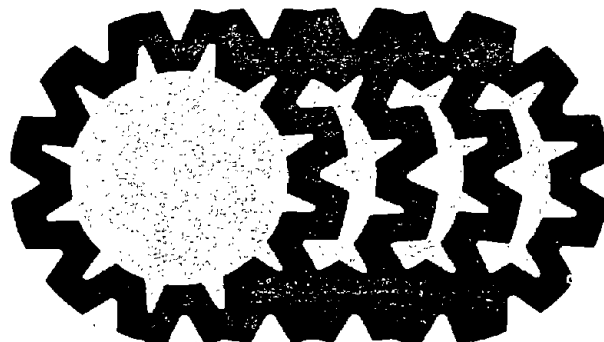




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Reliability and Utilization of Occupational Disease Data



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RELIABILITY AND UTILIZATION
OF
OCCUPATIONAL DISEASE DATA

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Development

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ABSTRACT

RELIABILITY AND UTILIZATION
OF
OCCUPATIONAL DISEASE DATA

Vernon Eugene Rose, Dr.P.H.

Knowledge as to the scope and magnitude of the occupational health problem in this country is a necessary prerequisite in organizing and implementing control programs. Prior to passage of the Occupational Safety and Health Act in 1970, occupational disease reporting as required under state laws was considered non-functional. The new legislation required, among other things, the US Department of Labor to design and implement a system which would make employers responsible for recording and reporting occupational diseases and injuries. Although the federal government, in cooperation with state governments, implemented a data collection and analysis system for occupationally related diseases (and injuries), several major deficiencies limit the usefulness of the effort. First and foremost is that in the recognition step, where occupational relationships are evaluated, decision guidelines are not available. The second problem involves the lack of specificity and timeliness of the existing system. These are seen as major constraints in implementing a system responsive to the needs of disease control programs. It is recognized that interactions between disease producing factors found in the workplace and

the individual are very complex. The World Health Organization suggests that there are at least four categories of occupational disease syndromes; only occupational in origin, occupational as one of the causal factors, occupation as a contributing factor in complex situations, and aggravation of preexistent disease. Therefore, where occupational relationships are determined on an individual basis, it must be recognized that the complexity of the problem demands consideration of uniformity and consistency in approach. After review of approaches used in different countries as well as for other disease surveillance systems, recommendations for the modification of the system used in this country are presented. The primary focus involves the development and application of guidelines for determination (for surveillance purposes) of specific diseases with emphasis on surveillance as a byproduct of prevention. It is recommended that identification and recording be associated with protective requirements. Consequently the first responsibility is to alleviate unhealthful conditions in the workplace. These can then be followed by reporting requirements. If occupational disease data are to be used as a tool in implementing responsive control efforts, the content and timeliness of reports are of major concern. Reporting procedures similar to those used for communicable diseases, but with responsibility still placed on the employer, are seen as one approach to improve the situation. The recommended changes involve reporting all cases of specific diseases rather than the complex approach now employed. The goal of the recommendations is to make occupational disease reporting not an end in itself, but rather a part of the overall control effort.

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CHAPTER I. INTRODUCTION

A. Background

A special report to the Surgeon General of the U.S. Public Health Service, in 1966, (1) suggested that a national program for occupational health should have two goals. The first would involve the elimination of any factor which "makes the worker pay with his health or his life for the privilege of having a job," while the second would be the "promotion of the nation's economy through the reduction of sick absence and lowered production because of correctible health factors associated with the workplace." Although the cause-and-effect relationship between an individual's occupation and the development of illness or disease has been observed for centuries, (2) the report went on to state:

It is almost inconceivable that this nation, with its vast resources and technical skills, has never developed a comprehensive picture of the work environment to determine the relationship with the health status of its productive workforce. Nor are all the...presence and trends of disease observed...Uniform recording and reporting procedures...on disease prevalence and mortality in employed groups would be a great assist in studies of this type.

In a somewhat more straightforward manner, the same issue was addressed in an editorial appearing some 5 years earlier in the Journal of Occupational Medicine which asked the question "How much occupational disease?" The answer suggested was that for the country as a whole "it honestly must be admitted that no one can make a defensible guess." (3)

Indeed, an even more basic question is: How many types of occupational diseases are there? McCord, in announcing the birth of the new occupational disease "acroostelysis" in 1970, suggested that the list numbered close to 3,000, of which "the majority are trivial in consequence and some are rare." (4)

Integral to the question of how much as well as how many occupational diseases there are, is the definition of occupational disease. The International Labour Organization, after trying out several possible definitions in an article on compensation of such diseases, suggests that it is "impossible to devise any internationally acceptable definition applicable in all circumstances, and (it is therefore) difficult to draw up comparable statistics." (5)

The lack of information on the scope of the problem was a recurring theme during congressional hearings on the need for federal legislation regarding occupational safety and health held in the late 1960's. As the then Assistant Secretary for Health and Scientific Affairs, U.S. Department of Health, Education, and Welfare, noted, "We are experiencing a continuing national tragedy of occupational injury, disease, and death. The scope of this tragedy, the number of its victims, we can only guess at, and acknowledge that our guess is probably low." (6)

At the hearings of the House of Representatives, the Director of the AFL-CIO Department of Legislation summed up the feelings of organized labor about specific needs for better statistics on job-related injury and disease in noting that:

This Nation has developed intensive uniform and valid national reporting systems - economic, fiscal, demographic, and many others. But valid national statistics on the nature and cause of industrial accidents and, in particular, occupational diseases do not exist.... As of now we see only the top of the job-hazard iceberg. It is our belief that when such a reporting system has been developed as a result of passing a strong occupational health and safety bill, it will reveal that the number of occupational illnesses and injuries will be two-fold larger than those presently reported by the National Safety Council's and the Bureau of Labor Standard's selective coverage. (7) [Editor's note: We believe "Standard's" should read "Statistics"]

B. Goals of an Occupational Disease Surveillance System

A range of strategies are applicable toward the control of human disease. At one end of the range, early recognition of potential problems is theoretically possible. At this point, control techniques could be implemented prior to exposure or to the development of the disease process. Experimental testing of new chemicals prior to their use by humans is an example of this strategy. When experimental results are reliably predictive of man's response, appropriate controls can be designed and implemented. However, in practical terms, no such screening or preevaluation system can be totally accurate. It must be recognized that in the final analysis the documentation necessary to determine that a hazard or chemical does not pose a significant health risk or that the risk is being adequately controlled must rest on a documentation and proper evaluation of the human experience. (8) The other end of the range of strategies involves response only after the disease process has become manifest in so many individuals that an epidemic is obvious. Between these two extremes lie the more typical courses of action.

The middle part of the range of strategies involves extrapolation from limited data before the epidemic stage, permitting the introduction of preventive as well as curative measures. It is in this part of the range--the "real world" situation--that disease monitoring or surveillance takes on its greatest importance. The World Health Organization has defined disease surveillance as a "concerted attempt to keep under continuous observation all the factors that contribute significantly to the occurrence of disease in human populations." (9)

Whether for communicable diseases or for health effects associated with environmental factors, control and prevention require knowledge of the magnitude of the problem. This is especially true in a world of increasing competition for available resources. Basic information as to how many people have been, are, or may be affected may be an important determinant of the allocation of resources necessary for control. If the incidence rate of disease X is 10 per 100,000 persons, while disease Y has an attack rate 2 or 3 times higher, expenditures for disease Y may therefore be larger than for disease X, if morbidity and mortality are comparable.

In no area is this truer than in occupational disease. As noted by the administrator of one of the largest state occupational health programs, "Such data would be of immense help to him in his efforts to realistically determine action priorities, clearly formulate program objectives, effectively allocate available resources, and provide meaningful cost-effectiveness information to sharp-eyed, cost-benefit-minded fiscal managers." (10)

Consequently, a basic measurement of the magnitude and potential impact of the problem is seen as the first goal of a surveillance system. Such a determination will better allow for the allocation of resources between occupational health and competing programs. If of sufficient detail, it will also allow for the measurement of the success of occupational health control programs.

At a seminar on early warning systems for toxic substances, it was proposed that the principal objective of such systems be "to detect asymptomatic, preclinical disorders, as well as overt diseases, in early stages of subacute pathogenesis, and to promote environmental and medical

management of associated factors in order to prevent the onset of acute pathology requiring hospital care." (11)

Here the goals of surveillance may include early identification of known problems in order to provide treatment for those affected and, at the same time, provide protection to others who may be exposed to the hazard. In addition to problem definition, these then become the second and third goals of the system - one being related to the individual already included in the surveillance system and the other being related to preventing a repetition of the same problem among other workers exposed to similar conditions. To approach the optimum end of the range, surveillance programs should have a fourth goal, that of identifying new or previously unsuspected health hazards, so that control measures may be implemented as early as possible.

It is important to note that the output of an occupational disease surveillance system has numerous applications. Such information is necessary in developing and establishing research priorities and in documenting the need to develop or revise prevention and control standards. (12) Such data can also be of importance in directing compliance activities. In one case, the occupational disease reports by types of industry from another state were used as input into an inspection priorities model for a local government where adequate reporting was not available in the local area. (13) Such applications are of special importance where a limited inspection force is responsible for monitoring conditions in a large number of workplaces. Such data also have application in the development of education programs.

Therefore, a reliable documentation of the scope and magnitude of the problem is without question one of the most important steps in planning, implementing, and evaluating governmental occupational health programs. There is an increasing awareness on the part of the general public of the problems associated with exposures to chemicals and other toxic materials in the workplace. As the public learns of situations such as that of the asbestos workers in Tyler, Texas (14) and the vinyl chloride workers in Louisville, Kentucky, (15) it becomes increasingly important that governmental officials responsible for controlling and preventing occupational health problems have available to them reliable information as to the nature and scope of the problem. It is also recognized that an understanding of occupational health problems has an even more important role beyond that of contributing to employee health protection. For many hazards, the work experience can be used to evaluate the potential impact on the general population. Although a smaller number of individuals with a higher than average health status are involved in the work force, exposures to environmental hazards are generally greater than that experienced by the general population. In addition, the exposed population is more accessible for monitoring. Consequently, the evaluation of the health status of the working population can play an important part in the protection of the general population, especially as it relates to concerns of environmental health and exposures to toxic substances and similar hazards. (16) For example, the development of a rare form of liver cancer in workers involved in the manufacture of vinyl chloride resulted in a more widespread concern for exposure of the general population to vinyl chloride from aerosol sprays and material used in the wrapping of some foods. (15)

As Langmuir noted, "good surveillance does not necessarily ensure the making of right decisions, but it reduces the chances of wrong ones."

(17) When reliable information is not available, programs are vulnerable to direction by crisis or misdirection. It is only when the problem of occupational disease is documented that long-range programs can be planned, established, defended, and, as necessary, protected from disruption by external forces lobbying for or against a specific activity.

C. Approaches and Problems

Historically, the most prevalent approach to occupational disease reporting has been one of observing or associating high incidences of a certain disease in persons involved in similar work. Where the physician is confronted with a single case, diagnosis as an occupational disease is often based on information established from similar observations or studies. This is the so-called "matching process" described by Johnstone and Miller. (18) The basic questions asked in this process are: "Is the suspected substance known to have toxic properties?" and "Did the reaction in the case under study conform to known, established reactions?" Based on the need to "conform to known, established reactions," new or unexpected disease relationships are not likely to be discovered where occupational relationship is evaluated on an individual basis.

The U.S. Public Health Service (19) recommends that the following four factors be taken into consideration when diagnosing possible cases of occupational disease. They are:

- (1) a meticulously taken history (including occupations);
- (2) knowledge of the nature and severity of the exposure(s);
- (3) signs and symptoms furnishing corroborative evidence as to its accuracy; and

- (4) supporting clinical and analytical laboratory tests indicating the extent of the exposure.

When these factors are taken into consideration, the problems associated with measuring the prevalence of occupational diseases become more apparent. For example, a 35-year-old person is found to have a marked decrease in hearing acuity. Medical evaluation rules out the more common diseases of the ear. Upon inquiry, the physician learns that the individual has been a jet aircraft mechanic for 15 years. In this case, a determination that the illness is occupationally related will probably result. Here, the physician has related the problem to a known occupational cause and has ruled out other conditions which might have produced similar symptoms.

When an individual has a condition not generally associated with the work environment or where the disease has a relatively high incidence in the general population, a determination of occupational relationship is less likely. For example, if the same 35 year-old person is found to have ulcers, it is highly unlikely that the disease will be diagnosed as occupationally related. If, however, an occupational history reveals that the patient is, or was, an air traffic controller, a possible causal relationship must be considered in view of the increased prevalence of peptic ulcer among air traffic controllers, as compared to certain other occupations. (20)

As regards prevention, it might be concluded that where disease determinations are made on an individual or on a case-by-case basis, two benefits can be achieved. The first would accrue to the individual himself when treatment is more effective if causal relationships are known, or to prevent recurrence of the disease. The second would benefit a larger

group of workers where the lack or inadequacy of hazard control measures are identified. Such identification would hopefully lead to the implementation of corrective measures. It is highly doubtful that the ultimate surveillance goal, that of identifying new or previously unsuspected relationships between work and health, can be accomplished where decisions are made on an individual basis.

To further complicate matters, it must also be recognized that such direct cause-and-effect relationships are not the only concern in the field of occupational health. The World Health Organization (21) suggests four categories of occupational disease syndromes:

- (1) only occupational in origin;
- (2) occupation as one of the causal factors;
- (3) occupation contributes to the occurrence of disease as one of a complex of exogenous factors; and
- (4) occupation determines the course of preexistent disease.

Although none of the categories are easily defined, the latter three offer special problems in the surveillance effort. For these situations, especially where the increased incidence of disease due to occupational factors is slight, an approach which does not involve determinations made on an individual basis may be necessary. Here epidemiologic and statistical analysis techniques become applicable. (22) Indeed, as Hatch notes, it may become necessary to develop "a total understanding of the interlocking influences on health of environmental stress at home and in the community as well as on the job." (23) For example, the National Cancer Institute has documented the variation of cancer on a geographical basis. (24) Consequently, environmental variability, which includes occupational exposures, appears to play a role

in this disease process.

Therefore, in addition to diagnosis and occupation, other variables, such as age, sex, genotype, nutrition, past or present diseases, previous or concomitant exposures outside the workplace, and social conditions, are also important in assessing the contribution of work to disease. (21) A compilation of a large number of reports and application of appropriate analytical techniques holds promise for identifying previously unsuspected or undocumented relationships between occupation and disease, including the uncovering of new causal relationships between work environment and disease.

Both types of information--direct reports and statistical relationships--are of importance in implementing and directing public health programs concerned with the control and/or prevention of occupational diseases. Monitoring of recognized and well-understood hazards is necessary to ensure that control techniques are being adequately applied. At the same time and in consideration of the rapid rate of introduction of new hazards and new chemicals into the American workplace, a surveillance system should also be sensitive to the development of new problems. The identification of probable causal relationships can result in the introduction of control strategies which are more truly preventive in nature. It is possible, however, that different surveillance strategies may be necessary for the monitoring of known hazards and for the identification of new problems.

D. Scope of the Effort

An initial step in the design of any surveillance system is consideration of the magnitude and complexity of the situation to be

monitored. In the case of a national program designed to maintain surveillance on the health status of the working population, consideration must be given not only to the size of the population involved (in the case of the United States, a work force of some 80 million) but also to the distribution of the work force throughout the country. It is one thing to know the number of workers in the United States, but quite another to know that the work force is distributed throughout the country and located in millions of differing workplaces involving innumerable products, machines, and processes; this adds extra dimensions to the situation. Tables 1 through 4 illustrate the distribution of the United States work force by type of occupation and by type and size of workplace. Additional characteristics such as the type of occupation within an industry add further complications.

If the output of a surveillance system is to lead to control and prevention, it is necessary that certain characteristics of the population be included in the system to allow for subsequent analysis and evaluation of implemented corrective measures. For example, although valid observations may result, is it realistic to monitor health status only on the basis of broad categories such as white collar workers versus blue collar workers? If the goal of the system is to identify and document problems with a degree of description sufficient to allow for the design and implementation of control measures, it is highly probable that attributes must be rather narrowly identified. Therefore, it is necessary to categorize occupations on a narrow basis. Although a detailed job classification system has been developed by the U.S. Department of Labor (25), other systems are in use in this country, thereby leading to problems

in comparing and analyzing occupational data. (26) As a result, the federal government is currently developing a Standard Occupational Classification System. (27) Whether this system will contain sufficient detail for the purposes of occupational health surveillance must still be determined.

Another factor impinging on this problem involves those instances in which a worker may perform several duties, or where a highly refined job classification system is utilized. In these situations, it may be difficult to determine the appropriate classification, thus resulting in classification inconsistencies at the reporting level. The problem is further complicated by job mobility, especially where chronic or latent health problems are of concern.

In an occupational disease surveillance system, classification by types of industry is also of importance. Such information is useful in developing standards, in compliance activities, as well as in implementing education programs for employers and employees. Although there is a widely used recognized classification system for workplaces (28), problems similar to those encountered in job classifications also exist. For example, several different operations may be conducted at one work location. In such cases, the standard industrial classification (SIC Code) associated with the predominant function will normally be used. However, if health problems are associated with other than the primary operation, inconsistent disease patterns may be identified.

In any event, it would appear that a surveillance program designed to monitor occupational disease would primarily be interested in three basic parameters. The first would be the disease or illness itself. The

second would involve individual characteristics, such as occupation, age, sex, and ethnicity. The third parameter of concern would be the type of industry or place of employment of the individual. An additional category of information, which is seldom available, is the environmental conditions associated with the job or with industry. Generally speaking, the introduction of this type of information, which is extremely useful in developing hypotheses regarding cause-and-effect relationships, is done subsequent to the surveillance or problem identification effort. However, such data are becoming more readily available. In 1972, the U.S. Public Health Service initiated a survey of some 5,000 establishments throughout the country. (29) The primary purpose of the survey was to identify environmental exposure conditions including chemicals used, controls available, and duration of exposure. The survey was designed such that the results could be expanded to represent occupational exposures in a large segment of American industry.

One approach to monitoring or maintaining a surveillance of worker health status involves the observation and recording by the employer of cases of occupational disease. If the workplace itself is to be utilized as the recording point or source of data, another factor of concern is the availability of medical resources in private industry. Consequently, it is of more than passing interest to note the availability of medical services throughout American industry. Table 5 depicts the distribution of physician services by establishment size in the construction and manufacturing industries. As expected, there is a direct relationship between size and establishment of formal arrangements with a physician.

E. Problems with Current Reporting of Occupational Disease in the United States

On December 29, 1971 the President of the United States signed into law the Occupational Safety and Health Act (29 U.S.C. 656). The purpose of the Act was to:

Assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes. (30)

Acting on information such as that recorded in the testimony presented earlier in this Chapter, the Act in Section 8, authorized the Secretary of Labor, in cooperation with the Secretary of Health, Education, and Welfare (HEW), to develop regulations requiring employers to "make, keep and preserve and make available" to both departments records on the employers' activities which are "necessary for developing information regarding the causes and prevention of occupational accidents and illnesses."

In Section 24 of the Act, which is concerned with statistics, the Secretary of Labor, again in consultation with the Secretary of HEW, is directed to "develop and maintain an effective program of collection, compilation, and analysis of occupational safety and health statistics." This activity is further described to include "accurate statistics on work injuries and illnesses which shall include all disabling, serious, or significant injuries and illnesses..."

The Department of Labor's approach to this responsibility is described in detail in Chapter V of Federal Requirements. Essentially, the system involves a two-step approach. Initially, regulations have been developed which require all employers subject to the provisions of the Act to record cases of occupational injury and illness occurring in their workers. It is estimated that this coverage involves about 5 million workplaces and some 60 million workers. (31) The second step involves annual reporting of occupational injuries and illnesses by a sample of employers.

In 1976, the United States General Accounting Office (GAO) forwarded a report to the U.S. Congress evaluating the Department of Labor's efforts in developing data on the severity and causes of worker safety and health problems. (31) The basic conclusion of the study was that, even though the Department of Labor "has made and is continuing costly efforts to obtain data for directing activities under the Act," such efforts were not satisfactory in that "the information compiled and analyzed was too vague to identify the hazards that can cause death and seriously disabling injury and illness." In recognition of the need for such data, the report indicated that the information collected "did not provide an adequate basis for deciding what should be done in standards development, enforcement inspections, and information and education efforts to minimize" the effects of workplace hazards. Although the report considered a broad array of different types of information, the primary focus was on occupational injury and illness reporting.

The report also recognized the difficulties associated with obtaining "health hazard" data and noted that, even if the recommendations

contained in the report were adopted, they "would not be adequate for directing efforts to protect workers from toxic chemicals and other health hazards." Two reasons were given for this conclusion. The first involved difficulties in recognizing the relationship between illness and work conditions which results in "understating the extent" of the problem. The second problem involved the latency of many diseases and noted that the data may therefore be "accumulated too late to be of maximum value in preventing illnesses." In developing recommendations, GAO noted that the Department of Labor had more authority to obtain data than it had exercised to date and specifically recommended a program to:

- (1) obtain information on employees' exposure to hazardous substances and agents and the effects of such exposures on health;

- (2) require employers to provide periodic medical examinations to employees exposed to harmful conditions, whether or not such conditions are covered by standards; and

- (3) to require monitoring, recording, and reporting of exposure levels.

The details of such an effort were not described in the report; however, there was no doubt left as to the need for developing and implementing new strategies to obtain data regarding the problem of occupational illness.

CHAPTER II. METHOD OF APPROACH AND GOALS

A. Methods of Approach

In evaluating the reliability and utilization of occupational disease data, the approach will first be to conceptually describe the elements of a model disease surveillance system (Chapter III). The elements will be described in detail with special emphasis on the tasks to be accomplished as related to the special needs and problems of occupational disease. As each element or task is examined, questions will be developed so that the model system can be used as an evaluation tool or template to evaluate existing approaches. In developing the factors to be considered, it is recognized that the success of any data gathering and evaluation system is dependent on attention to details at the operational level. In this dissertation, emphasis will instead be placed on broader issues and fundamentals of design which, necessarily, must be developed before specific operational requirements are designed.

The next step will be to present an overview of existing systems and related sources and techniques used in the United States and in other countries (Chapters IV through VII). A tabular summary of the most pertinent systems, compared to the model system, will then be presented (Chapter VIII), followed by a discussion of major strengths and weaknesses of the various approaches (Chapter IX). The final step will be to develop specific conclusions and recommendations for an "ideal" system (Chapter X).

B. Goals

The goals of this dissertation are to critically evaluate strategies for monitoring occupationally related diseases and to present specific recommendations which, if implemented, should provide better

surveillance tools for this problem. In reflecting on the complexities of the occupational disease problem, especially as related to determining cause-and-effect relationships, it should be recognized that probably no one approach can provide all the information needed. Nevertheless, such problems should not serve as a deterrent to striving for better understanding and, therefore, better control of the problem.

CHAPTER III. MODEL DISEASE SURVEILLANCE SYSTEM

A. Specifications of a Model System

In any surveillance system, regardless of the situation or parameters to be monitored, the initial step involves the identification of who, what, when, where, why, and, most importantly, how. A clear understanding of these descriptive elements is especially important where the system will involve a large number of observers and reporters and/or will extend over a lengthy period of time.

For example, if a surveillance system is developed to monitor the quality of drinking water, it is important to identify who is going to collect and who will evaluate the samples; what characteristics, such as hardness, bacteriologic count and chlorine residual, are to be measured; when or over what period surveillance will be maintained; where or within what boundaries, i.e., city, country, or water distribution system, the observations will be made; and finally, or ideally initially, why the surveillance program is being implemented. A thorough evaluation of why the program is needed should identify the steps to be taken between implementation and final outcome which usually involves the initiation of corrective action where warranted.

The final concern in the design of a surveillance effort involves consideration of the mechanics of the system. Often it may be assumed that if the other, more conceptual, questions are answered, the system will automatically work. However, consideration of fundamental questions such as design of forms to be used, individual responsibilities for processing information at various stages, and type of equipment needed to operate the

system are important in ensuring successful implementation.

Generally, the goals of a surveillance system do not include corrective actions to solve a problem. Instead, the purposes are to maintain watch over an identified population or activity, and, by measuring certain parameters, to react to changes in excess of predetermined tolerance limits. As such, the goals of the system are to identify that a problem exists, and also provide an initial level of information to allow for more in-depth evaluations leading to corrective measures.

Once the basic ground rules of the system have been established and the system has been initiated, the next step involves the recognition of deviant situations. The accuracy or reliability of such observations are dependent on a number of factors. A controlling factor is the initial definition of the goals and ground rules of the system, i.e., specification of normal.

Then comes the classification of observations. For a surveillance system concerned with monitoring a number of diseases, this step involves the observation of symptoms and, based on a standard disease classification scheme, the determination of the appropriate classification for the disease condition noted. Of concern here is the degree of detail or depth of the classification system. For example, is it sufficient for the purposes of the reporting system to classify diseases into broad categories such as cancer, or are more specific and detailed classification necessary? With cancer cases, classification might involve site or organ and/or type of cells involved, as in carcinomas, sarcomas, leukemias, and lymphomas. When both parameters are considered, more than 100 separate varieties of this disease alone are possible. (32)

After the disease is recognized and properly classified, procedures establishing consistent requirements for recording and/or reporting as appropriate are necessary. The use of standard forms to assist in obtaining adequate and consistent descriptive data of the observation is an important consideration. It is also important to ensure that both those originating and those receiving reports are aware of their individual responsibilities.

Once the reporting system has been implemented and disease reports begin flowing into a central or collecting location, the approach to collation of reports from various reporting units or individuals is necessary so that an overall picture or evaluation of the situation can be made. This may involve simple tabulations based on certain parameters, such as type of disease, or on other characteristics of the individual involved, such as sex, race, or occupation. However, as more sophisticated statistical and data processing techniques become available for the analysis of a large number of reported events, the collation stage may require entering the data into a computer system. Where such techniques are used, subsequent evaluations may involve the analysis of variables whose relationships to the disease are suspect.

The next step is the analysis and summary of a large number of events such that trends or variations in observations may be identified and documented. This step may require the application of statistical techniques to determine significant deviations in observed versus expected events.

At this stage, a surveillance system may have pointed out that unexpected conditions exist, however interpretation of the observations is

necessary and crucial. It is at this point that initial theories regarding possible causative or related factors may be introduced. Where the incidence of apparently occupationally related diseases is greater than expected, the development and implementation of appropriate control strategies require a thorough evaluation of the data.

Based on the initial interpretations of the data, the next-to-final step in a surveillance system would involve the development of recommendations to facilitate control, to document the apparent lack of a problem and/or to indicate possible areas needing more scrutiny. As pointed out earlier, the goal of a surveillance system is not to solve problems but rather to make their existence known and to initiate determination of causation. The design and implementation of effective control strategies are usually done outside of the surveillance program.

The final step in a disease surveillance system is the evaluation of the usefulness of the effort. This involves interaction with those responsible for control efforts and with other affected parties. In the case of occupational disease, the latter group involves occupational health researchers and educators, employers and employees and their representatives.

Each of these steps in the surveillance system will now be discussed in more detail as they relate to occupational disease. In each step, the major issues and ideal approach will be identified.

Step 1. RECOGNITION

The most important concern here is the degree to which the physician must determine the relationship between occupation and disease. Most of the approaches which will be discussed require a yes or no answer

based on the individual case. Here, the physician is required a priori to make the determination from information available on an individual basis that the disease observed is caused by the individual's work situation.

More than a decade ago, it was estimated that no less than 3,000 occupational diseases existed and that perhaps an additional 200 new ones were added each year (33). Although many of these diseases may be obscure, it is highly doubtful that physicians without specific training in industrial medicine or at least access to diagnostic guidelines would be able to identify occupationally related diseases.

Other approaches involve recognizing the disease and recording of the occupation. Here, considerations of cause-and-effect relationships can be delayed until aggregate data are available. Analysis of group data can then be performed, looking for significant differences in observed versus expected rates (34).

Another technique recently used on a pilot basis allows the physician a broader range of categories to select from. In its simplest form, the system might offer choices such as definitely related, possibly related, definitely not related, and probably not related to the work environment (35). The problem here becomes one of developing appropriate definitions of each category and then being assured of their consistent application. Even so, such a system allows the potential for action based on more obvious problems while more subtle evaluations could be performed on aggregate data.

Even before occupational relationship is evaluated, a surveillance system should identify the ground rules for what is or is not a disease state. What are the factors which classify a medical condition as a

disease? Is an in-depth clinical work-up necessary or is the fact that medical treatment and/or evaluation was sufficient to classify the case as one of disease or illness? In other words, what is to be reported?

Indeed, the difference between the use of the terms disease and illness is an appropriate point of consideration. Webster (36) defines disease as "an impairment of the normal state of the living animal...that interrupts or modifies the performance of vital functions" while illness is defined as "an unhealthy condition of the body or mind." A leading school of public health defines disease as the "process that causes physiological and psychological dysfunction" while illness is considered an "individual's subjective awareness of dysfunction" and, in addition, sickness is seen as a state of "social dysfunction" defined by expectations of the society. (37) For the purposes of this dissertation, it would appear that, as far as event counting is concerned, the term disease is a more appropriate descriptor.

Another factor in the prerecognition state is whether or not individuals in the population to be monitored have access to medical treatment in case of illness. How a case gets into the system is of much importance. Is routine monitoring of the population carried out? On the other hand, must the individual, through his own efforts, seek treatment which would subsequently lead to his inclusion as an observed case in the surveillance system?

The basic factors of most concern in the recognition step which in turn translate into the components of an ideal system are:

(1) the mechanism(s) whereby worker health is monitored to ascertain adverse effects and cases enter into the system; and

(2) the establishment of specific ground rules as to what is, or is not, a case of occupational disease. (This issue, which is probably the most controversial point of this dissertation will be more thoroughly examined in the recommendations section of Chapter IX, wherein each step of the model system is discussed in specific detail.)

In an ideal system, the minimum requirements would involve routine monitoring of the health of exposed workers to recognized hazardous conditions and the development of specific guidelines or requirements for determining occupationally related illnesses.

Step 2. CLASSIFICATION

Once a disease has been observed and diagnosed, the next step involves consistent classification. Such a step is necessary in providing a manageable system. The primary problem associated with classification is oversimplification. Here the goals of the system must be kept in mind. Will the final data provide the detail necessary to observe deviant situations so that appropriate controls can be implemented? For example, with dermatitis, is the classification system sensitive enough to allow for subclassification into categories such as irritant or allergic contact dermatitis?

In most cases, a hierarchical classification system will be available. Such systems allow for subsequent combining of events. However, to retain the greatest flexibility, initial observations should be classified at the level of greatest detail.

In occupational-disease reporting, problems of classification include the concept of cause versus effect. This is especially applicable

where occupational relationships are determined on an individual basis. A typical example involves diseases of the lungs being categorized by cause such as dust, gases, vapors, fumes, and mists. Although most systems employ the International Classification of Diagnoses of Disease and Death (ICDD) as to effect, a similar system based on cause is not available. Sterner, in addition to suggesting that the ICDD system needs to be modified to be useful in occupational disease reporting, makes the plea for standardization of coding procedures and analysis systems. (38) One way around this dilemma is to report both cause (agent) and effect (disease). Subsequent analysis can then be performed from either standpoint.

The basic factor of most concern in the classification step is then the degree of specificity associated with the event. In the ideal system, a balance must be struck between oversimplification which will not provide enough detail and too detailed classification which becomes overly complicated and possibly unmanageable. Generally, information on specific diseases is necessary. As this is developed, a hierarchial classification system can be established.

Step 3. RECORDING/REPORTING

After the disease has been recognized and properly classified, procedures for recording the information are the next consideration. For example, what additional information about the individual is required? Generally, information is available as to age, sex, and race on an individual basis. However, for the purposes of prevention of occupational illnesses, it may be necessary to include other variables in the reporting system. Certainly, the individual's history as far as other occupations and type of industry worked in is of interest. This is especially

important for chronic or latent health problems.

Information about environmental exposures is most helpful in the determination of cause-and-effect and in the development of preventive measures. However, such information is usually obtained outside the disease surveillance system.

The primary basis of concern is whether or not the recordkeeping and reporting requirements provide enough information for subsequent analysis and implementation of corrective measures as contrasted to being designed to simply count cases in the population being monitoring.

It is important to know if all participants in the recording and reporting phase have explicit instructions as to what material or information is to be obtained, how it is to be recorded, and where or to whom reports are to be sent. Incentives or motivational factors such as legal requirements regarding recording and reporting are therefore of interest.

The basic factors of concern in the recording and reporting step then involve the determination of responsibility, development of standardized forms and procedures, information to be included, frequency of reports, and disposition of records and reports. In an ideal system, the responsibility for recording and subsequently reporting should be that of the employer. This mechanism facilitates the collection of data and is responsive to the philosophy and requirements of the Occupational Safety and Health Act. In addition to the basic identification of the disease condition, records and as appropriate reports should contain information to facilitate epidemiologic evaluation and special studies. This would include type of industry, occupation and personal characteristics of the

worker, and hazard associated with the disease. Where possible, information as to exposure (environmental) levels should also be included. Standardized recordkeeping requirements and information as to reporting requirements are a must. It is also most important that case reports be available for analysis at central points within a state or region. For diseases of special interests, it may be appropriate to centralize collection at the national level.

Step 4. COLLATION

When individual reports or case histories are merged into a larger data base, it is extremely important that procedures are well documented. The recipients of individual reports must be aware of their responsibilities.

It is necessary to periodically or routinely evaluate the data base to determine if existing information is current and appropriate based on predetermined guidelines or requirements. Therefore, procedures must be developed to identify responsibilities and procedures for update of the data base.

Another point of consideration is whether or not all the information which is reported or recorded is to be entered into the data base. If a sample of the information is obtained, the use of appropriate statistical techniques to ensure that the sample compiled is indeed representative of the larger population being monitored is necessary. If various characteristics of an individual case, such as age, sex, or race, are not compiled, it should be because of a conscious decision that such information is not necessary at the present time.

It is important to note whether or not initial observations are retained where data are condensed or categorized in subsequent steps. Where original observations are available, the data base has the potential for being used for special studies. For example, if, in the previous stages of the system, classification as to occupation was on a very detailed basis, the compilation step may involve a regrouping of individual observations into much broader categories. While this often may be desirable and even necessary to facilitate further analysis, such steps should only be taken after thorough evaluation and consideration as to loss of specificity.

The most desirable approach may involve very detailed or specific classification at the recording and reporting stage and a combining of categories in the later stages of analysis. However, it must be recognized that combining specific characteristics into broader categories may result in the loss or blurring of significant problems within a particular group.

In the collation step the basic design factors, as opposed to operational requirements, involve two points. The first is the degree of extraction of data from individual reports resulting in a loss of sensitivity; while the second concern is the disposition of the original data. As regards the ideal system, it is recognized that other factors, especially timeliness of reports and the need to present overviews of problems, may control the design of this step. In any event, the original data should be available to facilitate special studies at the state or national level. The output of the collation step, at a minimum, should allow for analysis by type, size, and location of industry, and by occupation, hazard, or disease.

Step 5. ANALYSIS AND SUMMARY OF DATA

Once the data base has been established, the next step involves the application of appropriate tests and/or statistical techniques to evaluate the information available. Determination of statistically significant observations is an extremely important consideration in this phase as is the overall evaluation of the quality of the data in the system. Although there may be a tendency to hypothesize the cause-and-effect relationships at this stage, it is rather unlikely that anything more than educated guesses can be made. The more likely outcome is a determination of a significant association or relationship between an observed variable and the disease of concern. At this point in the system, one should only be concerned with the identification of those factors such as occupation or type of industry which appear to be significantly related to the disease under study. For example, if occupational lead poisoning is being monitored, a certain incidence rate will be observed by industry type and size. An increase in the incidence rate within an industry might be the result of changes in one or more factors operating alone or in combination. Such factors might include the introduction of new technology, increases in production rates, or other changes in manufacturing processes. However, this type of information generally will not be available at the analysis step. Therefore, conclusions as to actual association or probable cause and effect may be premature.

The major factor to be considered in the analysis and summary step is the manner in which the subsequent results will be presented. This involves a determination, at least for the purposes of developing initial reports, as to the most important variables or factors to be analyzed

recognizing that more detailed and sophisticated evaluations can be performed through special studies. In the ideal system, it would appear that the approach most useful for immediate control needs involves analysis of disease incidence for a given occupational hazard by type, size, and location of industry. Subsequent evaluation by occupation and other personal characteristics such as age and sex would appear to be most appropriate for special studies. Analysis and summary by industrial characteristics would seem to be the most useful approach for development of timely recommendations to facilitate control through inspections, standards development or revision, and education.

Step 6. INTERPRETATION

Interpretation of the results of the analysis step should involve a very thorough and sophisticated evaluation of probable associations. It is at this stage that other information, when available, can be evaluated to assist in the development of initial theories as to probable association between disease and workplace factors.

Ideally, the interpretation stage would also involve an analysis of the information for items such as consistency, strength of association, specificity, biologic plausibility, coherence of the evidence, and other appropriate tests of statistical data. (39) It is at this point that data from outside the surveillance system may enter the picture. Care must be exercised concerning the reliability of such data.

In the example cited in the analysis and summary step, it is at this point that other information such as that concerning new technology may become available for consideration.

The primary factors of concern in the interpretation stage involve initial analysis of trends in the data and observations regarding major problems that might be amenable to corrective action. In the ideal system, such other data sources as production trends and information on new technology would be evaluated at this stage.

Step 7. RECOMMENDATIONS AND REPORTS

It is important to realize that interpretations and observations do not in themselves result in the implementation of corrective action or prevention of future cases of disease. The next step in the surveillance system is that of getting the information to those who are responsible for implementing control or intervention strategies.

The development of sound, defensible recommendations based on the data collected is therefore the next element of the surveillance system. Such reports need to provide enough detail and background information to document the thoroughness and adequacy of the data collection, analysis, and interpretation steps. It is not sufficient to simply provide summary results or conclusion, especially where considerable resources may be required to control the problem. Therefore, it is necessary that the observations and conclusions drawn be thoroughly presented and that the entire system beginning with recognition and following through all subsequent phases be documented and available for evaluation. It is also important that reports and recommendations be developed in a timely manner. If too long a delay ensues between initial observations and the reporting of information the usefulness of the reports will be substantially reduced.

The most important consideration in the development of recommendations and reports is usefulness as regards control and

prevention. The two primary factors affecting usefulness are timeliness and degree of detail. For the ideal system, the approach initially is not to determine what is appropriate, but rather to develop a system which is flexible enough to respond to needs as identified in the final step of evaluation of effectiveness. In addition, the system must be capable of developing special reports to more thoroughly evaluate specific problem areas.

Step 8. EVALUATION

The final element in a disease surveillance system is an evaluation of effectiveness. Of all the previously described steps, this is the most important for no system can be perfect in original design. Without ongoing evaluation as to usefulness, such efforts become ends in themselves and do not contribute to the overall goal of prevention. In an ideal system for occupational health, the evaluation of effectiveness requires interaction across a wide range of interested and affected parties. At a minimum, these include occupational regulatory and research organizations, employers, trade associations, employee groups and a wide range of private and public health organizations.

In the final analysis, these eight steps suggest that an ideal system for occupational disease surveillance must successfully meet the following requirements:

- (1) the goals of the system must be responsive to predetermined needs as established by all involved or affected parties;
- (2) the design of the system must be carried through with meticulous detail; and
- (3) the product must be useful.

An evaluation of these tests suggests an involvement of both the user and operator of the system in all phases with one or the other dominating. Initially, in establishing the goals of the system, the user needs should be of utmost concern. In the design phase, the operator of the system must assume the major, but not sole, responsibility. The most difficult phase is that of evaluation of effectiveness. Here, neither the user nor the operator can dominate if an objective evaluation is to be accomplished. A balance as to needs and reality or practicality must be established.

B. Factors to be Evaluated

The following chapters present various approaches to both occupational disease surveillance and, as appropriate, the surveillance of other health conditions and problems. In evaluating these systems, and in an effort to develop more specific recommendations for an "ideal" system, the model system presented in this chapter will be used as a "yardstick" to evaluate existing systems.

As a generalized format, the following outline will be utilized in evaluating existing systems and in developing specific recommendations.

Evaluation Outline

1. Recognition
 - a. Worker's access to medical monitoring and method of entry of cases into the system
 - b. Use of criteria for defining cases of occupational disease
2. Classification
 - a. Use and specificity of classification schemes
3. Recording/Reporting
 - a. Responsibility for developing records and reports

- b. Development of standardized forms and procedures
- c. Type of information obtained
- d. Frequency of reports
- e. Disposition of reports
- 4. Collation
 - a. Data extraction for subsequent analysis
 - b. Availability of "raw" data for special studies
- 5. Analysis and Summary
 - a. Factors (variables), in addition to disease, routinely analyzed
- 6. Interpretation
 - a. Analysis of other data sources
 - b. Monitoring of significant changes in disease patterns
- 7. Recommendations and Reports
 - a. Timeliness
 - b. Degree of detail
- 8. Evaluation
 - a. Demonstrated flexibility to change based on interaction with users.

CHAPTER IV. NON-FEDERAL SURVEILLANCE SYSTEMS

A. Workers' Compensation Reports

The earliest organized source of reports on the occurrence of occupational diseases resulted as a byproduct of workman's, now known as workers', compensation legislation. Although the origins of workers' compensation appear to go back more than 900 years, it was not until the late 1800's that the industrialized nations, such as Germany and Great Britain and, after the turn of the century, the United States, formally enacted programs of compensation for disabling injuries. (40)

Early compensation systems were primarily concerned with injuries, such as loss of bodily function, or death. Concern for occupational diseases and their effects were separated from the category of injuries, and a separate body of legislation was developed to provide disease coverage. Initial legislative approaches for occupational disease were designed to limit the scope of coverage to the better-recognized and documented conditions resulting from age-old hazards, such as exposure to lead, mercury, carbon monoxide, and silica. The initial trend of covering only a limited number of scheduled cases of disease has, to a certain extent, been turned around in many of the various states in this country. However, in providing a broader coverage, one approach has been to exclude all "ordinary diseases of life to which the general public are exposed." (41) It is not clear whether this refers only to what are considered the degenerative diseases, such as atherosclerosis, or whether it is also applicable to cancer, hearing loss, and other conditions which also have nonoccupational etiologies. At the present time, most jurisdictions cover all diseases where occupational relationship can be established. However,

a few states are still operating on a scheduled basis with some limiting the number of diseases covered to only 12 conditions. (42) Nevertheless, these sources of data have been used for estimating the scope of occupational health problems and have been suggested as a source for obtaining better statistics. (43)

As an example of this problem, the Director of the Department of Occupational Health, United Mine Workers' of America, testifying before Congress on the question of national workers' compensation standards, noted that "British investigators identified miner's asthma as 'coal workers' pneumokoniosis' in 1942 and the following year it became a compensable disease in Britain. Yet in 1969, only 4 states (Alabama, Pennsylvania, Virginia and West Virginia) specified CWP as a compensable disease. A major reason for this delay was the lack of medical recognition of the disease..." (44)

Tabulation of workers' compensation awards thus becomes one source of information as to the incidence of occupational disease in the country. For example, the National Institute for Occupational Safety and Health (NIOSH), US Department of Health, Education, and Welfare, publishes an annual report on occupational illnesses and injuries associated with the agricultural industry. The latest report includes information from five states and Puerto Rico. (45) Also, within a single state, the use of compensation claims has been reported as useful in identifying hospital-acquired infection, thereby leading to the identification of high-risk hospitals. (46)

In the evaluation of this source of information, the characteristics and legal requirements of the system bear close scrutiny.

Factors such as settlements outside of the system, noncoverage of certain occupations such as agricultural work, limitations as to the diseases covered, variability in program design and implementation from one state to another, as well as difficulties in proving occupational relationships, must all be considered in evaluating the reliability and usefulness of this source of information.

Recently introduced federal legislation designed to provide minimal standards for state workers' compensation programs has included an awareness of the complexities of recognizing occupational diseases. The proposed "National Workers' Compensation Act" introduced by Senator Harrison J. Williams (47) would require the Secretary of Health, Education, and Welfare to study diseases related to employment and to make recommendations for standards for determining "whether such a disease arose out of and in the course of employment," and "whether death or disability was due to such disease." In developing such recommended standards the Secretary may include "reasonable presumptions wherever appropriate."

The proposed legislation goes on to provide that the Secretary of Labor would have the responsibility of promulgating standards for determining "whether a disease arose out of and in the course of employment, or whether death or disability was due to such a disease," and further that such standards in effect become part of state workers' compensation law.

In actuality, the federal government has already taken the first step in recognizing specific occupational diseases. The Federal Coal Mine Health and Safety Act of 1969 (30 U.S.C. 801) specifically recognized coal workers' pneumoconiosis, or "black lung," as a specific occupational

disease and initiated the payment of federal funds to victims and their survivors. (48) Out of a total of 645,000 claims filed under the Act, 397,000 have been approved, and the annual cost has grown from an expected rate of \$350 million to \$1 billion a year. (49) This for just one occupational disease out of McCord's 3,000!

In anticipation of this or similar legislation, NIOSH initiated a preliminary study of the decision-making process necessary to relate disease to occupation. (50) In evaluating the probability that a disease was work-related, the report suggested that the most specific piece of evidence needed is the documentation of exposure to a known toxic substance, and, in addition, that the degree of exposure affects the probability of the agent actually causing the disease. The report recognizes that the most difficult problems involve those dealing with aggravation of conditions which occur in the nonworking population or exist before employment, i.e., the other three categories of occupational diseases listed by WHO. (21) For the individual case, the decision-making process regarding occupational causation consists of six steps: (1) The medical evaluation which includes a complete, including occupational, history; a thorough physical examination and clinical evaluation; and complete laboratory evaluation. (2) Epidemiologic data involve an evaluation of other workers with the same work experience. (Here, it is suggested that "epidemiological data documenting that groups of workers and other human populations exposed to the suspected agent have sustained certain types of illness" will be most helpful in determining occupational relationships on an individual basis.) (3) Evidence of exposure is examined and involves the measurement and evaluation of disease-causing

agents in the workers' environment and the use of personal protective equipment such as respirators. (Here, it is probable that only the present environment is available for measurement, unless historical exposure records can be identified.) (4) The consideration of aggravation of preexisting conditions. (5) An evaluation of the validity of the available data and the qualifications of those providing testimony. (6) The integration of the information in deciding if the disease is occupational. In summary the report suggests that, in general, a disease is occupational if:

1. the medical findings of disease are compatible with the effects of the disease agent or agents to which the worker has been exposed;

2. there exists in the worker's occupational environment (past or present) exposure to an agent or agents sufficient to have caused the disease; and

3. the weight of evidence suggests that the disease is of occupational rather than nonoccupational origin.

The similarity of these requirements to those described in the "matching process" (18) is quite apparent and suggests that strategies for identifying occupational disease have not advanced greatly in the past 15 years.

B. Private Physician Reporting

In addition to the requirements under workers' compensation, many states and other governmental jurisdictions have passed legislation requiring that physicians report cases of certain types of disease. Although such reporting requirements are generally directed toward cases of communicable diseases, such as venereal diseases, tuberculosis, and

smallpox, state laws requiring the reporting of occupational disease were first passed more than 60 years ago. (51) A 1971 study of such laws by the U.S. Public Health Service (51) noted the lack of uniformity or consistency of reporting requirements. For example, nine states included occupational diseases as part of their communicable disease laws, nine others patterned their statutes after the British Factory and Workshop Act of 1895 (specific disease and all others contracted as a result of employment), while seven other states used different approaches. Of the 25 states with laws or regulations, 10 specified or limited diseases to be reported, while the remaining used a varying approach to arrive at coverage of all occupational disease.

Concern for thoroughness or motivation of the physician, especially the private physician, to report must also be taken into consideration. One example of the penalty-reward system is found in Connecticut where physicians are fined 10 dollars for not filing reports and are paid 50 cents for complying with the law. (51) Considering the problems in reporting communicable diseases for which it has been estimated that only 22 percent or less of the cases are reported (52), and where need as it relates to prevention of wide-spread epidemics can be established, one must be extremely concerned about the thoroughness or consistency with which occupational diseases are reported under such systems.

Generally, the statutes or regulations requiring that physicians report such cases are of a very broad nature. Much interpretation and range of decision-making is left up to the individual physician, and the laws are generally considered inoperative. (51)

C. California's First Reports of Work Injuries

Although a form of workers' compensation, California's First Reports of Work Injuries is unique and deserves separate discussion. Prior to federal requirements concerning the recording and reporting of occupational illnesses, this source of occupational injury and disease data was considered the most complete in the United States. (53) Consequently, most national estimates of the scope or incidence of occupational disease were based on extrapolations of the situation in California. Ratios of California's working population to the total U.S. population by industry or occupational group were used to expand California's rates to give national estimates ranging as high as 390,000 cases in 1972. (54)

The California information is a byproduct of a system whereby a physician treating an individual is reimbursed for his services if the illness is diagnosed as being occupationally related and the proper forms are filed with a State agency. The California statistics are thus based on a physician's first report which involves his initial evaluation as to cause-and-effect relationships. Where treatment is provided by a company physician, as opposed to a private physician, the employer is likewise required to file a report of work injury which includes coverage of occupational illnesses.

Under this system, the first step which affects the inclusion of a case in the reporting system involves either the worker's recognition or the physician's determination that work conditions are associated with the illness. As with most other compensation systems, the determination that occupational relationships are involved is accomplished on an individual case basis.

Payment for private physicians' services is tied to the diagnosis of work-disease relationship; there is therefore obvious concern about the reliability of such reports. However, a study conducted by the California State Health Department on the accuracy of these reports shows that only 6 percent of the diseases were subsequently judged to be not occupationally related. (55) Analysis as to false negatives, or cases simply missed by the system, is a more difficult undertaking. Results for 1973 are shown in Table 6. (56) It is interesting to note that during this period, for the 7.6 million employees covered by the system, 38,595 doctor's reports of illness were received, or a rate of 5.1 cases per 1,000. During the same year, the employer-based reporting system, as instituted under the Occupational Safety and Health Act, indicated that the California working population, in this case slightly more than 6 million, experienced 24,453 cases of occupational illnesses for a rate of 4.1 per 1,000. (57)

D. Other Systems

In addition to the legislated or legally required systems described earlier, voluntary approaches have been implemented in an attempt to determine the incidence of occupational disease. One system, developed by the American Medical Association, was the registry of adverse reactions due to occupational exposures (58). This was a voluntary system whereby any physician could report to the AMA cases of occupational illnesses. The system was designed to ensure the anonymity of reporting physicians in the hope that this would encourage widespread practice. After several years of operation, and after a very low level of reporting (primarily cases from California), the success of the system was reported as "limited." (59)

Probably the oldest voluntary system in the United States for collecting information on occupational injuries and, to some extent, illnesses, was that developed by the American Standards Association (now the American National Standards Institute) in 1937; it was entitled "Recording and Measuring Work Injury Experience (Z16.1)." (60) This standard, which has been revised many times, has been for decades the system used by the National Safety Council (NSC) to measure and report job-related fatalities and lost work time experienced by voluntary participants. (61) In this standard, work injuries are defined as "any injury or disease suffered by a person which arises out of or in the course of his employment." (62) In U.S. Senate hearings on the need for national occupational safety and health legislation, the President of the NSC, Mr. Howard Pyle, responded to the question of completeness and accuracy of reporting by saying that "current data are inadequate to state the scope of occupational caused disease and disablement. There is probably no field that is as short of reliable data as the health field." (63)

As a less broadly based approach, special disease-reporting systems or registers have been maintained for diseases associated with occupational exposures. In these programs, a specific disease is looked for in the general population and subsequent evaluations as to occupational factors are made. The British appear to have taken the lead in this field with their Mesothelioma Register (64) and bladder tumor coroner notification scheme. (65)

The U.S. Beryllium Case Registry was designed to monitor health problems associated with occupational exposure to this highly toxic chemical. (66) Although quite useful for a small group of employees where

a unique single hazard is of concern, such an approach would not realistically have widespread application for a large number of workers over many occupations involved in numerous and different work situations.

More broadly based systems, such as cancer registries, have also been useful in evaluating occupational relationships. For example, the Cancer Surveillance Program of the University of Southern California collects data concerning cases of diagnosed cancer in Los Angeles County. (67) The reporting system includes data on residence, birthplace, religion, marital status, ethnic group, occupation, and type of industry. One of its stated goals is to evaluate the etiologic relationship of human cancer to "industrial carcinogens" through epidemiologic studies.

The introduction of occupational information to such data collection systems is by no means standard. For example, a monitoring system concerned with birth defects (68) appears to ignore the question of occupation of both the mother and father. Where environmental factors, especially exposure to chemicals, are possibly etiologic agents, it would appear inappropriate to ignore the potential of the workplace to act as a source of disease.

CHAPTER V. FEDERAL REQUIREMENTS UNDER THE
OCCUPATIONAL SAFETY AND HEALTH ACT

A. Legislative History

Although comprehensive federal legislation in the area of occupational safety and health had been proposed for a number of years, it was not until the 91st Congress that legislation took serious shape. In 1969 and 1970, hearings were held to discuss a number of different bills introduced in both the House and the Senate. Although the majority of the testimony centered on basic design factors with emphasis on authority for setting standards, repeated testimony identified the growing concern for the problems of occupational diseases. As noted in the Introduction, there was also recognition that the real scope of the problem might not be known. (6,7)

The final versions of both the House and Senate bills contained several requirements concerning the generation of occupational safety and health statistics. However, it was only in the Senate version that specific requirements on the keeping of records and reporting of work-related injuries and illnesses were included. The House receded with an amendment excluding injuries and illnesses of a minor nature. (69)

The Senate committee was especially concerned with the problems of recognition and reporting of occupational diseases. They expected the Secretary of Labor and the Secretary of Health, Education, and Welfare, to make every effort to "obtain complete data regarding the occurrence of illnesses, including those resulting from occupational exposure which may not be manifested until after the termination of such exposure." (69) Most specifically, Section 8(c)(2) of the final Act required the Secretary of

Labor to:

...rescribe regulations requiring employers to maintain accurate records of, and to make periodic reports on, work-related deaths, injuries and illnesses other than minor injuries requiring only first aid treatment and which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job. (30)

B. Methodology

Within the U.S. Department of Labor, the responsibility for implementing programs for recording and reporting occupational injuries and diseases was given to the Bureau of Labor Statistics (BLS).

In the initial design stage, it was recognized that, in order to be most useful, statistics should be available on a level of detail less than national. Therefore, the program was designed to generate information on a national basis and on a state-wide basis. Accordingly, agreements were initially entered into with some 53 jurisdictions, including 48 states. The purpose of these arrangements was to implement a system which would involve a national sample of establishments, supplemented on a state-by-state basis with a sufficient number of establishments to allow for the generation of state-wide estimates. In 1972, the first full year of operation of the system, some 200,000 establishments were selected to provide national estimates. Approximately 400,000 establishments were added to this initial group in order to provide valid state-wide estimates. (70)

The heart of the system involves regulations (71) promulgated by the U.S. Department of Labor, requiring that all employers covered by the Act record cases of occupational injury or illness occurring in their employees. In the Department of Labor's yearly appropriations bill,

Congress has exempted small employers (10 or fewer in 1976) from the requirements. However, employers included in the sample mentioned above must still return the records. (72) In the regulations (71), an occupational illness is defined as: "Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment." Occupational illnesses include "acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact," and can be classified into the following seven categories:

1. Occupational skin diseases and disorders;
2. dust diseases of the lung (pneumoconioses);
3. respiratory conditions due to toxic materials;
4. poisoning (systemic effects of toxic materials);
5. disorders due to physical agents (other than toxic materials);
6. disorders due to repeated trauma;
7. all other occupational illnesses.

Examples for each category are shown in Appendix A. These are also made available to employers as part of the regulation.

Under the BLS system, recordable occupational injuries and illnesses are classified into three types. Those which result in a fatality, those which involve one or more lost workdays, and nonfatal cases without loss of workdays. This latter group includes cases which result in transfer to another job, termination of employment, medical treatment, and/or involve loss of consciousness, or restriction of work or motion. Also included in this class are all occupational illnesses reported to the employer which are not classified as fatalities or lost-workday cases. It

is important to note that, based on these definitions, this system goes beyond recording of compensable cases to include less severe injuries and illnesses.

The full system involves several records applicable to all work places in the US unless specifically exempted by Congress and, where the establishment is included in the survey, one reporting form.

All employers are required to make a one-line entry for all recordable injuries and illnesses on the Log of Occupational Injuries and Illnesses (OSHA No. 100). The Log serves as a summary listing of all cases, in chronological order, which can be reviewed by both management and inspectors to obtain an overview of the incidence of injury and illness in a particular establishment.

In addition, each case requires a Supplementary Record of Occupational Injury and Illnesses (OSHA No. 101), or its equivalent. These forms provide more detail about the individual worker and those factors associated with the injury or illness. In many states, a workers' compensation form may be used as a substitute for the federal form.

At the end of each year, the information on the Log must be tallied and entered onto the Summary of Occupational Injuries and Illnesses (OSHA No. 102). This form must then be posted to inform employees of the injury and illness record experienced at that establishment.

As noted earlier, approximately 600,000 establishments are identified each year for the purpose of participating in the reporting phase of the program. The sample is drawn by BLS from a universe of establishments developed through the cooperation of various state agencies. In most cases, the list of employers in a state is maintained by the state

agency responsible for processing unemployment benefits. Consequently, BLS maintains a working arrangement with the various states to provide current listings of places of employment.

The selected employers receive their report forms shortly after the end of the year of the survey. In addition to the data contained on the Summary Form (OSHA No. 102), information on the number of employee hours worked, the reporting unit's principal product or activity, and the average employment is also required.

The number of hours worked is used to calculate an incidence rate, based on the following formula:

$$\text{Incidence rate} = \frac{N}{EH} \times 200,000$$

Where:

N = number of occupational injuries and illnesses

EH = total hours worked by all employees during
the reference year

200,000 = base hours for 100 full-time equivalent workers
at 40 hours/week for 50 weeks

In addition to an overall occupational injury and illnesses rate for a particular year as experienced by 100 full-time workers, incidence rates are also calculated for lost-workday cases, illnesses, and fatalities. The Department of Labor has documented the concepts and methods involved with the system. (73)

The sample drawn by BLS is intended to be representative of all private industries in all states and territories as well as for the nation as a whole. In order to provide estimates for different industries, the universe is stratified based on SIC's, as discussed in Chapter 1. In manufacturing, the full 4-digit SIC code is used. In all other industries, a somewhat less detailed 3-digit classification is used. It was also

recognized that injury and illness patterns vary with the size of the establishment. Therefore, before selection, the universe is also stratified by employment size. Eight categories are used: 1 to 19, 20 to 49, 50 to 99, 100 to 249, 250 to 499, 500 to 999, 1,000 to 2,499, and 2,500 and larger. As mentioned above, the final classification is by state. (69)

It should be noted that the basic unsummarized data regarding all recordable cases are entered on the Supplemental record. Employers are only required to maintain this record for 5 years.

In an attempt to obtain more uniformity and consistency in recording and reporting, the U.S. Department of Labor developed a publication with answers to the most frequently asked questions. (74) Most of the questions and answers presented in the publication deal with mechanical aspects of the system. Indeed, the only question under the heading Occupational Illness is "Are occupational illnesses recorded only if they require treatment beyond the initial day reported?" The answer is "Any diagnosed occupational illnesses reported to the employer is (sic) recordable, whether or not medical treatment is given..." Although no guidelines concerning diagnosis or cause-and-effect are presented, one question assumes that an employee is sent to a doctor for a "definite diagnosis" and that the doctor "decides the employee's condition is not related to his work." Under these circumstances, the employer is told that if he (the employer) is in "agreement with (the) doctor, he does not put the case on the log (OSHA No. 100); it is not connected with the employee's work." While not definitively facing the issue as to work causation, the question of heart attacks and their possible relationship to work factors are also discussed in the guide. Here, the question involves an employee

"dying of a heart attack while phoning the office from a phone booth while having his car washed," and the fact that the workers' compensation carrier has set up a reserve for such a case. The answer as to whether or not this should be considered an occupationally related condition is intriguing in that it states that while it is prudent for insurance carriers to set up such reserves "whenever there is any possibility of work connection." It goes on to state that this case is "not a finding that the heart attack was related to his work." It is also suggested that "more information" is needed to make a decision but unfortunately does not provide definitive recommendations.

C. Results

The most complete data available are for 1974. (75) During that year, the Department of Labor estimated that the covered workforce of some 61 million workers in the private, nonfarm sector, experienced slightly more than 200,000 cases of recordable occupational illnesses or 3.3 cases per 1000 full-time workers. Of this number, some 89,000 (44.6 percent) were classified as diseases and disorders of the skin. Table 7 identifies the distribution of cases by category of illness.

Regarding the fact that occupational skin disease was the most often reported problem at 44.6 percent, it is interesting to note the close agreement obtained under a different system of reporting in California (Table 6) where this condition represented 40.6 percent of cases reported in 1973.

Because of cases missed, the completeness of the BLS approach is of much concern. In 1972, NIOSH implemented a pilot study to estimate the possible inaccuracies of the system. (35) A limited study was conducted in

two states and involved a random sample of 136 establishments drawn from high-risk industries such as those where employee exposure to noise, lead, and solvents was expected. The initial step in the survey involved industrial hygiene observations of the workplaces and identification of workers exposed to occupational health hazards. Workers thus identified were then given medical examinations by physicians trained in occupational health who were provided with guidelines for classifying their observations. Where an illness was diagnosed, the physician was required to assign the case to one of five categories: probable occupational disease, doubtful occupational disease, suggestive history (no objective evidence of disease as the time of examination, but history indicates disease consistent with exposure to injurious agent), cannot be evaluated, or probably nonoccupational. In the study, over 1,100 medical conditions were found among the 908 employees examined. Of these conditions, 31 percent were diagnosed as probable occupational disease. Overall, there were 346 cases of probable occupational disease distributed as follows: hearing loss, 28 percent; skin problems 18 percent; lower respiratory conditions, 14 percent; toxic, low-grade toxic effects and nonsymptomatic conditions (mainly elevated blood leads), 14 percent; upper respiratory conditions, 11 percent; conjunctivitis and other eye conditions, 9 percent; and the remaining 6 percent was distributed among anemia, diseases of the musculoskeletal and connective tissues and other conditions. In checking the employers' logs, mandated to be kept by the Department of Labor, only 11 cases of occupational disease were found. Workers' compensation files yielded an additional 9 cases for a grand total of 20 reported or recorded cases as compared to 346 identified as probable occupational diseases.

CHAPTER VI. APPROACHES IN OTHER COUNTRIES

Legal requirements regarding the reporting of occupational diseases vary throughout the world. The predominant scheme appears to involve the reporting of diseases by both management and private physicians under workers' compensation requirements. Generally, such reporting requirements are associated with a schedule of toxic chemicals, such as lead, phosphorous, arsenic, mercury, manganese, aniline, carbon disulfide, and benzene. (76) In addition to this "schedule" approach, the International Labour Organization (77) has, for the purposes of workers' compensation, identified two other methods of defining occupation disease. The first is general coverage, i.e., all cases caused or aggravated by conditions peculiar to the workplace, while the other, the "combined system," is a combination of the two. In the combined system, the general definition is supplemental with a listing of specific conditions. The aim here is to offer a greater degree of flexibility than that afforded by a schedule of diseases, and, at the same time, retain the greater degree of protection for the worker offered by a schedule, i.e., the worker should experience less difficulty in proving occupational causation where specific diseases are recognized as occupationally related.

Following are some specific examples of approaches by various countries.

(a) Canada

An example of the combined approach is found in the regulations of Alberta, wherein industrial disease is defined as "any disease arising out of and directly related to the person's employment." (78) The regulations go on to state that, without limiting the above definition, industrial

disease also includes:

(1) any illness or disease listed in the schedule of Notifiable Industrial Disease appended to these regulations, and

(2) any other illness or disease (that) the Provencial Board of Health may designate as an industrial disease.

Some 31 diseases are covered under their 1970 schedule as shown in Appendix B. The regulations identify the attending physician as the person responsible for reporting cases to the Department of Health. In addition to the diagnosis, details to be reported included name, age, sex, address, and place of employment of the worker.

At the present time, there is no national occupational disease registry, and compensation data are matters of provincial concern and involve differing requirements in each province. (79) The National Research Council of Canada has recently published a monograph describing an approach to a national monitoring system to evaluate delayed effects of certain occupational environments. (80) The proposed system would involve a computerized linkage of employment and death by Social Insurance Number.

(b) Great Britain

The British, who, if not the originators of the scheduled system, appear to have been using it as long as anyone, have through 1972 identified some 47 categories of occupational diseases in addition to pneumoconiosis and allied chest disorders. (81) Each disease is supplemented by a "medical note" which discusses etiology, diagnosis, differential diagnosis, and prognosis. (82) Also included are occupations normally associated with the development of the disease. In general, a disease is considered compensable where the disease and occupation

match. (81) The process for adding other diseases involves an evaluation of the question by the Secretary of State for Social Services based on advice provided by the Industrial Injuries Advisory Council. The criteria include a decision that "the disease is a particular occupational risk and not a risk common to all persons and furthermore that in particular cases the occupational causation can be established or presumed with reasonable certainty." (83) Furthermore, formal enactment by Parliament is necessary. (84)

In addition to workers' compensation reports, which are generally initiated by physicians, the Factories Act of 1961 requires British employers to report cases of some 17 listed occupational diseases. (85) In 1972, 274 cases, out of a working population of some 14 million were reported to HM Chief Inspector of Factories under this act. However, in Great Britain, responsibilities for occupational safety and health are shared by at least four departments. (86) Consequently, a number of sources must be consulted to provide an approximation of the total scope of the problem. For 1972, estimates as to incidence of occupational diseases are shown in Table 8. (87)

During the period 1970-72, an extensive evaluation of occupational safety and health was undertaken in Great Britain. The Robens report, so named after its chairman, dealt with a wide-range of issues including statistics. The report noted that there was a "considerable degree of divergence between the number of industrial injury claims (workers' compensation system) and the number of injuries reported to the safety authorities." (88) The general criticisms relating to the official statistics involved collection of data by multiple agencies, under-

estimation of the problem in that absence from work for 3 or more days is necessary for a case to be reported, and unnecessary duplication of the compensation reports filed with the Department of Health and Social Security. As for industrial disease statistics, the report states that they "are of little help as a means of monitoring current situations or in the identification of newly-emerging hazards."

In addition to these occupational disease data, the British Registrar General also publishes tables of occupational mortality. (89) The primary error associated with such data involves multiple occupations, i.e., need to record principal versus last occupation. Although such data have been reported as suggesting that "jobs may influence susceptibility of certain non-industrial diseases" (90) others contend that the data have not provided the initial lead in discovering any occupational health problems. (89)

(c) Czechoslovakia

In Czechoslovakia, in addition to plant physicians, territorial and hospital physicians are also required to report cases where conditions hint that damage to the health of the worker might be connected with work performance or environment. (91) During 1971, 5,124 illnesses (91) were reported in a working population of some 7 million for an incidence rate of approximately 0.7 cases per 1,000 workers. (92) Occupational skin diseases accounted for 47 percent of the total (2,400), which is consistent with the 45 percent reported in the United States.

(d) Federal Republic of Germany

The combined system for identification of occupational disease is also used in the Federal Republic of Germany and is considered as the model

in the European community. (93) Every physician and dentist is required to report observations of scheduled cases to the National or State Commercial Physician, or to the Occupational Protection Physician of the Federal Railway.

Two factors are taken into consideration when additions are made to the list of occupational diseases. The first is the recognition that the disease in question is caused by specific exposures. The second factor involves a determination that workers are exposed to the conditions related to the disease to a greater extent than that experienced by the general population. Prescribed forms, available from the state and from professional societies, are used to make reports. The legal requirement to report cases does not extend into the general area of the combined system but relates only to listed diseases. In both areas, however, it is necessary to establish sufficient probability that the specific case was occupationally related. For example, in the evaluation of cases of occupational dermatitis, the determination of causal factors involves a rather formal process. Requests for certification as an occupational skin disease are referred to a private dermatologist or to a clinic where an initial evaluation is made. This information, along with documentation concerning working conditions, is then reviewed by the state occupational health physician. The state physician must then take a position regarding occupational causation. If the case involves compensation, this information is then referred to an official committee, equally composed of employer and employee representatives, for final determination. (94)

The difference between a reportable and a compensable disease is best illustrated in the case of severe skin diseases, code number 46 on the

list of occupational diseases. For example in 1971, out of a total 27,200 cases of occupational diseases reported, more than 6,800 (25 percent) were skin diseases, making this the leading occupational disease. (93) However, during the same period, out of a total of 5,374 occupational diseases compensated, only 500 (9.3 percent) were severe skin diseases. For purposes of compensation, severe occupational skin diseases thus ranked fifth, behind silicosis, infectious diseases, meniscus diseases following underground work, and noise deafness. (93) Although delay between recognition and award of compensation is recognized, the system is sufficiently stable to enable one to draw the conclusion that the discrepancy is due to the fact that most skin diseases are of a minor nature and, therefore, do not lead to compensation. For compensation, three requirements must be met. First, a causal relationship must be established; second, the skin disease must be severe or repeatedly recurrent, and finally, the disease must have forced the worker to give up his occupational activity. (95)

Indeed, the real benefits gained in limiting the number of cases becoming severe enough to require compensation are attributed to the disease-reporting system and subsequent follow-up by insurance carriers to prevent mild cases from becoming severe. (93)

In 1971, 27,200 cases of occupational diseases, compared to 2,338,000 job accidents, were reported in a work population of 25 million, for an incidence rate of 1.1 cases per 1,000 workers. (96) Of these cases, almost 83 percent were attributed to eight categories of occupational diseases, as shown in Table 9, while the remaining 17 percent were due to 39 other occupational illnesses. Only 14 cases of nonscheduled

occupational diseases were reported in 1971. As noted earlier, reporting of these diseases is not legally required. The eight leading disease categories for compensation purposes are also shown. Of the 5,374 cases compensated in 1971, these eight leading conditions accounted for 5,043, or 94 percent of the total. The complete list of scheduled diseases is shown in Appendix C.

(e) France

The approach to occupational-disease reporting in France is apparently less formal than in other European countries. Although the schedule approach is used and covers 48 conditions, a 1972 study of under-reporting of workers' compensation cases suggested a poor understanding on the part of physicians as to their responsibility under the system. (97) Another factor involves the employer's responsibility to advise the government that work at a specific place of employment involves exposures to toxic chemicals or similar health hazards. Where a compensation application does not involve a reported hazard, a technical survey is required to document potential exposure. While this may prove successful for acute health hazards, its application in chronic problems may be difficult. The study also indicated that the procedures necessary to document a case are cumbersome and are hampered by many bureaucratic problems. In 1968, the labor force of almost 12 million experienced slightly more than 1 million occupational accidents as compared to 4,124 cases of occupational diseases. Almost 50 percent of the occupational disease cases involved cement dermatitis. In the study (97), it was suggested that most, if not all, cases of acute occupational disease were included in the accident figures.

(f) Australia

In Australia, the individual worker applies for industrial injury benefits through systems maintained by the various states and by the Australian Government. (98) Apparently, each state operates its own system and data for the country as a whole are not available. For most states, the approach is one of defining specific diseases which are deemed to be due to nature of occupation unless the employer proves to the contrary. Most of the diseases covered involve poisoning by toxic substances such as lead, mercury, arsenic, and chrome. Also covered in some states are more "exotic" occupational diseases such as primary epitheliomatous cancer of the skin in occupations involving the handling of materials such as mineral oils, pitch, and tar. In addition, several of the states do not give the employer the opportunity to refute occupational relationships where cause-and-effect relationships are intertwined, i.e., silicosis and exposure to silica dust and asbestosis and exposure to asbestos fibers.

(g) Japan

In Japan, occupational disease information is obtained as a by-product of the workers' compensation system. (99) Claims are filed by the worker, or his representative, and there are no requirements for reporting by employers or physicians. The Ministry of Labor has designated some 36 conditions as potential occupational diseases. In addition, there is a category of "other diseases caused apparently by work," thereby identifying the Japanese system as a combined approach, i.e., including a schedule of diseases as well as any other conditions which may be determined as work-related. The number of claims awarded in 1973 (fiscal year) is shown in Table 10. Data on claims filed are not available.

(h) Other Countries

In a 1976 report to the World Health Assembly, the Director General of WHO noted that schedules of occupational diseases exist in at least 80 countries. (100) One of the major drawbacks of a scheduled system of coverage, as opposed to a general or mixed schedule, was illustrated in the report which noted that "some schedules do not contain certain diseases that are known to be occupationally caused," such as hearing loss.

Reported cases of occupational disease for 10 countries are shown in Table 11. Estimated incidence rates based on cases reported and national work populations are included in the table. These figures should be used with caution in that information on the comparability of coverage in countries is not readily available. However, some interesting observations are apparent. Except for Sweden, the European countries for which data are available, show a rather close agreement with incidence rates around 1.5 cases per 1000 workers. A similar calculation for the United States, based on a work force of 80 million experiencing 200,000 cases of occupational illness as reported by BLS in 1974, would provide an incidence rate of 2.5 cases per 1,000 workers. Here, it should be remembered that the coverage, in terms of cases to be included, is greater than that under most workers' compensation systems in that it includes all cases serious enough to be recognized and made known to the employer.

CHAPTER VII. OTHER RELATED DATA SOURCES AND TECHNIQUES

A. National Health Statistics

In the United States, the responsibility for developing and producing, on a continuous basis, a body of balanced and relevant statistics for "planning, legislation, administrative, program evaluation, and research in the health field" belongs to the National Center for Health Statistics (NCHS) of the Department of Health, Education, and Welfare. (101) The Center's programs are concerned with many different areas of health statistics including vital statistics, population health status, health resource utilization, i.e., the use of health manpower and health facilities. (101) The output of these programs are a series of reports in the area of vital and health statistics. Series 1-4 of these publications are concerned with programs and collection procedures (Series 1), data evaluation and methods research (Series 2), analytical studies (Series 3), and documents and committee reports (Series 4). Other series then provide specific data from the various surveys conducted by NCHS.

Of specific interest and possible use in the area of occupational diseases are data from the health interview and examination surveys (Series 10 and 11) and data on mortality in the United States (Series 20).

Regarding the latter type of data, the Public Health Service has published data on mortality by occupation and industry. (102) They identify at least six factors which tend to "obscure the meaning of mortality rates by occupation or by industry." These are:

- (1) The selection of persons for health-related reasons, both through self-screening and preemployment examinations.
- (2) Selective transfer of workers who develop an illness or

become disabled.

- (3) Variations in retirement practices.
- (4) Concentrations of selected groups, based on race, sex, sex, nationality, in particular occupations.
- (5) Selection of the physical environment for certain industries.
- (6) Effects of education and socioeconomic status in relation to occupation.

The health interview survey is on a continuing nationwide basis and is conducted through household interviews. Each week, specially trained personnel obtain detailed information about the health and other characteristics of each member of the household visited. In 1971, the sample consisted of some 44,000 households containing about 134,000 persons. (103) Although initial emphasis is placed on visits to doctors, dentists, or hospitalization in the year preceding the survey, information is also collected on previous health problems. For example, one question involves existing health problems and whether or not the condition was caused by an old accidental injury. Positive responses are then probed further to determine how many years ago the accident happened and whether or not the accident happened at an industrial place. For persons who now work, or have ever worked, information is also obtained as to the type of industry which employed them and the individual's occupation. However, these questions only apply to the last full-time civilian job of those in the household. Evaluations of acute and chronic illnesses by broad occupational categories were published some 10 years ago. (104) More recent data are available for analysis as indicated by a recent publication of the American Public Health Association. (105) In-depth evaluations of

these data, which might be useful in identifying new, or previously unsuspected, occupational health problems, apparently have not been conducted.

In the health and nutrition examination survey, statistically selected samples of individuals are given physical examinations through the use of a mobile laboratory. These examinations include the eyes, ears, nose, and throat; thyroid; chest; body measurements; mouth and teeth. Occupational histories for the 3 months prior to the examination are obtained and are coded using the Bureau of Census occupational codes. Information on place of employment is not obtained. Cycle 1 of the survey, which lasted from 1959 to 1962, resulted in the examination of almost 7,000 persons between the ages of 18 and 79. Two subsequent cycles conducted during the period 1963-1970 were concerned with the examination of children between the ages of 6 and 17. The fourth cycle which took place between 1971 and 1973 involved the examination of some 6,000 persons between the ages of 1 and 74.

B. Special Studies

There are a number of data sources and methods of analysis which can be used to develop estimates of certain occupational-disease problems. (106) For example, if within one industry or occupational group it is determined that the incidence of a certain disease is to some degree in excess of that expected, it may be possible to approximate the scope of the problem for a group of workers larger than the study group. To make such estimates, it is necessary that certain requirements pertaining to sample selection, choice of comparison group and study design, and thoroughness be met before extrapolations are made. Even then, discussion of the results

must be based on associations rather than on cause-and-effect relationships. However, application of the technique can be useful in highlighting the potential scope and severity of a problem. Certainly, the concern for exposures to harmful agents, such as asbestos and vinyl chloride, go beyond that for those immediately experiencing the problem. Here, the transition is one of relating a known experience to the potential effect taking into consideration the number of workers at risk or exposed to the agents of concern. Consequently data developed from epidemiologic studies of working populations while not normally classified as "occupational disease data" can, if properly used, have a contribution consistent with the previously stated goals of the surveillance system, especially the final one of identifying previously unsuspected or undocumented occupational health problems such as occupational cancer. (107,108)

In addition, the application of epidemiologic techniques in situations where the disease entity is established introduces the concept of a "service science." McMichael (109), in explaining this concept, suggests that two services can be obtained by applying epidemiologic techniques to workers at risk to an occupational health hazard. The first involves hazards which affect only a "susceptible minority" of workers. Here, the service is to detect such workers through the use of periodic health testing of a larger group of workers, for example monitoring the indicators of coronary heart disease. The second application involves monitoring the impact of preventive measures, i.e., before and after comparisons.

As a more broadly based approach, the use of Social Security data has been suggested as a source useful in overcoming many of the major problems associated with epidemiologic studies of large working populations. Mancuso (110) suggests five reasons why this source is of particular interest:

- (1) the limitations of data referring to "usual" occupation or industry as recorded on the death certificates;
- (2) the difficulty of obtaining accurate employment history data from informants or family representatives;
- (3) the frequent changes of employment by workers;
- (4) multiple employments in the same period; and
- (5) the importance of the latent period.

Indeed, the problem associated with multiple occupations becomes very difficult especially when dealing with chronic or latent disease. Here, differences regarding occupational classifications must be kept in mind. For example, with census data and occupational information collected in the Health Interview Survey, an individual's current or last occupation is recorded while death certificates call for the "usual" occupation. A 1963 study by the U.S. Public Health Service of this problem revealed that biases are possible, but that the "net errors in most instances are not great." (111)

Probably one of the largest studies on morbidity experiences by occupation was conducted in the late 1960's through the use of Social Security Disability Insurance data. (112) Almost 700,000 disability awards were analyzed and proportionate morbidity ratios (PMR's), which compare the observed number of such awards with the expected number in an

occupational/condition group, were determined. More than 200 occupational groups and 75 categories of diseases were evaluated. The basis for determining occupation, i.e., usual, last, or that at onset of disability, was not provided. Such information does have the value, however, of identifying potential groups of workers at risk, thus allowing for the implementation of further evaluations. (113)

One unusual application of social security information has been suggested by Mancuso. (114) Rather than evaluating groups of workers by occupations, he suggests that the focus be on places of employment, possibly grouped together by SIC. Problem identification would then involve an evaluation of the health status of workers employed in the study group. The basic limitation here involves the lack of discrimination or ability to "focus" in on specific operations or problems. For example, in Lloyd's study of the steel industry, health problems were not uncovered until well-defined work processes within the industry, such as coke ovens, were examined. (115)

Another approach in identifying the health problems of workers is to study overall morbidity patterns. In such studies, considerations of occupational versus nonoccupational causation are set aside and the focus is on maintaining a health work force. (116) Such statistics might also allow for comparisons between different occupational groups or on an inter- or intra-industry basis in evaluating the potential for occupational factors of concern. (117) Some of the major problems involved in such an approach are reliability of the stated diagnosis, subjective factors involved with work attendance and the difficulties involved with comparison of health problems among different groups. (118)

C. Communicable Disease Reporting Systems

As noted in Chapter IV, where state or local health regulations include the reporting of occupational diseases by physicians, such requirements are often part of more inclusive rules concerning reportable communicable diseases. As applied to communicable diseases, the U.S. Public Health Service considers surveillance as the "continued vigil over the occurrence and distribution of disease and events or conditions which increase the risk of disease transmission" with an ultimate objective of determining "the extent of infections and the risk of disease transmission so control measures can be applied effectively and efficiently." (119)

The national disease surveillance effort had its beginning in 1878 when Congress authorized the Public Health Service to collect morbidity reports in connection with quarantinable measures against cholera, smallpox, plague, and yellow fever. (120) A congressional appropriation in 1879 authorized the collection and publication of notifiable disease data, and legislation was passed in 1893 providing for weekly collection of such information from state and municipal authorities. (120) Legislation to ensure uniform reporting through the use of standardized forms was passed in 1902 and, in later years, led to the development of a list of notifiable diseases jointly developed by the Federal Government and the Association of State and Territorial Health Officers. (120)

The major initiative in developing a national program designed to aid states in their control efforts was instituted in 1946 with the formation of the Communicable Disease Center (CDC), now known as the Center for Disease Control. (17) The Center's early experience with the surveillance of malaria indicated that "simple" appraisals of morbidity and

mortality reports could lead to unnecessary disease control programs. (17) This experience was identified as a "major factor emphasizing the necessity of a more current and comprehensive system of surveillance" wherein the criteria applied in the analysis step are of much importance. (17) In the evaluation of malaria reports, the problem involved the reporting of cases which in reality had their origin outside the United States, thus giving a false picture of "native" cases. Here, the solution involved application of the criterion that two or more cases with an epidemiologic relationship was necessary to determine endemic presence. (17)

The Center has developed a manual of procedures for maintaining surveillance of, and reporting on, communicable diseases wherein standardized reporting procedures are presented. (120) For a number of different categories of communicable diseases (quarantinable, notifiable, and those of special interest), requirements are identified as to who is responsible for making reports, by what means and to whom reports are sent, frequency of reporting, format, period covered, specific information required, reporting procedures, and deadline. In addition, information is provided on how the reports are used and how to correct previous reports. For example, with notifiable diseases a weekly telegraphic reporting system has been established. Currently this includes 30 categories of diseases ranging from mumps to rabies in man and including certain venereal diseases. The following procedures are identified by CDC for this reporting activity:

(1) Made by: State and Territorial Health Officers (STHO) or Epidemiologists;

(2) Transmittal: Collect telegram to reach Atlanta by

2:00 p.m. Eastern time on Tuesday;

- (3) Sent to: STATSEC, Station POL, CDC, Atlanta, Georgia;
- (4) When: As soon as possible after reporting week, but not later than noon on following Tuesday;
- (5) Form: Suggested tabular format given;
- (6) Period Covered: Preceding reporting week established by the STHO and constant from week to week;
- (7) Information Reported: Number of cases of the specified diseases occurring or reported to State Health Department by local, city, or county health departments;
- (8) Reporting Procedures: By telegram in tabular form with identification of originator;
- (9) Deadline for Report: Tuesday noon. If this cannot be met, CDC requests that the information be called in to a specific contact point. The need for prompt reporting is explained and is based on the need to submit compiled tables by disease, by state, to the printer no later than Tuesday night, so that the information can be mailed out by Thursday;
- (10) How Reports are Used: Preparation of the Morbidity and Mortality Weekly Report (MMWR) and for monitoring trends to determine departures from that which was expected;
- (11) Special Notes: Identifies procedures for adding or deleting information from previous reports, and identifies alternative procedures when national or state holidays fall on a Monday or Tuesday.

In addition to these reporting procedures, CDC has also developed some 43 standard forms, many of which are used in reporting specific case-related information. For example, the Notifiable Disease Case Report (Form

No. HSM 4.2929) is filled out by private physicians and hospitals to report the basic information on each case. In addition to name and address, information as to age, sex, and race can also be included on the form. These forms are then mailed to the state agency responsible for collecting the information. For certain diseases of national importance, summarized information on each case is forwarded to CDC for more detailed evaluations.

All in all, CDC has developed a very comprehensive and well documented system for maintaining surveillance over communicable diseases within which once a disease is reported, there is "apparently little slippage." (121) However, in translating this ideal system into reality, problems with getting cases into the system have been identified. (121) These include irregular reporting by physicians, with more common diseases such as measles and influenza being most poorly reported (10 percent ?); the lack of diagnostic criteria, clinical or laboratory, for disease verification and reporting; and lack of agreement as to what diseases should be reported.

CHAPTER VIII. SUMMARY OF SURVEILLANCE SYSTEMS

To best gain an overview of the major facets of various surveillance systems; and to be able to compare that information with each step of the model system, a tabular summary of results has been developed. To make the comparisons more understandable, private-physicians reporting and voluntary systems, both of which are considered nonoperational, will not be included in the summary. In addition, systems used in other countries primarily operate as part of workers' compensation activities. Therefore, one major category of surveillance will be identified as workers' compensation. Where unique factors have been identified, they will be described under the appropriate step in the surveillance system. In other words, the presentation on workers' compensation will draw the best from the various systems. The other major categories which have something to offer to an ideal approach are the BLS system, now operational in this country for occupational injury and illness reporting, and the approach used by CDC to maintain surveillance over communicable diseases.

SUMMARY OF SURVEILLANCE SYSTEMS

Factor	Workers' Compensation(1)	BLS	Communicable Disease(2)	Ideal
1. Recognition				
a. entry	primarily worker initiated; subsequent analysis may be on cases reported (California) or cases awarded (most other units)	any case reported to employee; may be initiated by worker or may result from in-plant medical monitoring	generally initiated by individual with subsequent action by private physician and hospital	medical monitoring by employer for workers' exposed to hazardous conditions
b. use of criteria	Great Britain- diagnostic guide- lines for compensable diseases, otherwise varies by medical/ legal interpretation	no specific criteria	generally no specific criteria used, how- ever, information on diagnostic tests sometimes required	specific criteria developed by disease
2. Classification	generally by specific disease with hierarchial classification	7 broad categories of disease	specific disease with hierarchial classification	specific disease with hierarchial classification
3. Recording/ Reporting				
a. responsibility	varies but generally employer	employer	private physician and hospital	employer

(1) Requirements vary from state-to-state and from one country to another. The "best" of various systems will be drawn upon.

(2) Some variation by disease, especially for internationally quarantinable disease, information reported is general approach.

SUMMARY OF SURVEILLANCE
SYSTEMS (cont')

Factor	Workers' Compensation(1)	BLS	Communicable Disease(2)	Ideal
b. standardization	standard forms used	individual record varies from state- to-state but minimum data required	standardized forms used	standardized forms required
c. type of information	case records and reports with specific information on industry, individual and cause maintained at state or national agency	case records kept by employer with specific information on industry, indivi- dual, and cause; reports are tabula- tions by industry and broad category of disease and sent to either partici- pating state agency or federal center	case records with specific information on individual and disease maintained at state health offices; reports include weekly case tabulations with more detailed case reports for specific diseases	case records with specific information on industry, indivi- dual and cause readily available for analysis
d. frequency	cases recorded and reported when observed	cases recorded as observed, yearly summary reported	cases recorded and reported to state when observed; national tabulations each week with individual cases reported for certain diseases at periodic intervals	cases recorded and reported at frequent intervals (monthly?) to facilitate control efforts

SUMMARY OF SURVEILLANCE
SYSTEMS (cont')

Factor	Workers' Compensation(1)	BLS	Communicable Disease(2)	Ideal
e. disposition	case records maintained at state agency	case records maintained by employer, summary reports maintained at state agency or federal center	case records maintained by state, summary records and reports maintained at federal center	case records maintained at state or regional offices with summary records and reports maintained at federal center
4. Collation				
a. data extracted	disease, industry characteristic	disease category, industry characteristic	disease, personal characteristics, location--more detailed evaluation at state-level	disease, occupation, industry charac- teristics, location
b. availability of raw data	at state workers' compensation office	at employer	at state health and national office for certain disease	at state level and national office for certain diseases
5. Analysis and Summary				
a. factors	type and size of industry by disease	type and size of industry by category of disease	personal characteristics, geographical	industrial characteristics, geographical, occupation

SUMMARY OF SURVEILLANCE
SYSTEMS (cont')

Factor	Workers' Compensation(1)	BLS	Communicable Disease(2)	Ideal
6. Interpretation				
a. analysis of other data	not apparent	not apparent	frequently done	necessary
b. monitoring of significant changes	usually reported	not apparent	primary purpose of system	necessary
7. Recommendation and Reports				
a. timeliness	yearly reports, several years after close of reporting period	yearly reports, several years after close of reporting period	varies with degree of concern; weekly tabulations, other reports on periodic basis	flexibility necessary, i.e., monthly tabulations with annual reports in more depth
b. detail	tabulation of cases reported, or awarded by type of disease and industry	tabulation of cases reported by category of disease and industry	weekly tabulation by disease and location (state); more detailed reports yearly	flexibility necessary, i.e., monthly tabulations by disease, industry and location (state); more detailed reports, especially by occupation, yearly

SUMMARY OF SURVEILLANCE
SYSTEMS (cont')

Factor	Workers' Compensation(1)	BLS	Communicable Disease(2)	Ideal
8. Evaluation	considerable range, but as by-product of another system, flexibility limited	interaction with business and labor advisory committees and occupational health research and enforcement agencies; major changes to system not demonstrated	interaction with state health officers and epidemiologists changes to system considerable	interaction with all affected parties, with procedures for change identified

CHAPTER IX. DISCUSSION

Although occupationally caused diseases have been known and studied for centuries, prior to 1970 there was no concerted effort in the United States to evaluate and document the scope of this public health problem. (1,³) Before the passage of the Occupational Safety and Health Act of 1970, occupational health officials had to rely on reports filed by physicians, workers' compensation reports, or extrapolation of other data from state sources, primarily from California. Individual physician reporting, often as part of requirements to report communicable disease, was recognized as being inoperative; workers' compensation requirements, in many states, had the drawback of covering only a limited number of diseases, and, in addition, it was recognized that the compensation system was not highly attuned to the concepts of occupationally caused disease; and the use of the California data, which was based on the first impression of physicians and involved payment for their services, was not considered as the most desirable way of evaluating national health problems.

This lack of ability to identify and measure the problem, both for occupational injuries and diseases, led the Congress to include a strong mandate to the Secretaries of Labor and Health, Education, and Welfare to "make every effort, through the authority to issue regulations and other means, to obtain complete data regarding the occurrence of illnesses, including those resulting from occupational exposure which may not be manifested until after the termination of such exposure." (69) Subsequent regulations from the Department of Labor required all covered employers to record and, on a sample basis, report occupationally related injuries and illnesses. Under this system, occupational illness is defined as:

...any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact. (30)

Evaluations of this system (31,35) have identified major problems.

A. Common Problems

The basic problem shared by all systems wherein occupational relationships are determined on an individual basis involves the difficulty, and, in many situations, the impossibility of making a determination that the disease is related to occupational factors. There are at least four independent but related major factors which impact on the problem. These are:

(1) The disease

Of primary concern is its uniqueness as far as occupational relationships are concerned. This may involve a disease which is seldom found outside certain occupations especially where the relationship with an environmental contaminant is well documented. This category is best exemplified by the classic disease problems associated with lead, mercury, and other heavy metals. In many of these situations, specific bioassay tests are available to evaluate excessive absorption, and clinical symptoms have been well documented. Another group of diseases includes those where occupational factors are known to be associated with the problem but where other factors of the general population may also contribute to, or be the cause of, the disease. Included here are problems such as loss of hearing, certain types of cancer, as well as more specific conditions such as skin diseases and allergic responses. A group of diseases for which it is even more difficult to assess occupational relationship are those where certain

occupations are known to have excessive response rates, but the linkage of occupation as a causal or even as a contributory factor is extremely difficult to ascertain. Included are those diseases which are generally found throughout the entire population and for which no specific etiologic relationships can be drawn with regard to work factors. Does job stress associated with work as an air traffic controller lead to the development of peptic ulcers, or are those who take up such an occupation inherently more susceptible to such health problems?

(2) Time factor

Many occupational illnesses are of a chronic or latent nature, i.e., they require many years for the problem to be manifested. This is especially true where the levels of exposure to environmental agents responsible for causing a disease are low. Also, as individuals age, a number of health problems may become apparent along with occupationally related conditions. Such developments might tend to mask, or at least lead to difficulty in diagnosing, occupational diseases. In many cases, the disease may not be diagnosed until after retirement of the worker, consequently causal relationships may be difficult, if not impossible to establish.

(3) Multiple occupations

More and more, the work force in our society is not only becoming more mobile as far as moving from one employer to another, but there is also greater opportunity to change occupations. In evaluating the possibility that an illness may be occupationally related, attention must be paid to an individual's work history, including both places of employment as well as previous occupations. In addition, even within one

occupation, workers are usually exposed to more than one occupational hazard. A U.S. Public Health Service survey of the distribution of hazards in certain industries in the Chicago metropolitan area indicated that, on the average, employees were exposed to slightly more than two occupational health hazards each. (122) For chronic conditions resulting from many years of exposure to a single hazardous agent, problems associated with change in employer or occupation are less difficult. However, where the recording system is employer-based, as under the Occupational Safety and Health Act, the probability that occupationally related cases of chronic diseases will be documented is very low. How does a case of angiosarcoma of the liver diagnosed in a person who worked for 10 years in the vinyl chloride industry but now works as a bartender get recorded? If the present employer is aware that the condition is occupationally related and therefore records it, what does this mean as far as subsequent analysis and development of control measures? The possibility of latent diseases even being identified as occupationally related, especially where a number of occupations take place between exposure and diagnosis, is even less likely. The probability that the previous employer will be advised of the case, and will in turn record it, is slight, if not nonexistent.

(4) Prevention versus treatment

With the primary focus of the medical profession on treatment as opposed to the broader-based programs of control and prevention, the desire as well as the incentive to determine causal factors is lessened. Regardless of who is responsible for recording and/or reporting cases of occupational diseases, most of the systems in effect require a determination by a physician that the disease is caused by factors in the

work environment. The number of physicians trained in occupational medicine is miniscule. Consequently, even where a physician probes into a patient's work history, his ability to develop associations is slight. To expect a physician to determine possible contributory relationships, or even possible, let alone "actual", causation without either a thorough understanding of occupational health or first-hand knowledge of the work environment, is somewhat unreasonable, especially when the primary demand on the physician is to heal rather than to prevent. Even where the physician suspects an occupational relationship, his approach may be one of advising a change in occupation, as opposed to the rather nebulous possibility of a greater good through reporting and subsequent involvement in legal and bureaucratic problems.

B. Special Problems and Strengths

In addition to the problems examined above, each of the approaches discussed in earlier sections suffers from one or more defects that are primarily associated with the system itself. Along with these defects, however, there also occur certain strengths or benefits associated with the approach.

(1) Individual physician reporting

Here, the problem basically involves a clear understanding of what should be reported, as well as how and to whom. Unlike the formalized procedures developed by the U.S. Public Health Service and state and local agencies for communicable diseases, the concept of occupational disease, where included, seems to be one of an afterthought. The glaring lack of well-defined procedures for surveillance of occupational diseases as opposed to those developed under the national requirements for morbidity

reporting documents the uselessness under present conditions, of such an approach. In the final analysis, however, it is the physician who must make the determination of occupational relationship, if it is to be done on an individual case basis.

(2) Workers' compensation reports

The primary obstacle to the use of data under this system is the nonuniformity of compensation benefits from one state to another. Under proposed federal legislation (47), this problem may in the future be alleviated. However, in the past, the goals of such compensation systems have not included the generation of statistics which are usually considered as an afterthought. Consequently uniform recordkeeping from state to state has not been achieved. For such data to be of use on a national basis requires the development and implementation of standardized recording procedures. The Bureau of Labor Statistics, U.S. Department of Labor is developing a supplementary data system (SDS) to augment injury and illness reports by the employer. (123) The approach is to utilize first reports of injury and illnesses filed by employers under state workers' compensation laws. It is anticipated that as many as 30 states may ultimately be involved in the cooperative program. Other problems have been the delays associated in case processing and cases settled out of court being lost to the system.

To overcome these problems to some extent, it would probably be useful to have available, on a national basis, claims filed as well as those awarded. This could be similar to the situation in the Federal Republic of Germany (93) where evaluation of both categories of data may lead to assessment of serious versus nonserious problems based on the

number of workers affected or on compensation costs. In the case of out-of-court settlements, it would seem appropriate to require employers and/or insurance companies to report such information to the state workers' compensation agency. As byproduct information, workers' compensation data do not require a structure of their own and can be developed as an add-on to management-type information. One of the major drawbacks to the system is that, in most situations, only the more serious health problems will be filed as possibly being work-related. Consequently, many occupationally related illnesses may be overlooked.

(3) Employer reporting

Although the U.S. Department of Labor has developed an extensive recording and reporting system, wherein the employer is responsible for accuracy and completeness, the foremost problem is the lack of medical services in U.S. industry. Most small- and medium-sized industries, which employ the bulk of the working population, do not have formal arrangements with a physician to monitor the health of their workers. The next major problem is the lack of specific guidelines as to what should be considered in determining the relationship between occupation and disease.

Where physician services are available in industry, they are often limited to preemployment examinations and/or treatment of on-the-job injuries. To expect employers to identify and record conditions wherein cause-and-effect relationships are questionable and which in turn may cause the worker to initiate a compensation claim is somewhat unrealistic. The major strength of the system is that the responsibility to identify, record, and report occupationally related diseases is placed on the right person, i.e., the employer exposing workers to hazardous conditions.

(4) Special studies

Although special studies involving an epidemiologic evaluation of large groups of workers are important in indicating the lack of underreporting or nonrecognition, such studies, in themselves, cannot be used to document or even begin to estimate the overall magnitude of the problem. In addition, they are generally expensive to implement and are not designed for a continuous monitoring of a population. The same holds true for health studies in the general population wherein occupation is not a factor in selection, but rather an attribute to be recorded. Epidemiologic studies are of special usefulness in documenting the possibility of previously unrecognized work/disease relationships in certain industries or occupations. In a surveillance effort, this information should then be used to create an awareness on the part of workers, employers, physicians, lawyers, and compensation officials to the possible relationship between working conditions and the development of a particular disease. For many diseases, especially where the cause-and-effect relationship is difficult to unravel, epidemiologic data may be useful in estimating the degree of underreporting.

CHAPTER X. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

Returning to the original question of how many occupational diseases occur in the United States, the most appropriate and realistic answer is that we do not know and probably never will know. However, it is a fact that occupational factors, alone or in combination with other conditions, do cause disease and are capable of aggravating existing disease conditions. Based on these "primary" assumptions and assuming that there is interest in preventing the occurrence of occupationally related diseases, the following conclusions seem appropriate.

(1) Occupational disease surveillance must be considered part of control requirements.

As noted in Chapter I, regardless of where efforts are on the range of preventive actions, follow-up information as to the degree of success of control efforts is necessary to ensure that future programs are targeted to achieve more optimal results. For example, laboratory animal tests indicate that a new chemical can cause contact dermatitis. Suitable protective equipment and work practices are developed and are required in occupational health regulations along with training and education of employees and requirements for medical surveillance on a periodic basis. Promulgation of occupational health regulations without subsequent evaluation as to prevention of occupational disease is only going part of the way in the prevention effort. Monitoring the results in the work force is a necessary step in ensuring that satisfactory results are being obtained; where lapses in control efforts occur, they are identified and corrected. This places occupational disease surveillance in its proper

role as a part of the overall control effort, which is the responsibility of the employer.

At the most basic level, the model may be limited to the workplace itself. In this instance, the plant physician would monitor the health status of exposed workers with particular emphasis on skin conditions among those working with the chemical of concern. As problems are noted, they could be referred to an industrial hygienist for purposes of evaluating work practices and making changes as appropriate. Here the problem may involve anything from a lack of adequate training of employees to a serious flaw in the basic standard such as insufficient requirements about protective clothing. In any event, a breakdown in the preventive effort occurred and was identified. This may then solve the problem in that particular plant. However, if the chemical is in wide use, and realistically taking into consideration the size and distribution of the work force as well as the lack of access to medical services at the workplace, it is not realistic to assume that the need for corrective action will be universally recognized in all workplaces. Consequently, the occupational health regulatory agency must monitor the success of control efforts on a large scale in order to guide compliance efforts and identify where changes are needed in existing standards.

(2) Problem estimation versus "precise" overall counts is more realistic and useful.

Because of the complexities involved in determining occupationally related diseases (occupation as the only factor, occupation as one of several factors possible, occupation plus other factors, and occupation aggravating existing conditions), it is not possible to have some overall

measure of the problem. Even if such a measure were possible, its usefulness regarding preventive efforts is not clear. The present total of the national "experience" is essentially meaningless as regards any, except the most general, guidance for control efforts. For example, it is reported under the BLS system that in 1974 the workforce experienced some 12,700 cases of "respiratory conditions due to toxic agents." (75) Some general information is also available as to the types of industries wherein the problems were noted. However, information as to what toxic agents were involved is not readily available, therefore problem identification to alert employers, employees, and inspectors about significant hazards cannot be effectively implemented. Also, working with data that are 2 to 3 years old and for which no specific guidelines for inclusion or exclusion of cases have been developed is essentially meaningless. With such a great time lag and lack of groundrules, there is no realistic basis for even assessing trends for the broad categories, let alone for the overall disease total.

It must also be recognized that, in most cases, prevention of occupational health problems is based on the control of specific hazards such as lead, mercury, silica, noise, and heat. Therefore, if surveillance is to be a part of the control effort occupational disease, information should be available by hazard or at a minimum by work process. Based on these concepts, it would seem reasonable that, if occupational disease surveillance efforts are to be effective, the relationship between specific disease and exposure to toxic substances should be objectively described with biologic and/or physiologic assessment criteria included where available.

Some degree of understanding does exist as to the role of contributory or causal environmental factors in the development of certain occupational diseases. Therefore, monitoring such diseases can directly lead to control efforts. With such an approach, the goal is not to try and measure some nebulous and ill-defined "total problem" but rather to keep track of those problems where occupational causation has been documented and consequently to direct control measures more effectively.

(3) Mandatory medical monitoring of workers exposed to hazardous environmental factors is necessary for control including surveillance.

Because of the magnitude and distribution of the work force, and the documented lack of availability of routine medical services in industry, it cannot be assumed that cases of occupational disease will be routinely identified even where specific guidelines are available. Monitoring of exposed working populations is a mandatory requirement for surveillance. Consequently, surveillance efforts must first be related to medical monitoring requirements associated with work involving exposure to toxic substances. Such a need was recognized in the Occupational Safety and Health Act which states that standards for control of exposures to occupational health hazards shall include where appropriate medical examinations. Promulgation of such standards by the U.S. Department of Labor is in reality the first step in building an occupational disease surveillance system.

(4) The present reporting system is usable but requires major modification.

The final consideration involves the design and implementation of

the concepts identified in Chapter III for a model disease surveillance system. Under such an approach, the place of employment is the basic reporting unit. This is consistent with the strategy that is now employed by the Bureau of Labor Statistics. However, the main differences involve what is to be reported to allow for greater integration of the surveillance function into control efforts and, to a certain extent, how reports are made. Considerable resources have been invested in designing and implementing the Bureau of Labor Statistics' Occupational Injury and Illness Recording and Reporting System. Therefore, to hold new expenditures to a minimum and gain from the time and resources already expended on this program, every effort should be made to utilize that system as the basic approach.

A review of that system indicates that all employers in the United States have been advised that it is their responsibility to record occupational injuries and illnesses. The determination that such occurrences are work related is left to the employer. For occupationally related illnesses, very little in the way of interpretive guidelines is available. Employers must initially work on a case-by-case basis for which a specific diagnosis would be available. However, at the end of each year when the cases are summarized and a random sample of employers are asked to report their experiences to the state and federal governments, the level of detail is reduced and information is only available for broad categories of illness, i.e., dust diseases of the lungs, systemic poisons, diseases due to repeated trauma, etc. The possibility of successfully integrating this information into control efforts is low.

To alleviate the more serious problems encountered with the present reporting system, the following recommendations are presented.

B. Recommendations

In presenting the recommendations of this thesis, the existing federal reporting system will be compared with the model system described in Chapter III. As problems are identified, the approaches used in other reporting systems, especially those for workers' compensation and communicable diseases, will be considered as to their applicability and usefulness.

(1) Recognition

In developing information on the more complex occupational diseases, the ideal approach in generating the basic data would probably be one wherein the physician was not asked to make a decision regarding occupational etiology on a case-by-case basis. Occupational relationships could then be developed by reporting all cases of illness and through group (occupation or industry) comparisons, identify significantly high incidence rates. However, the problem here would involve the possible loss of discrimination because of the high "background" rates of nonoccupational disease. Such epidemiologic efforts, which would be similar to those based on social security data, seem best suited to special studies of particular industries and occupations once the data base is established.

Another possible approach, at least as far as private physician and employer reporting are concerned, would involve the use of categories such as "possible occupational disease." Because of the difficulty in defining and, therefore, standardizing such a category, one might want employers and physicians to report all cases wherein occupational relationships cannot be

definitively ruled out. Based on the present state of knowledge regarding causative factors, especially where occupation is only one of a combination of causal factors, is a contributing factor, or determines the course of already existing disease, such an approach seems unwarranted.

For the present, reliance on employer reports seems most appropriate. However, as noted earlier, the present use of seven categories of diseases is not specific enough to provide the needed information, and an even greater drawback is the lack of physicians trained in the field of occupational health. Therefore, only two choices are available. The first is to wait until occupational health training is more widely available, while the second is to develop specific guidelines for determining what should be reported as an occupationally related disease. The latter seems to be the more pragmatic and, at the same time, controversial choice.

An approach modeled after that used in Great Britain for workers' compensation (81), where a list of specific occupational diseases and guidelines for diagnosis have been developed, would appear to be the most useful for employer reported data. Essentially, it would consist of identifying certain disease problems associated with specific hazards, occupations, and/or work processes. Whenever an employee is diagnosed as having the disease associated with the factor of concern, it would, for surveillance purposes, be defined as an occupational disease. As noted earlier, recording a disease under this system would not necessarily be synonymous with admitting liability under workers' compensation. At the same time, just because a disease was not identified as reportable would in no way mean that an occupational relationship was not possible. Where

biologic or other medical tests are available to corroborate the diagnosis, specific guidelines for applying these tests should be developed. Although there are very fine lines separating the individual physician's area of professional responsibility and the legal aspects of workers' compensation, some order and consistency must be brought into the surveillance area.

The process for identifying specific occupational diseases to be monitored is, of course, most crucial. The initial step in establishing such a list and the process of subsequent modifications will greatly affect the course of prevention, control efforts, education, training, and research in the field of occupational health. It is definitely not an exercise or responsibility to be taken lightly. At a minimum the approach should involve the creation of a panel of experts with representation from government, industry, labor, and academia. The federal agency responsible for designating the list of occupational diseases could then identify candidates based on new research information or special studies of working populations. In this effort, it would be useful to establish guidelines for designating which occupational diseases should be reported. Such guidelines should consider the potential severity of the disease, the size of population at risk, and the criteria available for determining occupational causation. The list of occupational diseases for which compensation is recognized in Great Britain would be an obvious and most appropriate starting point.

One final point to be discussed as to the criteria for making a determination that an illness is occupationally related involves the trade-offs associated with a greater degree of specificity. Where very specific criteria are established, i.e., a certain concentration of lead in blood or

a certain degree of hearing loss in designated frequencies, one is more sure that the cases reported, are indeed occupationally related, that is to say that one would expect a lower number of false positives in the results. However, at the same time limitations are also being placed on physicians who, in evaluating the health status of a worker, may be of the opinion that, although the criteria are not met, an occupationally related disease does in fact exist. Under such circumstances, the case would not be reported and underrecognition of the problem would be experienced. One possible approach might involve a variation based on that used in cases of tuberculosis, where, in reporting suspected cases, the physician is asked to provide information as to how the diagnosis was made. For example, the reporting physician indicates that the evaluation included an X-ray, a bacteriologic test, a tuberculin test, and whether or not chemotherapy involving one, two, or more drugs is ongoing. For a case to be counted in the U.S. Public Health Service's CDC Annual Tuberculosis Statistical Summary (124), it must have involved either a positive bacteriology or a treatment with two or more antituberculosis drugs. Cases based on other factors such as an X-ray reading alone are not counted. However, follow-up action is suggested. For a specific disease, this is probably the ideal approach. But, when one considers the number of occupational diseases for which reporting may be desirable, such a flexible approach does not seem feasible. Certainly, with the approach now used, the lack of any guidelines whatsoever is also undesirable. Therefore, it is recommended that the most straightforward approach is to develop specific reporting criteria which, even though some cases might be missed, will provide a more standardized data base with which to work.

It should be remembered that identifying specific guidelines for determining cases of occupational disease and requiring that periodic medical monitoring be made available to workers at risk has a primary focus on surveillance and prevention efforts at the workplace. Based on the requirements of the Occupational Safety and Health Act, it is not until step 3 of the surveillance system, when reporting is introduced, that requirements above and beyond those normally expected of an employer who is exposing workers to potentially hazardous conditions are defined. Even here, the Act requires the employer to make such information available to the government. To truly achieve the goal of preventing of occupational disease the question then becomes one of burden on the government (the people) to go forth and obtain information or on the employer to report. It is recommended that disease recognition procedures and reporting requirements be included as an integral part of standards for controlling occupational exposures to hazardous conditions.

(2) Classification

As noted above, the recognition step should be approached by using a list of occupational diseases, wherever possible associated with specific hazards, occupations and/or work processes. In developing such an approach, a necessary byproduct will be the development of a classification system based on occupational health concerns. There is no reason why the existing classification system used by the Bureau of Labor Statistics cannot be the starting point. As individual diseases are designated, they can be assigned to one of the seven categories listed earlier. This may provide some uniformity between future years' data and the information collected up until the time this program is initiated.

For example, the broad category of occupational skin diseases should be retained and specific toxic substances, which have been identified both as capable of causing skin disease and of widespread use in the workplace, should be listed. The category dust diseases of the lungs should include specific enumerations for silicosis, asbestosis, and byssinosis. Where a toxic substance has the potential for causing more than one type of disease, it should be listed under all appropriate disease categories. For example, certain hexavalent chromium compounds are capable of causing dermatitis, skin ulceration, and lung cancer. Diseases associated with hexavalent chromium compounds should therefore be listed under skin conditions and also under the category concerned with diseases of the lungs other than those caused by dust. As specific diseases are designated, they should be assigned to one of the seven categories.

(3) Recording and Reporting

Essentials of the basic recordkeeping system now required of all employers by the Bureau of Labor Statistics should be retained. However, certain changes involving who reports, what is to be reported, and how often reports are necessary, should be made. Generally, the recommended changes will be patterned after those employed by CDC for communicable diseases. As noted earlier, although all employers must record cases of illness on a yearly basis, only a sample of employers must report their experiences. In addition to certain identifying information about the place of employment, that of most interest being the type of work performed and the size of the establishment, employers selected to report only provide total number of cases for the seven categories of disease. This system should be revised as follows.

(a) All employers should be provided with the list of reportable occupational diseases including a reference to the appropriate occupational health standards which, in addition to defining conditions for safe use, would also include specific requirements for determination of cases of occupational disease.

(b) Major changes in reporting are necessary. First would be to report individual cases as they are identified to a specified location. For example, all cases of reportable disease could be sent to the state health department. An alternative would be to file reports with the office of the Occupational Safety and Health Administration having jurisdiction for the state in which the employee is located. This would allow the local compliance office to have more up-to-date information on health problems. Federal regulations now require all employers to follow a similar procedure in reporting occupationally related incidents involving deaths or the hospitalization of five or more employees. Employers could be required to file a copy of the OSHA Form-101 which gives a detailed description of each case. This recordkeeping procedure has been mandatory for all employers for almost 5 years. The only new requirement would be that of sending a copy of the form to the OSHA area office. This would be most useful as far as immediate follow-up inspections of disease reports are concerned.

Another basic reporting difference between the proposed system and the current approach followed by the Bureau of Labor Statistics is that under the new system, all cases of reportable occupational disease would be submitted, rather than gathering information on a sample basis. This would not seem to be an unmanageable task if the Bureau of Labor Statistics'

projected figure of 200,000 cases annually of occupational diseases is anywhere near correct. The reporting system would be handling a smaller number than this, at least initially, in that the list of reportable diseases would not be all inclusive.

Another concern involves the frequency of reporting. The current situation wherein reports are filed on a yearly basis and results are not available until 12 to 18 months later is not satisfactory where surveillance is designed as a part of control efforts. Utilizing electronic data processing techniques and initially reporting results on a state and regional basis, a goal of producing results within 6 months of the end of the reporting period should be established. As experience is gained with the system and intensified control efforts are necessary for specific diseases, semiannual reporting periods can also be utilized.

On a more frequent basis, possibly monthly or quarterly, case tabulations should be forwarded to a national reporting center. This will allow for the monitoring of disease trends at the national level. Also, it may be desirable to monitor certain diseases in more detail at the national level. For these diseases, periodic individual case summaries could be forwarded to the national office.

4. Collation

As noted in the description of the model system, data collation is a critical step and involves a careful documentation of the procedures utilized. Under the Bureau of Labor Statistics' system, this step essentially involves a tally of cases reported by industry size and type. For specific size groups, incidence rates can then be determined, i.e., 5 cases of occupational skin disease per 100 workers. The approach of

determining incidence rates should be maintained to allow for comparisons.

An employer should be able to determine if his plant's experience for a specific occupational disease is greater or less than that experienced by similar plants in his state, region, or at the national level.

Ideally, the employer should report the number of cases observed in the population at risk. For example, with lead poisoning this would involve a determination of the number of workers exposed to lead and the number determined to have an occupationally related case of disease due to that exposure. Determination of the specific "at risk population" is not currently a feature of the Bureau of Labor Statistics' system; consequently, incidence rates are based on the total population in the specific workplace. Although the most useful information would be gained where the incidence rate was based on the population truly exposed to the hazard, it is probably not feasible to obtain such information at the present time. Therefore, it is proposed that incidence rates continue to be based on an establishment's total work population.

For a given type and size of industry, i.e., a reporting cell, data on the total number of cases reported and the total work population will provide an overall incidence rate for that cell at the state, regional, or national level. Such information is necessary in developing comparisons between types and sizes of industry as well as for comparing the experience of an individual establishment with that of a larger group. In order to accomplish this task, the collation step will undoubtedly require the use of electronic data processing equipment.

One of the basic factors to be considered in the collation step is the retention and possible use of the original data supplied by the

employer. As the system is now proposed, the raw data coming into the state collection point would be a report from an individual employer which in addition to the specifics of the disease and worker affected, would provide information as to the name and location of the business, the type of business, and the number of employees at that establishment. For each employer filing a report, the basic data to be entered into a computer file would include an employer identifier number, SIC code, size category, number of employees, disease reported and occupation of employee affected. The reports themselves could then be retained at the state level, possibly on microfilm, for future use. The collation step would then involve tabulations and calculations of incidence rates for individual diseases by type of industry and size groups. Where follow-up surveys of specific establishments are desirable, the data base could be searched for those reporting a specific disease. Further refinements could be introduced to allow for selection of specific establishments experiencing high incidence rates of a specific disease.

5. Analysis and Summary of Data

The primary focus of the analysis and summary step should be directed at identifying industry groups, based on size and type of industry and geographical location, which appear to be experiencing the greatest problems as regards the occurrence of specific occupational diseases. Incidence rates, as well as total number of cases reported, for specific occupationally related diseases should be determined for groups of plants based on size and industry type. It would take assessment of the volume of data available to work with, but the initial goal should be one of structuring the scope of the analysis groups as narrowly as possible. For

example, the size groupings now used by the Bureau of Labor Statistics are 1-19, 20-49, 50-99, 100-249, 250-499, 500-999, 1000-2499, and 2500 employees and over. At a minimum, this degree of classification should be maintained. Where the data appear to be insufficient to allow for meaningful comparisons with these size groupings, the cells can be collapsed (1-49, 50-249, 250-999, 1000 and over) to provide more data in a given group. As far as industry type is concerned, the greatest degree of detail possible is most desirable. The Bureau of Labor Statistics' approach for classification by industry type is to use a four digit SIC code which is the greatest detail possible for manufacturing, and a three digit code for other industries. Analysis at this level should be continued.

The main goal in this step is to provide summaries of information, both incidence rates and total number of groupings in order to facilitate determinations of need and priorities for control efforts by federal and/or state authorities. Future efforts should be directed at developing similar information by occupation.

6. Interpretation

As noted in the discussion of the model system, this step involves a thorough and sophisticated evaluation of probable associations. In most epidemiologic studies, this usually involves evaluation of an array of personal characteristics associated with those individuals who have fallen victims to the disease being studied. In the system being discussed here, the workplace itself is considered as the object of study. The initial step of grouping establishments together by size and type is much the same as that of grouping individuals together by age and race. Once this step

is taken and the disease experience is presented by these various groupings, other factors can be brought into the interpretation stage. These other factors include, where available, considerations such as availability of medical and other occupational health services and information as to new processes introduced into specific industries. Where appropriate, special studies may be necessary to develop needed information. By following trends, it may be possible to develop associations between disease incidence and economic factors such as increased production rates. At the present time, there are no known activities associated with the analysis of causal factors related to the occurrence of occupational disease. The only factors receiving such study are the direct results of exposure and health effects.

Consequently, an area of much needed evaluation involves the study of those factors which may be most likely to contribute to the occurrence of an occupational disease. Here, concern should be directed at the type of industry, the size of the plant, its geographical location, both on a national basis (north, south, east, or west) as well as within a geographical area (urban, suburban, or rural). Factors such as the age of an establishment may also be related to the probability of disease occurrence. Any positive relationships which can be developed will provide a better focus for targeting compliance, education, and consultative efforts.

7. Recommendations and Reports

As discussed previously, the reports available in this country for analysis of occupational disease problems are essentially nonexistent. Only one source, the Bureau of Labor Statistics' annual survey of

occupational injuries and illnesses, attempts to provide a continuing overview of the most significant problems. The available data however are limited to broad categories of occupational disease and are often not available until several years after the end of the annual reporting periods. Such information provides little guidance to control efforts. There is no reason to believe that even the most well recognized occupational health problems, such as those resulting from exposures to lead, mercury, silica, noise, heat, pesticides, and commonly used organic solvents are being adequately controlled. Indeed, the very limited Public Health Service study conducted in the states of Washington and Oregon provides ample indication that there is significant underrecognition of even the more common problems.

Specific reports with recommendations for control needs should be developed on the state level for the reportable diseases. The reports should identify target industry groups based on size and SIC code. Recommendations can also be developed as to the relative importance of one disease problem as compared to another. For example, if hearing loss appears to be on the increase in a particular industry, it would be recommended that emphasis be placed on control efforts for this problem. An even greater benefit, probably best realized at the federal level, would be the comparison of disease rates in different parts of the country or in different locales such as urban, suburban, and rural. Such information would not only identify the need for reallocating national resources, but might also serve to identify areas for possible research as to why control is apparently better in one area than in another.

As noted earlier, reports must also be timely. If the disease experience is to be studied over a 1-year period, the goal should be to develop reports within 6 months after the close of that period. Where individual diseases are studied on a shorter time frame, possibly semiannually, every effort should be made to condense the time period for developing reports even further. As noted in the earlier description of the Bureau of Labor Statistics' system, the reporting system now involves some 600,000 establishments. This large number is apparently needed both to ensure the accuracy of projected figures for the nation as a whole and to obtain state level estimates. However, if the projected national estimates for the total number of cases of occupational disease are anywhere near correct at 200,000, it seems somewhat of an overkill to sample 600,000 establishments. It is possible, however, that such a design is necessary to develop estimates of the much larger problem of occupational injuries. If the surveillance of occupationally related diseases is separated from the occupational injury problem, and the approach is limited reporting of a finite list of diseases, the volume of data handled will be much less than that currently experienced. This will be true even if all, rather than a sample of cases, are reported. Consequently, the goal of providing more timely reports would not appear to be unrealistic. Indeed, even simple tabulations to monitor trends could probably be done at the national level on a monthly, or at least quarterly basis.

8. Evaluation

At the present time, there appears to be limited interaction between the operators and users of occupational disease surveillance

systems. The Bureau of Labor Statistics has established advisory committees for both industry and organized labor. Their degree of involvement or effectiveness have not been reported. A number of strategies to facilitate such contacts could be suggested. These would include continuation of formal advisory committees and national symposiums to develop recommendations for change. A very aggressive effort in this area is most needed.

C. Summary

As described in Chapter V, the current approach for determining the magnitude of the occupational disease problem in the United States consists of an annual survey of a sample of establishments. The survey is designed to provide incidence data at the state and national levels based on a projection of the information obtained for both occupational injuries and illnesses. Final reports are not available until several years after the survey and then only deal with broad categories of disease. The usefulness of such information in efforts to control health problems in the workplace is difficult to determine.

The major strength of the existing system is that every employer is required to record cases of occupational injury and illness. Unfortunately specific criteria for determining occupational relationships are not provided to employers. To give better direction to control efforts, it is recommended that the existing system be modified as follows.

1. A list of specific "reportable" diseases should be developed.
2. Existing control regulations for occupational hazards should include criteria for determining occupational

disease resulting from exposure to the hazard being regulated and require that exposed workers be provided medical monitoring.

3. Employers should be required to report all cases of "reportable" diseases.
4. The existing reporting framework, as established by the Department of Labor, should be used to compile and analyze reports of occupational disease separate from an annual survey of occupational injuries. However, this approach should be modified to more closely parallel that used to monitor communicable diseases wherein individual case reports are filed at the state level, while at the national level, overall tabulations and monitoring of high interest diseases takes place.
5. Interpretation of the results should also involve analysis of other information such as availability of occupational health services, as well as analyze differences due to size, type of industry, and geographical considerations.
6. Reports should continue to be concerned with disease experience by type and size of industry, but must be developed in a timely manner and initially focus on specific diseases.

An example of how the system might operate for two specific health problems, lead poisoning and hearing loss, is described in Appendix D.

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CHAPTER XIII. APPENDICES

APPENDIX A OCCUPATIONAL ILLNESS CLASSIFICATIONS USED BY THE U.S. DEPARTMENT OF LABOR

Occupational Illness - Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact, and which can be included in the categories listed below. The following categories are used by employers to classify recordable occupational illnesses:

Occupational skin diseases or disorder

Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflammations; etc.

Dust diseases of the lung (pneumoconioses)

Examples: Silicosis, asbestosis, coal worker's pneumoconiosis, byssinosis, and other pneumoconioses.

Respiratory conditions due to toxic agents

Examples: Pneumonitis, pharyngitis, rhinitis, or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung; etc.

Poisoning (systemic effects of toxic materials)

Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals, poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins, etc.

Disorders due to physical agents (other than toxic materials)

Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn), etc.

Disorders due to repeated trauma

Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

All other occupational illnesses

Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

Source: Occupational Injuries and Illnesses by Industry, 1972, bulletin 1830, US Dept. of Labor, Bureau of Labor Statistics, 1974, pp 118-19

APPENDIX B

SCHEDULE OF NOTIFIABLE INDUSTRIAL DISEASES
ALBERTA, CANADA

Poisoning by or intoxication with:

1. Lead or a compound of lead
2. Manganese or a compound of manganese
3. Mercury or a compound of mercury,
4. Arsenic or a compound of arsenic
5. Beryllium or a compound of beryllium
6. Cadmium
7. Nickel carbonyl
8. Organophosphorus compounds
9. Benzol or a nitro-, amido-, or chloro-derivative of
benzol or a homologue of benzol
10. Tetrachloroethane
11. Trichloroethylene
12. Methyl Bromide
13. Carbon Monoxide
14. Pentachlorophenol
15. Agricultural chemicals
16. Solvents

Ulceration due to:

17. Chromium compounds
18. Exposure to amenic, tar, pitch, bitumen, mineral oil,
soot, or any compound or residue of these substances

Other:

19. Radiation injury (to include exposure to laser activity,
microwaves)
20. Cataract (exposure to heat, radiation)
21. Pulmonary fibrosis
22. Pneumoconioses
23. Decompression sickness
24. "Farmers' Lung"
25. Noise-induced hearing loss
26. Occupational cramps of the hand or forearm due to frequent
repetitive movements which produce inflammation of the
tendon sheaths
27. "Dead hand" or "dead fingers" associated with direct
exposure to vibrations in excess of 2,000 vibrations/minute
28. Mesothelioma associated with exposure to asbestos

29. Neoplasm of the urinary bladder, renal pelvis, or ureter associated with exposure to chemical carcinogens
30. New growths of the skin associated with exposure to arsenic, tar, pitch, bitumen, mineral oil, soot or any compound or residue of these substances
31. Dermatoses of non-infective origin due to exposure to dust, liquid, vapour or any external agent affecting the mucous membranes or skin

Source: Alberta Regulation 62/70--Provincial Board of Health Regulations Respecting the Notification of Industrial Disease (Division 40). Filed, March 17, 1970. The Alberta Gazette, March 31, 1970

APPENDIX C

LIST OF NOTIFIABLE OCCUPATIONAL DISEASES
FEDERAL REPUBLIC OF GERMANYA. Diseases caused by chemicals

1. Mucous membrane alterations, cancers or other endoplasms of the urinary tract due to aromatic amines
2. Diseases due to arsenic or its compounds
3. Mucous membrane damage to the eye caused by benzoquinone
4. Diseases caused by benzene or its homologs
5. Diseases due to nitro or amino compounds of benzene or its homologs or their derivatives
6. Diseases due to lead or its compounds
7. Diseases due to chromium or its compounds
8. Diseases due to fluorine or its compounds
9. Diseases due to halogenated hydrocarbons of halogenated alkyl, aryl, or alkylaryl oxides or sulfides
10. Diseases due to cadmium or its compounds
11. Diseases due to carbon monoxide
12. Diseases due to manganese or its compounds
13. Diseases due to methanol (methyl alcohol)
14. Diseases due to phosphorous or its compounds
15. Diseases due to mercury or its compounds
16. Diseases due to nitrate esters
17. Diseases of the teeth due to acids
18. Diseases due to carbon disulfide
19. Diseases due to hydrogen sulfide
20. Diseases due to thallium or its compounds
21. Diseases due to vanadium or its compounds

Concerning Nos. 2, 4-8, 10-21: Skin diseases are not included. These are considered diseases in the sense of this appendix only insofar as they represent manifestations of a systemic disease caused by intake of the harmful substance into the body or are to be indemnified in accordance with No. 46

B. Diseases caused by physical factors

22. Chronic diseases of the bursa due to constant pressure
23. Pressure paralyses of the nerves
24. Diseases due to working with compressed air
25. Diseases due to vibration in the case of work with compressed air tools or similar tools or machines as well as use of impact machinery
26. Partial and complete deafness due to noise
27. Diseases due to X-rays, radiation from radioactive materials, or other ionizing radiation
28. Gray cataract due to thermal radiation

C. Diseases caused by mixed chemical-physical effects

- 29. Diseases of the deeper respiratory passage and the lungs due to aluminum or its compounds
- 30. Asbestos pneumoconiosis (asbestosis)
- 31. Asbestos pneumoconiosis (asbestosis) in combination with lung cancer
- 32. Diseases due to beryllium or its compounds
- 33. Diseases of pulmonary fibrosis due to metal dusts in the production or processing of hard metals
- 34. Quartz pneumoconiosis (silicosis)
- 35. Quartz pneumoconiosis in combination with active pulmonary tuberculosis (silico-tuberculosis)
- 36. Diseases of the lower respiratory passages and lungs due to Thomas meal (Thomas phosphate)

D. Diseases caused by pathogenic organisms or parasites

- 37. Infectious diseases if the insured was working in the health services, in welfare care, or in a laboratory, or was similarly severely exposed to the danger of infection due to any other activity
- 38. Diseases transmissible from animals to men
- 39. Helminthiases of miners, due to Ankylostoma duodenalis or Anguillula intestinalis

E. Diseases due to nonuniform exposure

- 40. Eye twitches in miners
- 41. Bronchial asthma forcing the victim to give up his occupational activity or any gainful work
- 42. Meniscus damage after at least 3 years of regular underground work
- 43. Diseases of the tendon sheaths or of the tendon sliding tissue as well as of the tendon or muscle attachments which have necessitated relinquishing employment or any gainful employment
- 44. Tropical diseases, spotted fever, scurvy
- 45. Fracture of vertebrae projections

F. Skin diseases

- 46. Severe or recurrent skin diseases which have forced relinquishment of occupation or any gainful employment
- 47. Skin cancer or skin changes tending to cancerization due to carbon black, crude paraffin, tar, anthracene pitch, similar materials.

Source: Wagner R: [The German Law concerning occupational diseases - the medical viewpoint.] Internist 15:293-96, 1974 (Ger)

APPENDIX D

DETAILS OF A SURVEILLANCE SYSTEM
FOR TWO OCCUPATIONAL DISEASES

As discussed in Chapter X, the basic step in the recommended approach for monitoring occupational health problems involves development of a list of reportable diseases. A variety of information sources and special surveys can be used to identify the most significant problems to be monitored. In addition to new information provided through toxicologic studies, several sources of data involving exposures to workers are of importance. Two of the most important sources are continuing programs of the National Institute for Occupational Safety and Health (NIOSH). The first involves industry-wide studies designed to uncover new of suspected conditions. A second NIOSH activity of importance in the selection of diseases to be monitored is their Health Hazard Evaluation program. This project involves investigations at the worksite to determine if chemicals are producing adverse health effects in exposed workers. The program usually involves environmental evaluations, and where appropriate, medical examinations. Requests for health hazard evaluations may be made by exposed employees, or employers.

Based on these, as well as other appropriate data sources, determinations can be made as to which occupational disease should be monitored. It would seem most appropriate to establish a formal advisory committee to aid in the selection of diseases to be monitored. Such a group could work with the Departments of Labor and Health, Education, and Welfare and should involve representatives of industry, labor, and the general public. Once a list of occupational diseases is developed, an implementation plan, similar to the following one described for two

occupational diseases, should be implemented.

In outlining the proposed surveillance system, occupationally related diseases involving exposure to lead and noise will be used as examples.

1. Recognition

The first step involves the development of diagnostic criteria for determining adverse health effects. Where the disease to be monitored is specifically related to an environmental factor, which will be the most usual case, the diagnostic criteria should be established as part of an occupational health standard. Following such an approach, the NIOSH concept of an "action level" can be used as the primary basis by the employer for determining which employees are to be provided medical monitoring. For example, if the permissible exposure to lead is set at 0.1 mg of lead per cubic meter of air, based on an 8-hour time-weighted average, the action level is set at one-half this value, e.g. 0.05 mg of lead per cubic meter of air. Where environmental measurements establish that workers are exposed to concentrations of lead greater than the action level, medical examinations are to be afforded to such workers. Once exposure has been established, the primary, but not necessarily the only, determinant in identifying a reportable case of occupationally related lead poisoning would involve observations of increased concentrations of lead in blood and/or urine. In the case of blood leads, NIOSH has recommended that values in excess of 0.06 mg of lead per 100 g of whole blood be of concern. (125)

It is recognized that there will be considerable debate as to the use of specific diagnostic criteria for determining reportable cases of occupational disease. However, there seems to be little sense in maintaining the current approach of operating a system essentially without

guidelines. One possible compromise might be to refer to reported cases as occupationally related "health incidents" as opposed to "diseases."

For surveillance purposes, all workers exposed to environmental levels greater than the action level and whose blood level measurements are in excess of 0.06 mg of lead per 100 g of whole blood, could be reported as having an occupationally related case of lead poisoning. One modification to the requirements might involve those situations where the worker's uptake of lead was a result of ingestion rather than inhalation. In such cases the environmental level might be less than the action level, but exposure and uptake develop as a result of poor work practices, such as eating sites being located in contaminated areas. If such employees were to come under medical surveillance and high blood levels were found, and were traced back to poor work practices, the cases should be considered as reportable.

In the case of occupationally related hearing loss, the surveillance system should again be a part of control regulations. The current OSHA standard for noise sets 90 dbA as the permissible level of exposure for an 8-hour day. (126) NIOSH has recommended that audiometric examinations be provided to workers who are exposed to noise levels in excess of 85 dbA over an 8-hour period. (127) Again, the concept of an action level is introduced into the standard. Hearing loss criteria, which should be age-adjusted to account for normal hearing loss, could then be included for determining those individuals whose hearing loss should be considered as occupationally related. Again, it must be emphasized that neither blood leads or audiometric examinations are definitive criteria for establishing "proof" of an occupationally related disease. In both examples cited, the parameters measured can be affected by nonoccupational exposures. However,

where workers are exposed to the hazards at environmental levels high enough to cause concern, and the appropriate tests indicate a response which is related to the hazard, access to this type of information is necessary in maintaining surveillance of the problem. As discussed in Chapter X, to develop very complicated diagnostic criteria or leave the decision entirely up to the physician are unrealistic alternatives. The recognition guidelines described for exposures to lead and noise are proposed as typical requirements for describing occupationally related diseases.

2. Classification

In the existing Bureau of Labor Statistics' (BLS) system for recording cases of occupational illnesses, lead poisoning would be included in the category of systemic poisonings, while noise induced hearing loss would be identified as a disease due to repeated trauma. Such an overall or categorical classification system may be of interest, however, the primary focus should be on specific diseases.

3. Recording and Reporting

For each case of occupationally related lead poisoning or hearing loss the employer would file a case report with the designated state agency. The information to be included at a minimum would be name, location, size, and SIC code of establishment; occupation of affected worker; and, disease diagnosed. Case reports would be filed as diagnoses are made.

4. Collation

The goal of the collation step is to provide information as to the incidence of specific diseases by size and type of industry, as well as overall figures. Therefore, the data must be available for summary

tabulations as well as incidence calculations. In collating data for calculation of incidence rates, it will be necessary to tabulate the total cases of a specific disease observed over a given time period in a single establishment. For example during the year, one employer with 100 employees may file 10 cases of occupationally related lead poisoning. On a yearly basis, this would give an incidence rate of 100 cases per thousand workers. To tabulate this as they come in is straightforward. To calculate an incidence rate at the end of the year would require a separate summary report by the employer or the use of sophisticated data handling system by the agency. In the latter (preferred) case, the employee would be assigned a unique number and case reports by disease would be "added" to his account for future incidence rate calculations. In addition to developing information on a state-wide basis, there is also the need to evaluate conditions on a national and possibly regional basis. Once the data file is closed for analysis, for example 45 days after the end of the year, a copy can be sent to a national center to be combined with information from other states. The goal is to be able to search the data base by type of industry, size group, and specific disease. The information to be generated involves both incidence rates and total number of cases.

5. Analysis and Summary of Data

As noted in Chapter X, the goal in this step is to identify industry groups which appear to be having the greatest problem with a specific occupational disease. Therefore, one would not, at least initially, wish to compare lead poisoning with hearing loss, but would be more interested in looking at the experiences associated with a specific disease.

In comparing different types of industry, especially based on size, the use of incidence rates is most appropriate. Consequently the initial step would be to evaluate the overall incidence rates experienced by different industries for hearing loss. This would give an overall estimate of which type of industries are potentially most in need of corrective action. Within a given industrial category, average incidence rates should be determined by size groups. This step allows for the determination of important findings to guide subsequent reports and recommendations. For example, if we are looking at the construction industry, hearing loss incidence rates should be determined for general building, heavy construction, and special trade contractors. Within each of these groups further subdivisions are possible. For example, using the SIC code, the special trade contractors can be subdivided into a number of categories such as those specializing in carpentry and flooring; concrete work; electric work; masonry, stonework, and plastering; and roofing and sheet metal work. Each of these categories can then be analyzed by size groups as discussed in Chapter X. Here, it may be found that the highest rates for noise induced hearing problems are associated with heavy construction, and in the specialty trades in the area of concrete work. If the incidence rates appear to be very high within any size group in a given industry, this would suggest a target area for special action.

6. Interpretation

The interpretation of the results is a most crucial stage, and as noted earlier great care must be exercised in this step. Using the category of occupationally related lead poisoning as an example, one would want to be most careful about interpreting that low incidence rates implied satisfactory conditions, especially in small establishments. It is at this

stage that those responsible for the interpretation might be able to merge other information into the system. For example, if inspection reports are available by industry, type, and size, it may be possible to analyze the compliance experience of employers for lead exposures. If a higher rate of violation is found in smaller plants, yet their disease experience is less, concern for adequacy of reporting may be appropriate. Also, on a survey basis it might be possible to have inspectors, in the normal course of their duties, report specifically on observed compliance or noncompliance with the medical monitoring and recordkeeping sections of a particular health standard. These data would allow for some degree of interpretation as to the accuracy of the disease estimates.

7. Recommendations and Reports

Basically two different audiences should be addressed in developing recommendations and reports. The first is the individual employer (and his employees) who should have the opportunity to measure his experience against that of his counterparts. In this regard, a report now prepared by the BLS for overall occupational injury and illness rates would be a good starting point to be applied to specific occupational diseases. The publication is essentially a guide for comparing an establishment's experience with that determined for specific industry and employment size groups. For example, the publication on the construction industry (127) outlines the steps the employer should follow in determining his establishment's overall injury and illness incidence rate. The employer can then compare his experience with that determined for the industry type and size group of which he is a part. In addition to the mean incidence rate, the first quartile, median, and third quartile values are also provided. Such information would be most useful to the individual employer

in his efforts to implement control measures.

The second type of report should be directed at those governmental agencies responsible for inspections, training, and other efforts to control workplace hazards. Essentially the recommendations should be designed to aid those responsible for control efforts in allocation of resources and determinations of priorities.

CHAPTER XIV. TABLES

TABLE 1

DISTRIBUTION OF U.S. WORK FORCE BY MAJOR OCCUPATIONAL GROUPS (1972)

<u>Occupation Group</u>	<u>Work Force (000)</u>
White-collar workers	42,092
Professional and technical	12,780
Managers and administrators	8,612
Salesworkers	5,515
Clerical	15,185
Blue-collar workers	27,216
Craft and kindred workers	10,716
Operatives	12,636
Nonfarm laborers	3,864
Service workers	11,493
Farm workers	<u>2,747</u>
TOTAL	83,540

Source: Statistical Abstract of the United States 1975--National Data Book and Guide to Sources, ed 96. US Department of Commerce, Bureau of the Census, 1975, p 359

TABLE 2
 DISTRIBUTION OF U.S. EMPLOYEES*
 BY SIZE OF EMPLOYMENT UNIT

<u>Size of Employment Unit (No. of Employees)</u>	<u>Total No. of Employees</u>	<u>Percentage</u>	<u>Cumulative Percentage</u>
1-3	2,985,453	5.1	5.1
4-7	3,954,231	6.8	11.9
8-19	7,377,848	12.7	24.6
20-49	8,719,647	15.0	39.6
50-99	6,325,646	10.9	50.5
100-249	8,057,863	13.9	64.4
250-499	5,764,232	9.9	74.3
over 500	<u>14,830,984</u>	25.6	99.9
TOTAL	58,015,904		

*Includes 76.2% of the total, paid civilian wage and salary employment. Excluded are agricultural, domestic service, government and railroad employees.

Source: County Business Patterns 1972--Employment and Taxable Payrolls Number and Employment-Size of Reporting Units by Industry Groups, CBP-72-1 US Summary. US Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, 1972, p 29

TABLE 3

DISTRIBUTION OF "ESTABLISHMENTS*" IN THE
UNITED STATES BY SIZE OF EMPLOYMENT UNIT

<u>Size of Employment Unit (No. of Employees)</u>	<u>Number of "Establishments"</u>	<u>Percentage</u>	<u>Cumulative Percentage</u>
1-3	1,698,585	47.9	47.9
4-7	763,516	21.6	69.5
8-19	618,509	17.5	87.0
20-49	286,670	8.1	95.1
50-99	92,213	2.6	97.7
100-249	53,061	1.5	99.2
250-499	16,779	0.5	99.7
over 500	<u>11,513</u>	0.3	100
TOTAL	3,540,846		

*Includes 76.2% of the total, paid civilian wage and salary employment. Excluded are agricultural, domestic service, government and railroad employees. Number of establishments does not include their places of employment. Establishments are classified as "reporting units." In manufacturing, reporting units are conceptually the same as establishments. In nonmanufacturing industries, employers are counted once in each county in which they operate, regardless of the number of establishments operated.

Source: County Business Patterns 1972--Employment and Taxable Payrolls Number and Employment-Size of Reporting Units by Industry Groups, CBP-72-1 US Summary. US Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, 1972, p 14

TABLE 4
 DISTRIBUTION OF U.S. EMPLOYEES
 BY TYPE OF INDUSTRY

<u>Type of Industry</u>	<u>Number of Employees</u>
Agricultural services, forestry, fisheries	204,244
Mining	597,228
Contract Construction	3,398,188
Manufacturing	18,696,367
Transportation and other public utilities	3,895,408
Wholesale trade	4,074,795
Retail trade	11,647,893
Finance, insurance, and real estate	3,924,084
Services	11,102,077
Unclassified establishments	<u>475,620</u>
TOTAL	58,075,904

Source: County Business Patterns 1972--Employment and Taxable Payrolls Number and Employment-Size of Reporting Units by Industry Groups, CBP-72-1 US Summary. US Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, 1972, pp 14-27

TABLE 5

ESTABLISHMENTS WITH FORMAL ARRANGEMENT*
WITH PHYSICIAN IN CONSTRUCTION AND MANUFACTURING

<u>Industry & Size Group</u>	<u>% Reporting Arrangement</u>
<u>Construction</u>	
1-19	35.3
20-49	48.2
50-99	55.9
100-249	66.9
250-499	78.2
500-999	83.6
1000-2499	94.4
2500 and over	<u>100.0</u>
TOTAL, ALL SIZES	39.7
<u>Manufacturing</u>	
1-19	47.2
20-49	64.2
50-99	75.2
100-249	84.2
250-499	90.7
500-999	94.8
1000-2499	97.4
2500 and over	<u>99.1</u>
TOTAL, ALL SIZES	61.0

*Full or part time, on call or at clinic. Data collected in the
US Department of Labor Occupational Injury and Illness Survey, 1972.

Source: Letter from H. Schaffer, US Department of Labor,
December 5, 1975

TABLE 6

OCCUPATIONAL DISEASES BY CONDITION FOR CALIFORNIA, 1973

<u>Disease Group</u>	<u>Number</u>	<u>Percentage</u>
Skin conditions	15,671	40.6
Eye conditions	11,281	29.2
Chemical burns	3,898	10.1
Respiratory conditions due to toxic materials	1,759	4.6
Digestive and other symptoms due to toxic materials	1,703	4.4
Ear conditions other than loss of hearing	938	2.4
Systemic effects of toxic materials	711	1.8
Heart and other circulatory conditions	547	1.4
Infective and parasitic diseases	432	1.2
Effects of environmental conditions	408	1.1
Respiratory conditions, mainly infectious	317	0.8
Loss of hearing	170	0.4
Pneumoconioses	13	-
Other and unspecified	<u>747</u>	<u>1.9</u>
TOTAL	38,595	100.0

Source: Doctor's First Report on Work Injury. San Francisco, State of California Division of Labor Statistics and Research, Department of Industrial Relations, 1973, p 5

TABLE 7

NUMBER AND DISTRIBUTION OF RECORDABLE OCCUPATIONAL
ILLNESSES BY CATEGORY OF ILLNESS IN THE UNITED STATES, 1974

<u>Category of Illness</u>	<u>No. (thousands)</u>	<u>Percentage</u>
Occupational skin diseases and disorders	89.4	44.6
Dust diseases of the lung	1.7	0.8
Respiratory conditions due to toxic agents	12.7	6.3
Poisoning	7.4	3.7
Disorders due to physical agents	27.1	13.5
Disorders due to repeated trauma	24.6	12.3
All other	<u>37.4</u>	<u>18.7</u>
TOTAL	200.4	100.0

Source: Chartbook on Occupational Injuries and Illnesses, 1974,
Report 460, US Department of Labor, Bureau of Labor Statistics,
1976, p 26

TABLE 8
 REPORTED OCCUPATIONAL DISEASES
 IN GREAT BRITAIN, 1972

<u>Place of Work</u>	<u>No. of Workers</u>	<u>Reportable Diseases</u>
Factories	14,000,000	274
Agriculture	700,000	25
Shipping	90,000	134
Coal mines	297,000	3,256
Quarries	?	?
Shops and Offices	<u>8,000,000</u>	-
TOTAL	23,087,000+	-

Source: Trevethicle RA: Occupational Health and safety in
 Great Britain 1972, Br J Ind Med 31:325-28, 1974

TABLE 9

REPORTED AND COMPENSATED CASES OF OCCUPATIONAL DISEASE
IN REPUBLIC OF GERMANY, 1971

A. Reported Cases

<u>Condition</u>	<u>Number</u>	<u>Percentage of Total</u>
Severe skin disease	6,853	25.2
Silicosis	4,964	18.2
Hearing loss due to noise	3,163	11.6
Infectious disease	2,908	10.7
Meniscus damage after underground work	1,675	6.1
Disease of the tendon sheaths, et al	1,525	5.6
Disease due to vibrations with compressed air tools	853	3.1
Bronchial asthma	632	2.3
Other scheduled	4,613	17.2
Nonscheduled	<u>14</u>	-
TOTAL	27,200	

B. Compensated Cases

<u>Condition</u>	<u>Number</u>	<u>Percentage of Total</u>
Silicosis	1,314	24.5
Infectious disease	996	18.5
Meniscus injuries following underground work	829	15.4
Hearing loss due to noise	715	13.3
Severe skin diseases	500	9.3
Silicotuberculosis	282	5.2
Diseases due to vibration with compressed air tools	279	5.2
Bronchial asthma	128	2.4
Other	<u>331</u>	6.2
TOTAL	5,374	

Source: Gartner H: [Health protection at work - considerations based on statistics of accident insurance with special reference to occupational diseases.] Dtsch Med Wochenschr 98:1923-29, 1973 (Ger)

TABLE 10
 COMPENSATED CASES OF OCCUPATIONAL DISEASE
 IN JAPAN, 1973

<u>Condition</u>	<u>Number</u>	<u>Percentage of Total</u>
Diseases caused by injury	8,288	34.5
Conjunctivitis and other eye diseases	2,137	8.9
Skin eruption over 2nd grade caused by work in hot or cold places or in handling hot or cold bodies	7,267	30.3
Sun stroke, heat stroke, heat exhaustion and heat stroke	128	0.5
Disease of muscles, tendons and joints, and prolapse of the internal organs caused by heavy and violent work	547	2.3
Pneumoconiosis	864	3.6
Intoxication and its complications caused by manganese and its compounds	145	0.6
Other scheduled diseases	1,950	8.1
Other diseases apparently caused by work	<u>2,679</u>	<u>11.2</u>
TOTAL	24,005	

Source: Letter from H. Sakabe, M.D., Japanese Ministry of Labour,
 June 17, 1976

TABLE 11
 REPORTED OCCUPATIONAL DISEASES
 FROM ELEVEN COUNTRIES

<u>Country</u>	<u>Year</u>	<u>Reported Occupational Diseases (1)</u>	<u>Estimated Working Population (2) (Thousands)</u>	<u>Estimated Incidence (3) (Cases/1000 Workers)</u>
Federal Republic of Germany	1974	32,762	26,000	1.3
Finland	1974	3,350	2,164	1.5
German Demo. Republic	1973	11,300	7,232	1.6
Iran	1974	5,548	-	-
Japan	1972	30,869	52,330	0.6
Poland	1974	6,728	-	-
Republic of Korea	1974	2,862	10,026	0.3
Sweden	1972	2,143	3,879	0.6
Switzerland	1972	3,319	-	-
Yugoslavia	1974	5,570	4,213	1.3
United States (OSHA)	1974	200,000 (4)	61,000	3.3
California (OSHA)	1973	24,453 (5)	6,000	4.1
California (First Reports)	1973	38,595 (6)	7,600	5.1

Sources:

- (1) Occupational Health Programme. Report by the Director - General, World Health Organization, Twenty-Ninth World Health Assembly, April 9, 1976, 38 pp
- (2) 1974 Yearbook of Labour Statistics, 34th Issue Geneva, International Labour Organization, 1973, 803 pp
- (3) Note: calculations based on the figures shown and do not take into consideration legal limitations of coverage of disease conditions or other differences in statutes
- (4) Chartbook on Occupational Injuries and Illnesses, 1974, Report 460, US Department of Labor, Bureau of Labor Statistics, 1975, p 26
- (5) Occupational Injuries and Illnesses Survey California, 1973, San Francisco, State of California - Agriculture and Services Agency, Department of Industrial Relations, Division of Labor Statistics and Research, 1973, 59 pp
- (6) Doctor's First Report of Work Injury. San Francisco, State of California Division of Labor Statistics and Research, Department of Industrial Relations, 1973, 14 pp

