

VITAL HEALTH STATISTICS

Proceedings of the Workshop on Needs and Resources for Occupational Mortality Data

This report contains the proceedings of the Workshop on Needs and Resources for Occupational Mortality Data, January 21–22, 1987. The Workshop was sponsored by the National Center for Health Statistics, the Bureau of Labor Statistics, and the National Institute for Occupational Safety and Health. The use of industry and occupation data from death certificates and the history of coding these data in mortality data bases are reviewed. Options for future occupational mortality data coding are developed and discussed by agency representatives and working groups of Workshop participants. Evaluation of the options include criteria of timeliness, geographic and occupational coverage and detail, data quality, surveillance capability, cost, and relevance to State and national research.

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Foreword

This report includes the proceedings of a Workshop devoted to the improvement of statistical data related to occupational safety and health. These activities were sponsored by the three agencies that entered into the formal tripartite Memorandum of Understanding at this Workshop: the Bureau for Labor Statistics, the National Institute for Occupational Safety and Health, and the National Center for Health Statistics.

The Workshop was organized by the National Center for Health Statistics. Special thanks go to Dr. Patricia Buffler. Other members of the Workshop planning group include Dr. Bruce Cohen, Dr. Harry Rosenberg, and Mr. Jeffrey Maurer from the National Center for Health Statistics; Dr. Gilbert Beebe and Dr. Thomas Mason from the National Cancer Institute; Mr. Harvey Hilaski from the Bureau of Labor Statistics; and Mr. Todd Frazier from the National Institute for Occupational Safety and Health. The Workshop proceedings were prepared under the direction of Dr. Diane Wagener. Special thanks also are given to

Dr. Jacob Feldman for filling in for Dr. Manning Feinleib who was suddenly hospitalized the day before the Workshop. In addition, we particularly appreciate the work of Ms. Jane Schienle from the Bureau of Labor Statistics and Ms. Madelyn Lane and Ms. Dorothea Donahue from the National Center for Health Statistics, who took care of the many administrative details of the Workshop.

Finally, the role of the weather must be recognized. At noon on the second day, the Workshop came to a premature end because of one of the heaviest snowstorms to hit Washington, D.C., in recent years. Therefore, most of the discussions, postscripts, and summary statements in these proceedings are not from the transcript but from comments prepared after the Workshop.

Ronald W. Wilson, Director
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Proceedings of the Workshop on Needs and Resources for Occupational Mortality Data^a

Introduction

On January 21, 1987, a Memorandum of Understanding (appendix I) was signed by the Bureau of Labor Statistics (BLS), the National Center for Health Statistics (NCHS), and the National Institute for Occupational Safety and Health (NIOSH) to work collaboratively in the development of improved reporting systems and surveillance of occupational illness and injuries. The occasion of the signing was used to convene a workshop (January 21-22, 1987, in Washington, D.C.) to explore the needs and resources for occupational mortality data. This volume includes the proceedings of that Workshop.

Surveillance and research in the areas of occupationally related illness and injury are important areas for health policy. According to Langmuir (1976), "good surveillance does not necessarily insure the making of the right decision, but it reduces the chances of making the wrong one." All three agencies (BLS, NCHS, and NIOSH) have been collecting data relevant to surveillance and research of occupationally related illness and injury. NIOSH has identified a spectrum of Leading Work-Related Diseases and Injuries

that necessitates the collection of health data from early symptoms of disease to clinical illness to death. The development of a coordinated national strategy to obtain these data may require the use of several different complementary data systems.

The purpose of the Workshop was to review the collection and use of data regarding mortality risks by occupation and industry and to develop recommendations regarding future direction. A variety of options focusing on data collected by NCHS and the States were reviewed, and the participants then evaluated these options in working groups. Evaluations included the following criteria: timeliness, geographic and occupational coverage and detail, data quality, surveillance capability, cost, and relevance to State and national research. The working groups then reported to the Workshop. In addition, a questionnaire for the evaluation of each of the options was given to the participants, and the comments that were returned were reviewed in these proceedings.

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Langmuir, A. D. 1976. William Farr: Founder of modern concepts of surveillance. *Int. J. Epidemiol.* 5(1):13-18.

^aWorkshop sponsored by National Center for Health Statistics, Bureau of Labor Statistics, and National Institute for Occupational Safety and Health.

Chapter I.

Plenary session

Greetings

by Ronald Wilson, Director, Division of
Epidemiology and Health Promotion,
National Center for Health Statistics

I would like to welcome you to this first Workshop on Needs and Resources for Occupational Mortality Data. This Workshop is a collaborative effort among the National Center for Health Statistics (NCHS), the National Institute for Occupational Safety and Health (NIOSH), and the Bureau of Labor Statistics (BLS). We hope that it will be the first of a number of such workshops dealing with issues related to occupation and health. The immediate concern of this Workshop is the issue of the coding of occupation and industry on the death certificate and the future of this activity at NCHS.

In 1980, the National Cancer Institute and NIOSH provided NCHS with the funds to implement coding of occupation and industry on death certificates for a limited number of States with the hope that this developmental project would lead to producing occupational mortality data from the death certificates on a routine basis. Later this year, NCHS will make available mortality data tapes with the occupation and industry codes for 16 States that participated in this program during 1985.

At this Workshop, we want to identify the needs, current and future uses, and resources available for the continued inclusion of occupational and industry information in the mortality data systems of NCHS. We have participants from the Federal Government, State governments, industry, labor, and academia at this conference. It is hoped that, with this broad participation, the Workshop will develop recommendations that will identify many needs and concerns regarding these mortality data.

Needs and resources for occupational mortality data

by Bailus Walker, Jr., Ph.D., M.P.H.,
Commissioner, Massachusetts Department of
Public Health

At the outset, allow me to commend the Bureau of Labor Statistics (BLS), the National Center for Health Statistics (NCHS), and the National Institute for Occupational Safety and Health (NIOSH) for their continuing efforts to prevent occupational disease and disability. The activities of these three Federal agencies are reinforcing our efforts at the State level. Their technical assistance, grants, and other forms of help have enabled us to pursue significant risk management programs, including worker education, in our States and in local communities.

This is indeed an appropriate time to evaluate the needs and the resources for developing occupational mortality data because we are recognizing at more frequent intervals the numerous and complex issues surrounding the identification and recognition of occupational diseases. At the same time, we are constantly reminded that the prevention and control of workplace risk require that we have in place comprehensive systems to capture occupational morbidity and mortality data. The development of such systems cannot proceed very far without sincere Federal and State cooperation.

I want to offer a State perspective from the vantage point of not only my Massachusetts public health portfolio but also my membership on the National Academy of Sciences and the Institute of Medicine's Commission for the Study of the Future of Public Health in the United States. This group was established last year by the Institute of Medicine to examine a broad range of public health issues and problems and to make recommendations for future positive directions for public health. It has held public hearings and collected a significant volume of information.

Even to the most casual observer, it is clear that we have made significant progress in the prevention and control of occupational disease and dysfunction since 1910, the year Alice Hamilton, one of the pioneers in occupational health, was in Brussels attending a conference on occupational disease. At that conference, the Belgium delegate walked up to her and said, "In the United States, occupational disease prevention and control activities do not in fact exist." According to Hamilton, she could not at that time find papers published on industrial poisoning. Employers eager to improve conditions in the workplace could find very little advice from medical experts at that time because little progress had been made in the area of industrial hygiene and in the monitoring and surveillance of occupationally related diseases.

The literature is far more complete now, and it provides us with ample evidence that work-related diseases must continue to be among our highest public health priorities. Indeed, *The 1990 Health Objectives for the Nation:*

A Midcourse Review (Public Health Service, 1986), published in late November of last year, underscores the fact that the nearly 104 million men and women who make up the workforce of the United States sustain an estimated 10 million traumatic injuries on the job each year.

It is important at the outset of this Workshop to recognize that, when we discuss occupational health and safety, we are dealing with an expanded universe. In the 1960's and 1970's, many of us watched the field of health and safety grow from one that was primarily concerned about injuries and acute poisonings to one that included concern for a broad spectrum of chronic diseases and dysfunctions—most notably, cancer. Today, we continually confront mounting evidence of reproductive disorders caused by workplace exposures, and we are increasingly aware of clinical and subclinical neurologic dysfunctions caused by workplace stressors. In addition, occupational asthma and cumulative trauma disorders must be recognized as substantial occupational health problems.

On the horizon, but not yet fully acknowledged in this country, is the entire realm of stress-related health problems, such as peptic ulcers, hypertension, and emotional disorders, that can be attributed to working conditions. This expanded universe of health problems is explained by a new awareness of longstanding concerns of health and work conditions and by the changing nature of work and workplaces.

Indeed, entirely new technologies and materials are being rapidly introduced without sufficient regard to their potential impact on human health. Few will debate that the challenge to prevent work-related diseases is today a substantial one. I submit that surveillance of health conditions and the workplace is an essential part of our prevention effort. We must, I believe, develop sensitive and timely surveillance systems to identify work-related health problems for targeting research and for intervention activities.

But, here again, *The 1990 Health Objectives for the Nation: A Midcourse Review* (Public Health Service, 1986) points to deficiencies in the system. For example, one of the objectives was the elimination of occupational heavy metal poisoning by 1990. According to the midcourse report, no data are available to measure, either directly or indirectly, progress toward obtaining this objective. Because no data are available, it is not possible to evaluate the likelihood that this objective will be reached by 1990.

Another objective stated that at least one question on lifetime work history and known exposure to hazardous substances should be added to all appropriate existing health data reporting systems. This objective was not achieved by 1985. It is, however, an important practical measure that is now in effect in many States.

Surveillance must not be limited to the monitoring of health conditions with well-established occupational etiologies. It must also enable us to generate new hypotheses, to identify new problems, and to develop more effective interventions. Occupational illness and injury surveillance should provide us with the numbers that we need to justify our policies and programs and to carry them out.

But before we focus on the needs and resources of occupational mortality data, we need to broaden our scope here to note that there is a necessity to develop a comprehensive surveillance program utilizing a variety of information from different data sets.

There are many surveillance mechanisms that have yet to be used. This year in Massachusetts, with NIOSH support, we have assembled an interagency task force to identify existing data sources that might be employed for occupational illness, injury, and hazard surveillance at relatively low additional costs. We are, for example, evaluating the utility of workers' compensation records, clinical laboratory reports, health maintenance organization data bases, and a broad array of data systems on the health of infants and children and the general population in Massachusetts. We are looking very closely at right-to-know data and pollution data for both indoor and ambient air. We are scrutinizing very carefully the regional Occupational Safety and Health Administration's data and our own State inspection reports. And we are exploring the feasibility of using the comparatively large number of occupational health clinics in Massachusetts for the surveillance of work-related lung disease and dysfunction.

We have also initiated, with NIOSH support, a pilot program to assess the feasibility of occupational disease reporting by sentinel physicians. It is within this broad context that we must evaluate the need and the resources available for gathering occupational mortality data.

In our enthusiasm for new and innovative surveillance mechanisms, however, we should not underestimate the value of death certificate information. Despite certain inaccuracies and limitations, death certificates remain one of the major sources of data on the health status of the population.

In Massachusetts, we are finding that these certificates are reasonably reliable and that they are accurate as indicators of the occurrence of certain diseases that are significant in the context of the health effects of the environment, including occupational environment.

Our experience indicates that death certificates can provide the information required for defining death from specified causes over time and identifying variations between geographic sections of our State. These analyses are most helpful in planning and in implementing programs for prevention and control.

Population-based occupation and industry data are very difficult to obtain in a timely and inexpensive way. Because of this, death certificate statements of usual occupation and industry would appear to be an attractive solution to this problem. Frazier and Wegman (1979), Frazier (1982), and Beebe (1981) have emphasized the potential usefulness of an occupational health surveillance system based on death certificates. Others have demonstrated that the analysis of death certificates is a relatively simple and low-cost means of generating leads about work-related health problems.

In Massachusetts, we are currently coding the occupation and industry information contained on our death cer-

tificates and, again with NIOSH support, we are analyzing these data to identify potential work-related health problems. We are concerned about occupational asthma and chronic solvent poisoning and reproductive outcomes. But we are also concerned about cancer and acute myocardial infarction and fatal injuries—outcomes that we can explore using death-certificate data.

Today we should not be debating whether occupational mortality data *can* be used, but rather, we should be asking ourselves to what extent we should code and analyze available industry and occupation information. Before we can answer this question, a series of preliminary questions directed to the Federal agencies need to be addressed.

- *What health conditions can be monitored by death certificates? Given these conditions, what alternative surveillance mechanisms are readily available? What are the comparative costs?*

For example, in Massachusetts, we are currently evaluating the use of cancer registry data for occupational cancer surveillance. We know that the diagnostic information in the cancer registry is more accurate than death-certificate diagnoses, but the occupational information is, thus far, less complete and more highly dependent on the medical community's inclusion of the occupational data in patients' medical histories. Not all States have cancer registries and not all cancer registries include occupational information.

- *Are there types of industries for which death certificates are perhaps the best available source of information?*

Industries with small workplaces—for example, gas stations and automobile repair shops—are difficult to study using cohort methods.

- *What are the limitations in the accuracy of death certificate data? Are these limitations inherent, or are there prospects for improvement in data quality?*

That is, will the forthcoming 10th Revision of the International Classification of Diseases enhance diagnostic precision? Can we improve on the occupational information being provided, for example, by funeral directors?

I am very tempted to ask whether we have the resources to follow up the leads generated by death certificate analyses, but I hesitate to judge the long-range value of a data system based on the short-run commitments to occupational health of some segments of the present administration.

- *What are the alternatives to nationwide, routine coding and analysis of occupational mortality data? What are their costs, including opportunity costs?*

One alternative that has been proposed is the analysis of data only for years coinciding with the decennial census. Will this approach provide sufficient data to analyze small industries concentrated geographically, such as the jewelry industry in Rhode Island? Who will code this information? Clearly, it does not make much sense to mount coding

capabilities in the States on a sporadic or catch-as-catch-can basis. Can these data be disaggregated back to the States and used for State-specific studies? We have approximately 55,000 deaths per year in Massachusetts; and we estimate that we need, at a very minimum, 3 years of occupational mortality data for meaningful analysis.

Another proposed alternative is to select a representative sample of States to provide data for nationwide statistics. Most certainly, in choosing only several States, we will lose information on certain geographically concentrated occupations and industries. Will sample data, for example, provide us with sufficient information to examine mortality patterns in minority groups? I am constantly appalled by the inadequacy of health data to provide meaningful information about minority health—information that will enable us to develop policies and programs designed to address minority health issues.

- *Can we target industries and occupations of interest by focusing on specific geographic locations? And who will decide what is "of interest?"*

How can we make use of NCHS survey data? Are survey samples large enough to allow for meaningful occupational morbidity analysis?

- *At this juncture, can we develop an automated system for coding occupation and industry information according to the U.S. Bureau of the Census classification scheme? I understand that it would be impossible to code 100 percent of the data by computer, but wouldn't it be possible to code a significant percentage?*

In our view, an automated coding system would result in more standardized information and would substantially reduce long-term coding costs. Additionally, such a system could be applied to multiple data sets used by a variety of agencies, including many represented here today.

As we consider the prospect of nationwide coding, it is inappropriate to envision coding systems based on old models—people in offices shuffling paper forms. It is 1987, we are in the midst of an information processing revolution with highly sophisticated technologies. Although previous attempts to automate coding have been limited, perhaps now we can move forward. Whatever type of surveillance system we consider, though, whether it involves death certificates, survey data, clinical data, compensation claims, or health maintenance organization data, we will certainly need to code industry and occupation information.

- *What are the roles of the various Federal agencies and State governments?*

Essentially, the options that we are considering require additional data gathering and analysis by the Federal Government. And yet, I think that the bleak realities we face in Federal budgeting make this somewhat difficult. I would

hope that history would not repeat itself. In the period of concern about the Federal deficit, I cannot resist the temptation to quote from a letter Alice Hamilton wrote to her sister in 1914 about the inability of the Bureau of Labor Statistics to pay her for her occupational health studies. Hamilton wrote: "They are so poor they cannot make a contract with me for an investigation of rubber, but I mean to do it anyway and trust to their making it in July, the new fiscal year."

I would hope that Janet Norwood's Bureau of Labor Statistics is more affluent today than it was when Alice Hamilton was on its payroll.

But I think it is important that there be a kind of collaboration. States are *extremely* hesitant to incorporate any additional data components into the Vital Statistics Cooperative Programs until the basic components have been adequately funded for all States. States, however, need to consider the value of coding occupational information for their own purposes as opposed to relying on Federal statistics. Our experience in Massachusetts would indicate that State-specific information provides more immediate direction for State research and intervention efforts. Clearly, it has a greater impact on our State legislature.

In the last 6 months in Massachusetts, we have had requests for occupational mortality data from unions, a large number of requests from academicians, and an inordinate number of requests from health care providers. We have used occupational data to elucidate the geographical distribution of cancer, which we analyze routinely as part of our environmental surveillance program.

Clearly, from our experience, there is a user constituency. By providing information and periodic reports, we increase that constituency; and in doing so, we gain support for our programs.

In conclusion, let me stress the need for collaboration between Federal agencies and the States. I commend the joint efforts of the agencies represented here today. I believe sincerely that these seminars and workshops are extremely helpful. And I suggest that, until we have a better, readily available source of information, the use of occupational mortality data is an essential component of any comprehensive effort in occupational medicine.

A 1986 report to Congress by its Committee on Government Operations was entitled *Occupational Health Hazard Surveillance: 72 Years Behind and Counting* (U.S. Congress, 1986). The overriding question is not can we afford to code occupational mortality data but can we afford not to?

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Review of activities: National Institute for Occupational Safety and Health

by J. Donald Millar, M.D., Director, National Institute for Occupational Safety and Health

Introduction

It is a real pleasure for me to be here with you for this Workshop on Needs and Resources for Occupational Mortality Data. I am proud to be associated in this with Dr. Manning Feinleib and Commissioner Janet Norwood, who, as true leaders in international statistical circles, have done so much to provide this Nation with sophisticated data on our health and work. Also, I appreciate the kind introduction by my good friend and colleague, Ronald Wilson. Among his many duties is service with me on the Subcommittee on Environmental Health Risk Assessment of the Public Health Service Committee to Coordinate Environmental Health Related Programs. In the Subcommittee, we grapple with some tough issues in quantitative risk assessment, and we know well the need for sound data.

It is good to be here with many colleagues from the State health and labor departments, where so much of the real work in statistics is done. When I was serving as Director of the Bureau of State Services, I heard from State officials a constant refrain—"We sure wish you Feds would get your acts together and give us a consistent message!" Well, the tripartite Memorandum of Understanding among the National Center for Health Statistics (NCHS), the Bureau of Labor Statistics (BLS), and the National Institute for Occupational Safety and Health (NIOSH) that will be signed today is aimed at that very purpose. We are very intent on getting our acts together in, as is stated in the Memorandum, "... improving occupational illness and injury reporting systems and surveys."

It is gratifying to me that the first highly visible collaborative action to be taken by us under terms of the Memorandum (paragraph II-8) is to bring together our partners from the States, business, labor, and academia. As long as we are getting things coordinated, it makes good sense for us all to do it together. Please note that this Workshop could be put forward as Workshop *number one*, suggesting it is the first of many. I hope so. It is an important beginning in making utilitarian sense out of a myriad of activities that are rich in complexity and diversity, but not in unity.

The movement

This meeting and the formal collaboration of NCHS, BLS, and NIOSH result from a growing national movement of people who recognize the need for sound information on the relationship of occupation and health—or, more precisely, the relationship of occupation to injury, disease, disability, and death. Two congressional hearings on the subject of the surveillance of occupational disease within the last 18 months testify to the strength of this growing

awareness. Until recently, it would have been unthinkable that a subject so seemingly esoteric and technical would have attracted such congressional attention. For this we are indebted to concerned activists, such as Eric Frumin of the Amalgamated Clothing and Textile Workers, AFL-CIO, who is here today. He and others have pushed this idea of occupational disease surveillance with enthusiasm, imagination, and effectiveness.

Dreams coming true

It would please me if this Workshop is seen in the minds of some here as solid evidence of the incipient realization of dreams long nurtured. Within NIOSH, for example, I think of Todd Frazier, who has labored long, hard, and diligently over the past 15 years to encourage, stimulate, and nourish the surveillance of occupational diseases and injuries. Todd, the seeds you planted have begun to bear the fruit of national attention.

What NIOSH is doing

Within NIOSH, the surveillance of occupational disease and injury is now proceeding across the organization. Within five of our seven divisions—in both Cincinnati and Morgantown—there are specific surveillance programs. I am proud of all this activity by NIOSH professionals, including those in attendance here: John Sestito, Patricia Honchar, Carol Burnett, Robert Mullan, Michael Moll, David Brown, and Dennis Bregman. Moreover, Dr. James Melius, whose Division of Surveillance, Hazard Evaluations, and Field Studies is most visibly associated with surveillance, will chair a portion of the Workshop.

Last week in Morgantown, we presented our annual Program Review of NIOSH to Dr. James O. Mason, Director of the Centers for Disease Control (CDC). In my judgment, it was the best program review by NIOSH since I first got involved with NIOSH as acting director in 1978. Included in the review was a presentation by Dr. Moll of preliminary results of a new surveillance effort. He presented an analysis of all death certificates for occupational fatalities during the years 1980-84. Straightforward and fairly simple preliminary analyses revealed striking evidence of a hitherto unidentified epidemic of occupational deaths among female workers due to homicide in the workplace; the results also showed that for most States in this great land, agriculture is the occupation associated with the highest rates of occupational mortality. For whatever reason, I had not expected that. His presentation graphically confirmed the point made earlier, that there still are important "leads" to be had in the collection and analysis of mortality data.

Because our surveillance activities in NIOSH have become so widespread and varied, I recruited Dr. Edward Baker from Harvard University onto our headquarters' staff as Assistant Director of NIOSH. He is one of the outstanding young figures in occupational medicine. I gave him a specific charge to develop a comprehensive plan for surveillance activities in NIOSH and asked him to coordinate our activities in accord with the plan. That plan was

developed, many of you have had input into it, and we are going about its implementation.

Surveillance in the national prevention strategies

As many of you know, because you were there, NIOSH convened two national symposia on the Prevention of Leading Work-Related Diseases and Injuries, one in Atlanta in May 1985 and the second in Cincinnati in October 1986. Both were attended by 450-500 of the Nation's top professionals in occupational safety and health. They came from a wide variety of organizational settings. In these symposia, we introduced for discussion and modification, by these professionals, 10 proposed national strategies for preventing each of the 10 Leading Work-Related Diseases and Injuries—one strategy for each entry on the list.

This process has been exhilarating to me personally, and it has given rise to a unprecedentedly broad-based understanding of what needs doing to reduce the burden of the Nation's most important occupational health and safety problems. In all of these strategies—each 1 of the 10—the Nation's experts called specifically for epidemiologic surveillance of the target conditions. In 9 of the 10 strategies, they also called specifically for environmental surveillance of the causative agents associated with the condition.

In responding to this ringing endorsement of the need for better surveillance, we have reinvigorated our notions of eventually having in this country a comprehensive system that would result in the reporting of all significant health problems associated with occupation. The concept also now has a name, SENSOR, which is the acronym for

Sentinel
Event
Notification
System, for
Occupational
Risks

Many aspects of this concept await full elaboration, but at least we have the dream and a name for it. You will hear more about it from Edward Baker.

The big question

With all the national interest generated in surveillance of occupational health problems, there is now a big and somewhat scary question posed by our many interested allies: "Now that you have our attention, what are you going to do about this thing called surveillance?" It is a challenge we cannot afford to fumble.

Action—The reason for data

In the Statement of Purpose for this meeting, there is a quote by Dr. Alexander D. Langmuir, for many years the Nation's premier epidemiologist and Director of the Epidemiology Program, Centers for Disease Control (CDC). He was my boss the first 5 years I was in the Public Health Service. In epidemiological circles, he is justifiably called the "Father of Disease Surveillance in America."

Beginning in the early 1950's, under Dr. Langmuir's leadership, CDC and its components have pioneered effort after effort in the surveillance of human health events. These encompass a very wide array from classical infectious diseases such as poliomyelitis and influenza to chronic diseases such as lead poisoning and cardiovascular disease to conditions that go beyond the definition of "disease" such as abortion and sudden infant death syndrome (SIDS). In discussing surveillance, he often said something akin to the following:

Surveillance is done for the sake of *action*—preventive intervention if possible—if not, at least analysis and meaningful reporting back to those who collected the data. Unless you are prepared to *act* on the data, surveillance is an unconscionable waste of resources.

We in NIOSH are interested in surveillance—surveillance for the sake of *action*, surveillance for the sake of *prevention*, and surveillance for the sake of *eradication*, if possible, of at least some occupational diseases and injuries. We, all of us here, now have the Nation's attention to the need for surveillance of occupational diseases and injuries. We have a priceless and probably fleeting opportunity to move forward briskly, intelligently, and together. Let's make the most of it!

Review of activities: Bureau of Labor Statistics

by Janet L. Norwood, Ph.D., Commissioner,
Bureau of Labor Statistics

Let me first say that I think that occupational safety and health is probably the most important issue in the labor market today. Jobs are important. Income is important. And there are a lot of other issues. But if we cannot have a safe and healthy workplace, it really does not matter to workers what happens otherwise.

Occupational safety and health information is essential to bringing about a safer and healthier workplace and to preventing the problems Dr. Millar was talking about. The economy today is changing; and I believe the changes are going to make it harder, not easier, to get good data. Our whole industrial economy is being restructured. Our manufacturing industries are becoming more efficient by removing from production many old, inefficient, and, perhaps, unsafe and unhealthy plants. At the same time, new technology is being put in place, and new substances are being used in the manufacturing process. We are creating a large number of jobs. In fact, in the past 49 months of recovery, we have added 12 million new jobs to the economy in different industries, activities, and occupations than before. We are, in fact, in the midst of change—both industrial and occupational. We need to take these changes into account if we are going to be looking at data on occupational safety and health.

What does this mean to us who are here today? We recognize the tremendous responsibility to develop information that can be used to establish public policy, to inform our citizens, and, for those who have responsibility to do so, to take preventive action. A number of these issues will be discussed here today. At the Bureau of Labor Statistics (BLS) we have had a program providing information on safety and health for a long time. When the Occupational Safety and Health Act was passed, the Secretary of Labor delegated the statistical requirements of that act to the Bureau of Labor Statistics. More than 10 years ago, we began a system of recordkeeping in establishments and a survey of business establishments—280,000 every year. We have a Federal-State cooperative relationship to develop consistent data from business establishments and from administrative records. We have also started a series of work injury surveys to provide data to the Department of Labor for regulatory decisions.

It is now more than 10 years since that work was begun. As in all statistical programs, it is always good to reassess where we are. For that reason, we have asked the Committee on National Statistics of the National Academy of Sciences to set up a panel to review this work. We believe, and I am very pleased to tell you that Secretary William Brock agrees, that recordkeeping and data are essential to the implementation of the Department of Labor's responsibilities. The data systems BLS and the National Center for Health Statistics (NCHS) maintain and the work that

the National Institute for Occupational Safety and Health (NIOSH) is doing can help to sensitize both workers and employers to these needs.

There are problems; there can be no question about that. There are problems with almost any statistical program. Some are harder to solve than others, but what we need to do is to keep working at them.

We have got to learn more about what causes injuries, illnesses, and fatalities in the workplace. By working together with NCHS and NIOSH, we can learn and perhaps develop a better data base for the population.

Many approaches can be taken to developing data in the workplace. There are household surveys, establishment surveys, and administrative records. Each data set has problems and strengths. In the household survey area, in addition to the NCHS sponsored surveys, there is the BLS's Current Population Survey that is basically a labor force survey. This survey, conducted for us by the U.S. Bureau of the Census, is used to collect information on people from 60,000 households who work or look for work. It was not designed to collect health, safety, or injury information. The surveys sponsored by NCHS are designed to collect health and injury data. They were not designed to collect information on the workplace. We need to experiment in both surveys to get additional information that will bring these data systems together.

We would be remiss if we ignored the fact that the existing household surveys were created for different purposes. There are a number of statistical issues that arise when we add questions to a survey. Occupational data are very difficult to collect. People do not always know what their occupation is. I had an interesting experience visiting the computer-assisted telephone installation of the U.S. Bureau of the Census, where testing on the Current Population Survey was conducted. I listened to the questioning of the respondents. One after the other, they stumbled on the questions of industry and occupation, but particularly of occupation. One respondent, when asked a question about industry and then about his occupation, said: "I just told you I worked in a bank. Why are you asking me my occupation?" Now we have to recognize as survey specialists that some improvements need to be made, both for survey purposes and also for administrative records. We should not get carried away with the belief that all we have to do is take a few questions and add them to the Current Population Survey or the National Health Interview Survey or put some extra codes on the mortality records. It may get us toward a more perfect data system, but it is not going to do it by itself.

I do want to express my admiration for the leadership that NCHS has taken in the whole area of cognition and survey research. I think Monroe Sirken's work is an example for the whole statistical system. It is an area that we at BLS are moving into as rapidly as possible. For the kinds of issues we are talking about today, cognitive testing is tremendously important.

There are other ways of getting data besides household surveys. Obviously establishment surveys are one way. At

BLS we have found that we get better occupational data from business establishments than from household surveys. Our occupational injuries and illnesses survey (interestingly the only mandatory survey in BLS) is an establishment survey based on a comprehensive recordkeeping system. We are working hard to improve the data from this survey. But we recognize that problems remain. We have also been looking at our other establishment surveys, such as the Wage and Industrial Relations Surveys, that may form the basis for further work. If we could find a way to get the resources, we would like very much to begin collecting data from business establishments and then surveying subsamples of employees at those establishments to get further information.

Another area of importance is the full use of administrative records. I am glad to see Fritz Sheuren here. He has probably done more than anyone in the statistical area to keep reminding us about the importance of administrative records as a source of data. They reduce the burden on respondents, and they usually cost less than direct surveys—certainly less than household surveys.

Our experience at the Bureau of Labor Statistics suggests that a great deal can be done through Federal and State cooperation. We like to think that BLS has developed one of the best Federal and State cooperative programs in the statistical system. Perhaps NCHS might disagree with us. We have, in the labor market area, tremendously good relationships with the States. We are building on those relationships in the safety and health area. The only way to have an effective Federal and State cooperative relationship is to make it truly cooperative. That means that there have to be two parties to the system. Second, it has to be a system in which both parties gain. You cannot go out to the States and say, "You have got to do this because the Federal Government wants you to do it." Even if you pay them for it, the States have to need the data that are collected.

In my experience, I have found the real work to be in the rest of the country—not here in Washington. The data that can be used by the States are usually the most practical data for administering programs and even for informing the general population. Our job in the Federal Government is

to try to provide leadership, to bring the States together, and to develop quality standards and statistical approaches to have data that can be matched or coordinated for the States as well as for the Federal Government. The National Center for Health Statistics has a great deal of experience in working with public health authorities. At BLS we are beginning to work more and more with public health authorities in the States. Our major contacts have been with the Departments of Labor in the States, in most cases with the employment security agencies. All of the data collected by these agencies are extremely important to the Nation as a whole and to its people. Because we believe that these issues are so important, we are devoting a great deal of attention this year to a complete reorganization of our Wage-Industrial Relations and Safety and Health Programs. George Stelluto and William Eisenberg are perhaps spending more time with me than they would like, but when we are through, we will have moved ahead a great deal.

This really underscores the importance of the work of this conference. We were very pleased at the response we got to the conference that BLS hosted with assistance from NIOSH and NCHS on issues involving the measurement of health statistics in Albuquerque. We hope to see more and more of these kinds of cooperative endeavors. The problems are too large to be solved by any single statistical agency. We have to remember that we are living in a period of budget austerity, and the challenge is to find ways to accomplish what we need to do at minimum cost. We have to get large benefits with small increases in budget. I believe that we can find ways to develop data from household surveys, from business establishments, and from administrative records. Sampling of administrative records is extremely important because collecting comprehensive data may not be possible.

We would like to draw from administrative data in a more practical manner to develop estimates for the States and the Nation as a whole. We believe that, by working together, we can find ways to develop the information that is needed to understand the kinds of issues that are facing this country and to move forward to improve the conditions in the workplace.

Review of activities and conference objectives: National Center for Health Statistics

by Jacob Feldman, Ph.D., Director, Office of Analysis and Epidemiology, National Center for Health Statistics

It is a great pleasure for me to welcome our distinguished speakers and participants to this Workshop on occupational health statistics. This Workshop, a joint effort of the National Center for Health Statistics (NCHS), the Bureau of Labor Statistics (BLS), and the National Institute for Occupational Safety and Health (NIOSH), will serve several purposes. The Workshop will identify gaps in occupational health statistics that are needed for problem identification and surveillance. It will help identify the role of participating agencies, particularly that of the NCHS, which is the Federal agency responsible for collecting general purpose health statistics. And, finally, the Workshop will help to identify resources to support this effort.

This Workshop will focus on occupational mortality statistics, an area in which NCHS and its predecessor agencies have a long history. Our current developmental activities are reaching a stage that makes today's topic particularly apropos. We are interested in determining how vital statistics data can contribute to the development of a national strategy for occupational mortality surveillance and research.

Surveillance and research in the areas of occupationally related illness and injury are extremely important topics. Indeed, the spectrum of the Leading Work-Related Diseases and Injuries identified by NIOSH (Centers for Disease Control, 1983) necessitates the collection of health data from early symptoms of disease to clinical illness and ultimately death. The development of a coordinated national strategy to measure these outcomes may require the use of several different and complementary data systems.

I will digress briefly to discuss some alternative methods for collecting occupational mortality data. A study published by Kitagawa and Hauser (1973) linked about 300,000 death certificates for the period May through August 1960 with the U.S. Bureau of the Census' schedules on April 1 for those individuals. From the U.S. Bureau of the Census questionnaire, the current occupation of the individual could be determined. Because the death certificates and U.S. Bureau of the Census questionnaires represented information for the same population, the mortality rates could be calculated for different occupational groups. Unfortunately, even with the fairly large sample size, the data base was not sufficiently large to do analyses on specific occupations or on highly specific causes of death.

In an ongoing study jointly sponsored by NCHS, the U.S. Bureau of the Census, and the National Heart, Lung, and Blood Institute, a sample of about a million individuals who had been participants in the Current Population Survey for 1978-83 are being tracked through the National Death Index (Rosenberg and Feinleib, 1986). This study

links the Current Population Survey sample with death records in a prospective fashion, providing a growing data base similar to that of Kitagawa and Hauser (1973).

Mortality as an endpoint has certain methodologic limitations for studies of occupational health. Death generally occurs late in the etiologic process. However, if morbidity measures can be detected at an earlier point, interventions might be performed. At NCHS we are currently planning our third National Health and Nutrition Examination Survey (NHANES III) in close collaboration with NIOSH and various other agencies. That survey will have an occupational component, including assessments of central nervous system and pulmonary functions. In addition, determinations of some trace metal concentrations in blood and urine and, in a nonrandom sample of 20 to 59-year-old subjects, volatile organic compounds in blood and pesticide residues in urine will be used as indicators of exposures to some toxicants. Two examination surveys were completed in the 1970's. The first of these surveys, NHANES I, is being followed up in collaboration with the National Institutes of Health. This will provide information on the course of occupationally-related diseases and on diseases that developed after the initial survey. Finally, the National Health Interview Survey (NHIS) can also be used for occupational morbidity analyses. NIOSH has used the survey to publish differentials in a variety of conditions according to industry and occupation (Kaminski and Spirtas, 1980). We are trying to improve the measures of occupational exposure in that survey. The 1988 NHIS will include a special topic section on occupational health developed in collaboration with NIOSH and BLS. This survey will include questions on longest job; symptoms of backpain or hand discomfort; work injuries; skin conditions; eye, nose, and throat irritation; and chronic conditions.

In this Workshop, we would like to review the collection and use of data regarding mortality risks by occupation and industry in order to develop recommendations regarding future directions. Of crucial concern to NCHS is the continued implementation of coding of industry and occupation on death certificates. A variety of options that focus on data collected by NCHS and the States will be reviewed. These should be evaluated using criteria such as timeliness, geographic and occupational coverage and detail, data quality, and surveillance capability (that is, sensitivity and specificity of the compilations of the occupationally related mortality data). The issues are:

- How many relationships between occupational exposure and deaths are discovered based on coded occupational data from death certificates?
- What proportion of all of the elevated standardized mortality ratios or proportionate mortality ratios that are identified turn out to identify hazardous situations?
- Could the information have been gotten by other methods?

We anticipate that, by using existing data that include coding occupation and industry from death certificates and by implementing new data collection efforts in support of a

national strategy for occupational mortality surveillance and research, the efforts of this Workshop will result in the development of practical recommendations and priorities.

Statistics compiled from death certificates have been crucial historically to occupational health studies. Over two centuries ago, Sir Percival Pott observed the association between the occupation of chimney sweep and an elevated risk of scrotal cancer, due to the exposure to soot. Since that time, many countries have produced occupational health data from death records. Great Britain has the best record; they have produced an occupational mortality supplement almost every 10 years for the past century from vital statistics in combination with their census data. The record for the United States is much spottier; we published national studies in 1870, 1880, 1890, 1900, 1930, and 1950.

Occupation and industry from information is obtained from the funeral director's entry on two items on the death certificate (figure 1). Figure 1 is the U.S. Standard Certificate of Death that is being recommended by NCHS for use

in the States beginning in 1989. The Standard Certificate of Death is revised about every 10 years to reflect changes in the need for statistical data and to meet changing State legal requirements. The Standard Certificate of Death that will be used beginning next year differs from that used for many years in the United States; however, the occupation and industry items (12a and 12b) are unchanged from the version of the death certificate currently in use. Almost all States use items that are identical or very similar to those recommended on the Standard Certificate of Death (Kaminski et al., 1981). Specifically, the information sought is the decedent's usual occupation, that is, the kind of work during most of his or her working life, and his or her kind of business or industry.

In the most recent national study for the United States by Guralnick (1962, 1963a, 1963b, 1963c), working with Moriyama and Dorn, occupational mortality was estimated from death certificates for over 300,000 male decedents. Table 1 provides illustrative data from this study for males

Table 1. Deaths of men 20-64 years of age of races other than white with work experience, from selected causes of death, by major occupation group, age, and standardized mortality ratios: United States, 1950
[Farmers and farm laborers]

Cause of death	Total	Standardized mortality ratio	
		20-64 years	25-59 years
All causes	11,569	190	196
Tuberculosis, all forms001-019	752	258	259
Syphilis and its sequelae020-029	251	405	439
Malignant neoplasm, including neoplasms of lymphatic and hematopoietic tissues140-205	889	700	104
Malignant neoplasm of buccal cavity and pharynx140-148	25	74	(¹)
Malignant neoplasm of stomach151	225	201	210
Malignant neoplasm of intestine and rectum152-154	89	72	83
Malignant neoplasm of trachea, and of bronchus and lung162,163	87	49	55
Malignant neoplasm of prostate177	100	270	324
Malignant neoplasm of kidney180	11	(¹)	(¹)
Malignant neoplasm of bladder and other urinary organs181	20	69	(¹)
Malignant neoplasm of brain and other parts of nervous system . . .193	12	(¹)	(¹)
Leukemia and aleukemia204	34	83	83
Lymphosarcoma and other neoplasms of lymphatic and hematopoietic tissues . .200-203,205	37	66	74
Diabetes mellitus260	96	143	164
Major cardiovascular-renal diseases330-334,400-468,592-594	5,555	187	190
Diseases of cardiovascular system330-334,400-468	5,170	180	183
Vascular lesions affecting central nervous system330-334	1,472	362	397
Diseases of heart and rheumatic fever400-402,410-443	3,408	145	145
Rheumatic fever and chronic rheumatic heart disease400-402,410-416	156	118	107
Arteriosclerotic heart disease, including coronary disease . . .420	1,184	71	73
Arteriosclerotic heart disease so described420.0	245	94	103
Other diseases of coronary arteries420.1,420.2	939	67	69
Other myocardial degeneration422	407	263	261
Hypertension with heart disease440-443	1,086	415	416
Hypertension without mention of heart444-447	151	343	303
General arteriosclerosis450	85	354	500
Chronic and unspecified nephritis and other renal sclerosis592-594	385	385	376
Influenza and pneumonia480-493	451	337	332
Other diseases of respiratory system470-475,500-527	71	703	713
Ulcer of stomach540	57	150	161
Ulcer of duodenum541	23	68	(¹)
Appendicitis550-553	34	179	229
Hernia and intestinal obstruction560,561,570	86	297	300
Cirrhosis of liver581	61	54	78
AccidentsE800-E962	1,139	175	179
While at work	167	108	109
Not while at work and not stated	972	195	202
SuicideE963,E970-E979	105	59	56
HomicideE964,E980-E985	629	662	672

SOURCE: Guralnick, 1963a.

¹Rate or ratio not computed.

TYPE/PRINT IN PERMANENT BLACK INK FOR INSTRUCTIONS SEE OTHER SIDE AND HANDBOOK		U.S. STANDARD CERTIFICATE OF DEATH		STATE FILE NUMBER
LOCAL FILE NUMBER				
DECEASED 1. DECEDENT'S NAME (First, Middle, Last) 4. SOCIAL SECURITY NUMBER 8. WAS DECEDENT EVER IN U.S. ARMED FORCES? (Yes or no) 9b. FACILITY NAME (If not institution, give street and number) 10. MARITAL STATUS—Married, Never Married, Widowed, Divorced (Specify) 13a. RESIDENCE—STATE 13b. COUNTY 13c. CITY, TOWN, OR LOCATION 13d. STREET AND NUMBER 13e. INSIDE CITY LIMITS? (Yes or no) 13f. ZIP CODE		2. SEX 3. DATE OF DEATH (Month, Day, Year) 5a. AGE—Last Birthday (Years) 5b. UNDER 1 YEAR 5c. UNDER 1 DAY 6. DATE OF BIRTH (Month, Day, Year) 7. BIRTHPLACE (City and State or Foreign Country) 9a. PLACE OF DEATH (Check only one; see instructions on other side) HOSPITAL: ☐ Inpatient ☐ ER/Outpatient ☐ OOA OTHER: ☐ Nursing Home ☐ Residence ☐ Other (Specify) 11. SURVIVING SPOUSE (If wife, give maiden name) 12a. DECEDENT'S USUAL OCCUPATION (Give kind of work done during most of working life. Do not use retired.) 12b. KIND OF BUSINESS/INDUSTRY 14. WAS DECEDENT OF HISPANIC ORIGIN? (Specify No or Yes—If yes, specify Cuban, Mexican, Puerto Rican, etc.) ☐ No ☐ Yes 15. RACE—American Indian, Black, White, etc. (Specify) 16. DECEDENT'S EDUCATION (Specify only highest grade completed) Elementary/Secondary 60-12 College 13-16 or 5+1		
PARENTS 17. FATHER'S NAME (First, Middle, Last) 18. MOTHER'S NAME (First, Middle, Maiden Surname)		INFORMANT 19a. INFORMANT'S NAME (Type/Print) 19b. MAILING ADDRESS (Street and Number or Rural Route Number, City or Town, State, Zip Code)		
DISPOSITION 20a. METHOD OF DISPOSITION ☐ Burial ☐ Cremation ☐ Removal from State ☐ Donation ☐ Other (Specify) 20b. PLACE OF DISPOSITION (Name of cemetery, crematory, or other place) 20c. LOCATION—City or Town, State		21a. SIGNATURE OF FUNERAL SERVICE LICENSEE OR PERSON ACTING AS SUCH 21b. LICENSE NUMBER (of Licensee) 22. NAME AND ADDRESS OF FACILITY		
PRONOUNCING PHYSICIAN ONLY Complete items 23a-c only when certifying physician is not available at time of death to certify cause of death. 23a. To the best of my knowledge, death occurred at the time, date, and place stated. Signature and Title 23b. LICENSE NUMBER 23c. DATE SIGNED (Month, Day, Year)		24. TIME OF DEATH 25. DATE PRONOUNCED DEAD (Month, Day, Year) 26. WAS CASE REFERRED TO MEDICAL EXAMINER/CORONER? (Yes or no)		
CAUSE OF DEATH 27. PART I. Enter the diseases, injuries, or complications that caused the death. Do not enter the mode of dying, such as cardiac or respiratory arrest, shock, or heart failure. List only one cause on each line. IMMEDIATE CAUSE (Final disease or condition resulting in death) a. _____ DUE TO IOR AS A CONSEQUENCE OF: b. _____ DUE TO IOR AS A CONSEQUENCE OF: c. _____ DUE TO IOR AS A CONSEQUENCE OF: d. _____ Sequentially list conditions, if any, leading to immediate cause. Enter UNDERLYING CAUSE (Disease or injury that initiated events resulting in death) LAST PART II. Other significant conditions contributing to death but not resulting in the underlying cause given in Part I.		28a. WAS AN AUTOPSY PERFORMED? (Yes or no) 28b. WERE AUTOPSY FINDINGS AVAILABLE PRIOR TO COMPLETION OF CAUSE OF DEATH? (Yes or no)		
29. MANNER OF DEATH ☐ Natural ☐ Pending Investigation ☐ Accident ☐ Could not be Determined ☐ Suicide ☐ Homicide		30a. DATE OF INJURY (Month, Day, Year) 30b. TIME OF INJURY 30c. INJURY AT WORK? (Yes or no) 30d. DESCRIBE HOW INJURY OCCURRED 30e. PLACE OF INJURY—At home, farm, street, factory, office building, etc. (Specify) 30f. LOCATION (Street and Number or Rural Route Number, City or Town, State)		
CERTIFIER 31a. CERTIFIER (Check only one) ☐ CERTIFYING PHYSICIAN (Physician certifying cause of death when another physician has pronounced death and completed item 23) To the best of my knowledge, death occurred due to the cause(s) and manner as stated. ☐ PRONOUNCING AND CERTIFYING PHYSICIAN (Physician both pronouncing death and certifying to cause of death) To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner as stated. ☐ MEDICAL EXAMINER/CORONER On the basis of examination and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner as stated.		31b. SIGNATURE AND TITLE OF CERTIFIER 31c. LICENSE NUMBER 31d. DATE SIGNED (Month, Day, Year)		
REGISTRAR 32. NAME AND ADDRESS OF PERSON WHO COMPLETED CAUSE OF DEATH (ITEM 27) (Type/Print) 33. REGISTRAR'S SIGNATURE 34. DATE FILED (Month, Day, Year)				

Figure 1. U.S. Standard Certificate of Death

Table 2. Observed numbers of deaths and standardized mortality ratios (SMR) for selected occupational groups exhibiting excess mortality from malignant and nonmalignant respiratory disease for males aged 20-64 years: United States, 1950

Occupational group	Mortality from malignant neoplasms of trachea, bronchus, and lung		Nonmalignant respiratory disease other than influenza and pneumonia	
	Deaths	SMR	Deaths	SMR
Barbers, etc	95	¹ 151	29	126
Cooks, except private household	91	¹ 165	41	¹ 195
Machinists and job setters	190	¹ 138	66	125
Molders, metal.	34	¹ 227	30	¹ 500
Painters (construction), paperhangers, and glaziers.	212	¹ 167	64	² 133
Taxicab drivers and chauffeurs	77	¹ 188	36	¹ 225
Laborers, wood products, etc.	414	¹ 138	20	154
Laborers, primary metal industries	82	¹ 167	49	¹ 258
Laborers, transportation equipment.	30	¹ 200	26	¹ 433
Operatives, etc., primary metal industries	77	¹ 145	41	¹ 195

¹SMR significantly above 100 at $p < .01$.

²SMR significantly above 100 at $p < .05$.

SOURCE: Guralnick, 1963a.

of races other than white whose usual occupation at the time of their death was farmer or farm laborer. The underlined standardized mortality ratios (SMR's) in the last two columns represent significantly elevated risks for death due to specific causes. The set of tables presented in the report by Guralnick identified specific causes of death as elevated in certain occupations and industries. Table 2 from the same study shows another use of these data. SMR's for nonmalignant respiratory disease (basically chronic obstructive pulmonary disease) and for malignant neoplasms of the trachea, bronchus, and lung were highly related, from which it was inferred that nonmalignant respiratory disease was probably an earlier indicator that might be used in a morbidity study to identify types of exposures.

Since the 1950 study, NCHS has undertaken no full-scale national study, but a number of States, including California, Rhode Island, Wisconsin, Washington, and Pennsylvania, have produced periodic studies; Wisconsin produces annual data from death certificates. A survey of States in 1979, carried out by the Association of Vital Records and Health Statistics, the voluntary organization that represents the interests of State vital registration officials, revealed that about a dozen States were coding occupation and industry on the death certificate. Six of these States coded both occupation and industry, five coded occupation only, and one coded industry only. However, the different States did not use the same coding system, resulting in problems of comparability among State studies. Prior to 1979, no national standards or procedures existed for coding or classifying the cause of death from the death certificate.

At the same time, there was a growing interest in environmental and health issues. The NCHS (1977) report, "Statistics Needed for Determining the Effects of the Environment on Health," discusses many of these interests. The convergence of interests and needs resulted in the collaboration of a number of Federal agencies (including NCHS, NIOSH, NCI, and the U.S. Bureau of the Census) and the States that has resulted in 32 States and the District of Columbia coding occupation from data on the death certificates on a routine and uniform basis. The rapid growth in

the number of reporting areas that have adopted uniform coding procedures for occupation and industry from the death certificate is shown in Table 3. The number of States that are providing the data to NCHS is now 20.

Let me briefly summarize our achievements to date.

- In 1978, with the U.S. Bureau of the Census and NIOSH, we conducted an evaluation study on the completeness of reporting and codability of the occupational information on the death certificate. We found that over 75 percent of the occupational entries in the sample of 5,000 records were codable (Rosenberg et al., 1979).
- In 1983, we published a handbook for funeral directors to promote accurate and complete reporting of occupation and industry information on the death certificate.
- In 1984, an instruction manual was first produced by NCHS, NIOSH, and the U.S. Bureau of the Census for uniform coding of occupation and industry on the death certificates (NCHS, annual).
- NCHS currently does quality control coding for the 20 States that submit coded occupational data to NCHS.
- In 1988, we plan to publish the first periodic report on occupational mortality as a supplement to the NCHS publication *Monthly Vital Statistics Report*. This will include data from about 270,000 deaths in 12 reporting States.

Table 3. Growth in number of reporting areas adopting uniform occupation and industry coding procedures

Date year	Number of areas coding occupation and industry	Number of areas providing NCHS with occupation and industry data	Number of areas reimbursed
1983	15	11	0
1984	26	13	0
1985	30	16	5
1986	32	19	7
1987	34	¹ 19	11

¹Estimate.

SOURCE: National Center for Health Statistics, unpublished data.

In a word, we have made considerable progress with the program of occupational mortality data collection, which is now institutionalized in two out of every three States.

NCHS has been able to make this progress in large part through collaboration with NIOSH and NCI, who have provided funding for the first steps. NCHS is giving a great deal of thought to the future of the occupational mortality program. As part of our planning for fiscal year 1989, we are, in fact, doing a rather full review of this program. It is imperative that any request for new funds to carry forward the occupational mortality program must be made only after a careful review of the needs of the States for the data, the uses to which it will be put, and the various options for its collection. We hope that with your assistance, we can explore these issues and provide a solid basis for developing NCHS' plans for occupational mortality.

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Utah's experience in building an occupational health surveillance program

by John E. Brockert, Director, Bureau of Health Statistics, Utah Department of Health

The initial impetus for the development of an occupational health program in Utah occurred in 1978 because of the interest of Mark Nichols, M.D., then the Director of the Chronic Disease Program. The Chronic Disease Program provided resources for the manual translation of occupation from the death certificate to a listing of all deaths of males 16 through 65 years of age, for the period 1959-68. That experience demonstrated the extensive amount of work involved in coding and keying occupation from the death certificate. However, the results of that analysis did identify a population potentially at high risk for myocardial infarction, employed in the rocket industries located in Utah. These results were reported in a master's thesis by Dr. Nichols.

In 1980 the National Institute for Occupational Safety and Health (NIOSH) announced the Surveillance Cooperative Agreements between NIOSH and the States (SCANS) projects and the staff in the Bureau of Health Statistics realized they had a great advantage to compete for one of these contracts. The Director of Health Statistics was concerned that Federal funding might be obtained; and then after 2 years, the Department would either have to go to the legislature for State funding or drop the program. That concern was expressed to the Administration of the Department, and the response was to apply for the contract funds and worry about additional funding later. The Utah proposal was one of six proposals that were subsequently funded through the first SCANS awards by NIOSH.

The Occupational Health Program efforts by the Bureau of Health Statistics were particularly productive during the next 2 years. We successfully coded the occupation and industry for all death certificates on file from 1957 through 1980. This was in excess of 150,000 deaths. We were also successful in doing some preliminary coding of occupation on the birth certificates. Proportionate mortality ratios (PMR's) were prepared for 85 cause-of-death categories and 85 occupation or industry categories. A series of technical reports was prepared on coal miners, farm workers, and wood workers in Utah that utilized the PMR's available from this large resource.

Several meetings were held with interested users from the University of Utah, the Rocky Mountain Center for Occupational and Environmental Health, the Utah State University, the State Industrial Commission, and from Dr. Mark Nichols (now director of a local health department). There was widespread support and encouragement for further analysis and publication of occupational health data. The report on lung disease mortality in Utah miners was printed in *Utah Science*, published by the Utah Agricultural Experiment Station at Utah State University. Two additional reports were presented, and they are part of the proceedings of two national scientific meetings.

The Department of Health continued to be interested in the occupational health program and, subsequently, allocated resources to obtain an occupational health epidemiologist. A member of the department staff, Richard Johns, M.D., was assigned to head up the department's epidemiology programs. He hired Dennis Perrotta, Ph.D., to work with him as an occupational health epidemiologist. Subsequently, Dr. Johns left employment with the Department of Health to complete post-doctoral studies in occupational health. Dr. Perrotta continued to be active in occupational health epidemiology with the department until October 1986, when he transferred to a similar program in the Texas Department of Health. While still in Utah, he was the recipient of a 1984 NIOSH contract to study the effect of anesthetic gas on reproductive outcomes of medical personnel.

The Bureau of Health Statistics was also a recipient of a 1984 NIOSH contract to study occupational injuries in Utah. This contract continued to build on the work that was already completed, extending it to include mortality data for 1981-84. Under this contract, we successfully linked the injury information from the Industrial Commission with our mortality files. This analysis provides preliminary confirmation that there were workers who were injury prone. They appeared in the Industrial Commission injury files on multiple occasions, and they had a higher probability of being linked with the Utah mortality file of deaths due to injuries than persons who appeared in the injury file only once.

Starting in 1984, Utah was one of the States to contract with NCHS for the provision of current mortality data coded for occupation and industry. That contract was to provide 1985 data; and, subsequently, it has been renewed for 1986 data. We have also been successful in recently completing the coding for 1984, and we will shortly be providing NCHS with that data tape.

With funding from the original SCANS contract, Utah has been developing an automated dictionary of occupation and industry titles and codes. Currently, we have about 25,000 linked occupation and industry titles and codes in our automated dictionary. Since 1978, we have keyed the literal entry for occupation and industry on all death certificates. Monthly, the keyed literals are matched with the dictionary. Currently, we are getting a 60-percent match. The balance are coded manually by our coding staff. The codes are keyed, and the monthly death file is updated. The automated dictionary is also updated.

Utah has approximately 800 deaths per month, and it is able to complete the occupation and industry coding and keying for a total cost of \$500.00 per month. This includes all of the activities described above.

I believe the success in the development of the Utah Occupational Health Surveillance Program has been at least partially the result of our willingness to involve other parts of the department and other agencies outside the department in our efforts. It is seen as a broad-range program that will improve the health of Utah's workers by reducing injuries and illness that are occupationally related.

Chapter II.

Review of options for producing occupational mortality data

The second session of the Workshop was devoted to a review of 10 options for producing occupational mortality data, focusing in particular on the existing system used by the National Center for Health Statistics (NCHS). These options (summarized in table 4) were suggested in discussions with several Workshop planners and participants in preparation for the Workshop. They were presented at the Workshop by representatives of the sponsoring agencies, but they did not necessarily reflect the priorities of those agencies.

The session was introduced by John E. Patterson, Director, Division of Vital Statistics (DVS), National Center for Health Statistics. DVS operates the national vital statistics program with the States under an administrative arrangement called the Vital Statistics Cooperative Program (VSCP). Data from vital records filed in the States are sent on data tapes to NCHS for consolidation into the national vital statistics data base, which includes births, marriages, divorces, fetal deaths, abortions, and deaths. Beginning in 1984, coded occupational and industry data have been sent by some States, now numbering 20, to NCHS along with other coded mortality information. A more detailed description of this program is given later as Option No. 1. Other options that were considered by the individual working groups and the Workshop as a whole in plenary session are also described. All of the cost estimates discussed in Option Nos. 1-10 are expressed in 1986 dollars.

Option No. 1. Existing system: Occupational mortality coding at the National Center for Health Statistics for 20 States (Annual)

Presented by Harry M. Rosenberg, National
Center for Health Statistics

Description

The purpose of this project, which is a collaborative activity of NCHS, the National Institute for Occupational Safety and Health (NIOSH), and the National Cancer Institute (NCI), is to develop a data system—within the context of VSCP—that can produce on a routine basis occupational mortality data from the death certificate.

The death certificate asks for the usual occupation and industry of the decedent. This information can be readily

coded using the existing coding and classification system developed jointly by NCHS, NIOSH, and the U.S. Bureau of the Census. The system is based on State utilization of common coding procedures promulgated by NCHS and on State acceptance of NCHS quality control standards for coding. The system was initiated during 1978-79, when a special study was undertaken by the U.S. Bureau of the Census for NCHS to evaluate the codability from the death certificate of the usual occupation and the usual business or industry of decedent (Rosenberg et al., 1979).

As of 1987, this VSCP approach was well institutionalized. A total of 32 States and the District of Columbia code this information from the death certificate, with partial support to 11 States from the participating agencies. A total of 20 of the 32 States are sending their coded data, including usual industry and occupation, to NCHS for quality control and for incorporation into the multi-State data base, which includes other routinely coded demographic and medical information available for all other deaths in the coded death records (including underlying and multiple causes of death). Seed money for this program has been primarily available on a reimbursable basis from NIOSH and NCI. The substantial NCI contribution will end with fiscal year 1988, at which time NCHS has indicated that it will attempt to obtain appropriated funds to continue and expand the program.

Uses

Occupational information from the death certificate is one of the most accessible, routinely available, and geographically comparable sources of data for measuring occupational health effects over time and across geographic areas. It can be used to identify possible problem areas (geographic or occupational), to generate hypotheses, and to monitor change over time. The usefulness of the vital statistics files for occupational health studies has been demonstrated over the years in the decennial reports of Great Britain, in periodic reports for a number of States (for example, California, Pennsylvania, Wisconsin, Washington, and Rhode Island), and the United States in 1950. Measures of risk based on the VSCP approach can include standardized mortality ratios (SMR's), at least on a decennial basis but possibly on an annual basis. In the absence of population data, measures of relative risk (for example, proportionate mortality ratios, or PMR's) can be used.

Table 4. Synopsis of options

Option	Average annual cost	Periodicity	Federal cost per death	Number of records/ number of deaths	Statistical measures	Can analysis be done by detailed I/O codes?	Can analysis be done by detailed causes of death?	Confidentiality an issue?	Comments
1. Existing system	\$691,000 ¹ (NCHS: \$294,000)	Annual	\$1.30	265,000/ 265,000	PMR	Yes	Yes	No	Provides for small area analysis for reporting areas; limited in coverage
2. Annual I/O coding for all States	\$3,850,000 ¹ (NCHS: \$1,450,000)	Annual	\$0.75	2,000,000/ 2,000,000	PMR	Yes	Yes	No	Maximizes statistical power, geographic coverage, and depth of I/O and cause of death analysis
3. I/O coding for all States for years around decennial census	\$4.4-7.4 ² million (NCHS: \$4.4-7.4 million)	Pericensal (for 3 years every 10 years)	\$2.20-3.70	6,000,000/ 6,000,000	PMR, SMR	Yes	Yes	No	Does not allow for development of ongoing state programs
4. Annual data for subset of causes and/or subset of States	Variable	Annual	Variable	Variable	PMR	Selected I/O codes	Selected causes	No	Lower costs, limited analysis depending on program design
5. Mortality Followback Survey	\$360,000 ³ (NCHS: \$90,000)	Every 5 years	\$90	20,000/ 20,000	PMR, rates	No	No	No	Analysis for detail dependent on survey design; no small area analysis
6a. Followup of NHANES III for 10 years	\$803,000 ⁴	1988-1994, followed for 10 years	\$2,870	28,000/ 2,800	SMR, population based measures	No	No	Yes	Extensive examination findings useful for analytic studies and prevalence estimates
b. Followup of 3 consecutive years of NHIS for 10 years	\$123,000 ⁵	3 years, followed for 10 years	\$37	330,000/ 33,000	SMR, population based measures	Yes	Perhaps	Yes	
7. Use National Infant and Maternal Health Survey	\$132,500 ⁶	4 year survey period	\$53	20,000/ 10,000	PMR	No	Perhaps	Yes	Potential use for reproductive hazard exposures
8. Use National Longitudinal Mortality Study	\$2,600,000 ⁷	1979-1981	\$48	1,000,000/ 55,000	SMR	Yes	Yes	No	Mortality differentials by industry and occupation for current job and usual industry and occupation from death certificate
9a. Use Annual Survey (BLS)	\$2,500,000 ⁸	Annual	\$ ⁹	2,800,000 employers/ 1,562 in 1985	Rates, counts	Industry only	Fatality event or source	Yes	Limited by coverage
b. Use SDS (BLS)	\$2,000,000 ⁸	Annual	\$ ⁹	Variable/1,179 in 10 States in 1983	Counts	Yes	Fatality event or source	Yes	Limited by coverage and lack of population base
10. Use of Compressed Mortality File	\$10,000 ¹⁰	1968-83	\$0.003	31,000,000/ 31,000,000	SMR	No	Yes	No	Excellent for geographic and time trend surveillance by underlying cause of death

¹Includes State costs.²Depends on State charges to NCHS for purchasing death certificates.³Costs attributed to occupational portion of survey.⁴Includes exam costs for occupational component estimated \$8,000,000 and \$28,000 NDI costs.⁵Includes \$900,000 interview costs for 3 years for occupational component and \$330,000 NDI costs for 10 years.⁶Based on estimated survey cost of \$480,000 over 4 years for occupational component plus \$50,000 for I/O coding.⁷Estimated costs per death based on 1973-1983 samples.⁸Includes costs of processing of both fatal and nonfatal cases.⁹Costs for processing fatal cases are not available separately from nonfatal cases.¹⁰Estimated processing and secondary data collection costs.

Costs

The projected cost of the program is as follows:

- If the program were to continue at the present level (11 States), the pass-through funding requirement for FY 1989 would be about \$176,000.
- If the program were to be expanded to the 20 States currently sending data to NCHS, it would require an estimated \$375,000.

These figures represent only the Federal support to the States for coding their data. The additional cost to NCHS for processing, analyzing, and publishing these data is estimated to be about \$118,000 annually, bringing the total NCHS cost to \$294,000 annually for program continuation at the present level (table 4). For NIOSH, the cost is about \$45,000 annually. Further, the States incur a cost estimated to be about twice that for which NCHS reimburses them. Altogether, then, the per record Federal cost of the existing approach to fund 11 States is about \$1.30. The per record cost, including the State share, is \$2.60. The cost of State coding might ultimately be reduced somewhat if automated coding of occupation and industry, being investigated by the U.S. Bureau of the Census for the 1990 Census, proves cost effective.

Advantages and disadvantages

Option No. 1, the existing system, is on line and working effectively in 32 States, of which 20 States are sending NCHS data on a routine basis for inclusion on data tapes and reports, the first report of which will be produced in 1988. The data are produced as an integral part of the ongoing vital statistics system at the State and Federal levels; neither technical nor administrative problems have been encountered that have not been overcome in a routine fashion. Option No. 1 can provide for the full range of occupation and cause-of-death detail for areas as small as counties and for States, a distinct advantage where surveillance is sought for detailed occupations and for small geographic areas. Second, all death certificates within these States are covered, not just a sample of deaths. And, third, as a State-based system, this approach can be used by the States in support of State-administered occupational health programs.

An advantage of the State-based approach is that questionable information reported on the death certificate can be queried by the State vital statistics offices, much as other questionable entries are often queried as part of the regular vital statistics program at the State level. Querying at the national level is no longer possible because the Federal Government is not a repository of actual death certificates, which are filed in the States, nor does it routinely receive copies of certificates. Increasingly, State vital statistics offices are making precoded information available to NCHS on data tapes. NCHS has copies of only a small number of records that are independently coded each month for quality control purposes, as well as an additional 10-percent sample of records used by NCHS to produce

current estimates of mortality by cause of death, published in the NCHS *Monthly Vital Statistics Report*.

A further advantage of Option No. 1 is that it is relatively inexpensive per record, even when compared with Option No. 3, which is a special study around the time of the decennial census.

The disadvantages of the system are related to developing meaningful measures of risk. In particular, the absence of denominator data on a routine and continuing basis can present a problem. Even with census-based data, there are differences between the nature of the occupational information collected through the vital statistics system and that collected by means of censuses and surveys: the death certificate asks for "usual occupation" whereas the Census asks for "current occupation." The absence of annual denominator data means that reliance for measures of risk has to be placed on frequencies or PMR's, which in many cases may serve well. Another disadvantage is the present limited number of States that participate. These States may not be representative of the United States as a whole or even of areas with occupational mortality patterns that merit attention.

Questions and Answers

During the brief question-and-answer period, the following points were made:

- The coverage of the ongoing system, with participation of 20 States, includes about 584,000 death records per year, or 28 percent of all U.S. deaths annually.
- The participating States are coding occupation and industry on all records that report this information, that is, there is no arbitrary age cutoff.
- Quality control on medical items and on demographic items, including occupation and industry, is carried out on a continuous basis by NCHS by coding a sample of records monthly that NCHS receives from the States and by comparing the NCHS-assigned codes with those sent to NCHS by the States. If the State coding does not achieve a pre-established level of quality, the batch of records that the sample represents has to be recoded by the State.

Option No. 2. Expanding the existing system to all States (Annual)

Presented by Harry M. Rosenberg, National Center for Health Statistics

Description

Option No. 2 is similar to Option No. 1 except that coverage would be rapidly expanded to include all 54 registration areas (that is, all States, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands), rather than the estimated 20 States in the program for 1987.

Uses

Occupational information from the death certificate is one of the most accessible, routinely available, and geographically comparable sources of data for measuring occupational health effects over time and across geographic areas. It can be used to identify possible problem areas (geographic or occupational), to generate hypotheses, and to monitor changes over time.

Costs

The estimated annual Federal support to the States under this approach is \$1.2 million. The additional cost to the Federal Government for processing, analyzing, and publishing these data is estimated to be about \$250,000. Further, the States incur a cost estimated to be about twice that for which NCHS reimburses them. The per record Federal cost is estimated to be about \$.75 and \$1.90 for the total cost (table 4), including the State share.

Advantages and disadvantages

The advantages of national coverage are the ability to produce national counts of deaths by occupation and industry; and, in contrast to the 1950 national study (Guralnick, 1962, 1963a, 1963b, 1963c), there would be a sufficiently large number of cases to provide estimates of occupational mortality for detailed occupations and causes of death. A larger data base also would permit occupational mortality analysis for small geographic areas.

Option No. 2 has all the advantages cited for Option No. 1. It is State based, and thus it can tie into occupational health programs at the State level. It can have a querying component at the State level to improve quality. Further, as a larger data base, it can provide estimates and measures of greater statistical reliability and it can provide a sampling frame for followback surveys.

Disadvantages are related to the absence of denominator data except for census years, although some limited population estimates by occupation and industry are available from the Current Population Survey, conducted monthly by the U.S. Bureau of the Census. Another disadvantage of Option No. 2 is the cost, about \$1.4 million annually. However, this cost is not considerable by comparison with some other Federal data collection activities.

Questions and answers

A question was raised regarding the quality of the information reported on the death certificate. In his answer, Dr. Rosenberg stated that the demographic information on the decedent is supplied by the funeral director based on information from an informant, often a family member. What is known about the quality of this information is largely from special studies, including a 1960 NCHS study that compared vital record information (excluding occupation and industry) with census information for the same individuals (NCHS, 1969). Similar comparisons were made in the 1950 national occupational mortality study produced by the National Office of Vital Statistics, the predecessor

agency to NCHS (Guralnick, 1962, 1963a, 1963b, 1963c). In the 1950 study, individual death certificates were matched with census records for the same individuals; and comparisons were made of the occupation and industry of the decedent, as reported on each record. Those results showed a generally good correspondence, despite the different types of questions asked on the two sources, but a lower match rate on an individual record-by-record basis. Another approach to studying the validity of information on the death certificate is the followback survey (see Option No. 5).

Option No. 3. Data for all States in census years only

Presented by Harry M. Rosenberg, National Center for Health Statistics

Description

An alternative to the VSCP approach of Option Nos. 1 and 2 would be to produce national occupational mortality data once every 10 years, the approach used for many decades in Great Britain. This approach was used in the United States for 1950, though the coverage of the U.S. study excluded females. By focusing on the 3-year period around the 1990 census (that is, 1989-91), such a study could take advantage—as did the 1950 study—of denominator information from the 1990 Census of Population. By adding together the 3 years of mortality data, numerator information would include more cases and would therefore have greater statistical stability and reliability, which would allow for more detailed geographic and occupational analysis than a single calendar year of data. Occupational data from the death certificate could be coded either at NCHS by the existing trained coding staff or under contract by the U.S. Bureau of the Census. The latter was done in a 1979 NCHS pilot study on the quality of occupational data on the death certificate (Rosenberg et al., 1979).

Uses

Occupational information from the death certificate is one of the most accessible, routinely available, and geographically comparable sources of data for measuring occupational health effects across geographic areas. It can be used to identify problem areas (geographic and occupational) and to generate hypotheses.

Costs

The costs of producing occupational mortality data under Option No. 3 would be high. Although it would appear that the cost would be a simple multiple of the annual cost under Option No. 2, there is an additional substantial cost because, in a once-a-decade study, one could not depend on States doing the coding, as under Option Nos. 1 and 2. It is believed that States would be unwilling and unable to participate in a data program that operates for only 1, 2, or 3 years in a decade. States prefer

to operate a continuous system, like the vital records system, with constant processing. In contrast, under Option No. 3, the coding would have to be handled in an entirely different way, either by contracting coding out to an experienced Federal organization, like the U.S. Bureau of the Census, or to a private organization. This would probably cost more per annum than an established, ongoing State system.

In addition, it would be necessary to purchase death certificates from States, an estimated \$1.50 to \$3.00 per record. Therefore, for the estimated 6 million deaths during the 3-year period, an additional cost of \$9-\$18 million for records and \$4 million for coding would bring the per record cost to \$2.20 to \$3.70 (table 4).

Advantages and disadvantages

The principal advantage of this approach, like that of Option No. 2, is having a large number of cases for detailed geographic and occupational mortality analysis. The disadvantages are that it does not develop a State capacity to code occupation and industry or to query records that could enhance the quality of reporting or promote better reporting by funeral directors through training. It also abandons the idea of occupational surveillance on a continuing basis and the possibility of relating occupational health surveillance at the State level with occupational health programs administered by the States. A formidable obstacle to this approach is the cost, which was understated in a recent Congressional report (the Weiss report) that suggested this as a feasible and desirable option (U.S. Congress, 1986). Under Option Nos. 1 and 2, the States absorb two-thirds of the production costs; under Option No. 3, they do not.

Option No. 4. Subsets of causes or subsets of States (Annual)

Presented by Harry M. Rosenberg, National Center for Health Statistics

Description

Under this option, only selected death certificates would be coded for occupation and industry. The selection could be made on the basis of cause of death, such as cancers or accidents, or on the basis of geographic areas, such as States with cancer registries.

Uses

Occupational information from the death certificate is one of the most accessible, routinely available, and geographically comparable sources of data for measuring occupational health effects over time and across geographic areas. It can be used to identify possible problem areas (geographic or occupational), to generate hypotheses, and to monitor changes over time.

Costs

The per record costs are estimated to be about the same as in Option No. 1, unless records have to be purchased from the States.

Advantages and disadvantages

The advantage of this approach is cost reductions roughly in proportion to the reduced number of records from Option Nos. 1 and 2. However, a major disadvantage of this approach is that it would have to rely on post-stratification. That is, the national mortality data would have to be processed annually by NCHS in cooperation with the States, as it does now. After the data are processed, the sample of records, based on cause of death or State, would be selected and separately coded for occupation and industry, either by the States or by a third party. As a two-stage process, it would be cumbersome compared with Option Nos. 1 and 2, where occupation and industry are coded on line with other items. Dr. Walker earlier raised the excellent question of who would decide which areas would be included among the representative areas.

Option No. 5. Mortality followback surveys

Presented by Gail S. Poe, National Center for Health Statistics.

Description

The mortality followback survey method is a powerful one and can be used to accomplish many objectives. Target groups, such as persons dying from certain types of cancer, can be oversampled for epidemiologic investigations. Furthermore, historic information can be captured, such as whether the decedent worked at any time for a particular type of industry or was exposed to certain types of substances.

NCHS is currently sponsoring a major national followback survey—the 1986 National Mortality Followback Survey (NMFS). In this survey, a sample of 18,500 death certificates of persons aged 25 years and over who died in the United States in 1986 was selected. A next of kin identified on the death certificate or some other knowledgeable person will serve as the respondent. The survey is designed to supplement the information on the death certificate. Additional questions are asked about usual occupation, industry, family income, and education. Other major topics are the use of health care resources in the last year of life, disability prior to death, and health habits, such as smoking and drinking alcoholic beverages. The survey has a number of sponsors, including NCHS; the Health Care Financing Administration; the National Cancer Institute; the National Heart, Lung, and Blood Institute; the National Institute of Child Health and Human Development; the Indian Health Service; the Alcohol, Drug Abuse, and Mental Health Administration; the National Institute on Aging; and the Veterans Administration.

A major purpose of the 1986 NMFS was to examine the reliability of items reported on the death certificate by comparing these items with the same items reported by the survey respondent. Items that will be compared include age, race, and veteran status. The present survey is also being used to examine the reliability of occupation and industry reported on death certificates. Considerable debate focused on the types of questions to be asked about occupation and industry. Initially, consideration was given to asking adaptations of the questions used on several other major national surveys, including the Current Population Survey; but, to save time and to more closely parallel the death certificate items, the number of questions on occupation was limited to two. About 5 percent of the original respondents are reinterviewed within 2 weeks of the original interview and asked a set of five additional questions on occupation and industry related to the job longest held. With two sets of questions, possible comparisons can be made to the information on the death certificate and to the information obtained from the more traditional surveys of employment and the labor force. An additional feature of the 1986 survey was that the 1986 National Health Interview Survey (NHIS) provided information relevant to the estimation of denominator data. The 1986 NHIS included questions on the longest held occupation and industry that complement those in the NMFS.

Instead of using the final mortality file of all deaths in the United States as a sampling frame, the 10-percent national sample of deaths, called the "Current Mortality Sample," was used in the 1986 survey. This file is used by NCHS to produce current cause-of-death estimates for the United States on a monthly basis, published in the *Monthly Vital Statistics Report*, in contrast to the final mortality file, which is not available until about 20 months after the calendar year of occurrence. Past followback surveys have underscored the importance of using the most current mortality file to reach persons familiar with the decedent because death is often followed by family dissolution and relocation that make followup difficult.

With the followback surveys, it is possible to oversample certain groups who would ordinarily be represented by very small proportions of national sample. The 1986 survey, for example, included oversampling of younger persons, black persons, American Indians, and persons dying from selected causes, including ischemic heart disease and selected cancers.

The survey is conducted by sending out questionnaires about 6 to 8 months after the death. If there was no response after two mailings of the questionnaires, information was obtained either by telephone or personal visit. The 1986 survey was conducted by the U.S. Bureau of the Census under contract with NCHS.

The 1986 NMFS contained 158 response items that required approximately 30 minutes to administer. The sample design was totally unclustered, resulting in increased interviewer travel costs for those interviews that cannot be obtained by mail or by telephone.

Uses

Mortality followback surveys can provide information on industry and occupational exposure and on other variables to supplement cause-of-death information obtained from the death certificate. These surveys can be used for hypothesis-generating or hypothesis-testing studies related to risk factors ascertained from responses to the questionnaire.

Costs

The total field cost includes forms design, interviewing, management of data collection, quality control, data keying, and computer edits. For a survey focusing only on occupation and industry, the costs would be approximately \$90 per case, assuming 20,000 cases, with a response of at least 90 percent over a 5-year period (table 4).

Advantages and disadvantages

Some advantages of the followback technique include the ability to use extensive questioning to better measure desired concepts; oversample certain demographic and occupational groups or causes of death; collect historic information on a decedent's work history, for example, rather than relying only on a single question of usual occupation; and have probing questions about exposure to hazardous substances on the job.

Among the disadvantages of the followback method for occupational mortality studies are that it is not linked to general population surveys; the sample is generally too small to provide information for occupational mortality analysis unless specifically designed for that purpose; and the sample is too small for geographic analysis of small areas. Because of the periodicity and geographic coverage problems associated with such followback surveys, this is not a technique for surveillance.

Questions and answers

Discussion after the presentation covered the following:

- Ms. Poe estimated that response rates of the present survey would be at least 90 percent, based on an unweighted response rate of 89 percent from returns of the first quarter.
- Costs per agency go down when the survey serves multiple purposes rather than having a single focus because of multiple agency sponsorship.
- Responses on these occupational and industry items have been very complete, in contrast to the expressed concern that incomplete reporting of occupation and industry would result because an informant, rather than the person who is the focus of the questions, responded to the survey.

- There was a question as to whether validation of responses with information from the Social Security Administration could be done, to which Ms. Poe indicated that this might not be possible because of confidentiality considerations.

Option No. 6. Followup of general population surveys using the National Death Index

Presented by Bruce Cohen and Jeffrey Maurer, National Center for Health Statistics

Description

Two major population surveys sponsored by NCHS—the National Health Interview Survey (NHIS) and the National Health and Nutrition Examination Survey (NHANES)—could be used for occupational surveillance and research. The purpose of NHIS is to provide national data on the incidence of acute illness and injuries, the prevalence of chronic conditions and impairments, the extent of disability, the utilization of health care services, and other health-related characteristics. Each calendar year data are collected from approximately 50,000 households, yielding about 135,000 persons. In addition to the standard questions that are asked every year, special questionnaires on current health topics are added each year. For instance, information will be collected during the 1988 survey on longest job and symptoms of occupationally related conditions.

Information is collected during NHANES on a national sample through physical examination, clinical and laboratory tests, and related measurement procedures as well as questionnaires. Prevalence data are collected for specifically defined diseases or conditions of ill health; and normative health-related data are collected that show total population distributions of particular characteristics, such as visual acuity, pulmonary function, or blood pressure. In NHANES I, 14,407 adults were examined; the NHANES III survey (which will begin in 1988) will yield examinations of approximately 28,000 adults.

Uses

Questions about current and longest job and symptoms of occupationally related illness (and direct examination findings in NHANES) make these surveys potentially useful for occupational research. Certainly, they can yield normative data for comparison with specific studies performed by others. The possibility also exists to link the respondents with later death certificates using the National Death Index (NDI) in order to examine mortality by occupation and industry. In fact, searches of mortality records have yielded over 2,000 deaths for the NHANES I cohort as part of the NHANES I Epidemiologic Followup Study. For these, questions in the followup included occupation longest held. Other occupational information includes results of rereading x-rays, which have revealed some evi-

dence of asbestosis. For the NHANES III study, an estimated 10 percent of the effort will be related to occupation.

A possible scenario for using NHIS would be to gather basic industry and occupation information on longest job for a 3-year period (perhaps supplemented by additional questionnaire information) and then follow this cohort using the NDI for a 10-year period. Followup of this sample eventually would yield over 30,000 deaths.

Both NHANES and NHIS could be developed to routinely include longitudinal efforts such as the NHANES I Epidemiologic Followup Study, which is a longitudinal reinterview with the NHANES I adult cohort originally examined from 1971 through 1974. Longitudinal designs would expand the capabilities of these surveys to collect occupational information. In both instances, the number of cases would be relatively small for detailed occupation and industry analysis; the NHIS would have a larger number of cases ultimately ascertained by the NDI, but would include no examination data.

Costs

Assuming a 10-year period of followup of NHANES III using the NDI, resulting in about 2,800 deaths identified over that period, the estimated cost (including the exam costs) per ascertained case would be about \$2,870 (table 4). An alternative approach would follow up the NHIS samples at 110,000 a year for 3 consecutive years; this would result in a larger data base, about 33,000 deaths identified over 10 years, for analysis and a lower cost, an estimated \$37 per case.

Advantages and disadvantages

The advantages of this approach are the availability of detailed measures of covariables, symptoms, and examination findings; the potential for questioning individuals directly for exposure information and morbidity history; and the potential for longitudinal followup. The disadvantages include small sample sizes that cannot support detailed analysis and surveillance activities by occupation or industry for specific causes of death or small geographic areas.

Option No. 7. Followup of targeted National Center for Health Statistics surveys

Presented by Bruce Cohen, National Center for Health Statistics

Description

In addition to the NHIS and NHANES programs, NCHS performs several surveys aimed at specific populations, two of which—the National Survey of Family Growth (NSFG) and the National Maternal and Infant Health Survey (NMIHS)—may be useful for occupational research.

Cycle IV of the NSFG was scheduled to start in May 1987. (Editor's note: The revised date for implementing his cycle is early 1988.) This sample of approximately 12,000 women was originally interviewed in the 1986 NHIS. The survey will include interviews with a national sample of women 15-44 years of age, regardless of marital status or pregnancy history. They will be interviewed in person. The interviews will include the woman's marital history, pregnancy history, contraceptive history, data on social and economic characteristics, and such risk factors as smoking, drinking, pelvic inflammatory disease, and certain sexually transmitted diseases.

Information will be collected for the current or most recent occupation and industry of employment for the woman (and her husband if she is married). Occupational data will be coded according to the 3-digit U.S. Bureau of the Census classification. Information regarding infertility, reproductive patterns, and birth intervals will be available that can be assessed by employment patterns and labor force participation. The NSFG currently includes some questions requested by BLS that pertain to employer contribution to maternity benefits.

The 1988 NMIHS will be equivalent to the three surveys that were previously conducted separately—the National Natality, Fetal Mortality, and Infant Mortality Followback Surveys—with information collected for three national samples of vital records: 10,000 live births, 4,000 fetal deaths, and 6,000 infant deaths. Thus, a total of 20,000 deliveries will be surveyed to include information obtained from the mothers, hospitals, and medical attendants. It will be possible to corroborate information obtained on vital records with that obtained by use of a detailed interview questionnaire for those States that code industry and occupation on their vital records.

NMIHS staff plan to include the following work-related items in the 1987 pretest of the 1988 NMIHS questionnaire: industry and occupation of employment for father at time mother became pregnant (coded to 3-digit U.S. Bureau of the Census codes), including dates of employment and average number of hours worked per week; and industry and occupation for mother at three time points—prior to pregnancy, during pregnancy, and at time of interview (approximately 5 months after delivery) (coded to 3-digit U.S. Bureau of the Census codes). These data will also include dates of employment and average number of hours worked per week. Examination of reproductive hazards may be possible with these data.

Other NCHS survey programs, such as the National Health Care Utilization Survey, should be examined for their potential usefulness for occupational research.

Uses

These are examples of special surveys that deal with reproductive history and outcomes. Because reproductive disorders were identified by NIOSH as one of the 10 leading work-related diseases, these data sources should be

examined for their utility to address specific hypotheses and/or generate prevalence estimates of potentially work-related conditions.

Costs

The estimated cost for the NMIHS occupationally related component is \$480,000. The coding of industry and occupation will cost an additional \$50,000. Therefore, the estimated cost per respondent is \$26 and the cost per death is \$53 (table 4).

Advantages and disadvantages

NMIHS includes 4,000 fetal and 6,000 infant deaths with enormous potential to examine occupational risk factors for both parents. The format could provide the opportunity for detailed and specific followback. Among the disadvantages of the NSFG is that it will likely contain information on very few deaths if the study population is followed with the NDI for subsequent adverse pregnancy outcomes. The NMIHS has information on a large number of fetal and infant deaths but not enough for most analyses by detailed occupation and industry or for small geographic areas.

Questions and answers

To the question of whether the information from the NMIHS could use occupational information currently being coded by the States, the reply was that the NMIHS decedents were infants (without occupations), and the State coding was for adult decedents. Unfortunately, no linkage between the two sets of records is feasible, but information on the occupation and industry of parents could be obtained in followback surveys such as the NMIHS to link occupational exposures of parents to health outcomes for their infants.

Another suggestion that was made was for coding occupation and industry of the parents on the report of the fetal death or on the birth certificate in those States in which data files of matched infant death and live birth records are being developed. (Editor's note: The occupation and industry of both parents are included in the U.S. Standard Report of Fetal Death, but they are only recommended for the U.S. Standard Certificate of Live Birth.) That may link environmental and occupational exposures to the outcomes of pregnancy. Some discussion ensued about the problems associated with linking infant death and live birth records. NCHS is currently exploring that possibility in a major multiyear evaluation project. A pilot study conducted jointly by NCHS and nine States in 1985 and 1986 generated a more than 95-percent match rate between these two vital statistics source records, suggesting that establishing an ongoing national data base of this type may be feasible.

Option No. 8. Cohort followup of national study groups

Presented by Gilbert Beebe, National Cancer Institute

Description

In recognition of the need for a national system of information on occupational mortality, consideration has been given to using administrative record systems and special study groups. The decennial census, the Current Population Survey (CPS), the Continuous Work History Sample (CWHHS) of the Social Security Administration (SSA), and State unemployment insurance files have all been examined as potential sources of information on differential mortality associated with employment. Despite strong encouragement of the National Institutes of Health, the U.S. Bureau of the Census has been unwilling to permit the use of any part of the decennial census in this way because of confidentiality requirements, but has agreed to the substitution of the Current Population Survey for the purpose. This has resulted in the National Longitudinal Mortality Study, a collaborative undertaking of the National Heart, Lung, and Blood Institute, the U.S. Bureau of the Census, and NCHS, with an expanding sample currently at 1.2 million individuals, about 40 percent of whom have been in the labor force.

The CWHHS of SSA consists of 1 percent of all those in the social security program since 1937. Beginning in 1957, the file contained a longitudinal history of employment with Standard Industrial Classification (SIC) codes and also reasonably complete information on the fact, but not the cause, of death. The National Cancer Institute (NCI) is funding SSA to obtain cause of death for the period 1973-77 in order to test the usefulness of the SIC information in this file. SSA, the Internal Revenue Service (IRS), and NCI have all been interested in the potential value of the occupational entries on the IRS Form 1040 and have supported a project to develop a partially computerized approach to Standard Occupational Classification (SOC) coding. One goal is the transfer of IRS occupational data to SSA for the CWHHS.

Another source of nationwide data on occupational mortality is the Dorn smoking study of nearly 300,000 veterans surveyed in the mid-1950's. Data through 1970 have been published by occupation and by industry, and data through 1979 are being analyzed now. An additional possibility would be to follow up a clearly identified occupational population, such as all members of a particular union or all employees of a particular company, with the NDI in order to identify potential excesses in mortality if appropriate comparison populations are available.

Uses

Each special study cohort presents a different mix of information on demographic characteristics, mortality, industry of employment, and specific occupation, but all of

them provide the basis for calculating mortality rates with consistency between numerator and denominator as to employment coding.

Costs

The costs of the National Longitudinal Mortality Study have been estimated to be \$48 per death for 1973-83 samples. Other national studies would have similar costs per death (table 4).

Advantages and disadvantages

Dr. Beebe discussed the advantages and disadvantages of Option No. 8 in relation to Option No. 2 (coding death certificates annually for all States). He characterized Option No. 2 as the "Cadillac" and as a goal for a data source on national and local occupational mortality trends and patterns. Dr. Beebe felt that use at the local level is perhaps an even more important consideration than national use, as studies by Samuel Milham, for Washington State, have demonstrated over the years.

The strength of the Current Population Survey (CPS) as a data base for occupational mortality studies, as in the National Longitudinal Mortality Study, is that it includes information on lifestyle as well as occupation. Lifestyle differences may account for a share of the differential mortality that now is attributed to occupation. The major drawback of the CPS is its small size. In addition, to ascertain mortality one has to go through three steps at present: (1) use the NDI to identify the deaths to the CPS cohort, (2) purchase copies of the death certificates of the identified individuals from the States, and (3) code the cause of death from these certificates.

The CWHHS has good identifying information, some demographic variables, the fact of death, and SIC code for the industry of the decedent. But it lacks occupational information, and one needs to go through the same steps as with the CPS to obtain the death certificate from the States to code cause of death. A further disadvantage is its small sample size.

Questions and answers

A question was asked about the status of a bill designed to create "statistical enclaves" (Beebe, 1981). Statistical enclaves would allow certain Federal agencies to link and pool records for statistical purposes, overcoming existing restrictions related to confidentiality that either completely or severely limit such information sharing. Dr. Beebe indicated that the legislation was defeated.

It was pointed out that the vital records were not subject to the Paperwork Reduction Act, implemented by the U.S. Office of Management and Budget, because vital records are State rather than Federal records; but other data sources of NCHS are subject to the act.

The information proposed for the 1990 census was discussed. The questions for the 1990 census are likely to be similar to those in 1980, including asking most recent occupation if the respondent had worked within the past 5

years (in the 1970 census, it was asked for respondents having worked in the past 10 years). The change reflects the continuing pressures on the census to reduce respondent burden.

Option No. 9. Records systems

Presented by William Eisenberg, Bureau of Labor Statistics, and John Sestito, National Institute for Occupational Safety and Health

Description

The Bureau of Labor Statistics is involved in two major Federal-State cooperative programs that collect information on occupational injuries and illness from record sources: the Annual Survey of Occupational Injuries and Illnesses (ASOII) and the Supplementary Data System (SDS), based on State workers' compensation reports. The annual survey is a mandatory sample of 280,000 employers concerning the private sector. Surveyed employers report all occupational fatalities, illnesses, and injuries, except first aid cases. The fatality cases that are reported in the survey are followed back to obtain general causal information about the fatal event. Fatality cases are then classified into 1 of about 15 different categories, such as highway vehicle accidents, fires, or electrocutions.

The other general source of information is the State workers' compensation systems, on which the SDS is based. Information provided in this program includes the industry and occupation of the affected worker, the nature and source of injury or illness, the part of the body affected, the accident or exposure type, the associated object of substance, and the sex and age of the worker. Thirty-two States provide this information voluntarily. Of these, 12 States provide information on fatalities. Ten States provide fatality information on "closed cases," that is, cases that have been settled. Two States provide information on fatalities on a "current basis," that is, cases for which claims are pending but have not yet been closed.

In the past, more traditional approaches to the definition of occupationally related illness and injury have limited the utility of workers' compensation files for studying certain occupational diseases. However, in some cases, legal and legislative initiatives have resulted in the compensation system expanding its coverage to other chronic health conditions.

Uses

The annual survey can provide national and State estimates of the numbers and incidence rates of occupational fatalities by general industry and causal categories. It can be used for trend analysis and interindustry comparisons.

The potential exists for followback of workers' compensation files at the State level or through SDS although it may be more useful for morbidity rather than mortality surveillance.

Costs

These surveys include morbidity, as well as mortality, records. If the total cost of the surveys were amortized over the death records only, the costs to maintain these two surveys is currently about \$1,600 (for ASOII) and about \$1,700 (for SDS) per death ascertained. The large cost per death reflects the fact that a majority of the records processed in these surveys are not death related.

Advantages and disadvantages

The annual survey has the potential for followback by industry or source and has detailed industry identification. Although information on the demographic characteristics of workers is not currently collected, this information is available and could be obtained through followback. In addition, demographic characteristics for facilities are calculated for employers with 11 or more employees. The survey excludes agricultural employers with less than 11 employees and the government sector, and it captures mostly traumatic fatalities due to accidents rather than chronic illness and may exclude fatal injuries when the death occurs in a different calendar year than the injury.

The SDS and workers' compensation files have excellent information on demographic characteristics, on factors relating to the event, and detailed industry and occupation information. In addition, there is potential for followback at the State level. SDS files are, however, limited by incomplete coverage of workers, incomplete participation from all State programs, variations in claims processing procedures, and lack of denominator information. The legal nature of the system affects its ability to serve occupational health and mortality surveillance. Being an insurance system, some diseases are not recognized as work-related, and, therefore, are not covered by the system. In addition, the confidential nature of some of the information contained on workers' compensation files may limit its ability to be used in a record linkage system.

Questions and answers

Among the questions asked of Mr. Eisenberg was whether his agency had given thought to establishing studies based on the Occupational Safety and Health Administration's (OSHA) Form 101, which is a supplemental record to the establishment survey that includes additional information on the demographic characteristics of the injured workers. A pilot study is being developed to test the feasibility of collecting the information on the OSHA Form 101. Also, BLS will explore the use of the standard ICD codes (the International Classification of Diseases recommended by the World Health Organization) that are used to code morbidity and mortality information.

Mr. Sestito noted that his colleagues in the Morgantown, West Virginia, office of NIOSH are developing a national fatality registration system, which is an attempt to link information from the mortality statistics system with

information from the workers' compensation system. Mr. Sestito feels that there is considerable potential in some of the State information systems, such as workers' compensation, particularly States such as California that are beginning to establish compensation funds for certain occupationally related diseases, such as asbestosis. The costs of workers' compensation is on the order of \$22 to \$23 billion per year.

Option No. 10. Use of compressed vital statistics files

Presented by Bruce Cohen, National Center for Health Statistics

Description

The detailed vital statistics files can be compressed for rapid, easy use by investigators. An example of this type of file is a county-level national mortality and population file developed at NCHS that spans the years 1968-83, referred to as the Compressed Mortality File (CMF). These files can be used to identify geographic areas with excess mortality rates that may be related to occupational exposures.

The CMF files are stored on only three reels of tape, two for the mortality data and one for the population data. Differential mortality trends can be easily and efficiently examined because of the compact nature of this file. An earlier version of this system, which covered the years 1968-78, was developed by Dr. Alan Gittelsohn (Department of Biostatistics, Johns Hopkins University School of Hygiene and Public Health) under contract with NCHS.

The compressed vital statistics files are derived from the 31 million U.S. microdata death records for this period. The 159-160 byte records were condensed to 23-byte records by reducing the number of variables included on each record. The variables included on the condensed file are county of residence, year of death, race (white versus all other), sex, age group at death (divided into 15 age groups), and underlying cause of death (4-digit ICD code). The 31 million records were reduced to 13 million records by counting records that were identical with respect to these variables, and then adding a count field.

The compressed population file is derived from annual estimates for each U.S. county by 5-year age groups, race (white versus all other), and sex. These estimates reflect adjustments based on the 1980 census, and they were prepared by the U.S. Bureau of the Census with modifications by NCHS. The compressed mortality files and the corresponding population data from the U.S. Bureau of the Census are now available as tapes from the National Technical Information Service for \$300 for the first 10 years and \$900 for the next 5 years.

Uses

This approach would be used to identify geographic areas (at the county level or greater) with excess cause-

specific mortality rates that may be related to occupational exposures. It would also examine time trends and geographic variations in cause-specific and possibly occupationally related mortality.

Costs

The costs to develop this data base are minimal because the source data are currently available through VSCP. The costs for processing and secondary data collection are estimated to be \$0.0003 per death (table 4).

Advantages and disadvantages

This approach is simple to use, and it can provide inexpensive, comprehensive cause-of-death information with broad geographic coverage over an 18-year span. However, it provides neither industry or occupation information nor exposure information; it provides only ecologic data; no individual-level variables are available.

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Chapter III.

Working group reports

Objectives for working groups

by Bruce Cohen, Ph.D., Office of Analysis and Epidemiology, National Center for Health Statistics

There are many data resources that can be used for occupational surveillance and research as depicted in figure 2. This figure is intended to represent the many interlocking parts of a puzzle. The National Institute for Occupational Safety and Health has several data bases that evaluate exposures and health hazards. The Bureau of Labor Statis-

tics collects information on work-related health events in their annual survey. Obviously, State government and university-based research play an important role in understanding the risks. Also, the National Cancer Institute conducts many industry-wide studies of cancer. In addition, there are studies sponsored by unions and industries. The National Toxicology Program performs laboratory research on toxic agents that are found in the workplace. The National Center for Health Statistics (NCHS) has surveys that address morbidity issues. The central location of NCHS mortality data in the puzzle is meant to focus our attention for this Workshop, not to imply that these data

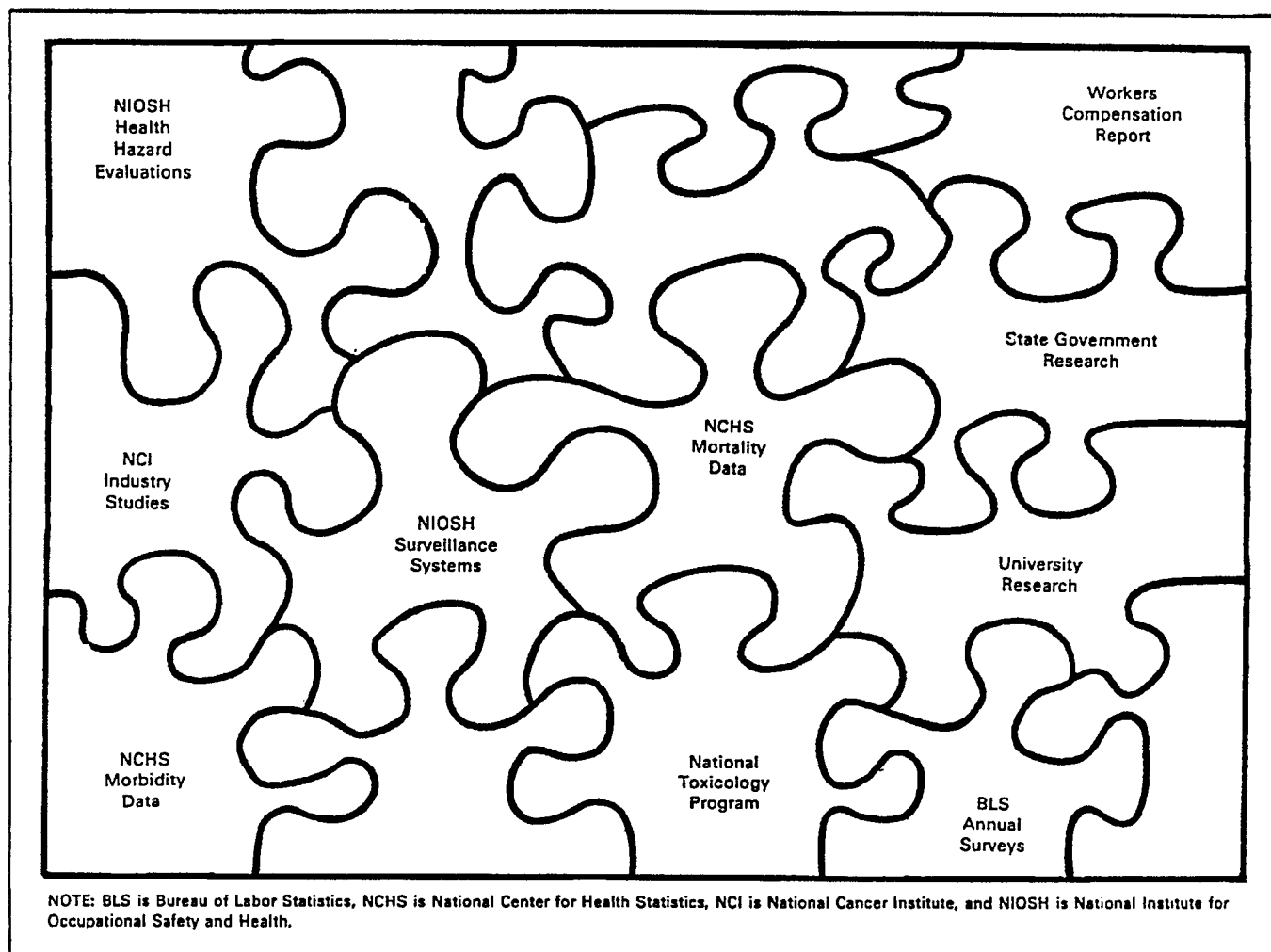


Figure 2. Data Resources for Occupational Surveillance and Research

are any more central than other data sources to the overall occupational health surveillance issue.

The visual display in figure 2 emphasizes several points: occupational health surveillance and research are a real puzzle. Further, there are many pieces that provide information relevant to the activity. How these pieces fit together is not being addressed at this Workshop, but the focus is on how NCHS might assist others in their research activities. We all work on different pieces of this puzzle, so I think that it is valuable that we view the NCHS mortality data in the context of all of the other pieces of the puzzle.

The first goal of this Workshop is to review the collection and use of data regarding mortality risk by occupation

and industry. The 10 options that were elucidated do not preclude consideration of other options or modification of the options that were proposed. The second objective is to make recommendations regarding the implementation of coding occupation and industry on death certificates. Certainly, in terms of the needs of NCHS for planning, this is the key objective. A third objective of the working groups is to discuss recommendations regarding the use of other NCHS data sources or data from other agencies for occupational surveillance. This last objective is a secondary goal of the Workshop.

Report from Working Group No. 1

- Henry Anderson, Wisconsin Division of Health
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Review of options

The approach taken by this working group was to temporarily ignore the options outlined for the group and all of the existing data sets and then ask the question: What would we design as a system for assessing occupationally related mortality? After that long process, the group agreed that Option No. 2, the annual industry and occupation coding for all States, represented the ideal situation. If one already has an existing vital statistics data system, such as currently exists in the Vital Statistics program at the National Center for Health Statistics (NCHS), despite all of the problems that anybody can identify, it is worth extending that system to include industry and occupation coding from as many of the States as possible on an annual basis.

The group felt that industry and occupation could not be viewed as a single, isolated entity. They have to be viewed as part of the vital records, specifically the mortality records. Therefore, the other data portions of those records should be considered in the analyses. There is a lot of other information available on the death certificate that is valuable for the analyses of occupationally related mortality.

With regard to whether a national data system was needed, we could come up with no sound arguments for not having a national system. Although a national system has problems, any system that does not cover the entire country has additional problems, such as incompleteness of data and limited application to other regions of the country due to regional characteristics. Another important aspect of a national data system is that problems of bias because of migration can be avoided. It was pointed out that, although some people may retire to northern States, a substantial proportion of the retired population tends to move to warmer States in the south. Hence, estimates of mortality for occupationally related causes at a State or regional level would be misleading. The only way to capture information relevant to an occupation or industry category, or to capture information relevant to specific industrial settings, is to have a national system.

Uses of a national data system

The working group summarized some of the important uses of a national system. At the national level, these include monitoring trends over time in mortality for particular occupations and industries, early identification of health problems, and hypothesis generation. The number of causes of death would necessarily have to be focused. For instance, the use of the sentinel health events (occupational) (Rutstein et al., 1983) would be key to causes of death to study. At the State level, one of the key issues would be the utilization of the data system to target prevention and industrial hygiene assistance programs. This would also be true for the Occupational Safety and Health Administration's sponsored activities.

Key issues in implementing the system

The working group discussed several issues that they considered central to the implementation of a high quality,

comprehensive data system. There needs to be national leadership and encouragement for this system. Now that the three agencies (the Bureau of Labor Statistics, NCHS, and the National Institute for Occupational Safety and Health) have signed a memorandum of understanding, it is hoped that new cooperation will engender greater attention and provide greater assistance and direction to the States. There is a need to use the information that has already been collected and publish it so it can be used to inform the States of the utility of this information. However, the States should be involved in discussions of how the data should be analyzed and summarized to avoid unilateral decisions by the Federal Government regarding such aspects as age brackets and grouping of other coded information.

The working group wished to stress the need to develop an automated coding system. This would assist the additional States to begin the coding and would help reduce escalating costs.

Clearly, the key to the program is quality control. We found that everyone seems to have a different definition of what quality control is. However, there was a consensus that quality control must go beyond simple verification of the coded information. There is a need for followback studies (Option No. 5) to assess the information that is coded, both for disease and for occupation and industry

information. Option Nos. 6 and 8 would also be useful in assessing data quality.

We felt that Option No. 4 was the best approach for States in transition to comprehensive coding.

Funding of the program

The working group thought that this program could not be accomplished by shifting support from ongoing activities at NCHS. There needs to be a total increase in the dollar support for the whole program because the other aspects of the vital statistics program should not be diminished. We felt that the best way to fund the program would be as a direct appropriation from Congress. It was felt that the program should not be funded on a partial basis. The importance of the issues of occupational and industry coding for death certificates needs to be recognized so that this system will be maintained in the future.

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Report from Working Group No. 2

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Review of options

The consensus of the working group was to concentrate on Option Nos. 1 through 4. Option No. 2, annual coding

for all States, was selected as the goal for the program. The other three options were viewed as special cases of the preferred option and represented logical stages in the evolution of a national program.

The working group recognized that fiscal constraints would affect the speed with which Option No. 2 could be implemented. It was proposed, therefore, that a modification of Option No. 4 should be implemented. Specifically, a program should be developed that includes industry and occupation coding in selected States plus demonstration project funding designed to increase States' ability to develop occupational disease intervention programs.

Uses of a national data system

The discussion of the group identified three important uses of this data system: description of trends in occupationally related mortality; hypothesis generating capability of mortality data with coded occupation and industry; and use of sentinel events (preventable deaths due to work injuries or diseases) that should result in effective intervention. At this point, it became clear that there were understandable, but major, differences in the uses made of the mortality data systems by Federal agencies and by the States. For some users, the purpose of the data is mainly descriptive; for others, the data represent a necessary first step toward intervention.

Issues of data quality, coding, and accessibility

The concept of an information chain in these data systems includes the flow of information from the attending physicians, to the informant, to the funeral director, to nosologists, to epidemiologists. All have a part in providing accurate information. The need for raising the awareness of physicians to the possible role of workplace hazards was noted. The work of the National Institute for Occupational Safety and Health (NIOSH) and the National Center for Health Statistics (NCHS) in publishing the Funeral Director Handbook was discussed. Mention was made of Dr. Milham's work developing industry and occupation codes that meet specific State needs but remain generally within the taxonomy of a national industry and occupation classification system. The role of NIOSH in training nosologists to code industry and occupation was credited, in part, for the increase from 6 to 32 States plus the District of Columbia now making use of the industry and occupation information on death certificates. Surveillance Cooperative Agreements between NIOSH and States (SCANS) and the NIOSH-funded State Capacity Building Agreements also helped enhance the value of the death certificate for occupational health surveillance.

Key issues in implementing the system

It was recognized that there are different goals, that is, that the needs of the National Center for Health Statistics (NCHS) or the Bureau of Labor Statistics (BLS) to make national estimates could not necessarily meet other Federal

or State Health Department needs. Clearly the current status, Option No. 1, that is, the collection of information from a limited number of States, is necessary but not sufficient.

The group recommended that emphasis be placed on the development of automated coding of industry and occupation, that is, keying the literal descriptors from death certificates and using the computer to code the industry and occupation.

Funding of the Program

Some concern over current funding plans was discussed. Although NCHS would plan to seek funding to

code occupation and industry on mortality records, there is no assurance that such increases in the NCHS budget would be possible. Without an increase, non-NCHS sources would have to be sought to support the program. The group urged NCHS to aggressively seek funding, and also urged the National Cancer Institute to continue funding for industry and occupation coding beyond fiscal year 1988 if new NCHS appropriations were not forthcoming.

Report from Working Group No. 3

Patricia Honchar, National Institute for Occupational Safety and Health

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Review of options

The consensus of the working group was for continued effort to move toward Option No. 2, the industry and occupation coding by all States. It was noted that Option

Nos. 1, 3, and 4 are included in Option No. 2. The group preferred to modify Option No. 2, however, to be an eventual goal, not a goal for rapid implementation. Rather, the group recommends an aggressive but realistic implementation of Option No. 2.

The group did not review Option Nos. 5 through 10 because of time restrictions, not priorities. The group did feel that there were many important options in this latter group and would encourage the careful consideration of these options at another time.

Uses of a national data system

The group discussed examples of industry and occupation presented by representatives from several States and found a wide range of applications. Nonetheless, the issue of development of further uses of the data beyond the currently understood potential uses was felt to have a high priority.

Uses of the data that were identified included trend surveillance, program and policy evaluation and development, and hypothesis generation. We feel that consideration should be given to providing support and assistance to States to continue to develop creative uses and evaluation of the industry and occupation coded mortality data. This could be conducted through demonstration projects to some states; it should also include exploration of use by States as well as usage for national level analyses.

Issues of data quality, coding, and accessibility

Because the quality, validity, and accuracy of other death certificate information is relevant in the analyses of the industry and occupation data that will be coded, the working group recommends that further attention be given to appropriate estimates of error, or to qualifications of the data, for all information collected on the death certificate in the process of reviewing the industry and occupation coding. There should be incentives provided to States to become part of the coding system. In most States, the effort required to develop industry and occupation coding could divert energy, time, and people away from other occupationally related activities.

Key issues in implementing the system

As noted before, the working group felt that an orderly, rapid implementation of the national system is required. There were two distinct approaches suggested for the implementation of the system. One approach would be to initiate the coding in one new State at a time. Another approach would be to begin coding with subsets of certificates from all States, with the eventual movement toward complete coding in each State. The group did not reach a clear consensus on the relative value of these alternative approaches.

The development and sharing of automated coding will be very important to the implementation of Option No. 2. If such software were available, the problem noted above of

diverting resources away from other occupationally related activities could be minimized.

Questions were raised about the States that are currently not involved in the industry and occupation coding of death certificate information sent to NCHS. Are these States using the information? Among the States that do collect industry and occupation information on the death certificate, what are the procedures and what is their experience in assessing data quality? The group urged that all of the States be involved early in the review of the implementation of a national system.

Funding of the program

The funding issue is related to the relative usefulness of the information. The working group recognized that the funds are limited at the national as well as State levels. Funding of this activity might mean the lack of funds for related activities. The group did recommend that the funding should be a multiagency activity. Involvement of several agencies is important both from a technical, as well as financial, point of view.

Report from Working Group No. 4

Thomas Mason, National Cancer Institute

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Review of options

The working group unanimously agreed that Option No. 2 was the goal to be sought. Any of the other options would be compromising the potential utility of the data. Therefore, at this stage of the process, Option No. 2 should be the focus of the program.

Uses of a national data system

The first question asked of the working group was whether anyone felt that we should not persist in coding industry and occupation on death certificates. No one in the group felt that the coding should stop. The group felt that the coding should continue not because the continued activity would facilitate answering important occupational health risk questions but because continued coding will stimulate use of the collected records and thought on alternative uses of the data. Scientists are opportunists; they take advantage of what is available. Therefore, it is important that the coding continue so additional data are available and so continued emphasis can be focused on the best way to use industry and occupation data. The group felt that the other uses for a national data system pale in comparison to the utility of these data to drive the research field of occupational health.

Key issues in implementing the system

One of the key issues not mentioned by the previous working group reports is the timely dissemination and reduced cost of obtaining the tapes. The working group felt that the National Center for Health Statistics (NCHS) has a good record in preparing and releasing data and, therefore, NCHS should continue to have the primary responsibility in collecting these data.

Funding of the program

The working group recommended that new funding sources be sought. In particular, the group noted the relevance of these data to the Agency for Toxic Substances and Disease Registry (ATSDR). The group felt that the recent Super Fund reauthorization legislation had broadened the mandate of ATSDR to provide for their participation in collecting environmental hazard data to be included in the registry. Most of the high-dose exposures to toxic substances occur in the workplace. Therefore, industry will probably be one of the largest users of the registry. Obviously, death is an extreme health effect of exposure, but the causes of death can give important information regarding the nature of toxic effects. The working group felt that ATSDR and other agencies involved in the assessment of toxic exposures and their effects should be informed about the work that is ongoing at NCHS and the need for additional funding.

Discussion

by Charles Rothwell, formerly the Director,
North Carolina State Center for Health
Statistics

This Occupational Mortality Data Workshop has brought together a diverse group of participants from various State and Federal agencies, private industry, and academia. The Workshop has provided a good forum for discussion of wide-ranging efforts relating to the collection and analysis of health-related industry and occupation (I/O) statistics. The tripartite agreement signed among the Bureau of Labor Statistics (BLS), the National Center for Health Statistics (NCHS), and the National Institute for Occupational Safety and Health (NIOSH) will encourage joint ventures in this field and considerable discussion has centered on the needs for various forms of I/O data. However, the primary purpose of the Workshop has been to discuss and then propose the most appropriate options that NCHS should implement to produce occupational mortality statistics.

The participants have considered 10 options for the collection of I/O data. The first four options related to I/O coding on death certificates; the next two options concerned the use of NCHS surveys for followup in the collection of I/O data; and the remaining four options related, for the most part, to the use of administrative data collection systems. The participants, although representing agencies of diverse responsibilities, were of one mind in their recommendation to NCHS. Both through open discussion and by questionnaire, they strongly urge NCHS to place primary emphasis on the collection and utilization of I/O coding on death certificates. Specifically, they propose that NCHS attempt to establish national coverage of I/O data on death certificates while first seeking firm funding for the States now involved in a pilot venture supported by short-term funding arrangements.

Summary

Although many options were discussed, emphasis has been placed on those alternatives that pertain to existing data sets of NCHS that utilize NCHS' strengths. Unlike NIOSH and other centers in the Centers for Disease Control, NCHS has not been involved with development of State or county level disease surveillance systems. The primary role of NCHS has been the creation of national data systems for research of national issues and for producing national estimates to aid in formulating and evaluating national policy. The exception to this national focus at NCHS has been the vital statistics system that is a cooperative effort at the local, State, and Federal levels. Although vital statistics can provide estimates at all three governmental levels, rates can be unstable for small-area estimates of rare events. Thus, the most prudent use of I/O data derived from death certificates for small-area estimation and sur-

veillance should be a combined responsibility of NIOSH and NCHS. For example, the refinement of the list of sentinel health events that are occupationally related (Rutstein et al., 1983) is currently under way by NIOSH. The use of these codes may be the most appropriate method for utilization of I/O mortality data for small-area surveillance.

The appeal of expanding the capabilities of a well-developed and highly utilized data system to serve as the primary national data system to measure the extent and impact of occupationally related disease is considerable. Nevertheless, the utilization of I/O information from death certificates is not devoid of problems. The quality of the data is of paramount importance. Data quality extends beyond the standardization of coding procedures and the verification of State coding. Financial support to States for the coding and provision of I/O data should be predicated on an active State-based query system to resolve ill-defined or improper I/O entries. Unfortunately at this time, most States collecting I/O information have not enacted a query system. The bulk of financial support will be needed to collect and code these data and assure their timeliness and quality; however, funding should not be directed solely to States. At this time, NCHS does not have the necessary capacity to internally support a national I/O mortality system. NCHS will need adequate staff to train State coders, to respond to daily questions from States on coding conventions, and to verify State coding in timely fashion. Also, given additional resources, the National Mortality Followback Survey could serve as a quality control mechanism for cause-of-death information and for I/O information.

Another concern regarding the development of a national system relates to the appropriate analysis and display of I/O mortality data. Central to this problem is the lack of denominator data. States and researchers have used various methods to depict differences in mortality outcome for selected occupations and industrial settings. Years of life lost and mean age at death have been used; yet, these measures may reflect differences in the age distributions of employees in selected occupations and not mortality differentials. Proportionate mortality ratios and odds ratios have also been used; however, they may provide an unacceptable level of false negative findings. Standardized mortality ratios and age-adjusted rates have been used successfully for years immediately surrounding the census when denominator data are available.

A more intractable, yet related, issue is that certain occupations or industries may attract employees with very distinct lifestyle attributes and economic pressures. Thus, the measurement of seemingly direct relationships between occupation and mortality and certain diseases may instead be the measurement of the relationships of certain diseases and a select group of people who seek and hold such employment. Unfortunately, many such lifestyle factors cannot be handled statistically because data for the factors are missing. For example, death certificates do not contain

smoking history, and it is well known that physicians severely underreport cause-of-death entities that relate to smoking. A similar statement can be made about the reporting of alcohol related mortality. Yet, even with adequate cause-of-death reporting, it cannot be assumed that smoking and the utilization of stimulants and depressants are uniformly distributed over industry and occupation groups. Here again, the National Mortality Followback Survey may be of some help. Much analytic work needs to be done on the proper methods of data analysis, and NCHS should provide such leadership.

Still another problem relates to the comparability of coding that will take place at the State level. The training of nosologists on standard methods of determining the underlying cause of death led to automated means of determining the underlying cause. In a similar fashion, NCHS should review efforts at the U.S. Bureau of the Census and at the Utah State Health Department to automate I/O coding. With this as a basis, NCHS may then be able to develop an automated means of coding of I/O data from literal entries. Funding will be needed to develop such a comprehensive automated coding system.

Strategy

Even with the problems previously mentioned, the most viable option for NCHS is to seek funding of a national effort to collect I/O data from death certificates. Funding should not be an "all or nothing" proposition. However, if there is no hope for expansion, the money for continued funding of pilot States should be placed elsewhere. By themselves the States currently providing data do not provide enough information for national estimates. The minimum level of commitment should be for funding of pilot States as well as necessary support functions within NCHS, coupled with a good chance for future expansion to the remaining States. If, for whatever reason, this strategy does not entice funding support, NCHS should re-examine the options relating to the utilization of linkages between its surveys and administrative data systems to provide national I/O mortality estimates. Although not recognized by this Workshop as the most appropriate set of options, these other options may generate more funding interest.

The future

Although a national I/O mortality system will take years to develop, NCHS should continue to examine future options. The problem of long latency periods from exposure to a diagnosed occupationally related disease is well known. Now with improved treatment leading to delayed mortality or death due to other causes, mortality data become even more removed as a measure of a current exposure problem. Several future possibilities exist.

In 1989, States will begin to collect I/O information on all fetal deaths of greater than 20 weeks' gestation. For infant deaths, a change in procedure could be established by States to either collect the I/O data of the mother on all

infant death certificates or to follow back on all infant deaths for the mother's I/O information. With the existence of a national linked birth and infant death file, considerable information is available surrounding conditions at birth. Combining I/O data from fetal death certificates and linked birth and infant death certificates could provide a very sensitive and low-cost surveillance system for occupational exposures by women. Such a system would not suffer from the problem of long latency periods between exposure and outcome. This project is also of interest because general mortality I/O data may not be useful for the female population in the near future. Women have only recently become employed in some occupations. The risks of mortality for women in these occupational settings can be expected to be underestimated. Yet we cannot, even temporarily, turn our backs on measuring the risks of adverse occupational exposure to women. Measuring reproductive outcome relative to occupational setting should be considered. The fetal and infant death file is relatively small, and it should be inexpensive to maintain. There are approximately 30,000 fetal deaths and 40,000 infant deaths in the United States each year. Even if each State paid \$2.00 per record for additional I/O data, the cost of data collection would be only \$140,000 per year; and internal NCHS support requirements beyond the general mortality I/O requirements would be minimal.

Population-based registries are now being created in many States. These morbidity registries include birth defects, cancer, trauma, and end-stage renal disease patients. Few registries collect I/O data. It would be most helpful if the National Committee on Vital and Health Statistics, as well as agencies that help support these registries such as the National Cancer Institute, the Health Care Financing Administration, and CDC, would emphasize the utility of collecting I/O data.

Many States are creating data bases for health care cost containment purposes. The agencies responsible for these data systems are seldom found in State health departments. Therefore, the emphasis of these data systems is not preventive health. There is a national organization, the National Association of Health Data Organizations (NAHDO), that encourages information transfer between these evolving State systems. Again, the National Committee on Vital and Health Statistics should work with these State agencies through NAHDO to sponsor discussion of such issues as the collection of ICD E codes, I/O data, and single-patient numbers. The data bases are of considerable interest because they cover such areas as hospital inpatient care, ambulatory surgical centers, and outpatient services.

Conclusion

The conclusions of the Workshop are specific and heartening; yet, the identified challenges are many. There is a clear demand for a national system to measure the impact and extent of occupationally related disease. There is complete agreement where that effort should begin and that it should not create a new reporting system with substantial reporting burdens. An existing system, the vital statistics

system, was selected for this purpose and its viability has been documented through a pilot project with States. Funding will be needed to build capacity at the Federal and State levels and research will be needed on analytic issues relating to the utilization of this information.

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Discussion

by Harry M. Rosenberg, Ph.D., Chief, Mortality Statistics Branch, National Center for Health Statistics

It has been most gratifying to have participated in this landmark Workshop, which is the first systematic and comprehensive review of alternatives for producing occupational mortality data. I am particularly grateful to Dr. Manning Feinleib, Director of the National Center for Health Statistics (NCHS), for convening this meeting. Dr. Feinleib has sought, and I believe to a large degree received, a balanced description, critique of options, and recommendations for producing occupational mortality statistics. Like many here, I admit to considerable surprise at the degree of consensus regarding the direction in which NCHS should proceed in this area, that is, that NCHS should exercise leadership in occupational mortality statistics through the vital statistics system by:

- Adding to the existing reporting area of reimbursed States.
- Exploring automated coding of occupation and industry from the death certificate.
- Undertaking research in methodologies, measurement, and analysis of occupational mortality.
- Promoting the quality of reporting occupation and industry on death certificates.
- Seeking appropriated funds for the NCHS budget to support State coding.

I would like to use this opportunity to do three things: to provide, for the record, some additional historic perspective on the program; to raise some new issues; and to comment on the remarks of the rapporteurs and the other discussants.

Some history

The current occupational mortality reporting system is the outgrowth of one decade of sustained collaborative effort by a handful of staff from four Federal agencies, with the support of the individual participating States, as well as the Association of Vital Records and Health Statistics. Since 1978, the following Federal agencies have worked together with dedication and a high degree of professionalism to develop a national occupational mortality data base through the vital statistics system (Rosenberg et al., 1984):

- The U.S. Bureau of the Census has provided standards for classifying and coding occupation and industry, developed materials for and carried out training for State and Federal coders, and served as a continuing focus for coding problem referrals and as a source of coding expertise for these items.
- The National Institute for Occupational Safety and Health (NIOSH) has provided financial support through funds to NCHS and through demonstration grants to the States in the Surveillance Cooperative Agreements between NIOSH and States (SCANS)

programs. It has provided assistance to NCHS in many operational aspects of the program, including programming, assisting in developing tabulation lists, and conducting training of State coders.

- The National Cancer Institute (NCI) has assisted NCHS in many aspects of the program and provided the core funding to the States for fiscal years 1985-88 to demonstrate the feasibility and usefulness of the program. It is an understatement to say that NCI's support has been crucial in institutionalizing the program within the States and at NCHS.
- The National Center for Health Statistics has administered the program with the States; carried out quality control on the data received from the States; developed instructional and training materials; developed, with NIOSH and NCI, tabulation lists for cause of death and for occupation and industry to be used in presentation and publication of these data; and has developed the publication specifications for the NCHS program.

The occupational mortality program was initiated in 1978 with a study to evaluate the codability of the occupation and industry entries on the death certificate (Rosenberg et al., 1979). The study, directed by NCHS staff, was carried out, under an interagency agreement, by the U.S. Bureau of the Census. The results demonstrated a high level of codability of these items and established cost and production parameters for the coding, which could be used as a baseline or standard by the States and NCHS.

The status of occupational mortality coding among the States as of the late 1970's was documented in a survey carried out jointly by NIOSH and the association representing State vital registration officials (Kaminski, 1981). At that time, only a handful of States were coding these items and were using a variety of classification and coding schemes that were neither readily comparable nor amenable to being organized into a single multi-State data base.

The situation is vastly different today. Over 30 States are using a single coding and classification system through which high quality data from 20 States are being routinely transmitted to NCHS as essentially a component of the vital statistics data system.

Principal staff contributing to this decade-long effort include Thomas Scopp and John Priebe from the U.S. Bureau of the Census; John Sestito, Carol Burnett, and William Crouse from NIOSH; Gilbert Beebe and Robert Spirtas from NCI; and Drusilla Burnham, Glenn Flinchum, Jeffrey Maurer, and Harry Rosenberg from NCHS.

Issues

A large number of issues associated with implementing occupation and industry coding have been identified. I would like to comment on a number of those from the point of view of the program at NCHS that has had a major responsibility for this activity.

Institutionalizing the program—There is a consensus among the working groups that NCHS should move toward a continuous program of coding occupation and industry

from the death certificate at the State level through the vital statistics system. To achieve this requires predictable, stable, and adequate funding and staff for the States and NCHS. It must be emphasized, however, that this support has to be for not only the occupational mortality program, but also for the basic vital statistics program to which occupation and industry coding are being added. Occupational data from the death certificate is of little value if the other data from the death certificate—such as cause of death, age, race, sex, and place of residence—are not available or of good quality.

The advantages of Option No. 2 are not only that it is economically competitive with other options that have been discussed but that it draws on the strengths of State and national vital statistics activities, which have been institutionalized for over 50 years. Vital statistics programs, which exist in all of the States, provide an administrative framework for ensuring uniform procedures, equitable reimbursement, quality control, data processing, and contact with data providers. These programs are also adaptable, which is essential in a statistical system, as concepts, classifications, and data requirements change over time. In the vital statistics system, changes in data production are institutionalized through the annual issuance of instruction manuals to each State for coding and processing vital statistics data and through the decennial revision of the standard certificates and reports.

Funding strategies—Principal funding support for the NCHS occupational mortality program was made on a demonstration basis by NCI only through fiscal year 1988. The funding strategy to continue the program that appears to have emerged from this Workshop is a proposal that NCHS pursue a multi-pronged approach with the ultimate objective of implementing Option No. 2 for an ongoing national program involving the vital statistics systems of all States.

The multi-pronged strategy would involve simultaneously exploring several potential sources: (1) expanded funding from NCI on a demonstration basis; (2) funding from the Agency for Toxic Substances and Disease Registry; and (3) funding through direct appropriation to NCHS. Clearly, the last of these is preferable to institutionalize this activity as an enduring and integral component of the national vital statistics program. I agree with the suggestion of Mr. Rothwell that a review of the program in 5 to 10 years would be desirable to ensure that the value and utilization of the data for surveillance and analysis warrants the expenditure.

I believe that we must approach the issue of resources in terms of both adequacy and stability. Although I agree that the magnitude of resources required for implementing Option No. 2 are quite modest compared with other federally supported activities, it should be noted that an occupational mortality coding program budgeted at \$1 million annually would be a nontrivial change in the NCHS budget, which is about \$50 million annually.

If the occupational mortality program is implemented even at a slightly expanded level from the 11-13 currently

funded States, NCHS must also be provided with the staff and budget resources for processing the greater volume of data, and, importantly, for the analyses of these data. With assistance of other knowledgeable agencies such as NIOSH and NCI, it is crucial that NCHS demonstrate how these data can be used at the national and subnational levels to show associations between occupation and cause of death.

Demonstration projects—Demonstration projects supported by grants to the States can develop creative ways to produce, analyze, and use the data in support of occupational health activities at the State level. There may be advantages to having such grants administered by program agencies, such as NIOSH and NCI.

Automated coding—The possibilities of automated coding should be explored as part of a continuing occupational mortality statistics program. NCHS already has experience implementing a pilot project in several States for an automated system for encoding of cause of death from the death certificate with the goal of ultimately having the capability to automatically convert English language entries directly into codes of the International Classification of Diseases. It is clear that the required internal dictionary in such a system must accommodate a large number of entries including synonyms and misspellings. The system will still require a manual component to accommodate the entries that cannot be automatically handled. It is unlikely that an automatic system can completely replace experienced coders for complex data items, such as cause of death and occupation and industry.

The U.S. Bureau of the Census is developing a system of this type for automatically coding occupation and industry in preparation for the 1990 census. In earlier discussions, U.S. Bureau of the Census staff indicated that, although the system is likely to work for a substantial proportion of cases, perhaps 50-70 percent, a large remaining number may still have to be manually coded. Perhaps, over time, this residual will be diminished. I strongly agree that automated occupational mortality coding should be explored by NCHS, possibly using 1-percent evaluation funds.

Measurement problems—The Workshop did not widely discuss measurement problems; but these should be noted and be explored thoroughly in an ongoing program. Briefly, measures of mortality risk usually have a numerator representing the occurrence of an event over a stated period of time, along with a denominator representing a population at risk to experience the event. The problem for occupational mortality statistics is the paucity of routinely available information on the denominator. Because denominator data are often not readily available, occupational mortality analyses must be carried out in terms of numerators only, that is, using proportional mortality analysis. The growing literature on numerator analysis needs to be tapped and explored to make effective use of occupational mortality data (e.g., Kupper et al. 1978).

Data quality—NCHS is cognizant of concerns in this area and is addressing these in several ways, beginning with reporting and extending through data processing to data

analysis. It is recognized that occupational mortality data can be no better than the information reported on the death certificate. Thus, efforts must be directed by State vital statistics offices to funeral directors to provide occupation and industry of decedents in sufficient detail and validity to be useful for analysis. To facilitate this, NCHS has worked with NIOSH to produce a handbook that provides funeral directors with guidelines on reporting occupation and industry of decedents (NCHS, 1983).

It has been suggested by Rothwell and others that additional efforts need to be made to improve the quality of occupational mortality data. In particular, it is suggested that States query incomplete and imprecise I/O information reported on death certificates. This is an excellent idea, and it should be part of a national strategy to improve the quality of this information reported through the vital statistics system. For other items on the death certificate, NCHS has developed a set of guidelines for State querying of demographic items on vital records (NCHS, 1982). Full and sustained querying and training programs at the State level will be costly; but they are crucial to improving the quality of occupational information on vital records.

A further suggestion is using followback surveys to assess the validity and reliability of occupational information on death certificates. NCHS is undertaking such an effort by including a number of occupation questions on the 1986 National Mortality Followback Survey.

Data use—National leadership in this program has been emphasized in the discussions of several groups. This would take several forms, including producing reports that can serve as models to the States for data analyses and data dissemination. It would include standardized tabulation lists, and it would recommend analytical methods. Accepted, standardized measures and analytical approaches are needed in an area where, because of potentially sensitive implications, absence of ambiguity in measurement and analysis is essential. A program at the national level would investigate measurement methodologies; examine issues of quality, reliability, and validity of reported information; develop resource materials for States to train funeral directors on reporting these items and for querying incomplete or ambiguous entries on death records; and identify resources to States for demonstration activities, including data use in support of occupational health programs.

Research opportunities—I would like to elaborate on a point made by Dr. Anderson regarding the nature of occupational information from the mortality data system; I call it the "baby bath syndrome" or "statistical myopia." It is the unfortunate tendency to denigrate not only occupational information but vital statistics information more generally because of known and obvious data imperfections and limitations. The challenge to all of us is to exploit this accessible, highly standardized data set.

Statisticians and epidemiologists working in the area of occupational health, accustomed to working with specialized surveys or with study cohort data, have to recognize and to creatively overcome the limitations of the vital

statistics data base, which reflects a data collection instrument—the death certificate—that serves both legal and statistical purposes. The vital statistics system is grounded not in a survey statistician's constructs but rather in the legal and statistical needs of State health departments. Problems of occupational mortality data identified in this Workshop can provide a research agenda for occupational mortality. Among the areas to be explored are:

- The absence of denominator data for some years.
- The difference between occupation elicited on the death record ("usual" occupation) and on census and U.S. Bureau of the Census surveys ("current" occupation).
- The lag between time of exposure to an occupational hazard and related onset of death, especially for some cancers.
- The problem of migration for subnational areas, which may contaminate observed geographical associations between occupation and mortality.
- The problem of confounding variables that may partially account for relationships between occupation and cause of death.

These problems, I would maintain, constitute a research agenda for this data base, and should not impede the production and use of occupational data reported on the death certificate.

Conclusion

The Workshop has provided, I believe, a balanced and thorough appraisal of issues associated with options for producing occupational mortality data. Broad consensus has emerged, I believe, on an approach to provide continuous, detailed, and high-quality occupational mortality data through the existing national vital statistics system; a desire to support NCHS in obtaining appropriated funds for this purpose; and a recommendation for leadership at the Federal level, through research, analysis, and demonstration activities. The Workshop clearly can serve as the basis for a major, sustained national thrust to develop a data base for occupational health by exploiting existing information reported routinely on the death certificate of every State.

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Summary of recommendations from participant questionnaires

Questionnaires were given to the 46 participants who did not represent the Bureau of Labor Statistics (BLS), the National Center for Health Statistics (NCHS), the National Institute for Occupational Safety and Health (NIOSH), or the National Cancer Institute (NCI). (See appendix II for a copy of the questionnaire.) Thirty-seven participants completed and returned their questionnaires. The form directed participants to weight the 10 options by indicating whether they agreed or disagreed with the implementation of each option. The following is a summary of the responses. These are not necessarily an unbiased sample of the opinions of the participants. Further, the discussion of the results includes interpretations by NCHS staff members.

Option Nos. 1 through 4. Occupation and industry coding from death certificates

It is difficult to assess the industry and occupation (I/O) coding Option Nos. 1 through 4 independently because many of the responses obviously considered these options as one issue. The overwhelming number of respondents strongly agreed (36/37) with Option No. 2 (annual coding of industry and occupation for all States). Many respondents identified this option as the ultimate goal of the system, rather than a strategy for immediate implementation.

Those who strongly agreed with Option Nos. 1 (the current system) and 4 (annual coding for a subset of States or causes) felt that these options were the most practical approach for current implementation but should be expanded to include all jurisdictions willing to participate. There were several alternatives for implementing Option No. 4.

- Bring States into the system as they are ready.
- Sample causes of death that may be occupationally related.
- Sample certificates from all States for industry and occupation coding.
- Sample death certificates by industry.

Those respondents who recommended implementation of the reporting system during census years only (Option No. 3) viewed it as a subset of Option No. 2 (full implementation) and suggested major pericensal reports based on annually generated data.

Many respondent comments highlighted two important foci of I/O coding from death certificates. First, a national system is needed for surveillance, for providing impetus to the States, developing methodologies of analysis and presentation, and for guaranteeing quality and comparability of the data collected in the different registration areas. The second focus is at the State level for developing intervention strategies for the prevention of occupational morbidity and mortality. As one respondent summarized: "We currently have no good baseline data on the magnitude of occupa-

tional illness in the U.S. (existing data being very poor with regard to chronic disease). State-based data are critical to State occupational health programs—for program and policy planning, prioritizing of resources, and trend surveillance."

Fifteen respondents (41 percent) recommended that automated coding of industry and occupation be explored. Several participants also suggested that a quality assurance program must be built into the system. Other suggestions included the following:

- Link I/O codes to specific occupational exposures.
- Establish a committee to develop a list of reasons that I/O coding should be done.
- Fund State demonstration projects emphasizing the use of the data.
- Request continued funding from NCI.
- Request funding from the Agency for Toxic Substance and Disease Registry (ATSDR).
- Request funding from Congress.

One respondent summarized several of the issues concerning coding death certificates as follows:

- Funding for the basic Vital Statistics Cooperative Program must be established before adding new components and processes.
- There is a need to include sufficient funding for quality control that includes followup to check the accuracy of the data reported.
- NCHS needs to develop an automated coding process so States can electronically record the literal entries for industry and occupation.
- NCHS needs to provide leadership on how to present I/O data in tabular and graphic displays.
- NIOSH and BLS should work with States on how to interpret and use I/O specific mortality data.

Option No. 5. Mortality followback surveys

Many respondents endorsed the use of mortality followback surveys as a valuable supplemental approach to Option Nos. 1 through 4. Although these surveys would have the problem of a limited sample size, the surveys could direct analytic research efforts, provide extremely important information on the quality of the data collected on death certificates, and obtain information on covariates for specific hypothesis testing. It was felt that the followback studies could not provide State-level data or generate national estimates.

Option Nos. 6 and 7. Using NHANES, NHIS, or other NCHS surveys with the National Death Index

In general, the comments on these options listed many problems of this approach, for instance, sample size and time constraints. This approach should not be considered as an alternative to Option Nos. 1 through 4. However, as an ad hoc basis to test certain hypotheses, the availability of covariate information from these data sets may make con-

sideration of mortality followup worthwhile. The problems of the sample sizes available for specific occupation or industry analyses and the length of time it would take to generate an appropriate number of deaths make these approaches less desirable.

Those responding to this option felt that it was important to include occupational data on the National Health and Nutrition Examination Survey (NHANES) and the National Health Interview Survey (NHIS). Many participants left this section blank or emphasized its potential contribution for morbidity analyses rather than mortality research. Several respondents mentioned that NCHS data should be examined for investigating reproductive hazards.

Option No. 8. Use of the National Longitudinal Mortality Study (NLMS), the Continuous Work History Sample (CWHs), or Internal Revenue Service (IRS) Record Followup with the NDI

Many participants did not respond to these issues. Those that did indicated that these efforts certainly should not distract from implementing an I/O coding option from death certificates. Some responses were positive for using NLMS or CWHs. Several participants raised concerns about the availability of data for analysis. Concerns were also raised about the quality of the occupational information available from IRS tax forms.

Option No. 9. Use of BLS Annual Survey of injuries and illnesses (ASOII) or the Supplementary Data System (SDS) for Occupational Mortality Surveillance

Many concerns were raised about the completeness of coverage and the quality of these data. The annual survey

was seen as more valuable for the industries it covers and could possibly be useful for surveillance of injuries.

Option No. 10. Use of the compressed vital statistics files

Comments ranged from "inappropriate" to "very valuable" for identifying excess cause-specific mortality and mapping. Several persons commented on the value and uses of ecologic data for surveillance.

Other suggestions

Below is a list of options useful for occupational mortality surveillance identified on the evaluation forms:

- Large sample of U.S. Bureau of the Census long forms.
- Data linkage "like the Swedes," that is, the U.S. Bureau of the Census linked with cancer incidence data and mortality information supplemented by followback studies.
- Use of the National Hospital Discharge Survey.
- Incorporation of Medical Examiners' data for E-code deaths into Option No. 2.
- Need to link mortality data with exposure information from the Occupational Safety and Health Administration (OSHA).
- Modify NDI to include cause of death.
- Facilitate use of IRS address file.
- Encourage record linkage and followup studies for death certificates, coroner's reports, OSHA inspections, NIOSH investigations, and workers' compensation claims.
- Use end-stage renal disease program data.
- Set aside money for State demonstration projects.
- Code I/O on NCI's Surveillance, Epidemiology, and End Results cancer registry data.
- Use OSHA forms for research and surveillance.

Chapter IV. Postscripts from sponsoring agencies

Postscript: Bureau of Labor Statistics

by William Eisenberg, Associate Commissioner
for Occupational Safety and Health Statistics,
Bureau of Labor Statistics

We, at the Bureau of Labor Statistics (BLS), are deeply committed to improving occupational injury, illness, and fatality statistics, and we heartily support interagency efforts, such as this Workshop, that are directed to the same end. We are particularly happy to be here at this first gathering under the tripartite agreement.

In the occupational illness area, BLS sponsored a symposium on various aspects of obtaining occupational illness data (U.S. Department of Labor, 1985). This symposium brought together officials and professional staff from State departments of labor and State departments of health, from the National Center for Health Statistics, the National Institute for Occupational Safety and Health, BLS, and the Occupational Safety and Health Administration, as well as representatives of labor, business, and academia. As a result of that symposium, a BLS-State health department committee was established to focus on ways to improve health and safety statistics, including fatalities.

In an effort to improve our statistics program overall, we contracted with the National Academy of Sciences for

an expert panel study of our data series, with fatalities a major emphasis, to help fashion an effective statistical program for surveillance and prevention (National Research Council, 1987).

As regards occupational fatalities, BLS recognizes that, if the death certificate system is to become a primary source of this information, the quality of the industry and occupation reporting on death certificates and the standardization of industry and occupation coding are fundamental requisites. We also recognize that, if it is to become a viable system, a common definition for "at work" fatalities is necessary as well as the participation of all States in the program.

In closing, I would like to express our thanks to the National Center for Health Statistics for sponsoring this conference, which focuses on such an important area in occupational health and safety, and we look forward to other promising collaborative efforts under our tripartite agreement.

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Postscript: National Institute for Occupational Safety and Health

by Edward L. Baker, M.D., M.P.H., Deputy Director, National Institute for Occupational Safety and Health

This Workshop was important for many reasons. First, it provided an important opportunity to discuss the merits of several options for the use of death certificates in surveillance of occupational illness and injury. Second, it provided an opportunity for continued interaction of occupational health professionals interested in surveillance systems. Finally, it represented an affirmation of the opportunity to improve surveillance data for occupational disorders. In response to this opportunity, the National Institute for Occupational Safety and Health (NIOSH) is committed to a continued, coordinated involvement designed to evaluate the utility of existing approaches to surveillance and to develop new surveillance systems. Central to this reassessment is the necessity of linking surveillance efforts with intervention programs to protect the health of individual workers. In this regard, I would like to review NIOSH plans for the future.

NIOSH is committed to the development of an occupational health-hazard-illness-injury coding system, survey, and surveillance capability (PHS, 1986). A variety of approaches are recommended along with a proposed revision of the initial objective, to read: "By 1990, using the surveillance systems initiated by 1985, injury, illness, and mortality trends should be depicted for at least 10 to 15 hazards, and 10 to 15 new priorities should be generated annually for possible epidemiologic or toxicologic research."

NIOSH injury surveillance data that are based on the Bureau of Labor Statistics' (BLS) annual survey differ from the results obtained from the National Electronic Injury Surveillance System sample of work-related injuries seen in emergency rooms. The reasons for these differences need to be understood. High-risk jobs need to be identified. Effective intervention programs must be implemented. These steps will require the combined efforts of Federal agencies (NIOSH, BLS, the National Center for Health Statistics (NCHS), the National Cancer Institute (NCI), the Occupational Safety and Health Administration (OSHA), and the Mining Safety and Health Administration) and State departments of health and labor. The precedent set for Federal and State collaboration by the tripartite efforts during this meeting points the way toward meaningful next steps.

Trend analysis for disease and mortality can be based on the current efforts to adapt NCHS surveys, NHANES and NHIS, for use in occupational disease surveillance. Mortality trends for a subset of States currently part of the Surveillance Cooperative Agreements between NIOSH and the States (SCANS) and Capacity Building States program and, eventually, for all States (the consensus of opinion at the Workshop) form another component of the desired surveillance program.

The proposal made by Dr. Millar for SENSOR is designed to enlist medical care providers in the effort to identify selected occupational disorders for further research and intervention. The concept of sentinel physicians along with the effort initiated by NIOSH in 1983 to make use of sentinel health events (Rutstein et al., 1983) provides a means of getting primary care providers to "... routinely elicit occupational health exposures as a part of patient history ..." (PHS, 1986).

Clearly, an expanded program for occupational injury and disease surveillance will require new funding. As evidence of the NIOSH commitment to these efforts, there will be an announcement soon of another round of NIOSH-State cooperative agreements, totaling about \$1,000,000 in fiscal year 87. It is reasonable for the States to assume that many of the factors that we have discussed at this Workshop will find their way into these guidelines. Specifically, reference will be made to the concept of occupational injury and disease surveillance centers; the continuation of State effort; the existence of State capabilities (in some cases working cooperatively with NIOSH staff to follow up on the leads developed from surveillance efforts); the commitment of NIOSH to staff consultation in addition to dollars; and, in some cases, the assignment of a NIOSH Epidemic Intelligence Service officer to a State. Another proposal was to build on the cooperative agreements a "line of credit" to States consisting of a specified number of Health Hazard Evaluations or similar forms of technical assistance.

Because more active provider reporting of occupational disorders through the Sentinel Event Notification System for Occupational Risks (SENSOR) was discussed briefly by Dr. Millar in his opening remarks, I would like to take this opportunity to describe it in greater detail.

Although many States require health providers to report occupational illness and injury, none maintains a comprehensive system to detect and respond to such reports. Because little action is taken in response to case reports, physicians and other providers have little interest in continuing to contribute to a reporting system that just collects data. The SENSOR project proposes a comprehensive system that would utilize a network of *sentinel providers* to recognize and report *selected occupational disorders* to a *surveillance center*. The center would be responsible for analyzing a case report and directing three types of response: management of the reported case, screening for possible disease in coworkers of the case, and evaluation of worksite factors potentially responsible for the case. Although primarily useful as a surveillance system designed for case identification, data from a SENSOR project could be used to monitor trends in the occurrence of selected occupational disorders within a State.

As discussed by Langmuir (1976) and by Foege and colleagues (1976), the purpose of surveillance is not only to collect and analyze data but also to direct active prevention programs designed to control and, in some cases, eliminate the occurrence of preventable disorders. In the past, a number of States have enacted specific regulations

requiring physicians and other health-care providers to report selected occupational diseases (table 5). Unfortunately, in most instances, these provider reporting programs were not linked to specific intervention efforts.

Table 5. Surveillance activities for occupational disease reported by health departments in 50 States, New York City, and Washington, D.C.: 1985

Item	Number of departments surveillance/reporting activity
Health-care providers	31
Mandatory reporting	27
Voluntary reporting	4
Penalties for not reporting	16
Six sentinel health events	19
Reporting	7
Data analyzed	8
Followup conducted	18
Worker education linked to reporting	7

SOURCE: Muldoon et al., 1987.

Other shortcomings of provider reporting systems have limited their usefulness. These include the uncertainty among providers of the nature of a specific occupational disorder, that is, lack of case reporting criteria. In the case of communicable disease reporting, development of reporting criteria have greatly facilitated the epidemiologic investigation of selected conditions (Thacker et al., 1983). Another limitation of existing occupational disease reporting systems, which is similar to that observed in communicable disease reporting (CDC, 1987), is the lack of a defined network of sentinel providers who have responsibility to report selected conditions to an appropriate State agency. Finally, in most States, the resources needed to receive, analyze, and direct a response to a provider report are minimal or lacking.

To address these limitations, a uniform provider reporting system will be developed for use by States to perform active surveillance of selected occupational conditions. The SENSOR system will build on previous experience of State health and labor departments. To some extent, prior support from NIOSH has contributed to the development of this capacity.

The SENSOR system will consist of two organizational components (figure 3). First, a network of sentinel providers, individual practitioners of clinic groups, will be developed. The function of the sentinel provider network will be to recognize and report cases of selected occupational disorders. The second component, a surveillance center, will receive the report from the provider, analyze the data, and direct action toward the individual cases, coworkers of the case, and to the workplace. In addition to fulfilling a central role in the coordination of response to provider reports of occupational disorders, the center would provide technical consultation in a wider variety of occupational health issues (for example, surveillance using vital records, hospital discharge records, or workers' compensation files to monitor trends of occupational disorders). Because State

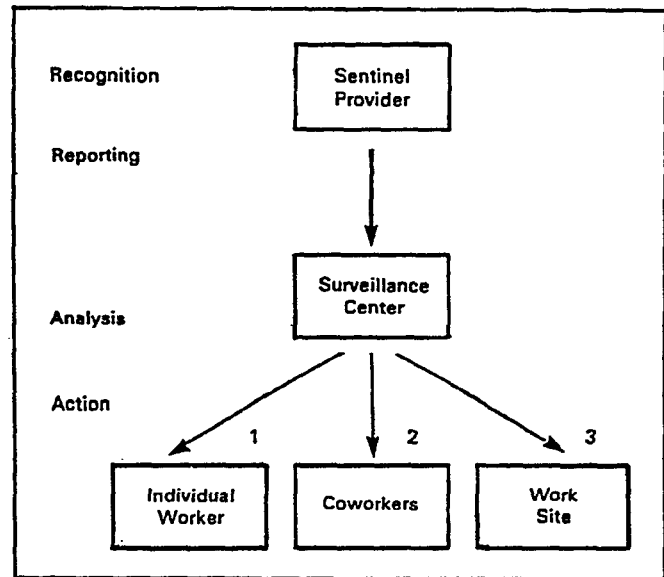


Figure 3. Sentinel event notification system for occupational risks (SENSOR): 1987

health departments and labor departments have variable, shared responsibilities in occupational safety and health, the creation of a surveillance center will serve to unite complementary programs that currently exist in relative isolation.

To facilitate the recognition of selected occupational conditions by the sentinel provider network, NIOSH will develop and maintain a list of conditions that lend themselves to provider reporting. To the greatest extent feasible, such conditions should be attributable to work in a high percentage of cases, reasonably frequent, easily diagnosable by practitioners having no access to sophisticated diagnostic tests, of reasonably short latency, and potentially reversible following case identification.

In addition to developing a list of conditions, NIOSH will develop a set of reporting criteria that can be used by practitioners to facilitate recognition. Such criteria are to be used for the purposes of improving provider recognition of selected occupational conditions and enhancing uniform reporting between different regions of the country. Analyses of these case reports will provide useful information regarding the characteristics of selected occupational conditions, their sequelae, and other important and clinical epidemiologic features.

Reporting by providers to State health departments has relied on a passive system in which the provider is encouraged to mail in reports of cases using forms developed by the requesting agency. In view of the recent advances in computer technology and telecommunication techniques, other alternatives exist for transferring information from providers to a central surveillance center. To facilitate a more active transmission of data from providers to a central surveillance center, NIOSH will support the development of computer technology that would allow for the transmission of data on suspected cases from providers to the center for analysis and possible response.

Utilizing staff epidemiologists, statisticians, and other occupational health professionals, the surveillance center will analyze cases reported from the provider network and determine whether additional actions are appropriate. In many States, opportunities exist for disseminating the results of such analyses through publications directed at public health professionals, physicians, and other professionals. The results of such analyses may also be appropriate for inclusion in the Centers for Disease Control's *Morbidity and Mortality Weekly Report*.

Three types of action could result from the receipt of a definite case report. First, individual case management recommendations will be developed by NIOSH for the conditions to be placed under active surveillance. Such guidelines will be made available to practitioners reporting these cases as a form of consultative assistance. The second type of action will be directed at coworkers of the case. Because coworkers with similar workplace exposures may be at risk for the development of occupational illness or injury similar to that experienced by the case, medical evaluation of such workers to detect early, potentially reversible health disorders is appropriate. Finally, action directed at specific workplace causes will be coordinated by the surveillance center in response to the report of an individual case. In view of the variable capacity of State programs to control occupational safety and health hazards, local resources will be examined to determine the most appropriate mechanism for directing such worksite action.

Provider reporting systems have been in effect in a number of States for many years, but because of various shortcomings, have not developed active surveillance of occupational illness and injury. To achieve a more uniform, active approach to provider reporting, SENSOR will be created as a cooperative State-Federal effort designed to develop local capability for the recognition, reporting, and prevention of selected occupational disorders. To demonstrate the feasibility of this approach, NIOSH will fund a small number of SENSOR projects in fiscal year 87. Ultimately, joint State-Federal support will be essential to maintaining SENSOR activity within a State.

SENSOR should not be viewed as the sole approach to the surveillance of occupational illness and injury. Other approaches to the identification of cases of occupational illness or injury and to monitoring trends of occurrence of these disorders have been developed by NIOSH and some States and will continue to function (Frazier, 1985; Halperin and Frazier, 1985). These programs will address other of the six objectives enunciated by NIOSH for improving surveillance in the future:

- Develop a model occupational disease reporting system for health care providers (SENSOR).
- Incorporate occupational health issues into national and regional surveys.

- Improve hazard surveillance.
- Develop uniform approaches for using existing health data sources.
- Disseminate information and share methodology.
- Perform surveillance for Leading Work-Related Disease and Injuries.

In closing, in my view we are presented with an unusual opportunity for improving surveillance data for occupational illness and injury. This can only be accomplished by a collaborative effort involving NIOSH and other Federal and State agencies committed to improving the collection of accurate data and, more importantly, a direct intervention program designed to improve the health of the U.S. workforce. I am convinced that through the activities, such as this Workshop, which have been organized over the past several months, we will achieve a dramatic improvement in the surveillance of occupational illness and injury for this country.

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Postscript: National Center for Health Statistics

by Manning Feinleib, M.D., Dr. P.H., Director,
National Center for Health Statistics

As evidenced by these Proceedings, this Workshop was quite successful, bringing together experts from Federal and State agencies, Congress, academia, industry, and labor to evaluate a wide range of options for studying occupational effects on mortality. I would like to thank members of the National Center for Health Statistics' (NCHS) staff, in particular, Drs. Patricia Buffler, Bruce Cohen, and Harry Rosenberg, for organizing the Workshop. Further, with the help of other participants, a great deal of effort was devoted to carefully drafting and documenting the options presented to the Workshop. Finally, the format for the program that allowed a long working group time was successful in generating vigorous discussion that could only be briefly recounted in the working group reports.

NCHS will take all of the recommendations under advisement. There appears to be consensus that the goal should be the eventual nationwide coding of industry and occupation on the death certificates. The achievement of this goal will not be simple. As was noted before, not all States code this information. Therefore, an educational initiative is needed to make the States aware of the value of industry and occupation information on the death certificate. Such an initiative would be best accomplished by the institutions that are devoted to the study of the working

population and occupational health, including not only the Department of Labor, the National Institute for Occupational Safety and Health, the National Institute of Environmental Health Sciences, the Environmental Protection Agency, and the Agency for Toxic Substances and Disease Registry, but also labor and industrial groups.

The value of occupation and industry coding would become clearer if there were more studies available that demonstrate their use. There are a few, by now classical, studies that demonstrate the utility of some kinds of data. But new analyses and new ways of combining data from different sources are needed to expand the usefulness of the data that already are available. This work can be accomplished by the academic community working with the various State and Federal agencies.

The Memorandum of Understanding that was signed at this Workshop encourages collaboration in the analyses of data and in planning and implementation of programs to promote and expedite collection of information essential for improving occupationally related health. Within NCHS, our occupational program will emphasize the analyses of multiple sets of data already available and a coordinated approach to the collection of data in the future. In addition, NCHS will continue to strengthen its capabilities to provide users with data relevant to subnational problems through programs such as benchmark communities or model-based estimation for small area data analyses. Finally, on the advice of this Workshop, we will evaluate ways to obtain funding to continue and improve the collection of the industry and occupation coding from death certificates.

Appendixes

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Appendix I.

Memorandum of Understanding

Among the Bureau of Labor Statistics, the National Center for Health Statistics, and the National Institute for Occupational Safety and Health

I. Purpose

In response to the need to improve occupational health and safety information, the Bureau of Labor Statistics (BLS), the National Center for Health Statistics (NCHS), and the National Institute for Occupational Safety and Health (NIOSH) enter into this Memorandum of Understanding for the primary purpose of developing collaborative plans for improving occupational illness and injury reporting systems and surveys.

II. Provisions and goals

1. Exchange data and information relevant to respective agency programs, capabilities, and needs.
2. As necessary, collaborate on the development of issue papers, position papers, proposals, and projects of mutual concern and interest.
3. Identify program areas where tripartite assistance or support is needed and identify:
 - kinds of assistance or support needed
 - when needed
 - resources involved.
4. For projects or proposals submitted for official approval of joint agency heads, develop funding and resource requirements and timetables for implementation.
5. Jointly pursue the cooperation of other agencies in the implementation of projects or proposals where involvement of other Federal and State agencies is required.
6. Develop options that promote the recognition and reporting of occupational illnesses and injuries.

7. Develop options that promote and expedite obtaining information essential for improving health and safety reporting systems, surveys, and data.
8. Collaborate in planning, sponsoring, and conducting seminars, conferences, or similar forums of discussion to exchange information, resolve problems, report progress, and so forth.

III. Performance requirements

A. Designation of representative(s)

Each agency will designate a person or persons to coordinate and carry out the provisions outlined in this Memorandum of Understanding. The agency representatives are as follows: Ronald W. Wilson (NCHS); Edward L. Baker, M.D. (NIOSH); and William M. Eisenberg (BLS).

B. Meetings

To accomplish the purpose and goals defined in this Memorandum of Understanding, the joint agency representatives will meet regularly (at least semiannually). In the planning, development, and execution of projects proposed under this tripartite agreement, meetings on such projects involving agencies not party to this agreement will be jointly attended.

C. Notification

The joint agency representatives will make oral or written reports as requested by joint agency officials. All written communications pertaining to joint project work will be mutually exchanged and copies of such communications will be sent to agency heads or their representatives, as appropriate.

Appendix II.

Workshop participant questionnaire

OCCUPATIONAL MORTALITY DATA WORKSHOP:

Option Preference Questionnaire

The purpose of this questionnaire is to determine your personal preference for options that NCHS might implement to produce occupational mortality statistics as part of its ongoing program (or encourage other agencies in their data collection efforts). Please circle how strongly you agree or disagree with each option for this purpose.

		<u>Please Circle</u>				
		<u>Strongly Disagree</u>		<u>Strongly Agree</u>		
Industry/Occupation Coding on Death Certificates						
Option 1:	Use existing system	1	2	3	4	5
Option 2:	Use annual I/O coding for all States	1	2	3	4	5
Option 3:	Use pericensal approach	1	2	3	4	5
Option 4:	Use annual, for subset of causes and/or subset of States (please specify)	1	2	3	4	5

Comments:

Use of NCHS Surveys for Followup

Option 5:	Use mortality followback surveys	1	2	3	4	5		
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Comments:

Please Circle

<u>Strongly</u> <u>Disagree</u>	<u>Strongly</u> <u>Agree</u>
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Option 6a: Followup NHANES surveys using NDI

1 2 3 4 5

Comments:

Option 6b: Followup NHIS surveys using NDI

1 2 3 4 5

Comments:

Option 7: Followup other NCHS Surveys using NDI
(please specify)

1 2 3 4 5

Comments:

Please Circle

<u>Strongly</u> <u>Disagree</u>						<u>Strongly</u> <u>Agree</u>
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Other Data Sources

Option 8a: Use National Longitudinal Mortality Study

1 2 3 4 5

Comments:

Option 8b: Use Continuous Work History Sample

1 2 3 4 5

Comments:

Option 8c: Use IRS Record Followup with NDI or
other data systems (please specify)

1 2 3 4 5

Comments:

Please Circle

<u>Strongly</u> <u>Disagree</u>	<u>Strongly</u> <u>Agree</u>
------------------------------------	---------------------------------

Option 9a: Use BLS Annual Survey of Illness and Injury for occupational mortality surveillance	1	2	3	4	5
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Comments:

Option 9b: Use Supplementary Data System (BLS) and/or other workers' compensation data systems	1	2	3	4	5
--	---	---	---	---	---

Comments:

Option 10: Use Compressed Mortality File	1	2	3	4	5
--	---	---	---	---	---

Comments:

Option 11: Other options (please specify)	1	2	3	4	5
---	---	---	---	---	---

Comments:

II. The purpose of this section is to identify your preference for different options or groups of options under varying resource constraints. Please use the option numbers designated below, our discussions in the working groups, and reasonable cost estimates to design a program given the funding constraints:

- Option 1 Existing I/O Coding on Death Certificates
- Option 2 Annual I/O Coding for all States
- Option 3 Pericensal approach
- Option 4 Subset of causes and/or subset of States
- Option 5 Mortality followback surveys
- Option 6a Followback of NHANES using NDI
- Option 6b Followback of NHIS using NDI
- Option 7 Followback of other NCHS surveys using NDI
- Option 8a National Longitudinal Mortality Survey
- Option 8b Continuous Work History Sample followup using NDI
- Option 8c IRS record followup or other data system (please specify) using NDI
- Option 9a Annual Survey of Occupational Illness and Injury (BLS)
- Option 10 Compressed Mortality File
- Option 11 Other options (please specify)

1. What option or group of options should be implemented if less than \$400,000 per year for funding is available?

2. What option or group of options should be implemented if between \$400,000-\$800,000 is available?

3. What option or group of options should be implemented if between \$800,000-\$1,200,000 is available?

4. What options should be implemented if there are no financial constraints?

III. This is an opportunity for you to provide any additional comments on the workshop.

A. Are there additional options that you feel NCHS should explore?

B. Additional comments.

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