Feasibility of an Occupational Disease Reporting System

Minnesota Department of Health

May 2015
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May 2015

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Acknowledgments
We would like to express our gratitude to the following people for their willingness to provide their time, expertise, and experiences with us.

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This work was supported by a grant from the National Institute for Occupational Safety and Health (5U60OH009855). All opinions are those of the authors and do not necessarily reflect the views of NIOSH.
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Executive Summary

A Minnesota statute originally enacted in 1939 required physicians to report within five days to the Minnesota Department of Health (MDH) any person believed to be experiencing any of ten specific occupational illnesses or poisonings or “any other diseases contracted as a result of the nature of their employment……” While two of the ten specified diseases (anthrax and lead poisoning) and one work-related cancer (mesothelioma) are being reported to MDH under entirely different state statutes, occupational disease reporting by physicians has not been systematically implemented or enforced. Given the fundamental importance of disease surveillance to occupational health and public health in general as well as the many challenges to physician-based disease reporting, an investigation was undertaken to examine the feasibility of an occupational disease reporting system.

Two concurrent activities were undertaken as part of this investigation. A literature review was conducted to examine the history, development, and usefulness of occupational disease surveillance. In addition, a survey was conducted of states that currently support an occupational disease reporting system to identify methods, diseases/exposures included, resources, completeness, usefulness, and other factors. The literature review and survey provided important information regarding the implementation, maintenance, and limitations of a reporting system. While all states can track mesothelioma—a fatal cancer primarily caused by occupational exposure to asbestos—and 41 states have had federally-funded adult blood lead surveillance programs as of 2013, reporting systems for other occupational exposures and diseases vary widely in focus, compliance, resources, and methods.

Key difficulties in identifying and reporting work-related diseases in individual patients include multiple risk factors for many diseases (e.g., asthma) and the long latency period for many chronic diseases (e.g., most cancers). Consequently, many reporting systems focus on a limited set of diseases that are most frequently associated with workplace exposures. Among the most common reportable conditions in other states were excess exposures to heavy metals, occupational respiratory diseases, pesticide poisonings, and carbon monoxide poisonings.

While reporting for all occupational diseases by physicians appears neither feasible nor cost effective at this time, increasing use of electronic health records and the potential inclusion of occupational information may offer new opportunities for disease surveillance. Presently, however, enhanced surveillance for selected conditions based on existing reporting systems represents a practical and useful approach for Minnesota. Two activities are recommended: (1) restore lost federal funding to the MDH adult blood lead surveillance program so that the 800 adults with elevated blood lead levels reported each year can be followed-up to identify workplace exposures; (2) seek new funding to implement an expanded mesothelioma surveillance/epidemiology program to ascertain detailed work and military histories of mesothelioma patients or members of their household to identify possible exposures to asbestos.
Background

In 1939 a Minnesota law was enacted requiring physicians to report to the Minnesota Department of Health (MDH) within five days any of ten specified occupational diseases as well as any other disease “contracted as a result of the nature of their employment…..” Minnesota Statute 144.34 (see Appendix A) was active for a short time in the 1950’s, recording some 61 cases of occupational disease (Trasko, 1953; Heimann and Trasko, 1964). However, since that time, physician reporting of occupational diseases to MDH has been implemented only for very specific conditions as required under other Minnesota statutes and rules. Two of the conditions specifically named in the original statute—anthrax and lead poisoning—are reported to MDH under the Communicable Disease Rules and the Blood Lead Surveillance System statute, respectively. Mesothelioma—a rare cancer almost exclusively associated with workplace asbestos exposure—is reported (along with other cancers) to the state cancer registry under cancer surveillance statutes. (While occupational injuries and illnesses are generally reportable by employers to the Minnesota Department of Labor and Industry under Worker’s Compensation and OSHA rules, occupational diseases are rarely reported and these reporting systems will not be discussed in this report.) An opportunity to evaluate the feasibility of reporting all or selected work-related diseases occurred when MDH received a grant in 2010 from the National Institute for Occupational Safety and Health (NIOSH) to enhance state-based surveillance of occupational health and safety in Minnesota. In addition to collecting and disseminating 20 Occupational Health Indicators, this surveillance activity included the evaluation of the resources, methods, and potential outcomes of an occupational disease reporting system.

Two approaches were utilized to provide background and perspective regarding implementation of an occupational disease reporting system: a literature review and a survey of states with functioning occupational disease reporting systems. The literature review included a summary of the human and economic toll of occupational injuries and diseases as well as the history of the development and implementation of occupational disease reporting at state and national levels. The literature review was conducted using PubMed to identify peer reviewed works detailing execution of occupational disease surveillance, exposure and disease relationships, hazard identification, and methodology related to occupational disease surveillance. Examples of methodology, protocols, and best practices were identified.

The Council of State and Territorial Epidemiologists (CSTE) state survey of reportable diseases and review of state health department websites was used to compile a list of states with occupational disease reporting systems. These identified states were then asked to participate in a survey regarding the implementation and maintenance of an occupational health surveillance system. The state surveys provided information regarding reportable conditions, day-to-day activities, funding, and other practical issues that are often not discussed in the literature. A
number of issues and concerns were identified as central to the design and creation of an occupational disease surveillance system, including: legal and ethical ramifications of reporting disease/injury/exposure related to work, justification for occupational disease surveillance, methodology and resources, cost and effectiveness, legislative authority, data usage and application, disease or injury of interest, and system evaluation.

**Burden of Occupational Disease and Injury**

The Bureau of Labor Statistics (BLS) estimated that in 2012 nearly 3 million workers were injured or developed a work-related illness and 4,383 workers died as a result of those injuries or illnesses (BLS, 2014). Steenland et al. (2003) estimated that occupational fatality ranked as the 8th leading cause of death in the United States for the year 1997. The impact of occupational disease and injury is widespread, affecting the individual, the family, the workplace, and society. The significant impact that occupational disease has on society is recognized in the inclusion of occupationally-related disease reduction as one of the Healthy People 2010 goals and continuation as a goal in Healthy People 2020 (CDC, 2010). To attain the Healthy People 2020 goals and quantify a reduction, a baseline measure of the incidence of occupational injury and illness is required.

Occupational disease or injury can significantly affect an individual’s socioeconomic standing, mental health, physical health, and family life. Moscato et al. (1999) investigated an individual’s socioeconomic standing after development of work-related asthma (WRA) and found that individuals who have been diagnosed with WRA experienced up to an 8% decrease in income and socioeconomic standing. Ameille et al. (1997) found that three years after diagnosis of WRA, almost 46% of individuals had experienced a loss in income and 44% had left the job that had either caused or exacerbated their asthma. The impact of occupational disease is not confined to the individual; there are substantial productivity and financial losses due to these illnesses and injuries.

The costs of occupational injury and illness are difficult to ascertain and relatively few estimates have been made. Leigh and colleagues (Leigh et al., 2001) estimated that agricultural injuries in 1992 cost $4.57 billion, with $1.66 billion comprising direct costs and $2.93 billion as indirect costs. Leigh et al. (2003) also estimated the medical costs associated with fourteen occupational illnesses in the United States for the year 1999 at $14.5 billion. More recently, Leigh found fatal occupational injuries for the year 2007 cost the nation $6 billion, whereas non-fatal occupational injuries cost $186 billion (Leigh, 2011). The financial impact is enormous and further magnified by the loss of trained and reliable production provided by these now injured or deceased employees. Schulte (2005) estimated that in 2002 costs for occupational mortality and morbidity for U.S. employers was between $128 and $155 billion. This estimate includes the 55,000 work-related deaths from all causes estimated to have occurred that year. These cost
estimates highlight the significant societal impact and burden on U.S. employers and health care system.

Zaloshnja et al. (2006) estimated that the reductions in injuries accomplished by occupational health and safety programs between 1993 and 2002 saved employers $31 billion. While improvements and evaluations demonstrate the successes of occupational health and safety programs, these cost analyses also affirm that there are many occupational hazards and exposures still to be addressed. In a comparison of costs related to occupational injury and illness among states, Waehrer et al. (2004) found that nonfatal cases with one day of work loss cost Minnesota $945 million, and $320 million for all fatal injuries in the year 2003. Even with these large costs, Minnesota had one of the lowest cost rankings, tying with Delaware for the 47th and 48th ranking, out of all 50 states. While this is laudable, there is still cause for concern and the need to further reduce occupational injury and illness in the state and nation (Wegman and Froines, 1985).

**Occupational Health Surveillance**

There has been long standing recognition of the need for accurate and detailed information regarding occupational injury and illness (Trasko, 1953; Heimann and Trasko, 1964). A more complete picture of the burden of occupational injury and illness in a state will aid in the identification of emerging problems, the development of priorities and standards, and the evaluation of the effectiveness of prevention programs. Recognition of the hazards, illnesses and injuries associated with occupation has led to a number of changes in policy and occupational standards to prevent these deleterious outcomes. A few of these policy and standard changes include safe patient handling laws, needle stick and sharps-related handling training and equipment controls, blood borne pathogen training requirements, blood-lead monitoring among adults, and revisions of the asbestos exposure standard. Each of these changes in policy and practice has led to decreases in employee injury and illness. To continue these improvements in occupational health and safety, reliable and timely data detailing exposure, injury and illness outcomes among working populations is necessary to further identify and prevent hazardous exposures. While considerable progress has been made in reducing work-related injuries and diseases, there remains a continuing need for reliable information detailing the impact of occupation on illness and injury as new manufacturing methods, chemical exposures, and ergonomic exposures have been introduced to the working environment.

**Surveillance Data Sources and Methodology**

Researchers have investigated the utility, effectiveness, efficiency, and practicality of occupational disease surveillance contrasting surveillance types and methodologies. Two methodologically different types of surveillance regularly referred to in the occupational
surveillance literature are active and passive. An active method requires the surveillance system to pursue disease case collection, to verify that all cases have been reported and check the accuracy and completeness of the data. A passive method relies on the reporter to recognize the responsibility to report and does not actively seek out cases for collection or review. While a passive system is far less resource intensive, it is likely to be less complete.

Spreeuwers et al. (2008) investigated the use of an active vs. passive system and found the active system provided higher quality and more timely information. Baker and colleagues have described the differences between the use of active and passive systems, the inclusion of physician reporting, sentinel reporters, or secondary data sets to conduct surveillance (Baker, 1988; Baker et al., 1988; Baker, 1989; Baker et al., 1989). More recently, Maizlish described in detail how to conduct occupational health and safety surveillance in a variety of methods and for a variety of institutions (Maizlish, 2000). Maizlish provides information for the development of occupational disease and injury surveillance at both the statewide and company level, providing recommendations pertinent to all safety and health professionals. These authors provide a framework for identifying goals of an occupational surveillance system: identification of emerging issues, priority setting, provision of data for intervention design, policy development and justification, exploration of disparities, and provision of the necessary data to explore occupational exposures and disease (Attfield et al., 2009).

A number of countries have national occupational disease and injury reporting systems. While they operate under different legal jurisdiction and funding support, the experiences and developed methodologies are worthy of evaluation and consideration. The United Kingdom, France, and Canada have implemented national physician reporting systems using a variety of methods including: sentinel reporting, targeted physician reporting, and universal reporting for the capture of occupational disease and injury (Cherry et al., 2000; Meyer et al., 2001; Meijer et al., 2004; Bakerly et al., 2008; Bonneterre et al., 2008; Gan et al., 2009). Nordman et al. (1999) compared the reporting systems of different countries for occupational asthma and found that the Finnish compulsory reporting system was the most complete and robust, and concluded that adequate funding and authority is a necessary component for complete case capture.

In the late 1980’s and early 1990’s, a significant effort was put forward to create and pilot test the Sentinel Event Notification System for Occupational Risks (SENSOR) surveillance model. SENSOR was developed through a collaboration of epidemiologists and researchers in state agencies and the National Institute for Occupational Safety and Health (NIOSH). It makes use of an active surveillance model and requires reporting of specific occupational diseases or injuries to state officials. While it is a very effective model, providing accurate and timely information, it is resource intensive. SENSOR requires immediate or timely reporting of a case to the designated authority, most often a health department or department of labor. The case is then interviewed and medical record reviewed to determine the likelihood of work-relatedness. The necessary staff and professional expertise to conduct this work is critical to the accuracy and completeness of the data collected. To date the majority of states conducting SENSOR activities
are funded through NIOSH. As of 2012, only 6 states were conducting SENSOR programs for WRA and 11 states were conducting SENSOR programs for pesticide poisoning (though only five of the pesticide states receive NIOSH funds and three states receive support from the Environmental Protection Agency (EPA). The details of these reporting systems described in the literature provide valuable insights into the usefulness as well as the pitfalls and challenges that will have to be accounted for when developing a reporting system. The SENSOR model provided Michigan and New Jersey with the ability to identify isocyanates as an asthma inducing agent through timely reporting of work-related asthma (WRA) cases (Reilly et al., 1994). With the identification of isocyanates as an exposure hazard, other states and NIOSH were able to develop prevention programs targeting isocyanate exposure in the workplace.

SENSOR inspired states with neither state nor external funding mechanisms to create methods to conduct occupational disease surveillance in a less resource intensive manner. Those efforts included the development of a set of occupational health and safety indicators (OHIs) that could be calculated with the use of secondary data sets (CSTE, 2005, 2009). These indicators use the following data sources: the Survey of Occupational Injuries and Illnesses (SOII), lead testing data from the Adult Blood Lead Epidemiology and Surveillance program, the Census of Fatal Occupational Injuries (CFOI), workers’ compensation data, hospital discharge data, and death certificate data. By utilizing existing data sets, state-based surveillance of occupational health and safety can be implemented with limited resources. While these OHIs provide estimates of the burden of occupational injuries and illnesses in a state, the use of secondary and sometimes incomplete data sources limits the conclusions that can be drawn for specific indicators (Kleinman and Cant, 1978; Stanbury et al., 2008). In addition, the inability to identify individuals from most of these data sources and the often lengthy delay in receiving the data prevent follow-up investigation of individual cases. Consequently, identification of hazards or exposures and timely intervention strategies are much more difficult if not impossible.

The annual SOII, based on a sample of employers in each state, provides the most widely-used estimates of non-fatal workplace injuries and illnesses in the US as well as in individual states. BLS estimates that in 2012 almost 3 million workers were injured or became ill due to work exposures in the United States. Unfortunately, in contrast to reporting of fatal occupational injuries by CFOI, SOII data is generally considered incomplete. It was estimated that almost 80% of work illness and injury are missed by this national system (Wolfe and Fairchild, 2010). Rosenman et al. (2006) found that the national system had missed approximately 70% of all work related injuries in Michigan. And recent work by Leigh et al. (2014) suggested that over 75% of farm-related injuries are missed by SOII.

Workers’ compensation data is another data source often utilized for estimation of the burden of occupational injury and illness within a state. The use of workers’ compensation data as a method of surveillance is limited and often an underestimation of work-related injury and illness. This underestimation is due to restrictions and exemptions of employee populations from participating in workers’ compensation as well as underreporting by employees, employers, and
physicians. While workers’ compensation data may be incomplete for the needs of surveillance and requires caution when making interpretations, it can provide useful information on the burden of occupational injury and illness. Anderson et al. (2010) used workers’ compensation data to investigate injury and illness hazards for different industry groups. They found that workers in the retail and trade sector experienced the greatest number of injuries from assault and violent acts, whereas wholesale trade employee injuries occurred in transportation incidents. The information provided was useful in identifying common occupational hazards to direct policy and workplace practices.

**Diseases and Exposures of Interest**

While SOII and workers’ comp have proven useful in monitoring rates and trends of non-fatal occupational injuries and identifying high risk occupations and industries, these sources provide a very incomplete picture with respect to occupational diseases. While occupational injuries, due to their acute nature, can usually be attributed to a workplace activity or environment, occupational diseases are often more difficult to attribute to an occupational exposure. Occupational diseases, such as asbestosis or mesothelioma, may occur many years or decades following exposures, often after the worker is in a different occupation or has retired. In addition, some occupational diseases such as asthma or lung cancer have multiple causes and it may be difficult for an employee, employer, or health care provider to attribute the disease to a workplace exposure. Consequently, the selection of diseases suggested for inclusion in occupational health surveillance is based heavily on those diseases with a strong relationship to occupational exposures. Another factor that pertains to inclusion is the ability to develop a standardized case definition that will facilitate consistency within a surveillance system and comparability between systems.

Lists of occupational diseases appropriate for surveillance activities have been assembled over the years to assist in the development of occupational disease surveillance programs. A list created by Rutstein et al. (1983) for SENSOR is often cited when identifying diseases of interest for an occupational disease surveillance system. Rutstein’s list is comprised of 50 diseases and injuries believed to be predominantly caused by occupational exposures, including: pulmonary tuberculosis, plague, hepatitis A, mesothelioma, aplastic anemia, cataract, noise effects on inner ear, asbestosis, silicosis, male infertility, and contact and allergic dermatitis. Several years later Baker et al. (1988) produced a list comprised of ten categories of injury and illness including: occupational lung disease, musculoskeletal injuries, disorders of reproduction, neurotoxic disorders, noise-induced hearing loss, dermatological conditions, and psychological disorders. While the Baker list is markedly shorter, it is comprised of categories rather than specific diseases, leaving greater room for variation as to which specific diseases would be included in a category. A broader category may include more cases, but it may also make it more difficult to identify specific exposures and patterns among cases. It may also make it more difficult to create a very specific and refined definition.
Evaluation and Cost-Effectiveness of Occupational Health Surveillance

“The evaluation of surveillance systems should promote the best use of public health resources by ensuring that only important problems are under surveillance and that surveillance systems operate efficiently. Insofar as possible, the evaluation of surveillance systems should include recommendations for improving quality and efficiency, e.g., eliminating unnecessary duplication. Most importantly, an evaluation should assess whether a system is serving a useful public health function and is meeting the system’s objectives” (Klaucke et al., 1988).

Evaluation of occupational disease reporting surveillance systems provides useful information for design and implementation as well as cost-effectiveness. Assessments of occupational disease reporting systems can provide useful data for the design and administration of a system in a cost-effective manner. As stated by Murphy et al. (2002), “Health surveillance programmes should focus on disease prevention without becoming a repetitious application of un-validated tools.”

Analysis of cost-effectiveness can be difficult to perform for specific occupational diseases, especially those with long latencies, as it may take years or decades before the effect of exposure is evident. A small number of researchers have attempted to conduct analyses to assess the cost-effectiveness of occupational disease reporting by comparing systems that do and do not utilize physician reporting to conduct occupational health and safety surveillance.

Wild et al. (2005) used a conventional cost-effectiveness model to demonstrate that disease surveillance within at risk workplaces was beneficial for the prevention of isocyanate induced asthma for both the employer and society. Wild et al estimated that for every 100,000 isocyanate exposed workers, the presence of an occupational surveillance system results in 683 fewer cases of work-related asthma over a ten-year period. In 1987 Fontus and Levy reported their feasibility study of using physician reports and hospital records for an occupational health surveillance system. They found that physician reporting was the more advantageous of the two data collection methods, in large part because, “Data are more timely and easier to access” (Fontus and Levy, 1987). Geidenberger et al. (1998) conducted an analysis comparing different data sources for surveillance, and concluded that physician reporting was the more cost effective method to identify problem worksites with silica exposures for investigation and regulatory action. Rosenman (1999) concluded that hospital discharge records were the more cost effective resource for worksite identification, in comparison to physician reporting. Regardless of the differing conclusions between Geidenberger and Rosenman, both research teams agreed that methodology that makes use of multiple data sources would be the more advantageous approach for a comprehensive understanding of the burden of silicosis.

In a separate investigation comparing hospital discharge data to physician reporting for surveillance of occupational lung disease, Rosenman et al. (1990) found that three to four times
more patients were seen in the outpatient setting than were hospitalized. As Geidenberger et al state “…physician cases are more likely to be sentinel cases in that they are more likely to lead to work sites in need of intervention” (Geidenberger et al., 1998). This could have significant implications for a surveillance system in regards to development of appropriate and timely prevention and intervention methods for specific diseases.

**Occupational Disease Surveillance Challenges**

Regardless of the type of data source, primary or secondary, for surveillance, there will be constraints and limitations on the use and value of the data. When using secondary data sources to conduct occupational disease surveillance, there are a unique set of issues or challenges that need to be addressed. Physician reporting of occupational disease presents a unique set of challenges when used to conduct surveillance. The challenges associated with physician based disease reporting systems have been well identified in the literature. Most challenges are associated with the completeness and accuracy of reporting, and are the two concerns most frequently cited in the literature (Arnaud et al., 2010; Lenderink et al., 2010; Souza et al., 2010). Coupled with secondary data sets, physician reporting could provide a more complete picture of occupational disease and injury.

Underreporting is a commonly cited concern when using workers’ compensation data or physician reporting of occupational disease or injury. Azaroff et al. (2002) describe a number of “filters” that may explain the underreporting of occupational injury and illness that occur in systems that utilize physician report of disease:

- employee fear of disciplinary action for reporting
- the partial wage replacement on workers’ compensation may be inadequate
- long latencies or unusual etiologies may prevent workers and health care providers from recognizing work relatedness
- health care providers unfamiliar with work related conditions, or the impact workers’ compensation claims have on insurance premiums may lead some employers to recommend against reporting
- company occupational health and safety personnel’s unfamiliarity with reporting and recording requirements

Unfortunately data to quantify to what degree these filters bias (undercount) occupational disease reporting is unavailable.

As Gelberg et al. (2011) point out, “Although underreporting is a cross-cutting issue in public health surveillance, it is of particular relevance to the surveillance of occupational health conditions. Surveillance for occupational conditions has not experienced the advances that have occurred in surveillance for communicable disease and other conditions.” To address these concerns a number of methods have been developed to increase or ensure reporting of disease.
Fontus, Levy (1987) made use of sentinel clinics and physicians. They chose clinics and physicians that served patient populations representative of the working population and created estimates of disease based upon disease reports. By selecting a subset of physicians they were able to concentrate and direct data collection resources into a manageable workload and help to assure that they were collecting a representative sample of occupational disease.

These challenges and issues are not new to occupational health surveillance as Victoria Trasko in 1953 states,

> “Among these difficulties of recognition and diagnosis, limited knowledge of occupational disease, or industry itself, and of materials handled and manufacturing process involved contribute to the lack of reporting. Moreover, it is probable that many physicians are of the opinion that reporting occupational diseases violates the confidence of the physician-patient-employer relationship. Other factors are the lack of standardization, non-enforcement, and other shortcomings of the laws themselves.” (Trasko, 1953).

**Survey of State Occupational Disease Reporting Systems**

**Introduction**

In 1953 Trasko completed an extensive review of state legislation to identify states with statutes requiring report of occupational disease by physicians. She identified a total of 27 states with legislation or regulations that required reporting (Trasko, 1953). In 1989 Freund et al. (1990) repeated Trasko’s review and added 5 more states to the list of those that had regulations or legislation requiring reporting of occupational disease. Unfortunately, of the 27 states identified by Trasko, only half were actively collecting reports of occupational disease. Interestingly at that time, Minnesota was identified as a state collecting case reports; that reporting has not remained active in the following decades.

In 2011 a telephone survey was conducted to gather information from key informants from other states regarding surveillance of occupational diseases. States were surveyed regarding how they had interpreted and implemented their various occupational disease reporting laws. Minnesota Statute 144.34 requires report of occupational disease directly to the MDH, not through workers’ compensation or first report of injury or illness; states with similar requirements were of particular interest for the survey. The survey included items such as the date the system was implemented, the number of laws governing the system, any changes or alterations to the legislation and its effects, the disease or injuries of interest for data collection by the system, how the system collects data, how the data collected was used by the agency and their partners, whether the system been evaluated, and any advice for a state implementing a system.
A list of potential key informants (interviewees) was compiled from several sources: published literature, the Council of State and Territorial Epidemiologists (CSTE) annual survey of state epidemiologists regarding reportable conditions, and state health department websites that made mention of a reporting system. In total, 18 states were identified as possible candidates for interview. Of the 18 identified, 3 reported that the system was no longer active (though one provided information about past activities), 12 responded and completed the survey, and 3 did not respond to repeated requests for an interview.

Two central themes were repeated throughout the surveys by respondents. First, each state has attempted and developed unique methods to leverage available resources to create the most complete reporting system. Second, state responses were very consistent regarding the difficulties in maintaining or increasing disease reporting by physicians. The challenges of physician reporting were also acknowledged in the literature. A challenge and hurdle that almost all disease reporting systems face is the implementation and maintenance of complete and accurate reporting by physicians.

**What is Reportable/Reported**

While the majority of surveyed states had the authority to collect case reports of any suspected occupationally-related disease, not all states make use of this provision. Among the many factors that may play a role in the decision to include or exclude specific diseases from surveillance, usefulness and cost of the data are significant considerations. If the data are not sufficiently reliable for use in evaluating trends or monitoring prevention programs, or if case collection would be very resource intensive with little gain, resources may be better utilized for other diseases. Many states reiterated the need to collect data and information that will be used; collections of unnecessary information or cases will not aide in gaining support for continued reporting of occupational diseases.

Disease selection for surveillance should be predicated upon the notion that some form of intervention or action can be taken to prevent further disease occurrence. In addition, when states have expanded their list of reportable conditions, they have selected conditions that have a high likelihood of work-relatedness and are state-specific concerns. Silicosis, asbestosis, and coal workers’ pneumoconiosis are all crippling, but preventable, lung diseases caused by known occupational exposures. With appropriate intervention at the workplace, future cases of these lung diseases might be reduced and these diseases were and are a high priority for a number of states. Michigan had concerns regarding occupational respiratory disease and has developed a reporting system to ensure the capture of cases of work-related asthma and silicosis, as well as other occupational respiratory conditions. Connecticut, California, and New Mexico have all developed systems that are intended to capture occupationally-related disease that cannot be quantified through laboratory testing such as asbestosis, silicosis, carpal tunnel syndrome, work-
related asthma, noise induced hearing loss, contact dermatitis, byssinosis and hypersensitivity pneumonitis. These systems are reliant upon health care professionals (physicians, nurses) and entities to recognize and report cases of suspected and known occupational illness. Which returns again to the common theme among interviewed states: reporting compliance is the most challenging aspect of using physician reporting of occupational disease for surveillance purposes. Difficulty in acquiring reports of disease from physicians is compounded by the fact that the work-relatedness of disease often goes unrecognized for a multitude of reasons, including: lack of recognition of work-relatedness by the health care professional, the patient fails to mention work-relatedness, or the patient requests the report of work-relatedness not be made.

Of the states interviewed, all collected reports of adult blood lead levels. Most have either partnered with or implemented a system to be as consistent as possible with the NIOSH-funded state Adult Blood Lead Epidemiology and Surveillance (ABLES) programs. Until it was defunded in August 2013, the ABLES program had provided the states with a functioning surveillance system model for the reporting of elevated blood lead levels by clinical laboratories. Some states have leveraged this reporting by requiring the report of all heavy metals, and in some cases carboxy-hemoglobin and pesticide metabolite measures, through the same system. By using an existing system they avoid a percentage of the start-up costs and have a baseline measure of the completeness of the reporting. For states with a pre-existing ABLES program, the introduction of heavy metals and other metabolites was easier for reporting laboratories to adopt since they were familiar with the process of case reporting to the state. Heavy metals, carboxy-hemoglobin, and pesticide metabolite levels in blood or urine were selected as reportable conditions since case definitions have been developed and the labs can easily identify reportable cases. While follow-up may still be required to ascertain occupation and industry associated with an exposure, identifying a reportable case is not as challenging for laboratory-based tests in comparison to most physician diagnosed conditions.

**Reporting Requirements**

A series of questions were asked of each state regarding reporting requirements:

- what is the time frame in which reporting is required by law,
- is that time frame enforced,
- how frequently does reporting occur,
- what format does reporting occur in,
- who was required to report,
- what were the differences between laboratory and physician reporting, and
- what other sources of data were utilized for surveillance.

The majority of interviewed states had a specific reporting time period requirement listed in the legislation. However, very few states reported strictly enforcing the reporting time requirement. Most states indicated that physician reporting was difficult to maintain and if a physician
reported a case, it was more useful to thank the provider for supplying the report rather than to criticize the provider for untimely reporting. There was a great deal of variation in the frequency in which reporting occurred both between and within states. The greatest difference in reporting occurs between physicians and laboratories. Some laboratories provided reports on a continual basis with weekly or daily reports, whereas physician and clinic reporting can be more variable and timeliness was often dependent upon how the information was transmitted and by whom. Some of the programs had worked out agreements with hospitals or individual clinics to report on a monthly or quarterly basis, while other programs received sporadic reports of occupational disease.

The method of reporting—paper form, electronic form, query of medical records, or the use of reporting by phone—all varied by state. States with occupational disease reporting systems that had been operational prior to 2000 tended to make use of paper forms; these reports are then delivered via fax or mail. A number of the newer state systems, such as in Iowa and Ohio, have retained or made use of the paper form option but are trying to create systems that are predominantly electronic. Iowa constructed their system so that it is integrated with their state’s communicable disease reporting system. As the system was designed to receive the information necessary for a communicable disease investigation, it is necessary to complete follow-up with the clinic or patient to determine occupation and exposure in some cases. To integrate into the system, Iowa chose heavy metals and carboxy-hemoglobin as the laboratories were familiar with reporting these cases electronically through the centralized system. Ohio has similarly selected heavy metals to be reported as the clinic labs are familiar with electronic reporting and the reports could be integrated into the established process.

Michigan supports multiple ways to report: paper forms can be faxed or mailed in, phone reports, forms that can be downloaded from the web or forms that can be submitted electronically from the web. By providing a variety of convenient reporting methods, the assumption is that health care providers will be more willing and timely in reporting.

Many states had expanded the requirement of physician reporting to include laboratories and other health care systems/providers such as clinics, hospitals, nursing homes, and other provider groups. It appears that despite the increase in the number of required reporting entities, it is still very challenging to get these groups to report. Laboratories are the most consistent and reliable reporting entities. A few states have also accessed medical and health records to bolster the information and confirm the reports of occupational disease, though this was not an activity that all states were able to pursue as it can be quite resource intensive.

**Reporting Enforcement and Encouragement**

For many states, the majority of time spent on informing, encouraging, and enforcing reporting compliance was directed at physicians and other health care providers. Many states reported that laboratories are often made aware of their responsibility to report when completing their accreditation or certification. To maintain certification, clinical laboratories must remain
compliant with reporting. If a laboratory was found to be in non-compliance, a letter or phone call was placed informing the lab of their responsibility. This limited interaction usually rectified the problem in regards to reporting compliance.

Encouraging and enforcing disease reporting by physicians and other health care providers is a much more challenging task. A significant part of that challenge relates to numbers of laboratories versus physicians: there are far more physicians than laboratories. Consequently, a greater effort is expended to keep physicians informed and compliant with the reporting requirement than is expended for laboratories to do the same. States have tried mailings, phone calls, newsletters, articles, thank you cards, in person visits, and surveys in varied attempts to inform providers of their responsibility and to maintain reporting. Many states have found that despite all these efforts, there was very little impact on the initiation and maintenance of reporting. Even states with the ability to provide financial incentives to occupational health clinics to support reporting found it necessary to continually remind providers of the reporting requirement. It is very clear from the conversations with states that initiating and maintaining reporting of occupational diseases with the physician population is the most challenging aspect of the reporting system.

Program Funds and Staff
Each state utilizes different funds to support the resources necessary to conduct an occupational disease reporting system. Almost all states utilized their ABLES program to provide cases of adult blood lead levels [note: NIOSH defunded the ABLES program in August 2013]. Some states had the advantage of state support, whether through general funds or the provision of money from specific fees. The majority of states support their occupational disease reporting programs with the limited resources of their NIOSH state-based occupational health surveillance grants. With this variation in resources, there was large variation in the staffing available for each system; some systems had a single individual and others had up to eight individuals that provided support in some capacity to maintaining the system.

Data Usage
The use of the data varied from state to state, in part due to restrictions regarding the transfer of private health information. Most states produced factsheets or reports addressing a specific issue of concern or detailing the trends of occupational disease or poisonings in the state. Some states would supply these reports or write short articles that could be used in trade union publications or provided back to physicians to maintain or increase reporting. The data was also used to support decision making and prioritization of resources and activities. Many states make these publications available on the web, at conference presentations, and to training programs. While some states are able to provide specific case information to OSHA for follow up or investigation of a worksite, others are unable to do this as there are restrictions regarding transfer of private health information. These considerations are important as they can limit the variety of
surveillance activities or may require the identification of worksites instead of individuals to complete follow up.

A number of states found the data from the reporting system had been useful in setting up new state standards, identifying new and emerging hazards, prioritizing efforts, and providing examples or anecdotes of how occupational disease affects individuals when advocating for support of occupational health and safety endeavors.

**Evaluation**

Michigan and Ohio are the only states to have performed a cost-effectiveness evaluation of methods of occupational disease surveillance that have been published. Ohio’s analysis was completed in 1996 and Michigan completed their analysis is 2000 (Geidenberger et al., 1998; Rosenman et al., 2001). Both chose a single aspect of the system to evaluate: the ability to identify worksites with silica exposure problems. While they are limited evaluations focusing on a single outcome, they provide an evaluation design that could be applied to other diseases and outcomes of interest. Few of the other states had attempted evaluation or a cost-effectiveness analysis; many states are operating with very limited resources and there are often no funds or staff readily available to complete an evaluation. It is also very difficult to quantify the “effectiveness” of a system as many occupationally related diseases have long latencies and the time frame necessary to see an effect may make evaluation unfeasible.

**A Few Pieces of Advice**

Each state was asked what advice they would give to a state investigating the implementation of their own occupational disease reporting system.

- Remain cognizant of the technological changes, the transition to electronic reporting and the advancement of electronic health records and how that will impact the system.
- Develop your system on focused Minnesota specific issues before expanding to other areas of occupational health.
- The use of quarterly grand rounds and other methods to inform physicians of their requirement to report as well as how the data are being used are worthwhile incentives and a feasible method for a state program.
- Be mindful of expectations and realistic of limitations.
- Develop a strong stakeholder group and network.
- Look at passive and efficient reporting systems – it can be difficult to sustain an active reporting system. There may be other sources of data that are adequate in attempting to quantify occupational disease.
- Avoid paper processing if you can – research the availability of electronic reporting.
- Make sure the information you are collecting will make a public health investigation possible.
- Use the case reports as stories of the impact of occupational disease; personalize the data.
Choose diseases for which you have good active partners that can assist in intervention efforts.
Let the statute provide the physicians a method to report.
Use the statute as an opportunity to educate physicians about occupational health.

Conclusions

Based upon the available information provided in our literature review and the state interviews, there are a number of important issues and decisions that need to be addressed when considering the design and implementation of an occupational disease reporting system:

- Determine if partnering with the communicable disease reporting system would be beneficial, and if so, how the partnership would be structured.
- Decide if the system will target specialty clinics, i.e. radiologists, occupational medicine specialists, audiologists, or pulmonologists, or with any clinic including general practice.
- Decide how reports of disease will be received: paper forms, faxed, mailed, electronically, or a spreadsheet provided to clinics to be returned with populated fields.
- Decide if the reported cases will be verified by medical record or interview.
- Determine who will have access to the data collected.
- Determine if any type of incentive can be provided to initiate and maintain reporting of occupational diseases by physicians.
- Decide which disease/exposures of interest will be included in the pilot project for report to the health department.
- Decide if the pilot project will make use of secondary data sources to enhance the information collected.
- Decide whether or how the occupational disease reporting statute would need to be changed to include laboratories, hospitals, and other health care providers as entities required to report.

While physician reporting for all occupational diseases by physicians is neither feasible nor cost effective at this time, the implementation of an occupational disease reporting/surveillance system in Minnesota for selected conditions remains a viable option. By addressing these issues, recognizing limitations and cost effectiveness, exploiting existing systems and data sources, and focusing on state priorities, a sustainable system can be developed that will be useful in monitoring rates and trends of occupational disease and in priority setting, policy design, and development of prevention activities.


**Recommendations for Minnesota**

As previously described in this report, many options exist for expanded surveillance of occupational diseases, each with its own cost, ease of implementation, compliance, usefulness, and other characteristics. In addition to these factors, Minnesota specific priorities and utilization or expansion of previously established systems, were critical considerations in developing recommendations for Minnesota. Two expanded reporting systems were considered: an expanded heavy metal surveillance program (building from an existing lead surveillance program) and an expanded mesothelioma surveillance program (a Minnesota-specific priority, building off an existing cancer registry). Each of these is discussed below.

**Heavy Metal Surveillance**

Minnesota, as with many other states, has an existing blood lead surveillance program. Clinical laboratories, clinics, and health care providers must report all adult (and child) blood lead test results to the MDH (Minnesota Statute 144.9502). Occupational information is to be reported with the blood lead test results for adults. Blood lead test results that exceeded the Occupational Safety and Health Administration (OSHA) standards are referred to Minnesota OSHA. Minnesota OSHA is then able to follow up on the case and if necessary conduct an investigation to ensure all occupational health and safety statutes and regulations are being met. This feedback loop provides an established and proven method to identify potential cases of lead exposure in the workplace and a means to address those concerns.

Several states have added other metals – primarily arsenic, cadmium, and mercury – to their required reporting. However, data from several states that have required reporting of test results for various heavy metals indicate that such efforts, excluding lead, are very limited in their usefulness in identifying occupational exposures. Data from the New York State Department of Health Heavy Metals Registry, which was established in 1980, provides a useful perspective (New York State Department of Health, 2013).

That system requires reporting of all test results for blood lead as well as test results above specific levels of concern for cadmium, mercury, and arsenic. The reporting is limited to adults since the primary purpose is to identify occupational exposures. Once reports are received by DOH, staff conduct interviews to identify sources of exposure. For the five-year period 2006-2010, the findings are shown in the Table below.

The New York data show that, except for adult lead exposure, a surprisingly small number of cases can be associated with occupation. Even with follow-up, a large fraction of cases involve an unknown source of exposure. The resources to collect these data, conduct follow-up interviews, etc. would clearly be quite substantial in relation to the small number of occupational cases identified.
Table: New York State Department of Health Heavy Metals Registry, 2006-2010

<table>
<thead>
<tr>
<th>Metal</th>
<th>Exposure</th>
<th>Number of Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>Occupational</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Non-occupational</td>
<td>813</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>193</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Occupational</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Non-occupational</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>14</td>
</tr>
<tr>
<td>Lead</td>
<td>Occupational</td>
<td>2,955</td>
</tr>
<tr>
<td></td>
<td>Non-occupational</td>
<td>894</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>3,969</td>
</tr>
<tr>
<td>Mercury</td>
<td>Occupational</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Non-occupational</td>
<td>3,569</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>13,792</td>
</tr>
</tbody>
</table>

Iowa conducts surveillance for the same metals as New York. In 2012, two cases each of mercury and arsenic poisoning, and no cases of cadmium poisoning were reported. In 2013, one case of arsenic poisoning and no cases of cadmium or mercury poisoning were reported. It was not stated whether any of these were occupational. In contrast, elevated blood lead levels were found in 818 adults in 2012 and 856 adults in 2013. The great majority (85-90%) of these cases were associated with workplace exposures (Iowa Department of Public Health, 2013).

After 10 years of cadmium surveillance, New Jersey—which also requires reporting of any adults with elevated levels of lead, mercury, arsenic, and cadmium to the Department of Health—recommended in 1999 that a centralized national system of reporting be established due to the small number of state-based reports and also that hazard surveillance would be a more cost effective method of identifying employers using cadmium (New Jersey Department of Health, 1999).

Based on these observations, adding a legislative requirement for clinical laboratories and/or health care providers to report these additional metals (arsenic, cadmium, and mercury) would likely have very limited usefulness in identifying occupational exposures to these hazardous agents and entail significant costs. Cadmium surveillance, in particular, seems non-informative. With respect to arsenic and mercury, non-occupational exposures represent the great majority of cases in which a source of exposure could be identified. These environmental exposures may be of interest to Minnesota’s Environmental Public Health Tracking and Biomonitoring.
Program. Given these findings, there would appear to be limited justification, and probably limited legislative support for implementation of new reporting requirements for arsenic, cadmium, or mercury. However, as previously noted, the NIOSH ABLES program was defunded nationwide in August 2013. While laboratories and health providers will continue reporting adult blood lead test results for Minnesota residents consistent with Minnesota statute, additional state or federal funding will be needed for follow-up of the approximately 800 new and previously-tested cases identified with elevated blood lead levels each year to identify occupational exposures. In a recent CDC report, over 70% of adult cases with elevated blood lead levels were attributable to occupational exposures, and over 95% of cases for which an exposure could be ascertained were attributable to occupation (CDC, 2011). Supplemental federal funding to support follow-up of adults with elevated blood lead levels in Minnesota was sought in an occupational health surveillance grant application submitted in September 2014. At the time of this report (June 2015), funding decisions had not yet been finalized by NIOSH. If federal funding should be denied, state funding should be considered a public health priority.

**Expanded Mesothelioma Surveillance/Epidemiology**

Mesothelioma is a rare and usually fatal cancer of the lining of the chest (pleura) or abdomen (peritoneum). Almost all cases are associated with asbestos exposure (another asbestiform mineral, erionite, is the only other known cause). In contrast to lung cancer -- another cancer that can be caused by asbestos -- mesothelioma is not associated with smoking. While many occupations have had potential exposure to asbestos and are an increased risk of mesothelioma, occupations categorized as high risk include plumbers, pipefitters, steamfitters, electricians, shipyard workers, railroad workers, and construction workers.

Mesothelioma has a long latency period, typically occurring 20 to 50 years after asbestos exposure. The median age at diagnosis in Minnesota is 72 for both males and females, while the age range is from 26 to 97. Approximately 60-70 new cases are diagnosed each year (Figure 1).

**Figure 1: Number of Incident Cases of Mesothelioma by Gender in Minnesota, 1988 – 2013**
Between 1988 and 2014, almost 1,600 cases of mesothelioma have been diagnosed among Minnesota residents. Four out of five cases were among males. The four-fold higher rate in males reflects differences in past employment in industries and occupations with asbestos exposure. While the great majority of cases in the U.S. are associated with asbestos exposure in the workplace, family members of asbestos-exposed workers may be exposed when clothing or footwear contaminated with asbestos fibers are brought into the home; this is often referred to as para-occupational exposures. Some cases have also been associated with non-occupational exposures to asbestos.

Despite its rarity, this cancer has been a source of public concern in Minnesota dating back to at least the 1970s when asbestiform fibers were found in the Duluth drinking water, as a result of taconite (iron ore) mining waste dumped into Lake Superior. Concerns about mesothelioma risk in Minnesota have primarily focused on several industries and communities in northeastern (NE) Minnesota. A two-fold excess of mesothelioma among males in that region (seven-county “Arrowhead” region) was identified in a 1997 analysis of cancer rates and trends. The two-fold higher rate among males has remained relatively constant over time (Figure 2).

Figure 2: Average Annual Age-Adjusted Incidence Rates of Mesothelioma Among Males by Time Period and Region, 1992-2012

Two of the NE counties are among the highest 25 counties in the U.S. for mesothelioma mortality rates for 2000-2009. Carlton County ranks 3rd highest with an age-adjusted annual rate of 55.1 deaths per million (age 15 and above) population, while St. Louis County ranks 21st with a rate of 25.1 deaths per million (age 15 and above). The U.S. average during that period was 11.1 mesothelioma deaths per million (age 15 and above). Subsequent analyses and record-linkage studies using existing employee records identified mesothelioma cases among employees
of two large NE industries: the Minnesota taconite (iron ore) mining industry and a ceiling-tile manufacturing plant (Conwed Corp.) in Carlton County that used asbestos from 1958 to 1974 as a component of the tiles. Occupational histories of the initial 17 cases among taconite miners indicated that commercial asbestos exposure was possible or probable where sufficient work history was available (Brunner et al., 2008). Following identification of dozens of additional mesothelioma cases among miners in 2007, state-funded studies of mesothelioma and other health outcomes among Minnesota taconite miners were initiated by the University of Minnesota School of Public Health. Final results of the multi-part studies were announced in December 2014 (University of Minnesota School of Public Health, 2014). Subsequent analysis by MDH in January 2015 identified additional mesothelioma cases among taconite miners and former Conwed ceiling tile workers, bringing the total known cases to 101 among 69,000 miners and 39 among 5,200 Conwed Workers (Minnesota Department of Health, 2015).

Aside from the specific issues related to NE Minnesota, mesothelioma represents a unique cancer in that over 80% of cases among males and over 40% among females are attributable to occupational or para-occupational exposures to asbestos (Spirtas et al., 1994; Goldberg et al., 2006; Rushton et al., 2012; Lacourt et al., 2014). Consequently, most cases can be considered an occupational disease. And although rare, over the past five years, mesothelioma deaths now exceed deaths from all occupational injuries – long considered a critical measure of occupational health and safety (Figure 3).

**Figure 3: Comparison of Fatal Work-Related Injuries and Mesothelioma Deaths in Minnesota, 1999 – 2013.**

![Graph showing comparison of fatal work-related injuries and mesothelioma deaths in Minnesota, 1999–2013.](image)

Minnesota, like all states, has a statewide surveillance system to monitor rates and trends of cancer and to facilitate cancer research and intervention programs. While a host of clinical data (cancer site, stage, clinic or hospital, etc.) and demographic data (age, gender, race, and address
at the time of diagnosis) are routinely collected, further data collection for mesothelioma cases would be extremely valuable in identifying potential occupational exposures and/or household/environmental (para-occupational) exposures. The expansion of the current tracking of mesothelioma cases with the additional collection of occupational and military histories of cases and family or other household members would meet two of the specified criteria in the creation of an occupational disease reporting system: it’s a specific public health concern in Minnesota and it is also primarily a disease related to occupation, with some occurrences due to do environmental exposures. Furthermore, despite increased regulation of asbestos exposures in the workplace and rapidly declining use of asbestos starting in the 1970s, mesothelioma rates nationally have shown little (males) or no (females) significant changes (Figure 4).


In 1998, the Minnesota state legislature established and funded the Occupational Respiratory Disease Information System (ORDIS) at the MDH to develop and test methodology for surveillance of occupationally-related respiratory diseases and to specifically investigate the excess of mesothelioma in NE Minnesota. Although the ORDIS statute was repealed and funding eliminated in early 2002, the identification and investigation of the initial 17 mesothelioma cases among miners was completed and pilot studies were initiated in NE Minnesota to evaluate the usefulness electronic billing/discharge data and patient interviews to identify occupational respiratory diseases. Several grant applications submitted to the National Institute of Occupational Safety and Health by MDH between 1998 and 2005 included an enhanced surveillance for mesothelioma and/or other occupational respiratory diseases; these initiatives were not funded.

Mesothelioma rates have not declined in Minnesota as of 2012 and there are continued questions about exposures in taconite mining and processing and other industries and occupations. A
surveillance/epidemiology program designed to identify occupational or para-occupational experiences to asbestos would provide a valuable and advantageous opportunity to conduct targeted investigations and identify previously unsuspected sources of exposure.

The detailed methodology and design of this program will be dependent upon the resources and funding made available to the activity, as well as changes in statutes, rules, and technical aspects of Minnesota’s statewide cancer surveillance system that are currently in planning. A summary of potential activities and components of an enhanced surveillance/epidemiology program are outlined in Appendix C. These activities will also lay a foundation for future research that could directly address some of the lingering scientific questions about the etiology of this disease, particularly with regard to the uncertain effects of “asbestos-like” amphibole fibers. Such a program would provide a valuable center of expertise and resources to the state for responding to concerns from the public, the press, industries, labor, elected officials, community health officials and the medical community about mesotheliomas and occupational asbestos exposure in Minnesota.

**Electronic Health Records**

The greatly expanded use of Electronic Health Records (EHRs) since 2009 has created new possibilities not only for patient care, but also for public health research and surveillance. NIOSH, among others, has been strongly advocating for the inclusion of an individual’s occupation and industry into the standards currently under development for the EHR (National Institute for Occupational Safety and Health, 2015). In 2011, an Institute of Medicine report made five recommendations to NIOSH for evaluating the feasibility of including occupational information in EHRs (Institute of Medicine, 2011). The possibility of using EHRs to conduct surveillance of occupationally related disease, as well as providing clinicians with important patient information, certainly represent “meaningful use” of EHRs. However, at this time, the EHR is continually evolving and the standards have not been finalized and established. As the collection of occupation and industry is not yet standard in the EHR, this method of surveillance was not among the listed recommendations. However, should occupation and industry become standard variables captured in the EHR, this issue will be revisited and the opportunities and limitations provided by this data source will be explored fully for occupational disease surveillance.
References


Appendix A: Minnesota Statute 144.34

144.34 INVESTIGATION AND CONTROL OF OCCUPATIONAL DISEASES.

Any physician having under professional care any person whom the physician believes to be suffering from poisoning from lead, phosphorus, arsenic, brass, silica dust, carbon monoxide gas, wood alcohol, or mercury, or their compounds, or from anthrax or from compressed-air illness or any other disease contracted as a result of the nature of the employment of such person shall within five days mail to the Department of Health a report stating the name, address, and occupation of such patient, the name, address, and business of the patient's employer, the nature of the disease, and such other information as may reasonably be required by the department. The department shall prepare and furnish the physicians of this state suitable blanks for the reports herein required. No report made pursuant to the provisions of this section shall be admissible as evidence of the facts therein stated in any action at law or in any action under the Workers' Compensation Act against any employer of such diseased person. The Department of Health is authorized to investigate and to make recommendations for the elimination or prevention of occupational diseases which have been reported to it, or which shall be reported to it, in accordance with the provisions of this section. The department is also authorized to study and provide advice in regard to conditions that may be suspected of causing occupational diseases. Information obtained upon investigations made in accordance with the provisions of this section shall not be admissible as evidence in any action at law to recover damages for personal injury or in any action under the Workers' Compensation Act. Nothing herein contained shall be construed to interfere with or limit the powers of the Department of Labor and Industry to make inspections of places of employment or issue orders for the protection of the health of the persons therein employed. When upon investigation the commissioner of health reaches a conclusion that a condition exists which is dangerous to the life and health of the workers in any industry or factory or other industrial institutions the commissioner shall file a report thereon with the Department of Labor and Industry.

History: (4327-1) 1939 c 322; 1975 c 359 s 23; 1977 c 305 s 45; 1986 c 444

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Appendix B: Occupational Disease Reporting System Survey
Survey of Occupational Injury and Illness Reporting Systems

State: _______________________________________

Name: ______________________________________

Title: _______________________________________

Date: _______________________________________

1. When did active reporting of occupational injuries and illnesses begin in your state? (Not including OSHA’s first report requirement)

   1a. (Cite Law) Is this the only law governing the reporting of occupational illness and injury in (state name)? (i.e. do you have separate provisions for the reporting of blood lead, for your ABLES program?)

2. Why did your state implement their reporting system?

   Was there a specific event or activity (such as a sentinel event, cluster, surveillance, etc.) to begin active reporting?

3. Has the reporting law/legislation/rule changed over time?

   If Yes to 3:

   3a. What were these changes and how did they affect the reporting system?

   3b. What would you describe as the most advantageous or useful change to the legislation?

   3c. Have any changes been detrimental to the collection of occupational injury/illness reporting?

4. What occupational conditions are actively reported in your state? (Please respond yes or no)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal Workers’ Pneumoconiosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpal Tunnel Syndrome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Repetitive Trauma Disorders (In General)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work-related Asthma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise/Hearing Disorders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Dermatitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide Poisoning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others: (Please List)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** If heavy metals screenings are collected, how are those reported? Is a system similar to the ABLES system utilized?
5. Are all the conditions listed in your legislation or rules collected?

   If Yes, skip to 6:

   a. If any injuries/illnesses (listed in the legislation) are excluded from active reporting, why?

6. Is there a specific time frame in which conditions need to be reported? (i.e. What is the expectation in regards to receipt of a disease report from the time of diagnosis or lab results?)

7. With what frequency does reporting occur?

   Every case
   Monthly
   Quarterly
   Annually
   Other (please explain): ________________________________

8. How is reporting conducted? (Please check all that apply)

   Paper forms

   If paper forms how are these delivered to the department?
   Mail
   Fax
   Phone

   Electronic forms

   Query of medical records

   Other (please explain): ________________________________

8a. Does your system collect data from electronic medical/health records?

8b. Does your system collect data from hospital discharge data and/or emergency department data?

9. Who is required to report? (Please check all that apply)

   Individual physicians, physician assistants, nurses
   Healthcare provider groups
   Hospitals
   Laboratories
   Clinics
   Other (please explain): ________________________________

   9a. If clinical laboratories are required to report, are there special reporting procedures or forms for laboratories or do they report in a similar method as a clinic or physician?
10. How do you inform reporting entities of their reporting responsibilities? (i.e. what information they are required to report, printed instructions, directions on a webpage, phone or email address for consultation)

   10a. If consultation is available, who provides that consultation and what is their training?

11. Does anyone review the cases that are reported for to determine or confirm that the case is truly work related? If so, how is it completed?

12. How is reporting supported? State funding, outside grants, etc.

   12a. How many FTE’s are required to support the reporting system requirements?

13. How do you go about encouraging or enforcing reporting? If so, how do you enforce or encourage compliance?

   13a. Have you found these methods to be effective?

14. How does your program or agency utilize the data?

15. How do your partners utilize the data?

16. How do you disseminate information and findings? Who are your target audiences? (employers, labor departments, unions, etc.)

   Annual Reports
   Alerts
   Web Publications
   Scientific Papers
   Conference Presentations
   Training Programs/Presentations
   Other: Please List ___________________________________________

17. Do you report individual cases to OSHA?

18. Are the data collected through your reporting system utilized in setting priorities for intervention or educational programs or in regulatory activities (both public health and regulatory)?

19. Has the reporting system identified an emerging problem?

20. Has it assisted in the development of new state standards?

21. Have you done any type of cost evaluation of the system? (measurement of outcomes, etc. to justify the cost of the reporting system.)

   If Yes:

   21a. What were the outcomes measured? What were the conclusions of the evaluation?
22. What scientific and technical issues have you encountered in developing and maintaining a reporting system? (i.e. diagnostic issues – evolving case definitions; determining true work relatedness, changes in epidemiologic methods, etc.)

23. For a new state attempting to institute a reporting system, do you have any recommendations or advice?
Appendix C: Mesothelioma Surveillance/Epidemiology Program

1. Utilize the Minnesota Cancer Surveillance System to identify reported mesothelioma cases for possible voluntary participation in a follow-up study of previous exposures to asbestos.

2. Collect detailed occupational and military histories on all recently diagnosed mesothelioma cases in Minnesota to:
   (a) identify specific occupations and previously unrecognized current sources of asbestos exposure in Minnesota,
   (b) evaluate changes in disease trends over time and by region of the state,
   (c) determine the extent to which “take-home” exposures may be contributing to disease incidence among family members of cases,
   (d) target intervention activities to reduce exposure to asbestos in the workplace, and
   (e) target resources to address worker and community concerns about asbestos-related disease.

3. Develop and test a questionnaire to obtain occupational and military histories from cases and/or their next-of-kin with special attention to exposures in the mining, construction, construction products industries, occupational exposures to vermiculite products and the known occupations with likely asbestos exposure (electricians, plumbers, pipefitters, etc).

4. Continue to conduct and analyze data linkages with the MCSS and two large, previously established occupational cohorts in Northeast Minnesota:
   (a) 69,000 taconite miners in which 101 mesotheliomas have been diagnosed
   (b) 5,000 workers from an asbestos fiberboard manufacturing plant (Conwed) and approximately 450 spouses who were the subjects of a worker notification program in 1990 in which 39 mesotheliomas have been diagnosed.

5. Review and evaluate the descriptive epidemiology of mesothelioma in Minnesota and how it compares to national trends (rates, trends, gender distribution, site and histological characteristics, age distributions and trends, and survivorship).

6. Develop and implement strategies to disseminate and publish surveillance results, in order to aid and support future research activities, and to educate health professionals about ongoing workplace or para-occupational exposures to asbestiform fibers and future trends in asbestos-related disease.

7. Establish and maintain a scientific advisory group to identify relevant Minnesota-specific issues and priorities for reducing asbestos exposures and identifying future cases of asbestos-related diseases.