Hazardous Chemical And Physical Agents In The Workplace                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |                                               | <b>5. Report Date</b><br>July 1977                                |
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| <b>7. Author(s)</b><br>Anonymous                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |                                               | <b>8. Performing Organization Rept. No.</b><br>NA                 |
| <b>9. Performing Organization Name and Address</b><br>National Institute for Occupational Safety and Health<br>U.S. Department Of Health , Education, and Welfare<br>Cincinnati, Ohio 45226                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |                                               | <b>10. Project/Task/Work Unit No.</b><br>NA                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |                                               | <b>11. Contract(C) or Grant(G) No.</b><br>(C) NA<br>(G)           |
| <b>12. Sponsoring Organization Name and Address</b><br>SAME AS ABOVE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                            |                                               | <b>13. Type of Report &amp; Period Covered</b><br>Research Report |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |                                               | <b>14.</b><br>NA                                                  |
| <b>15. Supplementary Notes</b><br><br>NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |                                               |                                                                   |
| <b>16. Abstract (Limit: 200 words)</b><br>The problems and issues involving the need to inform employers and workers about workplace hazards and hazard controls are reviewed. Issues addressed include notification, measurements, follow up programs, cancer screening procedures, transfer rights, workers' compensation, health insurance, economic impacts, and disclosure of information. Based on data derived from current NIOSH studies and surveys of health hazard exposures in the American workplace, estimates indicate that as many as 880,000 American workers currently face full or parttime exposure to carcinogens regulated by OSHA and that approximately 21 million American workers currently may be exposed on either a full or parttime basis to OSHA regulated hazardous substances. The authors estimate that the annual costs to society of monitoring workers with either full or parttime exposures to all OSHA regulated hazardous substances, including carcinogens, could range between 675 million and 2 billion dollars. The major policy implications for governmental agencies complying with the workers' right to know under the Occupational Safety and Health Act (OSHAct) are outlined. The authors conclude that all of the agencies involved in implementing the Toxic Substances Control Act and the OSHAct could contribute to solving the problems associated with informing workers of past or current exposures to OSHA regulated substances. |                            |                                               |                                                                   |
| <b>17. Document Analysis a. Descriptors</b><br><br>NOISH-Publication, NIOSH-Author, Occupational-medicine, Occupational-accidents, Industrial-health, Hazardous-materials, Toxic-substances, Chemical-exposure, Information, Knowledge, Work-places                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                            |                                               |                                                                   |
| <b>b. Identifiers/Open-Ended Terms</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |                                               |                                                                   |
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| <b>18. Availability Statement</b><br>AVAILABLE TO THE PUBLIC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            | <b>19. Security Class (This Report)</b><br>NA | <b>21. No. of Pages</b><br>42                                     |
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## I. EXECUTIVE SUMMARY AND CAVEATS

### SUMMARY:

Implementing Congressional mandates intended to minimize health and safety risks arising from exposures to hazardous chemical and physical agents is one of the most difficult long range problems faced by the Executive Branch.

Large numbers of workers (as well as substantial numbers of the general population) have already been exposed and are continuing to be exposed to a wide variety of potentially harmful chemical and physical agents. Most of these citizens are unaware of such exposures. This problem exists primarily because the potential health risks of new technologies and the commercial utilization of new chemicals has not been carefully considered or has not been well understood prior to their introduction into commerce. Even where health risks were well understood, industry has at times been reluctant to take steps that adequately protect workers and consumers.

Congressional concern has been expressed about the failure of the Federal Government to provide timely, adequate information to individual workers facing an increased risk of developing cancer and other diseases as a result of workplace exposures. The Senate Human Resources Committee has brought this issue to the forefront by requesting an investigation into "the social responsibility of biomedical research for occupational health and the need for employers with knowledge to take affirmative action to notify and provide fair health protection from exposure to health related environmental risks and to assure protection for workers and their families from work-related environmental health risks."

The National Institute of Occupational Safety and Health conducts a number of activities which provide information to employers and workers on workplace hazards and their control. In spite of the efforts of NIOSH, the need for informing workers is not always fully met. Clearly workers have the right to know whether or not they are exposed to hazardous chemical and physical agents regulated by the Federal Government. However, this right is linked to a complex series of problems which must be faced and resolved if any worker notification effort is to be successful. A number of these are summarized below.

Notification. Serious questions can be raised about whether notification in and of itself would be helpful to the individual. In some cases, it could be detrimental without assuring that provision has been made for counseling and medical follow-up and treatment.

Measurements. The lack of consistent monitoring of workplace exposures to hazardous substances makes it difficult to assess worker exposure to specific agents. This could result in notification of some workers who are not at risk.

Follow-up. There is a major gap in health and safety legislation dealing with past exposures to occupational health hazards. When workers exposed to carcinogens or other agents causing delayed toxicity leave one job for another or leave the workforce voluntarily or through retirement, there is currently no effective mechanism for notification, and for arranging and paying for medical examination.

Cancer Screening Procedures. The application of cancer screening procedures to apparently healthy individuals at risk is very complex. There are few, if any, simple procedures which can be applied to asymptomatic individuals repeatedly for many years at some interval which have been scientifically studied in proper clinical trials.

Transfer Rights. Up to the present time employees covered by the Occupational Safety and Health Act have not been provided with transfer and wage-retention rights when their functional capacity has been impaired or when they are at increased risk because of heavy exposure to OSHA regulated substances. This is in direct contrast to the Coal Mine Health and Safety Act which provides such protections. Consequently, unprotected workers may hesitate to seek desirable medical follow-up because their current employment may be jeopardized or future job opportunities limited.

Worker's Compensation. State workers' compensation systems do not adequately identify or equitably deal with occupational health problems. In general little or no provision is made to provide for medical examinations of former workers who were exposed to toxic agents, including carcinogens, but who are not clinically ill. Diagnosed occupational diseases generally are not adequately compensated.

Health Insurance. Most existing health insurance policies do not provide for diagnostic procedures or follow-up examinations made necessary by exposure to toxic substances in the workplace or in the general environment.

Inflationary Impact. Inflationary impact statements required for occupational safety and health standards consider only direct outlays by industry. They do not consider the costs of workplace exposures including counselling and medical follow-up which are now hidden or being borne by others. The cost of research will also be increased if agencies are to notify and counsel all individuals involved in studies utilizing records

and not involving personal contact. No provision now exists to pay for any follow-up examinations that may be requested by persons included in such record studies.

Disclosure. A major stumbling block to identifying exposed workers is the failure of chemical re-packagers and primary producers to show the chemical composition of their product.

#### POTENTIAL CANDIDATES FOR NOTIFICATION

The following are estimates, based on information derived from current NIOSH studies and surveys of health hazard exposures in the American workplace:

- As many as 880,000 American workers, or one percent of the current labor force of 84 million persons currently face full or part-time exposure to carcinogens regulated by the Occupational Safety and Health Act (OSHA).
- One in every four American workers (approximately 21 million) currently may be exposed on either a full or part-time basis to OSHA-regulated hazardous substances. Upwards of 40 to 50 million persons or 23 percent of the general population in the United States may have had exposure to one or more of OSHA-regulated carcinogens or hazardous substances during their working lifetimes.

#### COSTS

- The aggregate annual costs of physical examinations for workers currently exposed to carcinogens on either a full or part-time basis are estimated to be about \$230 million. The actual amount would depend on particular examination costs and the degree or worker participation.
- The annual costs to society of monitoring workers with either full or part-time exposures to all OSHA-regulated hazardous substances including carcinogens could range between \$675 million and \$2 billion.

#### POLICY IMPLICATIONS

Based on the results of this preliminary assessment of the magnitude and impact of the workers' right to know under OSHA, the following are principle policy implications for investigation and consideration by DHEW, DOL, Interior, ERDA, EPA, DOD, and other involved Federal agencies and the Congress.

- requirement of employers to notify all workers both past and present about exposures to Federally regulated toxic substances;
- transfer and wage retention rights for exposed and disabled workers beyond those currently in force under existing law or major industrial union collective bargaining agreements. This in turn has very strong implications in possible future disability claims.

- mandatory disclosure of trade product chemical contents through amendment of the Toxic Substances Control Act and enforcement by the EPA and OSHA;
- financial incentives to facilitate the development and introduction of industrial products with fewer possible carcinogenic properties or hazardous exposures. This would avoid the extensive social costs of monitoring and compensating current exposures with their untoward results on both workers and the general community.

CAVEATS:

The rough estimates provided in this report should be viewed as a first, but hopefully useful, approximation of the problems and issues which flow from the right to know. A great deal of further discussion and refinement will be necessary. Throughout the report the authors have emphasized the uncertainties inherent in preparing this first approximation. A number of these caveats should be re-emphasized.

--There may well be conscientious responsible persons who disagree with the basic assumption that workers and the general public have a right to be informed about current and past exposures to toxic substances that pose actual or potential health risks.

--Serious questions can be raised about whether or not it is necessary to notify individuals directly even though very few would deny the need to better inform employers and employees about workplace exposures through more general educational measures.

--Estimates of the numbers of workers exposed to various chemicals are not nearly as precise or as current as one would like. These estimates will be improved as the National Occupational Hazards data base becomes more easily accessible and is updated.

--The duration and intensity of exposure to hazardous substances currently regulated by the Occupational Safety and Health Administration are not well quantified. Better definition of the extent of exposure is important if one is to deal effectively with the "right to know" problem because the best known determinant of health risk is the extent of exposure. Exposures below the "action level," usually set at one-half of the recommended environmental limit, would not generally require medical follow-up.

--With better definition of the scope and frequency of the medical examinations required and more experience in demonstration projects, cost estimates might change appreciably.

--It is likely that research will uncover new workplace hazards and reveal that exposures to some agents previously considered to be relatively innocuous do in fact pose significant health risks.

## II. INTRODUCTION

Implementing Congressional mandates intended to minimize health and safety risks arising from exposures to hazardous chemical and physical agents is one of the most difficult long range problems faced by the Executive Branch. Current public policy recognizes the right of citizens to be informed about known hazards and to participate in the regulatory process. Congress has also enacted the Toxic Substances Control Act which among other things can require the labelling of existing chemical mixtures and is intended to prevent the introduction or restrict the commercial use of new chemicals and substances which may pose an unreasonable risk to health or to the environment.

As part of the overall effort, the Public Health Service as well as other Federal Departments and Agencies have accelerated their research to identify new environmental contaminants and workplace hazards and to define more adequately the scope of hazards that were already suspected or clearly recognized.

Large numbers of workers and substantial numbers of the general population have already been exposed and are continuing to be exposed to a wide variety of potentially harmful chemical and physical agents. Most of these citizens are unaware of such exposures. This problem arose because the potential health risks of new technologies and the commercial utilization of new chemicals were not carefully considered or were not well understood. Even where health risks were well understood, industry has at times been reluctant to take steps that adequately protect workers and consumers. Control of workplace exposures and prevention of chemical contamination of communities continue to be vexing problems for the Federal Government.

At a minimum, workers and members of communities exposed to substances or physical agents that are clearly hazardous have a right to know that such exposures have occurred. Notification of workers and communities does not, however, complete the process. Once notified, workers and exposed members of the general community require counselling and may need or demand medical examination. Mechanisms exist to handle accidents and the immediate acute effects of accidental chemical contamination, but mechanisms are generally not in place to provide for counselling and medical examination when the health effects of workplace exposures or environmental contaminations are delayed. In the case of carcinogens, a latency period up to several decades may elapse between workplace exposures and the appearance of a clinically recognizable cancer. Delayed effects other than carcinogenesis are also being recognized with increasing frequency. The signs and symptoms of delayed toxicities may be rather non-specific and involve a number of organ systems or may be

recognized as distinct clinical diseases such as the pneumoconioses.

As additional recommended health standards for the workplace are promulgated under the Occupational Safety and Health Act, employers will continue to be required to notify, counsel and provide preventive medical services for employees exposed to many of the more hazardous agents. The Federal Coal Mine Health and Safety Act also provides a mechanism to deal with these issues. Relatively few employers provide these services when Federal laws or regulations do not require them. There is, however, a major gap in health and safety legislation dealing with occupational health hazards. When workers exposed to carcinogens or other agents causing delayed toxicity leave one job for another or leave the workforce voluntarily or through retirement, there is no mechanism to provide or pay for notification, counselling and medical examination.

The practical problems and policy issues flowing from the principle that workers and the public have a right to know can be better understood by considering the answers to the following ten questions:

- Why aren't employers and employees already informed about current and past exposures?
- What steps have Federal Agencies taken to inform workers and control exposures?
- How many workers are exposed to hazardous or toxic substances currently regulated by the Occupational Safety and Health Administration (OSHA)?
- How can individual workers be notified?
- What counselling might be necessary?
- What kinds of medical examination might be required?
- What are the estimated costs of notification, counselling and medical examination?
- What steps can NIOSH take to provide notification and medical follow-up for exposed workers?
- What policy issues should be considered?
- What important caveats must be kept in mind?

### III. WHY AREN'T EMPLOYERS AND WORKERS ALREADY INFORMED ABOUT CURRENT AND PAST EXPOSURES?

Employers and employees are still not generally well informed about occupational health hazards. Between 1972 and 1974 the National Institute for Occupational Safety and Health (NIOSH) conducted the National Occupational Hazard Survey (NOHS) to determine the extent of worker exposure to chemical substances and physical agents. Visits were made to 4,636 workplaces selected to provide a cross-section of industry by type and size. The NIOSH teams collected general information about each plant such as its major product or service, the number of employees, available illness and injury statistics, the availability and kind of medical care. They also recorded the number of workers in each job category potentially exposed to chemical and physical agents.

Although we have had access to certain aspects of the survey in making rough estimates of specific worker exposures, we are just now beginning to be able to use the data in establishing priorities and projecting worker exposure to a large number of hazards. We have found that an individual employee is often exposed to more than one substance regulated by the Occupational Safety and Health Administration (OSHA). A major problem in completing the study is that employers were often not aware of the chemical composition of the substances used in their plants. Over 70 percent of the exposures identified were recorded as trade name products for which the chemical composition was not known to the company. We have contacted more than 10,000 manufacturers to identify precisely what chemicals were contained in these trade name products. To date, we have determined the chemical composition of only slightly more than half of those trade name products. Some of the manufacturers who responded stated that their trade product contained trade secrets. Of those trade products which contained OSHA regulated substances, 32.5 percent were designated as trade secrets by the manufacturer and a portion of these were OSHA regulated carcinogens.

The National Occupational Hazard Survey shows that the widespread use of trade name products and lack of a uniform system for labelling hazardous materials makes it difficult for workers to know the nature of substances they are exposed to. This problem is compounded by the frequent claim that product ingredients are trade secrets, even though ingredients may be known to be toxic or even cause cancer. Furthermore, interactive effects of certain mixtures can be more toxic than any of the separate components. For example, rust preservatives (nitrites) and emulsifiers (amines) used in some cutting and hydraulic fluids

have the potential to combine to form nitrosamines, a potent class of carcinogens.

There are a number of other factors that also contribute to the problem. Educational programs for workers and employers are not as well developed in the United States as in a number of other countries. Plant health and safety committees are an exceptional rather than a common finding in the United States. Industrial hygiene and occupational health services are not available or not utilized by most businesses. Trained occupational health professionals are in short supply and most of the nurses and physicians working in the field are treatment oriented and have received little formal training in toxicology, ergonomics or industrial hygiene. Occupational health personnel are not generally responsible for and usually have only limited involvement in care and rehabilitation of workers who become ill or who are injured. This discontinuity in the health care system contributes to several problems. Physicians caring for ill or injured workers often do not elicit detailed work histories and occupational health personnel often don't have available to them knowledgeable medical specialists with a variety of clinical skills. There are also other social and educational factors that tend to limit the interest of health professionals in workplace problems.

#### IV. WHAT STEPS HAS NIOSH TAKEN TO INFORM WORKERS AND CONTROL WORKPLACE HAZARDS?

A vital part of any research program is getting information to those who can put it to good use, in this case unions, employers, occupational safety and health professionals, other government agencies, and other researchers. Toward this end NIOSH has developed a program of information dissemination. This year we will issue over 100 different NIOSH publications and many additional articles will appear in scientific journals. We will distribute about one and one half million copies of our publications. Additional copies will be available from the Government Printing Office and the National Technical Information Service of the Department of Commerce.

One of these documents, used primarily by health professionals, is the annual Registry of Toxic Effects of Chemical Substances, which in 1976 listed over 25,000 different chemicals. A sub-file of suspected carcinogens from that list contained nearly 2,000 substances and another sub-file is being developed on pesticides and agricultural chemicals. NIOSH also sponsors conferences and publishes their scientific proceedings. In addition to publishing scientific proceedings of a conference on occupational carcinogenesis, which we co-sponsored, we are publishing another version written in non-technical language to be used by workers and other laymen.

We have developed a series of health and safety guides specifically targeted on small businesses. These guides, covering such diverse establishments as auto repair and body shops, foundries, and sporting goods stores, give general health and safety guidelines and provide a checklist of OSHA regulations applicable to that particular establishment. We also have a series of good work practices manuals for workers in different occupations.

A criteria document, "An Identification System for Occupationally Hazardous Materials," which was transmitted to the Department of Labor in 1974, presents a uniform identification system that would alert employers and employees to hazardous chemicals through placards, labels, and material safety data sheets. This system would provide for the identification of hazardous materials, indicate the degree and type of hazard, describe symptoms of over-exposure, and prescribe safe handling procedures, emergency care, and disposal methods. Adherence to such a system would substantially improve the information available on chemical exposures in the workplace.

One of NIOSH's most important responsibilities under the Act is to transmit recommended standards to the Occupational Safety and Health Administration (OSHA) in the Department of Labor. The NIOSH recommendations are intended to assist OSHA in developing new standards and in revising and completing the approximately 400 consensus health standards which consist only of environmental limits that were promulgated when the Act was passed.

NIOSH has transmitted more than 60 criteria documents recommending new health standards to the Department of Labor. These criteria documents include an environmental limit for workplace exposure, recommendations on the use of labels and other forms of warning, type and frequency of medical examinations to be provided by the employer, sampling and analytical methods, procedures for technological control of hazards, and suitable personal protective equipment. Criteria documents serve a useful purpose even before being promulgated as enforceable standards. They are widely distributed and many companies and unions use them as a basis to control hazards even though the documents do not have the force of law. They also provide an up-to-date review of the existing literature and state of knowledge on a hazard and serve as an impetus for further research by NIOSH and others.

In addition to criteria documents, under a joint Standards Completion Program with OSHA we have developed draft technical standards for most of the consensus health standards. These standards supplement the existing environmental limits with procedures for informing employees of hazards, monitoring techniques, engineering and control mechanisms, and medical surveillance programs. Once these recommendations have been promulgated as standards and these standards are enforced, workers should be protected from many of the most serious occupational exposures. Late this year NIOSH will publish five documents summarizing in non-technical language the supplemental information developed on the consensus health standards promulgated by OSHA. One document will be a general guide, one will be a pocket handbook, and the remaining documents will cover respirators, personal protective equipment and medical monitoring.

We also issue current intelligence bulletins when we receive new information on potentially dangerous chemical substances. In two to four weeks we can provide background information on the chemical substance, including its known toxicity to man and animals, known producers and users, estimated extent of occupational exposure, and further NIOSH action planned. These bulletins are now distributed to 1,200 representatives from the occupational safety and health community, other government agencies, management, labor and public interest groups.

NIOSH has promulgated regulations governing field investigations (42 CFR Part 85a). Under these regulations, it is our practice to meet with company management and with employee representatives before initiating a study to explain its purpose and scope. Before conducting medical examinations, investigators must receive specific approval from the NIOSH Human Subjects Review Board and the informed consent of each employee examined. All employees we examine and their designated physicians are notified of the results of these medical examinations. Before releasing final reports on group data (with individual identifiers removed) we provide draft copies to employers and employee representatives for their comments on technical accuracy. The results of our epidemiologic studies are presented in NIOSH criteria documents and technical reports, in scientific journals, at scientific meetings, and at OSHA hearings on workplace standards.

The two most common types of epidemiologic studies we conduct involving workers are retrospective cohort studies and cross-sectional medical studies. In cross-sectional medical studies we elicit a personal history and physically examine workers who have had exposures to agents under investigation as determined by industrial hygiene sampling. The results of these medical examinations are compared with accepted medical norms or similar test results from another population not exposed to the agent in question. Examined workers are notified of the results.

In cohort studies we obtain employment records from unions, professional societies, and companies for purposes of classifying workers according to departments where they worked, their job categories, and the duration of their employment. Personal identifiers, including name and Social Security Numbers, obtained during this process are used to determine the vital status and current address of the individuals through records kept by other Federal agencies, such as the Social Security Administration, and, until recently, the Internal Revenue Service. When we learn that an individual is deceased, we attempt to obtain a copy of the death certificate from the State in which the death occurred. Using the death records, we contrast the observed risk of dying from specific diseases among our study population with the risk expected in the general population or other groups not exposed to the substance of hazard.

At plants where the studies are conducted, we discuss the results of our research with management and labor. Although we do not notify workers individually unless we have examined them, we expect that those employed at the plant will be informed about our study results by their union or by management. We would not expect that workers in other similar plants would be directly informed

about the results of our studies. An even bigger problem involves workers who once worked in such plants but no longer do so. These workers, who may have changed jobs or retired, are less likely to know of health risks attributable to past workplace exposures.

Workplace investigations are also conducted in our health hazard evaluation, safety, and technical assistance programs. Under these programs we respond to requests from employers and employee representatives to investigate a workplace, collect environmental samples, make toxicity determinations, and provide medical examinations for workers. The results of these investigations, including recommendations for work practices, personal protective equipment, and engineering controls, are reported back to plant management, employee representatives, and OSHA. Also, the results of the health hazard evaluations are required to be posted for thirty days in the area of the investigated plant.

V. HOW MANY WORKERS ARE EXPOSED  
TO OSHA REGULATED SUBSTANCES?

Although it is known that hundreds and perhaps thousands of chemical substances have the potential to induce cancer or to increase the risk of cancer, it is obvious that exposure to these chemicals does not always result in disease. This is one of the factors which could unduly arouse anxiety in the notification of workers.

For purposes of this paper estimates were based only on exposure to OSHA regulated substances because at this point in time they appear to represent the greatest risk to the overt development of disease.

NIOSH has conducted thirty-five cohort or record studies directed toward over twenty-five different regulated substances including five of the sixteen carcinogens already regulated by OSHA and four other carcinogens where stringent regulations have been recommended (see Appendix A). This list was compiled with the help of epidemiologists in the Cincinnati and Morgantown laboratories. Some were conducted as far back as 1967, and some of the project officers are no longer with NIOSH. The number of workers involved in each study represents the best available information at this time. It is possible that these numbers may change when the individual study records are reviewed. These thirty-five studies dating back to 1967 involve over 100,000 workers. Other Federal research programs, have lists of tens of thousands of persons who may also require examinations.

The first step in determining the costs associated with notifying workers of the potential toxic exposures at their worksite consists of roughly estimating the number of workers involved. Recognizing that at best it will be necessary to establish a priority for the order in which workers are notified and at worst the costs and other problems of notifying all workers would be prohibitive, a variety of estimates are provided. These estimates are differentiated by the nature of substances included and by whether the potential exposure is full time.

The major source of information on broad ranges of potential exposures to OSHA regulated substances is that contained in the National Occupational Hazard Survey (NOHS). Between 1972 and 1974 the National Institute for Occupational Safety and Health (NIOSH) conducted this survey to determine the prevalence of worker exposure to chemical substances and physical agents.

In the National Occupational Hazard Survey, no attempt could be made to determine the actual exposure of individual workers. Rather, potential exposure was determined by the presence of substance at the worksite. If, however, the substance was present only in a closed system from which no exposure could occur, no potential exposure was recorded. Potential exposures were divided into two categories: (1) Part time, defined as a potential exposure of at least 30 minutes per week and not more than 4 hours per day; (2) Full time, defined as a potential exposure of 4 hours or more per day. Since the occurrence of toxic effects depends on the intensity, duration and frequency of exposure, and since simultaneous or sequential exposures to a number of different substances may also alter toxicity, we cannot easily assess what health risks are faced by individual workers.

At this time only preliminary results are available from the NOHS survey. Facts relevant to this paper can be summarized as follows:

- Approximately 7.5 million persons in the work force were exposed to one or more trade name substances discovered to date to contain an OSHA regulated substance.
- Approximately 310,000 persons in the work force were exposed to one or more trade name substances discovered to date to contain a carcinogen.
- Approximately 5 percent of persons exposed to one or more trade name substances discovered to date to contain an OSHA regulated substance or a carcinogen have been exposed for more than four hours per working day (full time).
- Ninety-five percent of persons exposed were exposed at least 30 minutes per week and not more than four hours per day (part time).

Approximately 70 percent of exposures, hazardous or otherwise, arise from trade name substances. Approximately 50 percent of the trade name substances have been identified as to content.

Since the NOHS survey results do not presently provide estimates of the total number of persons exposed to all products containing OSHA regulated substances or specified carcinogens, approximations have been developed based on NOHS estimates of total workers exposed to trade name products which have been analyzed for content to date.

To estimate the numbers of exposed workers, three assumptions are necessary. These assumptions may be disproven at some future time when more complete processing of NOHS data is possible. How-

ever, they are necessitated now by the limitations of the existing data. The assumptions are:

1. Toxic substances occur in the remaining 50 percent of trade name exposures in approximately the same percentages as in those which have been translated into their chemical composition.
2. The proportion of toxic potential exposures among non-trade name substances is approximately identical to that among the trade name substances.
3. Trade name substances not analyzed for content to date and non-trade name exposures affect a completely different group of workers than trade name substances already analyzed for content.



Based on these assumptions and the above facts from the NOH Survey, the total number of workers currently exposed to all OSHA regulated carcinogens and to all OSHA regulated substances either used in trade name products or in generic form are projected as shown in Table 1.

Violations of these assumptions may lead to biases in the estimates. The dependence of the estimates on trade name data (necessitated by the existing time constraints of the study) probably underestimates exposures to basic materials such as asbestos and lead which would seldom be hidden by trade names. Although the third assumption may lead to overestimation of the number of workers, this effect would not be sufficient to offset the underestimation caused by the reliance on trade name data. For example others have suggested that as many as one million workers may be exposed to asbestos, an OSHA regulated carcinogen. This estimate clearly exceeds our estimate of 880,000 workers exposed part-time or full time to OSHA regulated carcinogens.

The potential magnitude of the problem of workers exposed to OSHA regulated carcinogens and OSHA regulated substances can be seen in Table 2. Although the full-time exposure to carcinogens of up to 44,000 workers may be considered more significant, it is important to recognize that the part-time exposure to carcinogens may involve repeated peak exposures and thus be equally dangerous.

When the broader range of OSHA regulated substances is considered, the number of exposed workers increases dramatically. The full-time exposure to these substances is estimated to be as high as 1,050,000 workers and the full and part-time exposures are estimated as high as 21,000,000.



TABLE 1

BASES OF ESTIMATES OF MAXIMUM NUMBERS OF WORKERS CURRENTLY EXPOSED TO CARCINOGENS & TO OSHA REGULATED SUBSTANCES

| Numbers of persons exposed full time or part time to OSHA regulated Substances <sup>a</sup> |   | Number of persons estimated from NOHS to be exposed to a trade name substance discovered to date to contain an OSHA Regulated Substance                               |   | Total number of Trade Name Substances in NOHS<br>Number of Trade Name Substances in NOHS analyzed for content to date <sup>b</sup>                              |   | Total Exposures in NOHS<br>Trade Name Exposures on NOHS <sup>c</sup> |
|---------------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------------------------------------------------------------------|
| 21,407,011                                                                                  | = | 7,484,969                                                                                                                                                             | x | 2                                                                                                                                                               | x | 1.43                                                                 |
| Number of persons exposed full time or part time to OSHA regulated carcinogens              |   | Number of persons estimated from NOHS to be exposed to a trade name substance discovered to date to contain an OSHA regulated carcinogen                              |   | Same as Above                                                                                                                                                   |   | Same as Above                                                        |
| 879,839                                                                                     | = | 307,636                                                                                                                                                               | x | 2                                                                                                                                                               | x | 1.43                                                                 |
| Number of persons exposed full time to an OSHA regulated substance                          |   | Number of person exposed full time or part time                                                                                                                       |   | Full time Exposures<br>Full time and part time exposures                                                                                                        |   |                                                                      |
| 1,050,000                                                                                   | = | 21,000,000                                                                                                                                                            | x | .05                                                                                                                                                             |   |                                                                      |
| Number of persons exposed full time to an OSHA regulated carcinogen <sup>a</sup>            |   | Number of persons exposed full time or part time to OSHA regulated carcinogen                                                                                         |   | Full time Exposures<br>Full time and part time exposures                                                                                                        |   |                                                                      |
| 44,000                                                                                      | = | 880,000                                                                                                                                                               | x | .05                                                                                                                                                             |   |                                                                      |
| <sup>a</sup> Estimated                                                                      |   | <sup>b</sup> Since only half of the generic chemicals in trade name products have been identified we assume other half will be comparable and thus must multiply by 2 |   | <sup>c</sup> Since only 70% of exposures arise from trade name products, it is necessary to use the reciprocal of 70% to arrive at estimates of total exposures |   |                                                                      |

TABLE 2

ESTIMATED NUMBERS OF WORKERS EXPOSED TO CARCINOGENS AND OSHA REGULATED SUBSTANCES

| <u>TYPE OR WORKERS</u>                                                                  | <u>ESTIMATED NUMBER</u> |
|-----------------------------------------------------------------------------------------|-------------------------|
| Workers in NIOSH studies<br>potentially requiring no-<br>tification                     | 101,000                 |
| Workers currently exposed<br>full time to OSHA regulated<br>carcinogens                 | 44,000                  |
| Workers currently exposed<br>full time to all OSHA<br>regulated substances              | 1,050,000               |
| Workers currently exposed<br>full time or part time to<br>OSHA regulated carcinogens    | 880,000                 |
| Workers currently exposed<br>full time or part time to<br>all OSHA regulated substances | 21,000,000              |

Estimates of workers currently exposed represent only part of the problem. The NOHS data were based on a cross-sectional survey of exposure to hazardous substances. Thus, estimates of total persons at risk due to exposure must consider workers who have been exposed at some prior time over their total working life.

The current labor force is approximately 84 million. There are approximately 22 million persons over the age of 65. Using a typical participation rate of 60 percent of the general population, over 13 million of these would be retired from long-term working status. Thus, approximately 100 million persons in the current general population have been in the labor force for significant periods of time during their life time.

Approximately eight to nine percent of workers change occupations in a given year. Numerous studies of occupational mobility indicate that (1) movement is most likely to occur between occupations that are closely related in work requirements, (2) occupational mobility patterns have been stable over time, (3) mobility rates are highest for occupations with limited training requirements, and (4) mobility shows a strong negative correlation with age.

However, none of the mobility studies nor the NOH Survey provides adequate data to determine movement into and out of industries in which exposure to hazardous substances may be prevalent. Given the high mobility rates one could reasonably assume that the number of persons in the general population who have been exposed for some substantial period of time to OSHA regulated substances and carcinogens is at a minimum two to three times greater than for a given point in time represented by data in the NOH Survey. Thus, the backlog of workers exposed to OSHA regulated substances could be as many as 40 to 50 million persons in the general population.



## VI. HOW CAN INDIVIDUAL WORKERS BE NOTIFIED?

Federal agencies conducting cohort studies would need to trace each individual whose records were included in a previous study and to write, telephone or otherwise contact such individuals. Because records of such studies are covered by the Privacy Act and because the fact of prior exposure might compromise the employment opportunities of an individual worker, it would not seem appropriate to involve employers unless the worker were still employed at the plant where exposures took place. Unions, however, might be able to play an active role in the process.

On the other hand, it would seem equitable that employers undertake the responsibility of informing all current and former workers about exposures to OSHA-regulated substances. In practice, this may not be possible since employment records may have been discarded and since exposures will often not be known. During the years since past exposures occurred, mergers and changes in products and processes could further complicate the task.

A reasonable question to ask is which workers could most benefit from notification. Workers exposed to substances which cause delayed toxicity or which cause permanent impairment of functional capacity would seemingly benefit most. For these workers to benefit, adequate provision for compensation and health care are necessary.

A related question is when to notify a worker who has been exposed to a non-regulated, but potentially hazardous, material or substance. Notification before the findings of research are generally accepted by the scientific community could add to confusion on the part of the worker and rejection of corrective action on the part of management. On the other hand, delay until an agent falls under regulation may lead to undue exposure and risk.

A variety of record systems might be used to trace individuals. The most cost effective systems are those of the Internal Revenue Service and the Social Security Administration. There are legal and administrative barriers to the utilization of these systems by Federal research groups. Unless these barriers are removed, more expensive tracing mechanisms such as credit bureaus would be needed. Employers would have no difficulty in notifying currently employed workers or workers covered by their retirement plans. Employers would be forced to utilize commercial tracing sources, such as credit bureaus, to find many former employees, however.

In either case, health professionals involved in notifying workers would need to compose a number of different letters addressing different types of exposures and different health risks. These communications must be carefully worded and should indicate where the worker can obtain any necessary additional information.



## VII. WHAT COUNSELING MIGHT BE NECESSARY?

Workers notified about exposures will probably need further counseling as will health professionals, worker representatives and legal advisers who become involved. Federal health agencies have conducted demonstration projects that identified, notified and provided medical examinations for workers exposed to asbestos and vinyl chloride monomer, which are carcinogens, as well as to workers exposed to leptophos, a pesticide that causes neurotoxicity. In each of these studies, questions arose about the relationship of workplace exposures to personal habits and about legal liability and compensation. Attempts to deal with the delayed effects attributable to therapeutic use of diethylstilbesterol (DES) have also demonstrated the need to have counseling services available. Notification without counseling services can have a number of undesirable results. Some may react by denying any personal risk, others may be so over-concerned that their mental well being is impaired. Notification without counseling and adequate medical examination may prove socially disruptive and lead to an undermining of confidence in government and perhaps also in private industry or even labor unions.

A necessary part of worker notification and counseling is the provision for a telephone hotline where the workers, their physicians and others may call for additional information on exposure and follow-up. Hotline services offered by NCI and CDC although not geared specifically to environmental/occupational cancer problems, provide experience relevant to the estimation of costs.

It is estimated that 35 to 50% of the private physicians may avail themselves of such a service based on the premise that non-occupational health physicians may not be aware of the adverse effects associated with exposure to certain chemicals, and also the fact that there are few protocols detailing appropriate surveillance procedures for former workers who were previously exposed to agents which may increase the risk for cancer or cause other delayed toxicities.



#### VIII. WHAT KINDS OF MEDICAL EXAMINATIONS MIGHT BE REQUIRED?

Chemical agents may cause damage to a single target organ or to a multiplicity of organs, and the associated physiological changes may be subtle or profound. In addition, certain agents such as carcinogens may not demonstrate an effect until 20 or 30 years after exposure. For this reason, the advisable follow up medical examinations would vary in complexity and in frequency of performance, depending on the agent or agents to which the worker is exposed. The type and frequency of examination would also depend on whether or not the worker is still exposed to the agent or agents. For example, a worker continuing to have exposure to organic dusts from agricultural products should have yearly pulmonary function tests to see if there is any evidence of pulmonary changes. A worker needs only a pulmonary function test at termination of employment to determine if his past exposure has resulted in pulmonary disease.

Workplace exposures frequently involve more than one regulated substance at a single job station. Over a working lifetime, a single worker may also be sequentially exposed to a number of toxic substances. For example, a number of workers involved in saccharin manufacturing were previously exposed on the job to OSHA-regulated carcinogens that cause bladder cancer. Such considerations require that medical examinations be somewhat tailored by the attending physician to fit the needs of the individual worker-patient.

Despite these complexities, four general categories of medical examination and follow-up can be identified.

- A single, simple examination required only once for workers previously exposed to agents not known to cause cancer or other delayed effects after exposure has been terminated. For example, an exam for a worker previously exposed to organic agricultural dust but no longer exposed to an OSHA regulated substance might involve an interim history, and simple tests of pulmonary function.
- A single complex examination required only once for workers previously exposed to agents not known to cause cancer or long delayed toxicities after exposure has terminated. For example, for a worker exposed to leptophos but no longer exposed to an OSHA regulated substance, an examination might require an interim history, physical examination and non-routine diagnostic tests.
- Recurring, but simple examinations required for workers who continue to be exposed to toxic agents not known to cause cancer. Workers exposed to organic dust or lead would, for example, fall into this category.

- Recurring, complex examinations for workers exposed to carcinogens or other agents known to cause delayed effects in the past or on a continuing basis. Some examples are workers exposed to asbestos or vinyl chloride monomer or bischloromethyl ether.

The type of follow-up examination required for each type of chemical exposure was ascertained by consulting the Standard Completion Program recommendations for medical follow-up.

IX. WHAT ARE THE ESTIMATED COSTS  
OF NOTIFICATION COUNSELING AND  
MEDICAL EXAMINATIONS?

A number of steps are involved in estimating the cost of meeting the obligation imposed by the right of workers to know about toxic exposures. The complexity of the problem is increased greatly when we recognize that many workers who have been notified of their toxic work exposures will seek further information regarding the implications of the exposure and recommended medical care. In many cases, workers will subsequently seek the recommended medical examinations. The costs of this entire system, including the process of notification, counseling, and follow-up medical examinations, are costs which are incremental to society with respect to fulfillment of the worker's right to know. That is to say, the realization of these costs occurs either directly or indirectly because of the worker becoming aware of his exposure. Because the worker has a right to know, however, it would be improper to avoid these costs by failure to inform the worker. In order to properly avoid these costs, the worker must be made aware of the toxic nature of substances at his work site and must be protected from possible adverse effects through control and monitoring of potential hazards. Unfortunately, this latter and correct method of avoiding these costs to society has not been adequately carried out in the past. It therefore becomes necessary to determine the magnitude of this too frequently hidden liability.

Each of the costs involved in notification, counseling and medical follow-up are considered in turn. It should be noted that the direct bearer of the costs will depend on who performs the particular task. Insofar as industry can be required to meet their obligations with regard to the workers's right to know, the costs should not be borne directly by the government. However, there is no requirement for industry to do so at the present time. To avoid having the taxpayer shoulder the entire burden of notification, this omission in the law should be addressed.

The costs and even the feasibility of obtaining names of workers identified only through a statistical study such as the NOHS are virtually impossible to obtain. The process first involves determining firms in Standard Industrial Classification (SIC) categories where exposures are expected. The Bureau of Labor Statistics (BLS) in the Department of Labor is able to locate firms associated with SIC codes through the use of unemployment insurance files. While BLS has reportedly performed this service for NIOSH in the past at no charge, the magnitude of the problem at hand suggests that such an informal arrangement could not be used. Once a plant has been located, it is necessary to obtain the list of workers from the firm.

For workers currently or recently employed, this may be a fairly simple task. For many firms, however, it may be virtually impossible to provide lists of names of workers who are previously employed and worked in tasks where potential exposures to particular substances are likely to have occurred. With insufficient information on the likely exposures of workers, the numbers of names to be searched and notified may increase

dramatically from the estimates included here. There is no way to estimate the extent to which this would occur or the costs involved in obtaining the names of the individuals from the plants. In the past it has been necessary for NIOSH to find cooperative employers or unions in order to obtain the names of the individuals exposed. The right of NIOSH to require firms to divulge this information is currently being questioned by a large corporation.

The costs of locating workers varies with the way in which the search is conducted and with the level of difficulty encountered.\* The most efficient searches are performed through the Internal Revenue Service (IRS). Costs of obtaining an address through IRS are 30 to 50 cents per name. Under current law, however, this source is not available to NIOSH. Furthermore, it must be recognized that the ability of IRS to conduct the necessary searches may well depend on the numbers of names for which addresses must be obtained. The resources required to obtain a few thousand names for the purposes of conducting a study may be available in slack times while those required for obtaining current addresses for millions of individuals could be another matter.

Information can be obtained from the Social Security Administration (SSA) for about the same costs as from the IRS. Because there is a delay when SSA obtains the information from IRS, the information available is not as current as that available from IRS. The ability of SSA to provide the resources required for a massive search must be questioned as was that of the IRS.

If searches cannot be conducted through IRS or SSA, it is necessary to use the services of credit reporting firms. This increases the costs by orders of magnitude. A simple search by these firms costs about \$20. In past NIOSH experience, more complex searches have cost as much as \$50. The average cost is \$25 - \$50 per name. For purposes of estimating this cost we will assume that IRS/SSA would be responsible for necessary searches at a cost of 40 cents per name.

Composition of an appropriately worded letter of notification is not a trivial task. It is necessary to attempt to motivate the worker to seek appropriate follow-up while not unduly alarming the worker or the worker's family. Based on NIOSH experience in composing letters to notify industry of potential hazards, each different type of letter may cost approximately \$400. While a special letter will not be required for each substance, a range of 10 to 20 essentially different letters is reasonable. For purposes of estimating this cost we assume 15 different letters at \$400 each.

Printing, mailing, addressing and related mechanical costs run approximately \$1 to \$2 per notification. Considering the complexity of ensuring the workers receive appropriate letters with correct indications of the substances to which they were potentially exposed, the cost could run as high as \$3 per letter since a significant amount of customizing may be necessary. It is also virtually certain that a larger number of letters than shown in the estimates will be used because of an inability to avoid sending multiple letters to individuals who have been employed in a number of affected worksites. The price of \$1.50/worker is used to estimate this cost.

\*These costs do not include the costs of personnel responsible for managing the search.

Cost estimates for a hotline counseling service are based on the experience of the Center for Disease Control (CDC) in operating an interstate VD hotline service to answer questions from concerned individuals in any of the states except Hawaii and Alaska. CDC pays for training volunteer operators, rental of the telephone lines, and certain other public information expenses. CDC does not pay for housing or most personnel costs. The costs to CDC for this operation is \$1 per call. We have adjusted the cost of the hotline for workers to \$3 - \$6 to reflect additional costs of housing, personnel to man the phones, and the more complex nature of the worker-related phone calls. The figure of \$4.50 per call is used to estimate this cost.

The need for appropriate information to be developed to respond to the needs of the medical profession is great. In the case of carcinogens, for example, NCI has stated that they do not have a professional consensus for most of the protocols needed for the follow-up of non-symptomatic patients. In order to assemble the best available information regarding appropriate follow-up procedures, it will be necessary to hold a number of conferences of experts. The cost per conference will be approximately \$25,000. Considering the various potential cancer sites and the variety of organs that can be affected by other toxic substances, 15 to 20 conferences would be required for a total cost of \$400,000 to \$500,000. For estimates we assume 15 conferences at \$25,000 each.

Dissemination of information to physicians can be accomplished by having the hotline refer such inquiries to appropriate consultants.

The costs of medical surveillance can cover a very wide range. Certain procedures such as the taking and reading of X-rays are less expensive when carried out as part of a special program such as the Coal Mine Health and Safety Act than when they are carried out as part of the ordinary medical system. Urinalysis, blood counts, routine blood chemistries and the usual tests of pulmonary function taken individually are basically simple. When more complex surveillance is required, the costs rise dramatically. In a recent NIOSH sponsored conference, the consensus was that the physical exam and laboratory tests frequently suggested in NIOSH recommendations costs about \$200.

That estimate may be low for many complex exams. In NCI demonstration programs, follow up for patients and the offspring of patients who had been administered DES cost \$300 - \$400 per person. Examination of asbestos workers in another demonstration project cost \$400 to \$500 per examination. Monitoring of workers exposed to vinyl chloride monomer in Louisville, Ky., cost \$800 - \$1,000 per worker. Given this wide range of possible costs and the fact that for purposes of estimation it is not possible to be precise regarding the exact procedures required for each substance, we chose as typical lows and highs \$50 and \$100 for simple procedures and \$200 and \$500 for complex procedures.

It is estimated that between 60 and 80% of the workers will participate in follow up examinations. This estimate is based on the experience of NCI in demonstration products involving follow up of workers exposed to asbestos and vinyl chloride (82 to 97% participation), and the

experience of NIOSH in the Coal Miners Survey where a high percentage of the workers participate in examination programs. The high worker participation in these studies may be attributed to two factors (1) the miners received job transfer rights or compensatory payments if a work-associated disability was found and (2) participation in follow-up is higher if clinical facilities are directly tied into the surveillance programs. Since this may or may not be the case here, a more conservative estimate of worker participation was used.

The costs potentially associated with notification of workers depends upon the nature and cost of medical surveillance required. It is therefore necessary that the estimates of potential exposures be allocated to categories of medical follow-up for costing. Furthermore, the required medical follow-up depends upon whether the worker is currently being exposed or was exposed some time in the past. The estimates provided result from the following process.

For each OSHA regulated substance found in the NOHS, a category of medical surveillance was determined. Using data from the NOHS regarding the number of workers potentially exposed to each substance, the proportion of potential exposures in each examination category was determined and applied to estimates of persons exposed to determine the potential number of each type of medical follow-up required. This procedure inflates the number of inexpensive surveillance procedures required. This bias would arise when, for example, a worker is exposed to two substances one of which requires a simple exam, the other a complex exam. In many cases, his participation in the complex surveillance procedure would obviate the necessity for the simple one. The extent of this potential bias cannot be determined. The results of these estimates are shown in Table 3. The greatest burden is associated with those workers requiring complex surveillance for life. Although only 200,000 workers, representing 25% of the total workers currently exposed full time to OSHA regulated substances require complex lifetime surveillance, they represent the major portion of costs because of the costly and recurring nature of the exams.

The estimated surveillance costs for potentially exposed workers who seek medical follow-up is shown in Table 4. This table assumes a life expectancy of 37 additional years for the average worker currently employed. The costs associated with recurring examinations required only during the time the worker is exposed assume two examinations per worker. This is based on the "quit rate" for manufacturing as published for BLS. Of course as new employees are exposed, these costs too would take on a recurring nature. Costs associated with these "future" exposures are not included, however.

The sensitivity of surveillance costs to varying levels of participation and varying levels of medical costs can be seen in Table 4. For each worker group the highest estimate of surveillance costs is more than three times the lowest cost. For final cost estimates the mid-point between the lowest and highest estimates was used.

Table 5 shows total costs for the alternative groups of workers. Given the high costs involved, these alternatives provide policy makers with a range of costs which might be undertaken. Approximate average

annual costs are also shown there. Because of average ages and life expectancy being used throughout, a more meaningful distribution of costs over time is not available.

Even when consideration is limited to carcinogens substantial costs are involved. The total cost associated with workers currently exposed to OSHA-regulated carcinogens full-time is around \$424 million. The cost for both full and part-time workers is nearly \$8.5 billion. We believe that any worker exposed to a carcinogen for four or more hours a day should receive follow-up care.

If consideration is extended to workers currently exposed full-time or part-time to any OSHA regulated substance, total program costs are estimated to be \$54 billion. Most of these would be incurred for workers requiring lifetime surveillance. Based on an average life expectancy of 37 years, this represents an annual cost of nearly \$1.5 billion.

It should be noted that all of the cost estimates ignore possible additional employer liability or compensation costs resulting from discovery of compensable physical impairment during examination, entitlements under various federal and state programs, and recovery for damages under possible third-party legal actions, brought by workers, their employers or insurance companies.



TABLE 3

PERSONS POTENTIALLY EXPOSED BY SOURCE OF NIOSH INFORMATION AND CATEGORY OF REQUIRED SURVEILLANCE

| Recommended Follow-up   | Workers in NIOSH Cohort Studies* | Est'd. currently regulated | Number of persons exposed to OSHA carcinogens | Maximum number of persons currently exposed to OSHA regulated substances |                   |
|-------------------------|----------------------------------|----------------------------|-----------------------------------------------|--------------------------------------------------------------------------|-------------------|
|                         |                                  | Full time                  | Part time                                     | Full time                                                                | Part time         |
| None                    | 0                                | 0                          | 0                                             | 200,000                                                                  | 3,115,000         |
| One time simple         | 7,000                            | 0                          | 0                                             | 230,000                                                                  | 4,830,000         |
| One time complex        | 500                              | 0                          | 0                                             | 140,000                                                                  | 2,940,000         |
| Simple during exposure  | NA                               | 0                          | 0                                             | 20,000                                                                   | 420,000           |
| Simple for life         | 0                                | 0                          | 0                                             | 10,000                                                                   | 210,000           |
| Complex during exposure | NA                               | 0                          | 0                                             | 200,000                                                                  | 4,200,000         |
| Complex for life        | 93,000                           | 44,000                     | 880,000                                       | 250,000                                                                  | 5,250,000         |
| <b>TOTAL</b>            | <b>100,500</b>                   | <b>44,000</b>              | <b>880,000</b>                                | <b>1,050,000</b>                                                         | <b>21,000,000</b> |

\*Excludes studies in which workers were notified

TABLE 4

ESTIMATED SURVEILLANCE COSTS FOR PERSONS POTENTIALLY EXPOSED WHO SEEK MEDICAL FOLLOW-UP  
(Millions of Dollars)

| Worker Group                                                                        | 60%<br>Participation |                   | 80%<br>Participation |                   |
|-------------------------------------------------------------------------------------|----------------------|-------------------|----------------------|-------------------|
|                                                                                     | Low <sup>2</sup>     | High <sup>3</sup> | Low <sup>2</sup>     | High <sup>3</sup> |
| NIOSH Cohort Studies <sup>1</sup>                                                   | \$ 192               | \$ 480            | \$ 256               | \$ 640            |
| Workers currently exposed<br>to OSHA regulated<br>carcinogens full time             | 195                  | 490               | 260                  | 650               |
| Workers currently exposed<br>to OSHA regulated<br>carcinogens full and part<br>time | 3,900                | 9,760             | 5,210                | 13,000            |
| Workers currently exposed<br>to OSHA substances full<br>time                        | 1,200                | 2,975             | 1,600                | 4,000             |
| Workers currently exposed<br>to OSHA substances full<br>time and part time          | 25,080               | 62,500            | 37,000               | 83,000            |

1 Because these studies were conducted over a period of years and in many instances involved cohorts selected by age, costs cannot be properly adjusted for life expectancy of workers involved. Costs shown are for current exposures and assume a life expectancy of 17 years as compared with 37 years for other groups.

2 Low estimates are based on \$50 for simple and \$200 for complex exams.

3 High estimates are based on \$100 for simple and \$500 for complex exams.

TABLE 5

TOTAL COST ESTIMATES FOR DIFFERENT GROUPS OF WORKERS\*

|                         | Workers in NIOSH<br>Epidemiological<br>Studies | Workers Currently<br>Exposed to OSHA<br>Regulated Carcino-<br>gens Full Time | Workers Currently<br>Exposed to OSHA<br>Regulated Carcino-<br>gens Full Time or<br>Part Time | Workers Currently<br>Exposed Full Time<br>to OSHA Regulated<br>Substances | Workers Currently Exposed<br>Full Time or Part Time to<br>OSHA Regulated Substances |
|-------------------------|------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Number of Workers**     | 101,000                                        | 44,000                                                                       | 880,000                                                                                      | 1,050,000                                                                 | 21,000,000                                                                          |
| Obtain Addresses        | \$ 40,000                                      | \$ 18,000                                                                    | \$ 352,000                                                                                   | \$ 420,000                                                                | \$ 8,400,000                                                                        |
| Compose Letters         | 3,000                                          | 3,000                                                                        | 3,000                                                                                        | 6,000                                                                     | 6,000                                                                               |
| Print and Mail          | 152,000                                        | 66,000                                                                       | 1,320,000                                                                                    | 1,575,000                                                                 | 31,500,000                                                                          |
| Hotline                 | 114,000                                        | 50,000                                                                       | 990,000                                                                                      | 1,181,000                                                                 | 23,625,000                                                                          |
| Conferences             | 200,000                                        | 200,000                                                                      | 200,000                                                                                      | 375,000                                                                   | 375,000                                                                             |
| Surveillance            | 415,769,000                                    | 423,280,000                                                                  | 8,465,600,000                                                                                | 2,580,500,000                                                             | 54,193,000,000                                                                      |
| <b>TOTAL</b>            | <b>\$416,278,000</b>                           | <b>\$423,617,000</b>                                                         | <b>\$8,468,465,000</b>                                                                       | <b>\$2,584,057,000</b>                                                    | <b>\$54,256,906,000</b>                                                             |
| Approximate years       | 17                                             | 37                                                                           | 37                                                                                           | 37                                                                        | 37                                                                                  |
| Approximate Annual Cost | \$ 24,000,000                                  | \$ 11,000,000                                                                | \$ 229,000,000                                                                               | \$ 70,000,000                                                             | \$ 1,466,000,000                                                                    |

\*Groupings used here are not usually exclusive and should not be summed.

\*\*Cost of locating names of all workers included in NIOSH studies not included.



X. WHAT STEPS CAN NIOSH TAKE TO PROVIDE NOTIFICATION  
AND MEDICAL FOLLOW-UP FOR EXPOSED WORKERS?

The present NIOSH budget does not provide for counseling and medical follow-up. It is possible for NIOSH to assume responsibility for the notification of workers in its cohort studies. However, the participation of the Social Security Administration and/or the IRS is essential to keep the costs within reason. Notification will require reprogramming monies from the NIOSH carcinogen program to cover the estimated \$309,000 cost of obtaining addresses, composing letters, printing and mailing and operating a hotline. It will also mean NIOSH personnel will have to be diverted from essential ongoing research projects. For example a retrospective study of 2,000 - 10,000 workers requires 1 - 3 man-years of effort. Therefore, attempting to notify at least 100,000 workers would conservatively take 10 - 30 man-years of effort. In addition, it should be noted that the above effort would not include notification of other workers in the same plant who were not included in NIOSH studies.

NIOSH would make available the recommendations from the Standards Completion Program to those in the medical community who may need additional information for the follow-up of exposed workers.

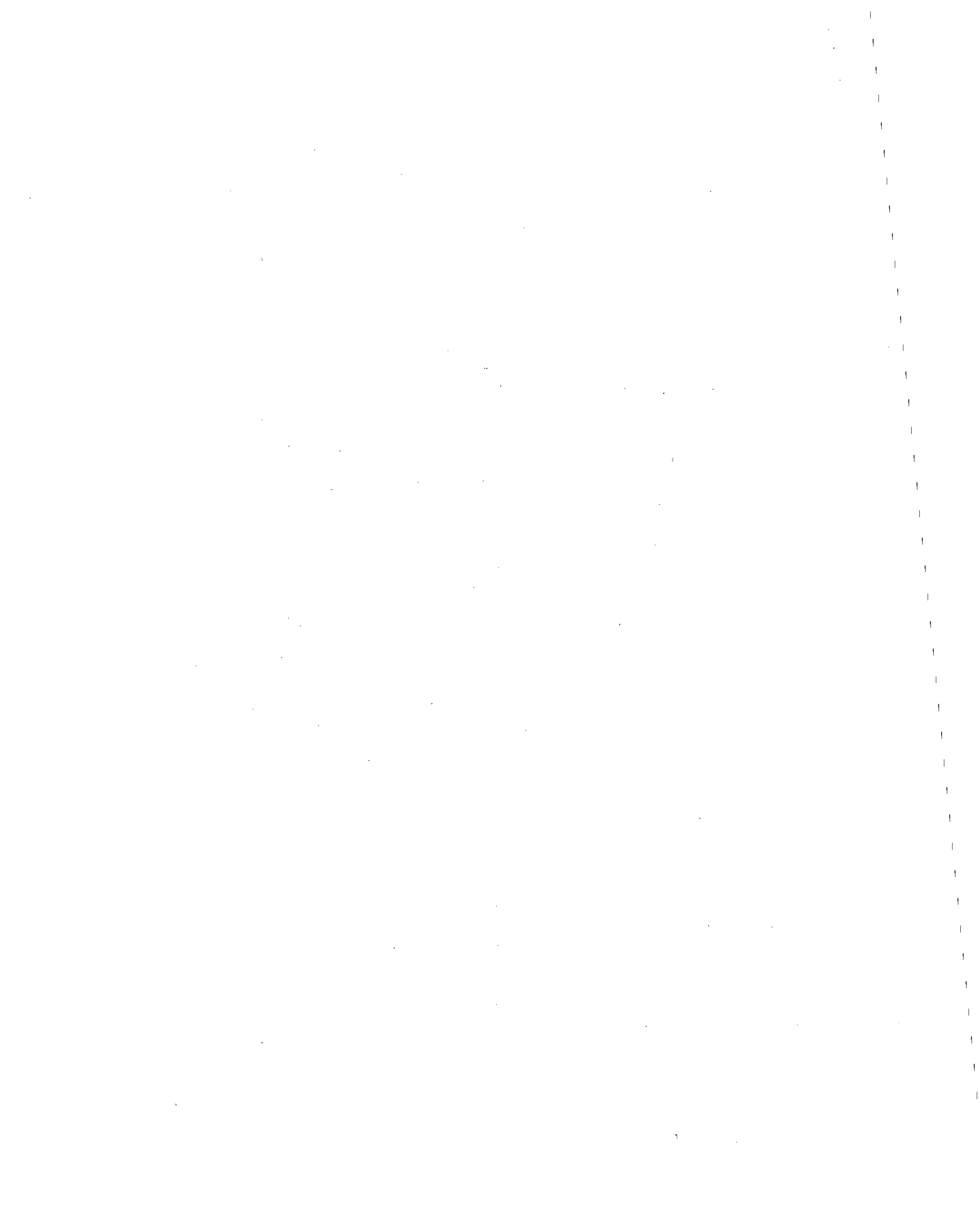
NIOSH is willing to work with the Division of Cancer Control and Rehabilitation of the National Cancer Institute in their present efforts to develop medical surveillance protocols for follow-up in people exposed to chemical carcinogens.

The estimated cost associated with the surveillance of workers is over three orders of magnitude greater than that of notification. This could prompt the decision to notify workers without providing for surveillance. Such a decision would reduce the benefits of notifying workers and would impose the cost of follow-up on other segments of society.

An important aspect of notification is to permit the worker to seek appropriate medical care for purposes of prevention and early detection of disease. If we fail to provide for a system for medical follow-up, the worker will know he has a problem but may not be able to do anything about it.

If workers seek a private source of care through an insurance group such as Blue Cross and Blue Shield, then that group will have to absorb the cost which will ultimately be passed on to other members of the group through higher payments. Furthermore, these plans seldom provide for testing of asymptomatic subscribers.

In view of the extremely high costs associated with reducing the consequences of high exposures to workers in the work place, it would seem more prudent for industry to institute intensive monitoring procedures and appropriate engineering controls to ensure low levels of exposure to physical and chemical agents and thus avoid a recurrence or further growth of this problem.



## XI. WHAT POLICY ISSUES SHOULD BE CONSIDERED?

The right of workers to know of past or current exposures to OSHA regulated substances intertwines with a number of policy issues involving the conduct of research by Federal agencies, trade secrecy protection, legislation dealing with health and safety regulation, health care financing, contamination of the community environment and workmen's compensation. A number of Federal Departments and Agencies conduct studies on workers where positive findings have resulted and the workers can be identified. Research groups in NIH (principally NIEHS and NCI), CDC, FDA, EPA and ERDA are all likely to face problems in dealing with the right to know. The Social Security Administration, the General Services Administration, the Internal Revenue Service and the Bureau of Labor Statistics of DOL would need to be involved in discussions concerning notification. All of the parties involved in implementing the Toxic Substances Control Act and the Occupational Safety and Health Act could contribute to the solution. The Occupational Safety and Health Administration through a required uniform labeling and warning system for workplace hazards and through a vigorous program to establish health standards and assure compliance with those standards can ensure notification, counseling and medical examination for workers currently exposed to toxic substances.

- If research agencies are to notify and counsel all individuals involved in studies utilizing records and not involving personal contact, the costs of these studies will be substantially increased. No provision now exists to pay for any follow-up examinations that may be requested by persons included in such record studies.

- A major stumbling block is the failure of chemical repackagers and primary producers to show the chemical composition of their products. Steps are being taken to promote voluntary disclosure. It may be possible for EPA to require that labeling of industrial chemicals include product composition. New legislation may be required if EPA is forced to go through the hearing process for each chemical constituent contained in trade name products.

- Since adoption of an effective uniform labeling and warning system for chemicals found in the workplace might be hindered by revealing trade name composition, an interim step might be a requirement that the Materials Safety Data Sheets submitted to the General Services Administration be improved, collated and made generally available to employers and employees.

- Inflationary impact statements, required for Occupational Safety and Health Standards consider only outlays by industry. They do not consider potential cost savings or increased productivity for industry nor do they consider that workers have a right to know about exposures to workplace hazards and that the costs of counseling and medical follow up are now hidden or being borne by

others. Changes in the structure of or the requirement for such statements should be considered.

- Employees covered by the Occupational Safety and Health Act have not been provided with transfer and wage-retention when their functional capacity has been impaired or when they are at increased risk because of heavy exposure to OSHA regulated substances. This is in direct contrast to the Coal Mine Health and Safety Act which provides such protections. Consequently, unprotected workers may hesitate to seek desirable medical follow-up because their current employment may be jeopardized or future job opportunities limited.
- Providing transfer and wage rate retention rights for workers exposed to OSHA-regulated carcinogens having significant functional impairment as a result of exposures to agents like asbestos, cotton dust, silica, lead and certain other metals might be dealt with in regulations or may require new legislation.
- A number of episodes involving contamination of the general environment with toxic substances pose problems much like those discussed in the workplace. Current problems involving environmental contamination with polybrominated biphenyls and quarry dust pose problems involving notification, counseling, medical follow-up and compensation. In Japan, environmental contamination episodes involving cadmium and mercury contamination were followed by enactment of an environmental compensation law. Current Federal legislation in this country can provide for research, notification and counseling but there is no easy way to pay for diagnostic determination of adverse effects or any necessary medical follow-up.
- Most existing health insurance policies do not provide for diagnostic procedures or follow-up examinations made necessary by exposure to toxic substances in the workplace or in the general environment. Workers no longer in the labor force may not be covered by the Occupational Safety and Health Act. A number of other groups of workers, such as State and local governmental employees currently in the workforce may be exposed to toxic substances including carcinogens but may not be protected by OSHA standards. These gaps could be closed by legislation dealing with occupational safety and health, by changes in State compensation systems or by provisions for such care in proposals for national health insurance.
- Workmens' compensation systems in the States do not adequately identify or equitably deal with occupational health problems. In general little or no provision is made to provide for medical examinations or former workers who were exposed to toxic agents including carcinogens but who are not clinically ill. State or Federal legislation reforming workmens' compensation could deal systematically with and establish a mechanism for notification, counseling and any necessary medical follow-up. Clearly the right of workers and citizens to know whether or not they are exposed to hazardous chemical and physical agents regulated by the Federal Government is linked to a complex series of policy issues that need to be considered together.

APPENDIX A

NIOSH EPIDEMIOLOGIC STUDIES OF WORKERS  
EXPOSED TO CARCINOGENS  
AND OTHER HAZARDOUS SUBSTANCES



APPENDIX

NIOSH EPIDEMIOLOGIC STUDIES OF WORKERS EXPOSED TO CARCINOGENS AND OTHER HAZARDOUS SUBSTANCES\*

| TYPE OF EXPOSURE                              | NAME OF STUDY                                     | NUMBER OF WORKERS<br>STUDIED | TYPE OF FOLLOWUP EXAM<br>REQUIRED                         |
|-----------------------------------------------|---------------------------------------------------|------------------------------|-----------------------------------------------------------|
| Arsenic                                       | Study of Arsenic Workers                          | 200                          | Recurring complex for current and ex-employees            |
| Asbestos                                      | Study of hard rock gold miners                    | 2,000                        | Complex recurring exams for both exposed and ex-employees |
| Asbestos                                      | Cincinnati Resp. Disease Study                    | 200                          | Complex recurring exams for both exposed and ex-employees |
| Asbestos                                      | Study of workers in Tyler, Texas Asbestos Plant   | 3,500                        | Recurring complex exam for current and ex-workers         |
| Asbestos                                      | Studies of workers in asbestos related industries | 4,125                        | Recurring complex exam for current and ex-workers         |
| Auto exhaust<br>(Carbon Monoxide-Hydrocarbon) | New Jersey Motor Vehicle Examiners                | 1,453                        | Recurring complex exams for both present and ex-employees |
| Benzene                                       | Study of workers exposed to Benzene               | 4,000                        | Recurring complex exam for both current and ex-employees  |
| Benzidine                                     | Study of workers exposed to Benzidine             | 1,500                        | Recurring complex exam for both current and ex-employees  |
| Beryllium                                     | Beryllium/sarcoidosis study                       | 10,000                       | Recurring complex exam for current and ex-workers         |

\*This table subject to change when individual records are studied.

**NIOSH EPIDEMIOLOGIC STUDIES OF WORKERS EXPOSED TO CARCINOGENS AND OTHER HAZARDOUS SUBSTANCES\***

| TYPE OF EXPOSURE       | NAME OF STUDY                                     | NUMBER OF WORKERS STUDIED | TYPE OF FOLLOWUP EXAM REQUIRED                                                      |
|------------------------|---------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------|
| Betanaphthylamine      | Betanaphthylamine Worker's Study                  | 1,500                     | Recurring complex exam for both current and ex-employees                            |
| *Bischloromethyl ether | Study of workers exposed to Bischloromethyl ether | 702                       | Recurring complex exam for both current and past employees                          |
| Cadmium                | Study of Cadmium workers                          | 800                       | Recurring complex exam for current and ex-workers                                   |
| Carbon Monoxide        | Union Pacific Carbon Monoxide Study               | 200                       | Recurring complex exams for present employees. Single complex exam for ex-employees |
| Chloroprene            | Chloroprene Study                                 | 800                       | Recurring complex exam for both current and ex-employees                            |
| Cotton Dust            | Byssinosis Study of North Carolina                | 250                       | Recurring simple exam for presently exposed - simple single exam for ex-employees   |
| Cotton Dust            | Byssinosis Research                               | 1,500                     | Simple recurring exam for presently exposed - simple single exam for ex-workers     |
| Cotton Dust            | Byssinosis Study                                  | 200                       | Simple recurring exam for presently exposed - simple single exam for ex-employees   |
| Dichlorobenzidine      | Study of workers exposed to Dichlorobenzidine     | 226                       | Recurring complex exam for both current and ex-employees                            |

\*Bischloromethyl ether is no longer manufactured in the U.S.

Workers in NIOSH study have been informed of exposure

**NIOSH EPIDEMIOLOGIC STUDIES OF WORKERS EXPOSED TO CARCINOGENS AND OTHER HAZARDOUS SUBSTANCES**

| <b>TYPE OF EXPOSURE</b>                 | <b>NAME OF STUDY</b>                                        | <b>NUMBER OF WORKERS STUDIED</b> | <b>TYPE OF FOLLOWUP EXAM REQUIRED</b>                                         |
|-----------------------------------------|-------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------|
| <b>Fibrous glass</b>                    | Studies of workers exposed to fibrous glass                 | 10,000                           | Complex recurring exams for both exposed and ex-employees                     |
| <b>**Leptophos</b>                      | Study of workers at Bayport, Texas                          | 350                              | Single complex exam                                                           |
| <b>Methyl Butyl Ketone</b>              | Study at Columbus Coated Fabrics                            | 300                              | Complex recurring for present employee - Complex single exam for ex-employees |
| <b>Naphthylketone asbestos, Benzene</b> | Study of Paint Trade Workers                                | 4,000                            | Recurring complex exam for both current and ex-employees                      |
| <b>Perchloroethylene</b>                | Perchloroethylene Study                                     | 2,000                            | Recurring complex exam for both current and ex-employees                      |
| <b>Polychlorinated Biphenyls</b>        | Polychlorinated Biphenyls Study                             | 3,000                            | Recurring complex exam for both current and ex-employees                      |
| <b>Polynucleated aromatics</b>          | Machinists exposed to cutting oils                          | 5,000                            | Recurring complex exam for both current and ex-employees                      |
| <b>Polyvinyl chloride</b>               | Workers exposed to Polyvinyl Chloride in Plastic's Industry | 7,600                            | Recurring complex exams for both present and ex-employees                     |
| <b>Radon daughters</b>                  | Uranium Miner Study                                         | 15,000                           | Complex recurring exams for both exposed and ex-employees                     |
| <b>Silica</b>                           | Vermont Granite Workers' Study                              | 2,500                            | Recurring simple exam for present and ex-employees                            |
| <b>Silica</b>                           | Silicosis Study                                             | 1,332                            | Recurring simple exam for present and ex-employees                            |

**\*\*Leptophos is no longer manufactured in the U.S.**

**Exposed workers located by NIOSH had neurological examinations.**

**NIOSH EPIDEMIOLOGIC STUDIES OF WORKERS EXPOSED TO CARCINOGENS AND OTHER HAZARDOUS SUBSTANCES**

| <b>TYPE OF EXPOSURE</b>                                 | <b>NAME OF STUDY</b>                       | <b>NUMBER OF WORKERS STUDIED</b> | <b>TYPE OF FOLLOWUP EXAM REQUIRED</b>                                                      |
|---------------------------------------------------------|--------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------|
| <b>Styrene Butadiene</b>                                | <b>Styrene Butadiene Study</b>             | <b>6,000</b>                     | <b>Recurring complex exam for both current and ex-employees</b>                            |
| <b>Sulfur Dioxide</b>                                   | <b>Utah Sulfur Dioxide Study</b>           | <b>200</b>                       | <b>Recurring complex exams for present employees. Single complex exam for ex-employees</b> |
| <b>Talc Asbestos</b>                                    | <b>Workers exposed to Talc</b>             | <b>1,500</b>                     | <b>Complex recurring exams for both exposed and ex-employees</b>                           |
| <b>Uranium</b>                                          | <b>Uranium Mill Working Study</b>          | <b>3,000</b>                     | <b>Complex recurring exams for both exposed and ex-employees</b>                           |
| <b>Vinyl Chloride</b>                                   | <b>Study of Pottstown Chemical Workers</b> | <b>2,550</b>                     | <b>Recurring complex exam for both current and ex-employees</b>                            |
| <b>Wood particles plus other unidentified chemicals</b> | <b>Paper pulp and Plywood study</b>        | <b>5,000</b>                     | <b>Recurring complex exam for both current and ex-employees</b>                            |

**An additional group of 50,000 Anesthesiologists were studied by NIOSH. Results of this study have been shared with the appropriate professional societies who, in turn, should notify the individual anesthesiologist members in their society.**