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NIOSH OCCUPATIONAL HEALTH AND HAZARD SURVEILLANCE SYSTEMS

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I will briefly describe: (1) the overall occupational health survey system of NIOSH; (2) the National Occupational Hazard Survey, its design, use, and an update; (3) some opportunities for collaboration that I think have been identified here at this meeting; and, (4) some problems that have been encountered in trying to make occupationally related exposure assessments.

Surveillance, as defined by Alex Langmuir (1), is the collection of relevant facts, the analysis of these facts, and the effective dissemination of these facts. So, surveillance is a function of collection, analysis, and dissemination. The problem is to decide what are the relevant facts, how to analyze them, and how to disseminate them to people who can make use of them.

The NIOSH occupational health and hazard surveillance systems were authorized by the Occupational Safety and Health Act of 1970. The hazard surveillance activity in NIOSH will be the primary subject of this paper.

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Under the Health Service Act of 1978, the National Center for Health Statistics was given the assignment to prepare three documents, one of which was concerned with developing a plan for the collection and coordination of epidemiologic and statistical information for environmental health (2). Two of the recommendations from this plan are concerned with the uses of the data for priority setting and one recommendation called for interagency coordination, which is exemplified by this meeting.

My first purpose will be to describe, by use of the National Occupational Hazard Survey and its new counterpart, the National Occupational Exposure Survey, data that can be used for hazard surveillance, and how these can be used as an input--and I emphasize "one input"--into a priority system. Following that, I will indicate how data of this type can be coordinated with other Agencies' data bases.

The National Occupational Hazard Survey (NOHS) was conducted from 1972 to 1974 to provide estimates of the number of workers potentially exposed to job hazards. A second aim of the survey was to describe the industries and occupations where these potential hazards were observed. Finally, the survey identified medical, industrial hygiene, and safety practices used to protect workers.

This survey started with a probability sample of 5,000 of 5 million U.S. work sites. Twenty surveyors--college graduates, including chemical engineers, industrial hygienists, and other scientifically trained people--were trained in the NOHS surveying

technique. These 20 surveyors did plant walk-throughs and observed potential chemical and physical workplace hazards. The survey results were noted in a standardized survey format that was then transferred to computer files and analyzed.

One of the main things that came out of this survey was a list of chemical ingredients found in 65,000 out of about 80,000 trade name products found in a probability sample of all U.S. workplaces. It is very important to point out that workers are not usually exposed to chemicals; workers are exposed to trade name products. Many times workers don't really know the chemical ingredients and the potential dangers of the products they use on the job. Thus, a major contribution from NOHS is the capability of linking potential hazards to industries and occupations.

The National Occupational Hazard Survey data are used as one input for setting NIOSH research priorities. In addition, they were sent to OSHA where they were used as a part of their regulatory priority-setting mechanism for control of workplace hazards.

Other Agencies also make use of NOHS data. For example, information about the number of people potentially exposed to a chemical in the workplace is used to help rank chemicals on a list for study by the National Toxicology Program. Information of this type is, in many respects, very important in determining the level and type of research activity that should be associated with the type of chemical.

The NOHS survey also contributed to the identification of high-risk groups: high-risk industries, high-risk occupations, or workers who are potentially exposed to classes of chemicals, e.g., carcinogens, mutagens, teratogens. Information of this type from the NOHS data base is requested on an average of once a day by a wide variety of groups, including many Government Agencies.

The NOHS data are used to prepare computer-generated county level maps that depict potential workplace hazards. Computer-generated mapping at NIOSH has been assisted by funding and interest from the National Cancer Institute. By making several assumptions, we extrapolated from the NOHS sample of 5,000 worksites to national profiles based on the Dun & Bradstreet file of some 4.7 million worksites in the United States, coded according to the Standard Industrial Classification (SIC) code. One assumption is that the SICs seen in our sample of 5,000 worksites are representative of those same SICs in the Dun & Bradstreet file. For the purpose of generating hypotheses for our mapping exercise, we believed that this was a reasonable assumption.

Four types of maps have been generated. One shows the distribution of facilities utilizing a specific chemical, e.g., formaldehyde. This type map was developed by using the National Occupational Hazard Survey in conjunction with the Dun & Bradstreet file, to depict SICs at the county level. In designing a study, this type of map could help identify areas where there is a concentration of facilities that potentially use formaldehyde.

A second type of map shows the number of workers potentially at risk. Areas having a high density of workers potentially at risk might be picked up by our Industries Wide Study Branch, another group in the NIOSH surveillance activity, for further indepth epidemiologic study.

A third type of map shows workers per 100,000 in a county work force. This "rate map" gives some idea of the extent of potential exposure to a workplace hazard.

The fourth type of map combines NOHS data into classes of chemicals. One example that we are working with now shows the teratogens that we observed in one mid-western state. This is the kind of map that might be useful for a study based on birth records for a particular set of counties that must be identified. One limitation of this approach is that we usually find few workers potentially exposed to the teratogens of interest. However, this might be a very important finding in the sense that it avoids using scarce resources to do a study of teratogenic effects among a very small population at risk.

We are now conducting a new survey called the National Occupational Exposure Survey (NOES). The survey started in November of 1980, and the field phase is scheduled to end in March of 1983. Again, 5,000 worksites were selected. The probability sample was designed by survey design experts. The interviewing has been done by a team of 10-20 surveyors. Over 3,000 work sites employing over a million workers have now been surveyed. We have had only 20 refusals out of the 3,000 sites.

If resources are available, the data collection, editing, and compiling will be finished by the end of FY83. We may have to defer some of the trade name clarification parts of the survey until we get sufficient additional funds.

I want to briefly mention NIOSH collaboration with other Agencies. One of the things that we have been talking with NCI about is the display of workplace hazards by state economic areas in a way that will conform to the NCI Atlas of Mortality from Selected Diseases (3). This may give a useful side-by-side portrayal of potential exposure to chemicals and disease patterns of interest.

We are also working with states through the funding mechanism of cooperative agreements. We are trying to decentralize our surveillance activity to the state level to help states do more detailed occupational health surveillance. They are much closer to the problem, and there are many reasons for doing this type of decentralization.

Finally, I want to end up with an example of the use of maps in surveillance. The county distribution map that shows deaths due to pneumoconiosis for white males, age group 20 to 64, is nearly identical to the map that shows the distribution of anthracite and bituminous mines. In contrast to this, a map for deaths due to pneumoconiosis for white males 65 and over shows a different county-wide distribution. In addition to deaths in the Appalachian counties, there are also deaths in Florida and in some of the other sunshine states. These are areas in which there are no mines.

There are some data base problems with regard first to the exposure assessment. As I pointed out, exposures were not measured in either the National Occupational Hazard Survey or the National Occupational Exposure Survey. Trained surveyors assessed the potential for worksite exposures, taking into account the duration of exposure and the control mechanisms that were in place and functioning. One of the things we need to consider in the future is the use of the National Occupational Exposure Survey as the first stage of a sampling frame that identifies high-interest industries that can be studied systematically for industrial hygiene problems and probable health effects.

A second problem is the variability within the SIC group. It is a big leap of faith to say that a four-digit SIC seen in the National Occupational Hazard Survey is characteristic of all of the types of things that go on within that SIC, particularly in a rapidly changing industrial group, such as the plastics industry where all kinds of products and processes are being developed in a very short time.

There is also is a problem of how to link health effects data to occupational exposures that may have occurred many years ago. This is complicated by the fact that our population is highly mobile. Some studies require small-area estimates. Finally, another problem is the tremendous cost of these surveys.

These are the kinds of things we have encountered in trying to do the three components of the surveillance activity--collection of the relevant facts, the analysis of these facts, and the

effective dissemination of the facts to people who can use them to create a better workplace for the U.S. worker.

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DISCUSSION

Michael Gough, Office of Technology Assessment: Is there a threshold size of a workplace before you entered on a survey?

Mr. Frazier: Yes. We arbitrarily limited this to the same types of facilities covered by OSHA's recordkeeping requirements, i.e., more than eight workers.

Aaron Blair, National Cancer Institute: In regard to the lack of direct measurements in the exposure and hazard surveys, surely in some cases after that first survey was completed, NIOSH has, for other reasons, gone back into one of those plants, either because of workers' requests or another study. Has any attempt been made to link those direct measurements, then, back to the estimates from the hazard survey?

Mr. Frazier: I am not sure we went back into many of those 5,000 out of 5 million plants. We went back into plants similar to those. The problem is that when we go back in, we are quite often called back in for a health hazard evaluation where we would be looking at a specific part of that plant and we may be going at it in a way that would not be comparable to the investigation conducted the next time we go into a plant, even for the same problem.

So, it is hard to link the heterogeneous data we get from the surveys in a very effective way. However, when NIOSH does a

health hazard evaluation, we make information from the NOHS file available. The persons doing the health hazard evaluation bring back new trade name product information and put it into our base file, indicating clearly that it was an add-on, not from the NOHS, but from a hazard survey.

Kate McGuire, National Center for Health Statistics: I would just like to know, on the exposure survey, what kind of data are you obtaining from the workers?

Mr. Frazier: We are not questioning workers. We are doing a walk-through observational survey. We don't stop and talk to workers. Our surveyors are usually accompanied by a management and often a labor representative as they move through the plant. They may say something to the worker about the frequency of use of a particular trade name product or chemical, but they don't ask the worker any structured set of questions.

Jerry Chandler, National Institute for Occupational Safety and Health: In the linkage of health effects to the time, place, and person, using these maps, I don't understand how, if you have an overlap in two counties on the map, this would filter out other factors that may influence the disease incidence in that area, such as the genetic background, the social habits, climate, the soil, these other things that may influence chronic disease. Do you have some linkage there that you can manipulate these with?

Mr. Frazier: Certainly not from this survey. This is a hypothesis-generating survey that may, for example, result in the recommendation to do a case-control study in that particular locality.