Trends of a Decade—A Perspective on Occupational Hazard Surveillance, 1970-1983

Joseph A. Seta
David S. Sundin
Surveillance Branch
Division of Surveillance, Hazard Evaluations, and Field Studies
National Institute for Occupational Safety and Health

The passage of the Occupational Safety and Health Act of 1970 (OSH Act) resulted in increased concern for the safety and health of workers in the United States. This legislation codified the responsibilities of employers for the safety and health of workers and sought to "assure safe and healthful working conditions" for all working Americans. Since its enactment, standards have replaced guidelines, requirements have replaced recommendations, and research in occupational health and safety has expanded in academia, industry, and government.

Early in 1971, a Hazard and Disease Task Force, formed by the Department of Health, Education, and Welfare, identified a need for more detailed information on the distribution of potential exposures of employees of industries regulated under the OSH Act to chemical and physical hazards. To address this need, the National Institute for Occupational Safety and Health (NIOSH), established by the OSH Act as the principal governmental agency for research in occupational safety and health, has conducted two major national surveys as part of its hazard surveillance program. The first, conducted in 1972-1974, was called the "National Occupational Hazard Survey (NOHS)" (*1*); the second, conducted in 1981-1983, was called the "National Occupational Exposure Survey (NOES)" (*2*). Completed nearly a decade apart, these two surveys permit the analysis of certain trends in patterns of potential exposures and in distribution of in-plant health and safety services and control technology.

Methods

NOHS collected data on a probability sample of 4,636 facilities, distributed among 67 Standard Metropolitan Statistical Areas (SMSA), excluding facilities engaged in agriculture, mining, and government. During the two-year field-investigative phase, 20 engineers surveyed the facilities selected, conducted interviews of management to gather basic information about the business and its occupational health policies, and performed walk-through surveys of the facilities. All possible exposures to specific chemicals, trade-name products, and physical agents observed during the walk-throughs, were recorded as potential exposures. NOHS covered a sample that included 895,725 employees in more than 600 different types of industry (at the 4-digit Standard Industrial Classification [SIC] level) and 453 different occupations. More than 8,000 potential hazards and 86,000 unique trade-name products were identified.

Because the sample was designed to permit extrapolation of the results to the workforce as a whole, it is possible to estimate such information as the total number of workers potentially exposed to a particular hazard, the percentage of those who use personal protective equipment or are protected by other controls, and the percentage who receive periodic medical examinations. It is also possible to identify the hazards associated with particular industries or occupational groups and to estimate the total number of persons potentially exposed in the nation.

By 1979, data from NOHS were becoming progressively outdated and less representative

of the current situation. Since there were no mechanisms to update and supplement the statistics from NOHS, an information need similar to that which characterized the early 1970s was again developing. As a result, planning began for a second such survey, the NOES.

Similar in design to NOHS, NOES had as its objectives to:

1. estimate the number of workers potentially exposed to chemical, physical, and biologic agents
2. describe the nature and extent of exposures to occupational hazards and the degree to which businesses had implemented programs to reduce occupational health problems
3. compile data that, together with similar data from NOHS, would allow analysis of trends in exposures

A probability sample of 4,490 facilities in 98 geographic sampling units was selected for NOES. Field investigations began in November 1980 and continued for 30 months, involving site visits by an average of 15 surveyors who observed processes, administered a questionnaire to plant managers, and recorded potential exposures of all employees. NOES covered a sample that included 1,830,330 employees in 523 different types of industry (identified by SIC Code) and 410 different occupations. More than 10,000 potential hazards and 100,000 unique trade-name products were identified.

Results

Many useful comparisons are possible using the data from these two national surveys. The first such comparison, using answers to selected questions in the management questionnaire, is presented here.

Figures 1 through 6 depict the responses to questions regarding occupational health services, the use of personal protective equipment, and environmental monitoring. These figures are broken down by the size of the business, as determined by the number of employees: small, 8-99 employees; medium, 100-499 employees; large, 500 or more employees.

The results shown in Figures 1 through 4 reveal an increase in the proportion of plants that have 1) an established health unit at the facility (NOHS 14%, NOES 24%), 2) an employee designated to provide emergency medical treatment (NOHS 48%, NOES 57%), 3) at least one nurse on the payroll to provide care for employees (NOHS 8%, NOES 17%), and 4) a requirement that new employees have a medical examination (NOHS 35%, NOES 44%). The percentage of employees covered by these services has also increased.

Figure 5 reveals an upward trend in the proportion of businesses that require or recommend personal protective equipment or devices and in the percentage of employees in plants where such policies exist (NOHS 74%, NOES 85%).

Figure 6 presents a most dramatic result. There was a more than twofold increase in the proportion of plants in which environmental conditions are monitored (NOHS 10%, NOES 28%). This trend was especially prominent for those facilities with small and medium workforces. There are also noteworthy increases in the proportion of employees working in plants with such monitoring practices.

Table 1 presents data on the proportion of facilities in various types of industries (SIC) in which employees were potentially exposed to continuous noise without controls. A general trend toward better control of exposure to noise is evident, with greatest improvements occurring in textile mills, lumber and wood production, paper and allied products, chemicals and allied products, primary metals, miscellaneous manufacturing, and miscellaneous repair services. By contrast, air transportation and auto repair services showed an unexplained *opposite* trend toward worsened noise exposure.

FIGURE 1. Results of NOHS and NOES compared: a formally established health service unit at the facility, by size of facility

FIGURE 1-a. Proportion of facilities with this attribute

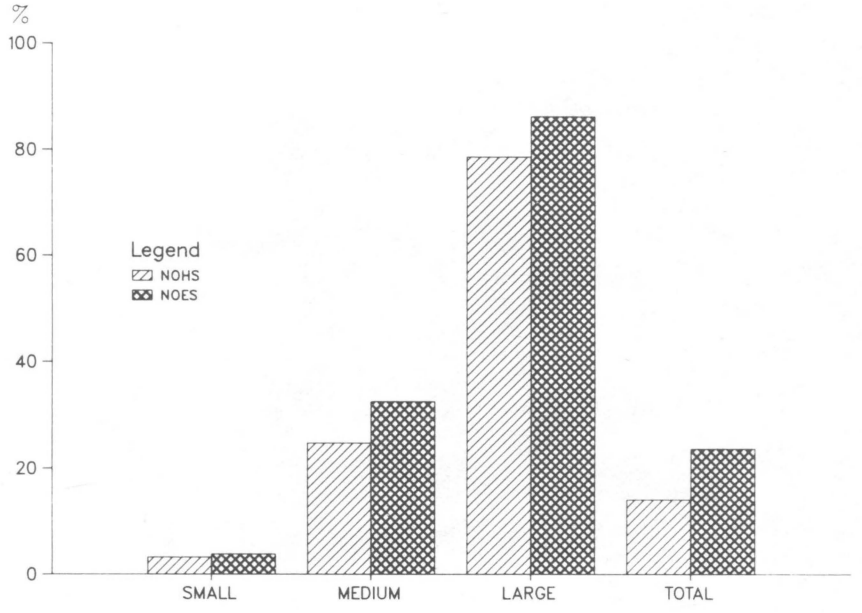

FIGURE 1-b. Proportion of all employees working in facilities with this attribute

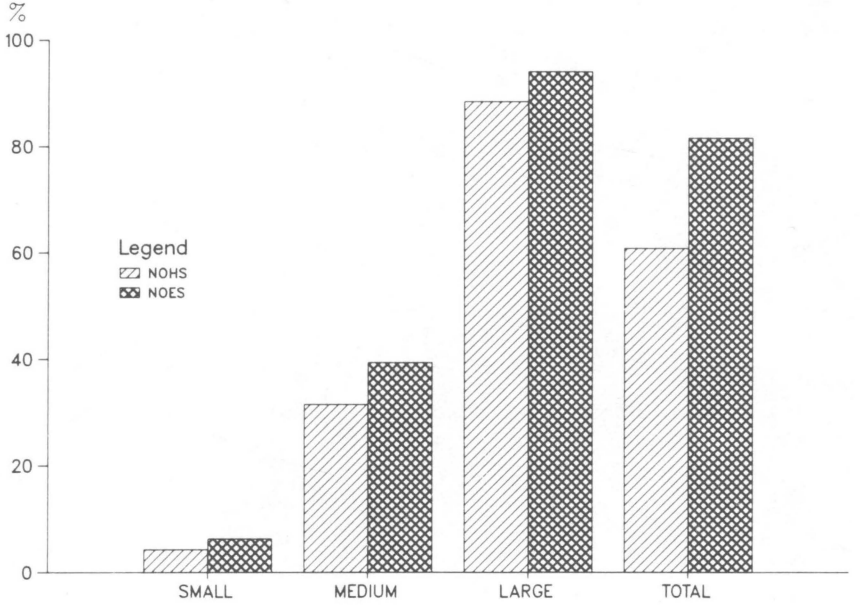

FIGURE 2. Results of NOHS and NOES compared: an employee with formal first-aid training, designated to provide emergency medical treatment at the facility, by size of facility

FIGURE 2-a. Proportion of facilities with this attribute

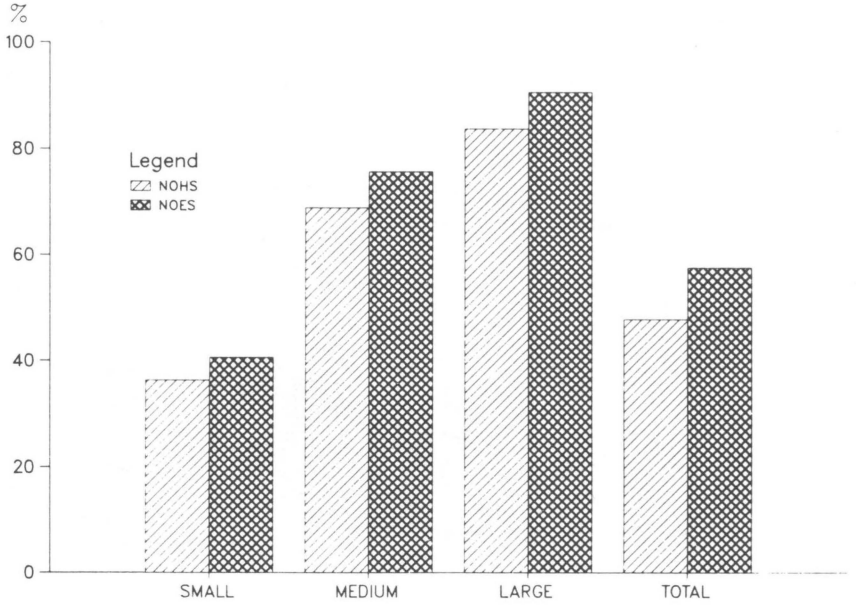

FIGURE 2-b. Proportion of employees working in facilities with this attribute

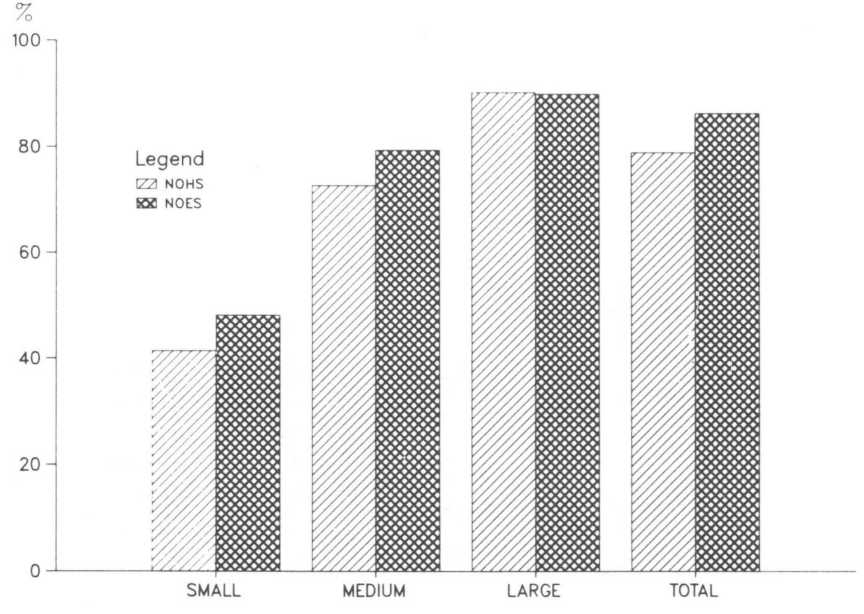

FIGURE 3 Results of NOHS and NOES compared: one or more nurses on the payroll to provide care for employees, by size of facility

FIGURE 3-a. Proportion of facilities with this attribute

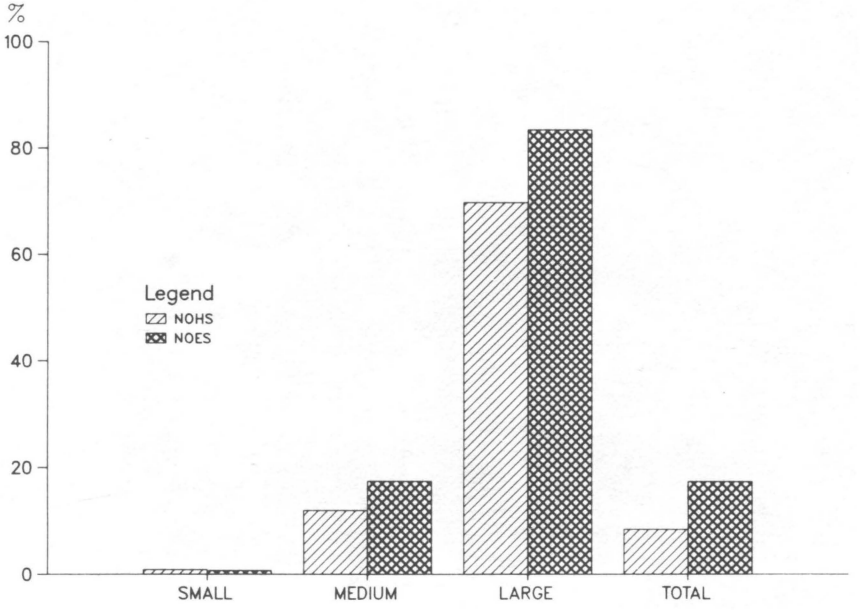

FIGURE 3-b. Proportion of total employees working in facilities with this attribute

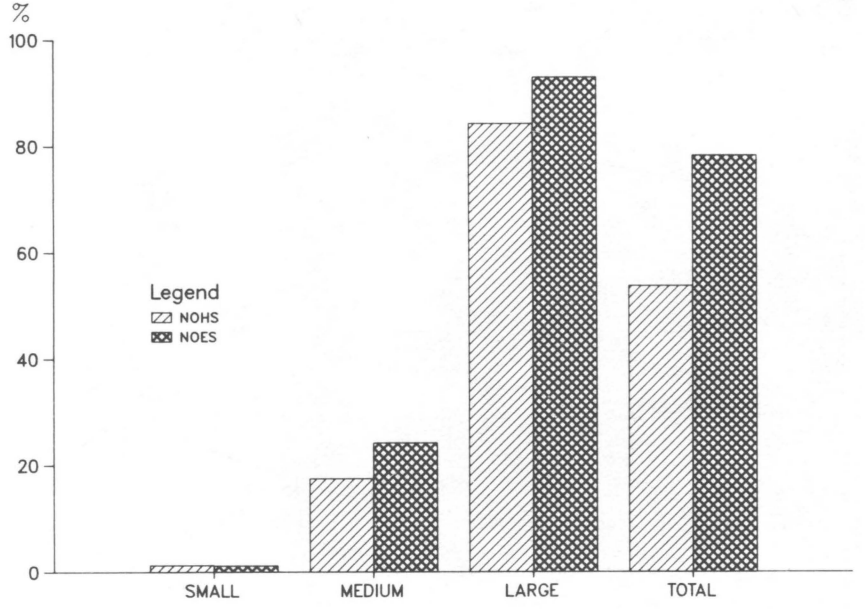

FIGURE 4. Results of NOHS and NOES compared: policy that requires new employees to take a medical examination before being hired or placed; by size of facility

FIGURE 4-a. Proportion of facilities with this attribute

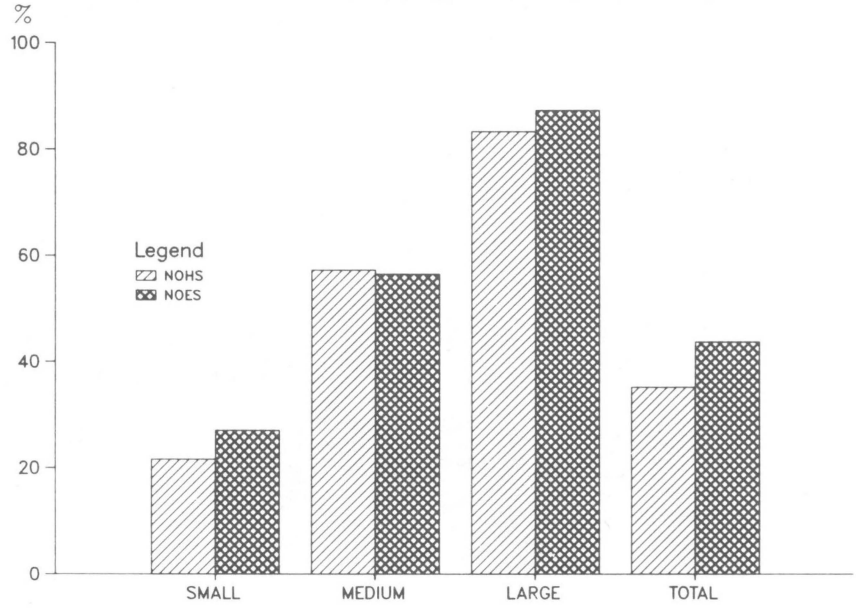

FIGURE 4-b. Proportion of employees working in facilities with this attribute

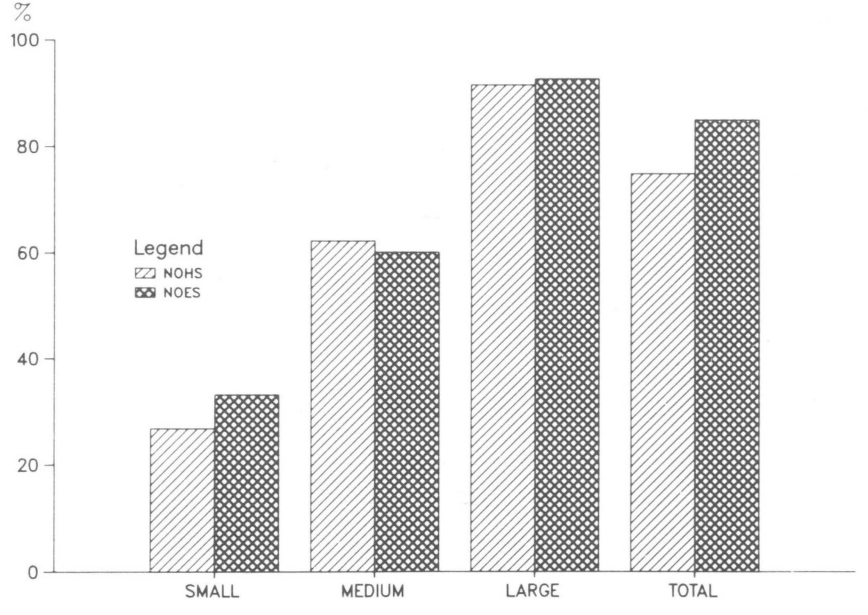

FIGURE 5. Results of NOSH and NOES compared: policy that requires or recommends use of personal protective devices, by size of facility

FIGURE 5-a. Proportion of facilities with this attribute

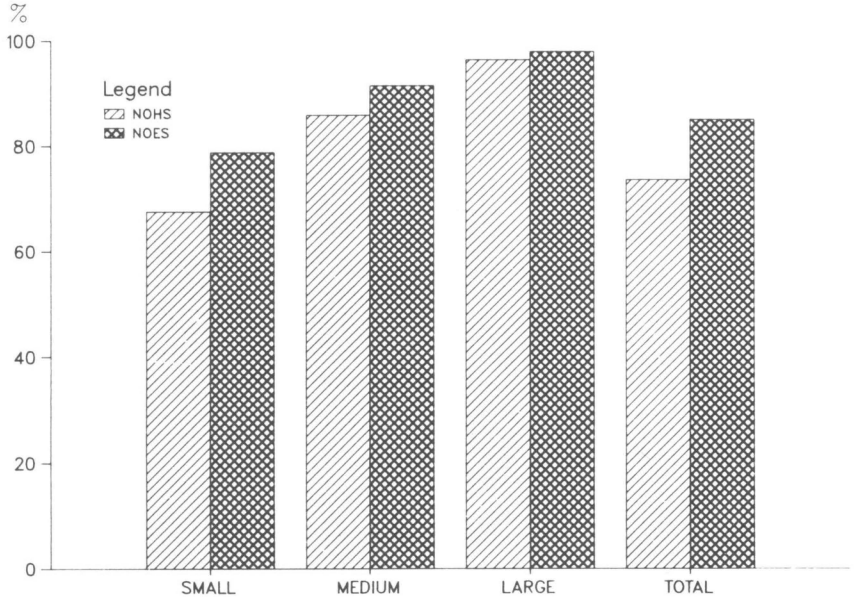

FIGURE 5-b. Proportion of employees working in facilities with this attribute

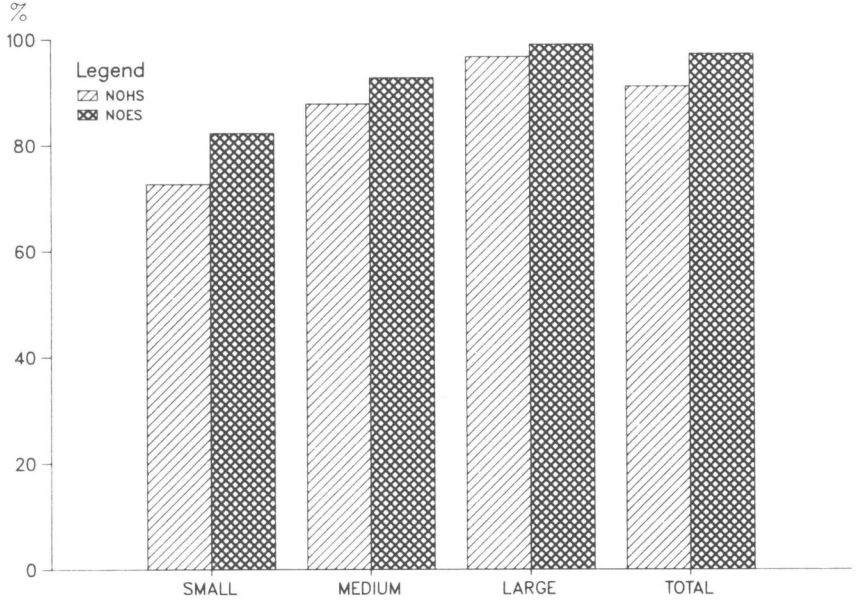

FIGURE 6. Results of NOHS and NOES compared: regular environmental monitoring of fumes, gases, mists, vapors, dust, noise, vibration, radiation, or other similar conditions, by size of facility

FIGURE 6-a. Proportion of facilities with this attribute

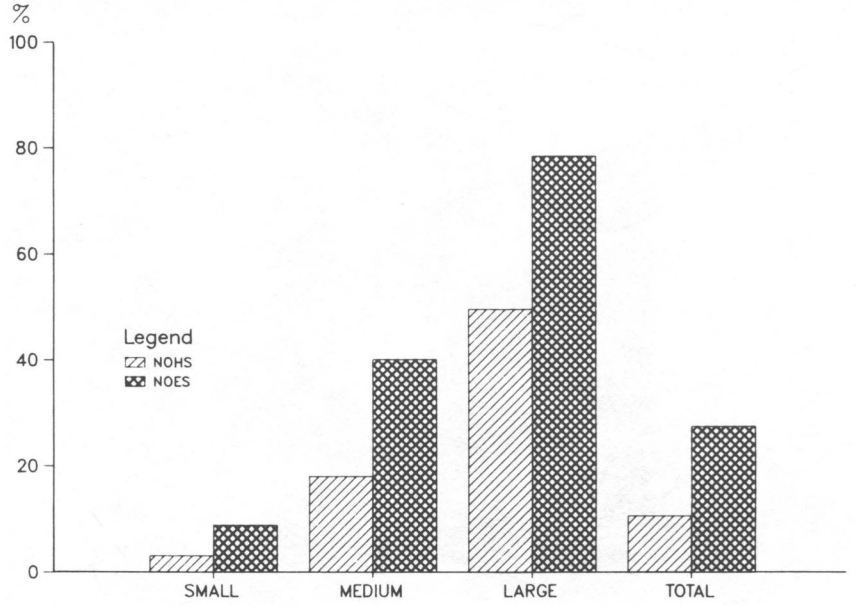

FIGURE 6-b. Proportion of employees working in facilities with this attribute

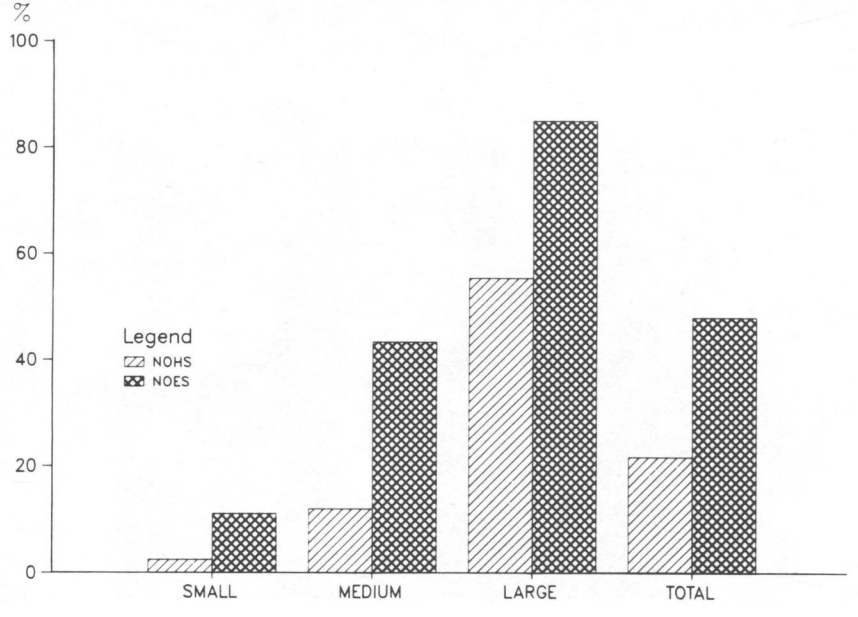

Table 2 reveals general improvement in the prevalence of potential exposure to x-radiation without controls. Indeed, facilities in the primary metal industry control 99.4% of such potential exposures.

Comment

Although it has not yet been possible to identify specific explanations for these trends, any or all of the following may reasonably be advanced as factors contributing to observed improvements:

1. the existence of the Occupational Safety and Health Act of 1970
2. collective bargaining agreements between workers and managers
3. employers' concerns about legal liability
4. employers' increased investments in human resources
5. employees' increased awareness of hazards in the workplace

While it may be interesting to measure quantitatively the significance of these factors, it is not absolutely necessary from a hazard surveillance perspective.

TABLE 1. Results of NOHS (1972) and NOES (1981) compared: proportion of facilities in which potential exposures were found to continuous noise without functioning controls, by SIC

SIC code	Type of industry	Proportion (%) NOHS	NOES
15	General building contractors	92.5	88.4
16	Heavy construction contractors	92.7	72.6
17	Special trade contractors	99.6	90.3
22	Textile mill products	58.7	34.5
23	Apparel and other textile products	99.4	80.9
24	Lumber and wood products	90.2	55.2
26	Paper and allied products	89.1	45.1
27	Printing and publishing	79.3	72.3
28	Chemicals and allied products	88.8	38.0
33	Primary metals industries	87.4	47.2
34	Fabricated metal products	77.0	56.2
35	Machinery, except electrical	86.0	60.1
39	Miscellaneous manufacturing industries	91.2	57.2
45	Transportation by air	37.9	50.0
75	Auto repair services and garages	79.8	99.5
76	Miscellaneous repair services	81.1	21.1

TABLE 2. Results of NOHS (1972) and NOES (1981) compared: proportion of facilities in which potential exposures were found to X-radiation without functioning controls, by SIC

SIC code	Type of industry	Proportion (%) NOHS	NOES
33	Primary metal industry	14.8	0.6
36	Electric and electronic equipment	26.9	18.7
80	Health services	4.1	1.9

Future Plans

Through surveillance of occupational hazards, NIOSH seeks to collect information on environmental conditions existing in workplaces in order to 1) establish a base of information for clarifying the relationship between disease and environmental factors in the workplace, 2) measure the extent to which industry has implemented programs to prevent occupational disease (including methods for reducing hazards in the workplace), and 3) indicate areas were increased concern and more aggressive intervention should be directed.

In both NOHS and NOES, the majority of potential exposures reported were to agents in trade-name products. Since both surveys describe potential exposures by agent identity rather than by trade name, information on the the ingredients of trade-name products must be obtained from the manufacturers. This is an enormously time-consuming process that greatly delays the analysis of results of the surveys. Thus, a more complete interpretation of the discernable trends awaits the painstaking identification of ingredients in the more than 100,000 trade-name products identified in the surveys. To facilitate this, NIOSH plans to use improved techniques for linking data from NOES to data contained in the Registry of Toxic Effects of Chemical Substances (RTECS), using a model that calculates industry- and occupation-specific indices of potential risks of exposure to these substances (*3*). In addition, by correlating information in NOES with national demographic data, NIOSH will be able to generate county-level maps that graphically depict the location of work sites with various potential exposures (*4*). It should be possible to identify geographic areas where changes in patterns of potential exposures to selected agents have been most dramatic, and where greatest attention to preventive measures is warranted. The results of these and other analytic efforts will be published as they become available.

References

1. National Institute for Occupational Safety and Health. National Occupational Hazard Survey. Cincinnati, OH: NIOSH (DHEW Publication No. [NIOSH] 74-127) May 1974.
2. National Institute for Occupational Safety and Health. National Occupational Exposure Survey. Volume I, Survey Manual. Cincinnati, OH: NIOSH, (in press).
3. National Institute for Occupational Safety and Health. A Model for the Identification of High Risk Occupational Groups Using RTECS and NOHS Data. Cincinnati, OH: NIOSH (DHHS [NIOSH] Publication No. 83-117) 1983.
4. Frazier TM, Lalich NR, Pedersen DH. Uses of Computer-Generated Maps in Occupational Hazard and Mortality Surveillance. Scand J Work Environ Health 1983;9:148-54.