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FINAL REPORT

A Study of the Impact of Occupational Safety and Health Training and Education Programs on the Supply and Demand for Occupational Safety and Health Professionals

by

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Prepared for

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Abstract

The Research Triangle Institute (RTI) conducted a study for the National Institute for Occupational Safety and Health (NIOSH) to:

- Assess the impact of occupational safety and health (OSH) academic programs on the marketplace for OSH professionals.
  - -- Determine the nature and number of OSH academic programs.
  - -- Estimate the current and projected numbers of graduates from OSH academic programs.
- Assess the employment experiences of graduates from OSH academic programs.
  - -- Determine the graduates' success in obtaining suitable OSH employment.
  - -- Determine the relationships between skills that graduates obtained in OSH academic programs and skills needed in the workplace.
- Assess employer demand (both current and projected) for OSH professionals.
- Design an information system for monitoring the match between OSH educational/training programs and workplace needs.

The methodology for the study was to address the study objectives by (1) obtaining and analyzing data-of-record descriptive information from all identified OSH academic programs; (2) coordinating a survey of industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, and occupational medicine graduates conducted by the Educational Resource Centers (ERCs), and analyzing the collected data; (3) interviewing a limited number (nine for each of the five OSH disciplines of interest) of employers of OSH graduates. Analysis consisted of tabulating the various descriptive data and of addressing the supply-demand issue by noting the current relationship between the ability of graduates to find suitable employment and the ability of employers to fill positions, and then to note factors that could change this relationship in the future.

Major findings of the study were:

- One hundred and thirty-six academic institutions in the United States offer a total of 241 OSH degree programs.
- In 1979-80 (and again in 1981-82) these academic programs produced about 1,600 graduates.
- Almost half of all masters, doctoral, and post-doctoral graduates came from the 15 ERCs.
- The numbers of ERC graduates have been and are projected to continue at about the 1979-80 and 1981-82 level (except for the number of occupational safety graduates which has experienced a sharp decline). The numbers of graduates from non-OSH academic programs are expected to be somewhat lower than the 1979-80 and 1981-82 levels.

- ERC graduates reported ease of gaining suitable employment, high job satisfaction, and a reasonable match between training and job requirements.
- Employers reported some shortage of occupational health nurse graduates and occupational medicine graduates, a reasonable balance in supply and demand for industrial hygiene graduates, and a possible surplus of occupational safety graduates.

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-- ERC personnel at the 14 supporting ERCs.

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I. INTRODUCTION

A. Background of the Study

The Occupational Safety and Health Act of 1970 (Public Law 91-596) declares it to be Congress' purpose and policy:

> ...to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources...by providing for training programs to increase the number and competence of personnel engaged in the field of occupational safety and health....

Section 21(a) of the Act further states that:

> The Secretary...shall conduct, directly or by grants and contracts (1) education programs to provide an adequate supply of qualified personnel to carry out the purpose of this Act....

Section 22(a) of the Act established the National Institute for Occupational Safety and Health (NIOSH) to carry out certain policies and to perform certain functions, such as those outlined in Section 21(a), of the Secretary of Health and Human Services.

As one mechanism for meeting its commitment to provide an adequate supply of qualified personnel, NIOSH initiated a training project grant program in 1971. This program's primary objective was to provide support for single discipline training activities. NIOSH expanded its support role in 1977 by inaugurating an Educational Research Center Grants Program to provide a comprehensive multidisciplinary approach to meeting Occupational Safety and Health (OSH) manpower needs. This program currently supports 15 Educational Resource Centers (ERCs) representing the geographical regions of the United States.

The goal of the ERC program is to help alleviate shortages of qualified OSH professionals by providing a mechanism to:

- Develop, expand, and coordinate full-time and part-time multidiscipline and multilevel training programs in core OSH disciplines.
- Provide continuing education courses for practitioners in the field.
- Provide outreach consultation services to assist other institutions and agencies to develop OSH training activities.

Most of the 15 ERCs currently have academic and continuing education programs in each of the four core OSH disciplines: industrial hygiene, occupational safety, occupational health nursing, and occupational medicine. In addition, many of the Centers have programs in other closely related fields, including industrial toxicology, epidemiology, biostatistics, dermatology, and ergonomics.

While previous research[1] had indicated a continuing need for NIOSH assistance in assuring an adequate supply of qualified personnel, no current data were available regarding the number of, demand for, need for, and qualifications

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[1] A Nationwide Survey of the Occupational Safety and Health Workforce, DHHS (NIOSH), Publication 78-164, 1978.

required of professionals in the emerging field of occupational safety and health. A number of factors, including changes in the regulatory and business climate, may have impacted the need/demand for OSH personnel and influenced the nature of training needs. Additionally, the impact of NIOSH-supported educational programs was not fully known because of an absence of information regarding the career progression of graduates from the ERCs and from other NIOSH-supported training projects. Both NIOSH and the ERCs require such information in order to structure education programs that are fully responsive to the needs for an adequate supply of qualified OSH personnel. Further, NIOSH and the ERCs need a system for continuously or periodically monitoring the match between ongoing OSH educational programs and the workplace demands for graduates of these programs. Such information would permit continuing necessary adjustments in curriculum, faculty, etc. to meet changes in the job market.

B. Objectives of the Study

To meet the information needs indicated above, the Research Triangle Institute (RTI) conducted a study to:

- Assess the impact of OSH academic programs on the marketplace for OSH professionals.
  - -- Determine the nature and number of OSH academic programs.
  - -- Estimate the current and projected numbers of graduates from OSH academic programs.
- Assess the employment experiences of graduates of OSH academic programs.
  - -- Determine the graduates' success in obtaining suitable OSH employment.
  - -- Determine the relationship between skills that graduates obtained in OSH academic programs and skills needed in the workplace.
- Assess employer demand (both current and projected) for OSH professionals.
- Design an information system for monitoring the match between OSH educational/training programs and workplace needs.

This report provides details of the methodology and outcomes of the study activities developed to address these objectives.

C. Limitations of the Study

As originally conceived, the study was to include surveys of (1) all identified OSH academic programs, (2) a nationally representative sample of recent graduates of OSH academic programs, and (3) a sample of approximately 150 employers of recent OSH graduates. Such surveys are subject to the provisions of the Paperwork Reduction Act of 1980 and require approval of the Office of Management and Budget (OMB). The request by NIOSH for such approval was rejected by OMB, based on OMB preceptions of the practical utility of the collected data in view of the status of NIOSH funding to support OSH training programs. Because of this disapproval, the research strategy was modified and restricted to (1) analysis of minimal data-of-record from OSH academic programs, (2) analysis of OSH graduate information provided by the ERCs, and (3) contact with fewer than 10 employers of each employment category of interest. These restrictions, of course, delimit the study by minimizing the

completeness of provided OSH academic program descriptive information, generalizability of statements regarding employment experiences of OSH graduates, and generalizability of statements regarding employer perspectives of supply-demand relationships. However, in spite of these limitations, the research plan as overviewed in the next subsection is thought to have provided the best available current analysis of the present and projected qualitative and quantitative OSH supply-demand relationships.

D. Overview of the Study Methodology

As noted above, the occupational safety and health field includes a number of related disciplines. While the disciplines share a workplace emphasis and a safety and health orientation, professionals in each of the core disciplines typically are graduates of distinctly different academic programs and often have distinctly different work activities, professional associations, employer characteristics, etc.

These disciplines traditionally have been categorized as:

- Industrial hygienist (concerned with the prevention of occupational illness due to exposure to low levels of airborne contaminants and physical agents).
- Occupational safety professional (concerned with the prevention of traumatic occupational injury, including fire protection).
- Industrial hygiene and safety professional (concerned with the prevention of both traumatic occupational injury and illness due to exposure to low levels of airborne contaminants and physical agents).
- Occupational health nurse (concerned with the treatment and prevention of occupational injury and illness).
- Occupational medicine professional (typically a physician, concerned with the treatment and prevention of occupational illness and disease).

Because of the differences between these disciplines, each of the study objectives listed above (Subsection I.B) was addressed separately for each discipline. Thus, in a real sense, five parallel studies rather than one integrated study was required.

The nature of the study objectives clearly indicated a need to collect data/information from three sources. The first objective required contact with academic institutions to determine the nature and number of OSH academic programs and the current and projected numbers of graduates from these programs. Related study activities included (1) visits to nine academic programs to determine the general nature of such programs, (2) telephone and mail contact with all colleges and universities thought to have an OSH academic program, to verify the existence of a program and to request data-of-record program descriptive information, (3) telephone and mail contact with all identified programs to determine the numbers of 1979-80 and 1981-82

graduates,[2] and (4) informal discussions with academic program personnel regarding projected numbers of graduates. The collected information regarding numbers of graduates was particularly pertinent to the supply-demand aspects of the study in that the sources of graduates were identified (with the sources, in some cases, being a relatively small number of academic programs) and impressions were gained of expected changes in the supply of graduates.

The second study objective required contact with graduates of OSH academic programs to determine success in finding suitable employment and the extent to which academic training matched workplace training needs. The related study activities included the coordination of surveys of graduates by 14 of the 15 ERCs, and analysis of questionnaire data. The questionnaire data not only provided an estimate of the then-current quantitative match between supply and demand for OSH professionals but also provided an estimate of the qualitative match between the graduates' skills and the workplace requirements.

The third study objective required contact with employers of OSH professionals to estimate (from an employer perspective) the demand for OSH employees. The related study activities included telephone interviews with nine identified employers of each of the five core OSH disciplines. These interviews not only provided information regarding the extent to which current needs for OSH employees is realized, but also provided an employer perspective as to projected employment and factors likely to affect the projections. In addition, the interviews provided an employer perspective regarding the adequacy of the content of current academic training programs.

The final study objective of designing a monitoring system for continuously monitoring the supply-demand relationship was addressed by considering the various constraints and options and providing recommendations that reflect procedures found to be effective in this then-current study.

Of note is that the study methodology as it related to the quantitative aspects of supply and demand was <u>not</u> one of projecting the number of graduates, projecting the number of open positions, and noting the extent of the match (or mismatch) between the two. Rather, the approach was to note the extent of the current match (or mismatch) as reflected in the ability of graduates to find suitable employment and the ability of employers to fill positions, and then to note factors that could change this balance (or imbalance) in the future.

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[2] The numbers of 1979-80 and 1981-82 graduates were obtained primarily to construct the sampling frame of graduates intended to be surveyed. The original research plan was to include 1979-80 graduates (who then would have been in the labor market for two years since graduation) to determine job progression of graduates, and to include 1981-82 graduates (who represented the then most recent graduating class) to determine recent ability to obtain suitable employment. While, as noted in Subsection I.C, we were forced to revise this original research strategy, the numbers of graduates still provided a useful basis for supply estimates.

II. DESCRIPTION OF OCCUPATIONAL SAFETY AND HEALTH ACADEMIC PROGRAMS

A. Methodology for Collecting Program Descriptive Information

The collecting of program descriptive information involved (1) visiting nine academic programs to gain insight into program content and operation, (2) identifying the OSH academic "degree" programs[3] offered in the United States, and (3) contacting identified programs and requesting data-of-record descriptive information.

The initial visits to nine sites provided information upon which to base the definitions of the OSH disciplines and academic programs to be studied and provided insights into the availability of descriptive data-of-record.

To identify OSH academic programs, NIOSH officials and Study Advisory Panel members were solicited for indications of OSH academic programs not listed in the 1979 NIOSH Directory.[4] In addition, a thorough review was made of current college directories of academic programs in an attempt to find OSH programs not previously identified. All potential programs (both programs listed in the Directory and newly identified candidates) then were verified by telephone. The results of these activities are reported in the next subsection.

Once OSH academic programs were verified, program personnel were contacted by mail and the following data-of-record information items requested.

- Any program brochure and/or catalog that provided information regarding:
  - Entrance requirements for students entering the OSH programs during the 1981-82 school year.[5]
  - Tuition and fees for the OSH programs for the 1981-82 school year.
  - Program curriculum and course offerings (including all requirements for completing the program) for 1981-82 for all degree offerings for the particular OSH academic program area offered by the institution.

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[3] A "degree" program was defined as either (a) an associates degree or certificate granting program, (b) a baccalaureate degree granting program, (c) a master's degree granting program, (d) a doctoral degree granting program, or (e) a post-doctoral residency program, offered by a particular institution in either of five program areas (industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, occupational medicine). If an institution offered more than one degree program at the same degree level in the same program area (e.g., an M.S. degree in Industrial Hygiene and an M.P.H. degree in Industrial Hygiene), this was counted as one degree program.

[4] Directory of Academic Programs in Occupational Safety and Health, DHHS (NIOSH), Publication No. 79-126, 1979.

[5] Since this information was collected in the fall of 1982, the 1981-82 school year was the latest completed academic year.

- Any program brochure, program announcement, or program summary describing continuing education and/or special course offerings, including:
  - -- Title or summary description of each 1981-82 continuing education course offering.
  - -- Length of each continuing education course (in hours) (or average course length).
  - -- Enrollment/attendance in each continuing education course (or average course enrollment).
- The number of 1979-80 and 1981-82 graduates from each offered OSH academic program.

These various items of information were tabulated and analyzed. The findings are reported in the next two subsections.

The 15 ERCs were recontacted in early 1985 and asked to provide the numbers of OSH graduates for 1982-83 and 1983-84. This information (as noted in Subsection II.C) was intended to assist in providing trend data for use in estimating the near-future numbers of OSH graduates. Information also was solicited, in informal contacts with knowledgeable academic program personnel, regarding any anticipated changes in programs offered and numbers of graduates. This information also was used (in the next subsection) to estimate the near-future numbers of OSH graduates and the factors likely to affect the supply of graduates.

B. Description of 1981-82 Academic Programs

The activities to identify OSH academic programs resulted in the identification of 39 degree programs not listed in the 1979 NIOSH Directory. The disciplines and degree levels of these programs are listed as Table 1. While some were new, most were ongoing programs that had not been identified when the 1979 Directory was prepared.

When personnel of programs listed in the 1979 Directory were contacted to verify that the programs were still operating, 54 of the degree programs were stated to have been discontinued.[6] Reasons given for discontinuance were as follows:

- Seventeen programs had insufficient enrollment.
- Three programs had insufficient enrollment combined with lack of funding.
- Two programs had difficulty in placing graduates.
- Five programs were insufficiently funded.
- One program lacked campus facilities.
- Two programs had merged with other programs.
- Eight programs either had never existed, or were not OSH programs.
- Four programs were at schools that had closed.
- Five programs terminated because an essential instructor had left.

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[6] Thirty-seven of these programs were stated to have been discontinued when contact was made in late 1982; 17 additional programs were stated to have been discontinued when recontact was made in the spring of 1984. All 54 of these discontinued programs are excluded from the following program descriptions.

TABLE 1. OSH ACADEMIC PROGRAMS NOT LISTED IN 1979 DIRECTORY

Degree Level	Program Area					
	Industrial Hygiene	Occupational Safety	Industrial Hygiene and Safety	Occupational Health Nursing	Occupational Medicine	Total
Associate and/or Certificate	-	5	2	1	-	8
Baccalaureate	3	4	4	-	-	11
Masters	3	3	3	3	-	12
Doctoral	2	2	1	1	-	6
Post-doctoral	-	-	-	-	2	2
Total	8	14	10	5	2	39

Reasons for the discontinuance of the remaining seven programs are not known. The disciplines and degree levels of the discontinued programs are included in the listing in Table 2. The following program descriptions are based upon the 241 operating programs.

The 241 identified OSH academic programs represented 136 academic institutions in the United States that offered OSH academic programs in any one of the five program areas (i.e., industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, occupational medicine). The institutions varied in the numbers of program areas in which they offered degrees--111 institutions offered degree programs in only one of the program areas, 14 offered them in 2 program areas, 8 had degrees in 3 areas, and 3 institutions granted degrees in 4 of the 5 program areas.

Thirty of the 136 institutions were participants in one of 15 Educational Resource Centers (ERC). These centers were established under a NIOSH grant program to provide a mechanism to coordinate OSH training programs, provide continuing education courses for OSH practitioners, and provide outreach consultation services to assist other institutions and agencies. The centers represent major geographical regions of the United States. Half of the institutions participating in the ERCs offered degrees in more than one OSH program area. Institutions associated with ERCs offered one-third of the total 241 OSH degree programs offered in the United States. Ninety-two percent of the degree programs offered by ERC participant institutions were at the master's level or higher.

The numbers of identified OSH academic degree programs, by program area and degree level, and provided as Table 3. The numbers of degree programs, by program area and funding source category, are provided as Table 4. Following are summary descriptions of programs in each of the five academic degree categories.

1. Description of Associate Degree/Certificate Programs

Thirty-five institutions offered a total of 29 associate degree programs and 20 certificate programs. These consisted of 1 associate degree programs in industrial hygiene, 10 associate degree and 8 certificate programs in occupational safety, 18 associate degree and 10 certificate programs in industrial hygiene and safety, and 2 certificate programs in occupational health nursing.

No particular differences in entry requirements were noted between associate degree and certificate programs or between the program areas of industrial hygiene, occupational safety, and industrial hygiene and safety. Typically, the only entrance requirement for these program areas was a high school diploma or equivalent. Six programs required a "satisfactory" score on the American College Test (ACT), Differential Aptitude Test (DAT), or Scholastic Aptitude Test (SAT). Two programs required some background in mathematics and science. The entrance requirement for the two occupational health nursing programs was completion of an RN program.

No particular differences in tuitions and fees were noted between associate degree and certificate programs or between program areas. The mean in-state

TABLE 2. OSH ACADEMIC PROGRAMS LISTED IN 1979 DIRECTORY BUT NOT CURRENTLY OPERATING

Degree Level	Program Area: Industrial Hygiene	Occupational Safety	Industrial Hygiene and Safety	Occupational Health Nursing	Occupational Medicine	Total
Associate and/or Certificate	1	7	14	1	-	23
Baccalaureate	5	3	2	1	-	11
Master's	8	3	2	1	-	14
Doctoral	4	-	1	1	-	6
Post-doctoral	-	-	-	-	-	-
Total	18	13	19	4	-	54

TABLE 3. NUMBER OF OSH ACADEMIC PROGRAMS, BY PROGRAM AREA AND DEGREE LEVEL

Degree Level	Program Area: Industrial Hygiene	Occupational Safety	Industrial Hygiene and Safety	Occupational Health Nursing	Occupational Medicine	Total
Associate and/or Certificate	1	12	20	2	0	35
Baccalaureate	20	22	29	0	0	71
Master's	34	19	20	13	1	87
Doctoral	18	9	6	0	0	33
Post-doctoral	0	0	0	0	15	15
Total	73	62	75	15	16	241

TABLE 4. NUMBER OF OSH ACADEMIC PROGRAMS, BY FUNDING SOURCE CATEGORY

Degree Level	ERC	Non-ERC Recipient of NIOSH Training Project Grants	Other	Total
Associate and/or Certificate	2	5	28	35
Baccalaureate	5	15	51	71
Master's	42	11	34	87
Doctoral	20	3	10	33
Post-doctoral	14	0	1	15
Total	83	34	124	241

1981-82 tuition was $991 per year, with a range of no cost to $4,120. The mean out-of-state tuition was $2,069 per year, with a range of $450 to $4,120.

The requirement for the associate degree in all three programs offering such a degree (industrial hygiene, occupational safety, and industrial hygiene and safety) was the successful completion of two years of course work. The requirement for the certificate in all three program areas offering a certificate (occupational safety, industrial hygiene and safety, and occupational health nursing) was the completion of one year of course work. The mean number of semester hours required for the associate degree was 64.2 with a range of 60 to 72. The mean number of semester hours required for the certificate was 26.7 with a range of 13 to 36. The distribution of semester hour requirements is shown in Tables 5 and 6.

The course work required for completion of the associate degree or certificate may be categorized as follows:

- Courses specific to occupational safety and health (e.g., courses in recognition, measurement, evaluation, or control of potential hazards).
- Courses specific to safety and health but not to occupational safety and health (e.g., courses in environmental health or public safety).
- Courses related to occupational safety and health (e.g., courses in general science, mathematics, or engineering).
- Courses other than the above (e.g., general coursework or electives required to meet state or college requirements).

While the numbers of required semester hours falling into each of the last three categories were difficult to ascertain, the course work specific to occupational safety and health was reasonably clearly specified in the program descriptions. Thus, the number of semester hours of such specific, required coursework was derived for use as one measure of program emphasis. While no particular differences were noted between program areas or funding source categories, a slight difference did appear between associate degree programs and certificate programs. The mean number of required semester hours specific to occupational safety and health was 25.8 for associate degree programs (with a range of 10 to 60) and 14.4 for certificate programs (with a range of 13 to 36). The distribution is shown in Table 7.

2. Description of Baccalaureate Degree Programs

Sixty-eight institutions offered a total of 71 OSH baccalaureate degree programs. These consisted of 20 programs in industrial hygiene, 22 programs in occupational safety, 29 programs in industrial hygiene and safety, and one program in occupational health nursing.

No particular differences in entry requirements were noted between the program areas of industrial hygiene, occupational safety, and industrial hygiene and safety. About half of the programs reported a requirement for a "satisfactory" score on the American College Test (ACT) or Scholastic Aptitude Test (SAT). About 10 percent of the programs required a minimum grade point average (2.0-2.5). About 10 percent of the programs reported successful completion of lower-division academic work to be a requirement for entry. The entrance requirement for the occupational health nursing program was completion of an associate degree program and one year of work experience in nursing.

TABLE 5. NUMBER OF PROGRAMS BY SEMESTER HOUR CATEGORIES, ASSOCIATE DEGREE

Required Number of Semester Hours for Associate Degree	Number of Programs
Fewer than 62 hours	9
62-65 hours	8
66-69 hours	9
More than 69 hours	3

TABLE 6. NUMBER OF PROGRAMS BY SEMESTER HOUR CATEGORIES, CERTIFICATE

Required Number of Semester Hours for Certificate	Number of Programs
Fewer than 29 hours	7
29-30 hours	8
31-32 hours	3
More than 32 hours	2

TABLE 7. NUMBER OF PROGRAMS BY CATEGORIES OF SPECIFIC COURSE HOURS

Required Number of Semester Hours Specific to Occupational Safety and Health	Number of Programs	
	Associate Degree Programs	Certificate Programs
Fewer than 18 hours	6	5
18-23 hours	6	7
24-29 hours	5	3
30-35 hours	7	4
More than 35 hours	5	1

No particular differences in tuition and fees were noted between program areas. The mean 1981-82 in-state tuition was $1,605 per year, with a range of $420 to $7,000; the mean out-of-state tuition was $2,849 per year, with a range of $741 to $7,000.

The baccalaureate programs required, on the average, 126.8 semester hours of course work. The range was 120 to 142 semester hours. As with associate degrees, collected information about the baccalaureate programs generally indicated course requirements in sufficient detail to permit determination of the number of required hours in coursework specific to occupational safety and health. The mean number of required semester hours specific to occupational safety and health was 28.8, with a range of 9 to 61. No particular difference were noted between program areas or funding source categories. The distribution is shown in Table 8.

3. Description of Master's Degree Programs

Sixty-five institutions offered a total of 87 master's degree programs. These consisted of 34 programs in industrial hygiene, 19 programs in occupational safety, 20 programs in industrial hygiene and safety, 13 programs in occupational health nursing, and one program in occupational medicine (for physician's assistants).

No particular differences in entry requirements appeared among the program areas of industrial hygiene, occupational safety, and industrial hygiene and safety. About half of the programs required the submission of Graduate Record Exam (GRE) aptitude test scores. A few programs permitted the substitution of the Miller Analogies Test (MAT). About one-third of the programs required a minimum grade point average (2.5-3.0) for undergraduate work. A baccalaureate degree was required by all programs and about one-third of the programs required that the baccalaureate degree be in a related academic area. Nine programs required related work experience (1 to 2 years). The entrance requirements most often occurring for occupational health nursing programs were a NLN accredited baccalaureate degree and current nursing licensure.

No particular differences in tuition and fees were noted between program areas. The mean in-state tuition was $1,917 per year, with a range of $159 to $8,603 per year. The mean out-of-state tuition was $3,303 per year, with a range of $449 to $8,603.

The master's degree programs required, on the average, 36.6 semester hours of course work. The range was 20 to 67 semester hours. The information collected about the masters programs permitted determining the number of hours required in coursework specific to occupational safety and health. The mean number of required semester hours specific to occupational safety and health was 23, with a range of 5 to 49. No particular differences were noted between program areas or funding source categories. The distribution is shown in Table 9. Over two-thirds of the master's degree programs required the completion of a thesis or master's essay. Internships were required by twelve programs.

TABLE 8. NUMBER OF PROGRAMS BY CATEGORIES OF SPECIFIC COURSE HOURS (BACCALAUREATE PROGRAMS)

Required Number of Semester Hours Specific to Occupational Safety and Health	Number of Programs
Fewer than 18 hours	9
18-29 hours	33
30-41 hours	19
More than 41 hours	10

TABLE 9. NUMBER OF PROGRAMS BY CATEGORIES OF SPECIFIC COURSE HOURS (MASTER'S DEGREE)

Required Number of Semester Hours Specific to Occupational Safety and Health	Number of Programs
Fewer than 18 hours	26
18-29 hours	35
30-41 hours	23
More than 41 hours	3

4. Description of Doctoral Degree Programs

Twenty-four institutions offered a total of 33 doctoral degree programs. These consisted of 18 programs in industrial hygiene, 9 programs in occupational safety, and 6 programs in industrial hygiene and safety.

No particular differences in entry requirements were noted between the program areas. More than half of the programs required Graduate Record Examination (GRE) scores. Over half of the programs required a master's or professional degree while about one-third permitted entry with a relevant baccalaureate degree. About 20 percent of the programs required a minimum grade point average (2.5-3.5) for previous academic work. Slightly more than one-third of the doctoral programs required completion of certain science or mathematics course work prior to entry. A few programs required relevant work experience.

There were no significant differences in tuition between the program areas. The mean 1981-82 in-state tuition was $2,166 per year with a range of $159 to $8,603. The mean out-of-state tuition was $3,674 per year with a range of $1,020 to $8,603.

Doctoral programs typically were wholly or partially individually designed, and specific requirements for the degree generally were not clearly stated in the descriptive literature. For this reason, total required semester hours or specific course requirements could not be ascertained. The most uniformly applied degree requirement in the doctoral program was the dissertation or its equivalent; over 80 percent of the programs reported such a requirement.

5. Description of Post-Doctoral Programs

Fifteen institutions offered residency programs providing preparation for board certification in occupational medicine. These programs also included the opportunity to receive a master's degree as a part of the residency.

Most institutions required the possession of an MD degree and the completion of 1 year of internship or clinical residency as entrance requirements. One school would accept a DDS or DVM degree.

Several institutions charge no tuition or fees for the occupational medicine programs. Approximately one-third of the institutions reported tuition charges for the program; for these institutions, the average 1981-82 in-state tuition was $1,822, with a range of $159 to $6,450. The mean out-of-state tuition was $3,294 with a range of $1,070 to $6,450. About one-half of the institutions reported stipends of $13,000 to $14,000 per year paid to the residents.

The mean length of residency was 2.5 years with a range of 1 to 4 years. Of those institutions stipulating a minimum number of semester hours for awarding the master's degree, the mean number of semester hours required was 41.2, with a range of 33 to 48 hours.

6. Description of Continuing Education and/or Special Courses[7]

In addition to the OSH degree programs noted above, several institutions reported OSH continuing education programs. These programs were offered to assist non-OSH professionals and paraprofessionals in industry who require some OSH academic training, to present special topics in which experienced OSH professionals and paraprofessionals have not received training, and to update skills of OSH professionals and paraprofessionals. Forty-one institutions reported having such continuing education programs. The number of continuing education courses offered by participating institutions in an academic year ranged from 1 to 77. Classroom hours for these continuing education courses ranged from 4.5 to 60. Attendance ranged from 5 to 60 participants. Approximately half of the institutions reporting continuing education activities were members of ERCs. All fifteen of the ERC's reported continuing education programs in one or more of their member institutions.

C. Recent and Projected Numbers of Graduates

The numbers of 1979-80 and 1981-82[8] graduates from the academic programs discussed above, by program area and degree level, are provided as Table 10. Of note is that the numbers of graduates reported here are not estimates based upon sampling. Since 100 percent of the identified programs provided the numbers of their graduates, the figures reported herein are actual counts. The numbers of graduates, by degree level and funding source category, are provided as Figures 1 and 2. Approximately 60 percent of the completers of postgraduate programs were from ERC programs or other programs that were recipients of NIOSH training grants. Approximately 47 percent of the completers of postgraduate programs were from ERCs alone.

The numbers of 1979-80 and 1981-82 graduates by program area and funding source category are provided as Figures 3 and 4. This figure gives a clear picture of the role played by the ERCs in training OSH professionals. As may be noted virtually all of the Nation's 1979-80 and 1981-82 graduates in occupational health nursing and occupational medicine were from ERC programs. Also, 37 percent of all industrial hygiene graduates, 19 percent of all occupational safety graduates, and 11 percent of all industrial hygiene and safety graduates were from ERC programs.

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7 This subsection reflects information as reported by the participating institutions. The absence of a response to the request for a description of continuing education activities was treated as an indication that no program existed. This may lead to an understatement of the continuing education offerings.

8 The numbers of 1979-80 and 1981-82 graduates were obtained primarily to construct the sampling frame of graduates intended to be surveyed. The original research plan was to include 1979-80 graduates (who then would have been in the labor market for two years since graduation) to determine job progression of graduates, and to include 1981-82 graduates (who would have represented the then most recent graduating class) to determine recent ability to obtain suitable employment. While, as noted in Subsection I.C, we were forced to revise this original research strategy, the obtained numbers of graduates still provided a useful basis for supply estimates.

TABLE 10. NUMBERS OF GRADUATES[a] BY PROGRAM AREA AND DEGREE LEVEL

Degree Level	Program Area: Industrial Hygiene	Occupational Safety	Industrial Hygiene and Safety	Occupational Health Nursing	Occupational Medicine	Total
Certificate and/or Associate	11 (13)	67 (85)	117 (145)	0 (6)	0 (0)	195 (249)
Baccalaureate	101 (100)	313 (318)	188 (222)	6 (14)	0 (0)	608 (654)
Masters	318 (293)	281 (257)	64 (73)	18 (52)	0 (3)	681 (678)
Doctoral	20 (21)	7 (3)	0 (5)	0 (0)	0 (0)	27 (29)
Postdoctoral	0 (0)	0 (0)	0 (0)	0 (0)	36 (37)	36 (37)
Total	450 (427)	668 (663)	369 (445)	24 (72)	36 (40)	1,547 (1,647)

[a]The first entry in each cell is the number of 1979-80 graduates, the second entry (in parentheses) is the number of 1981-82 graduates.

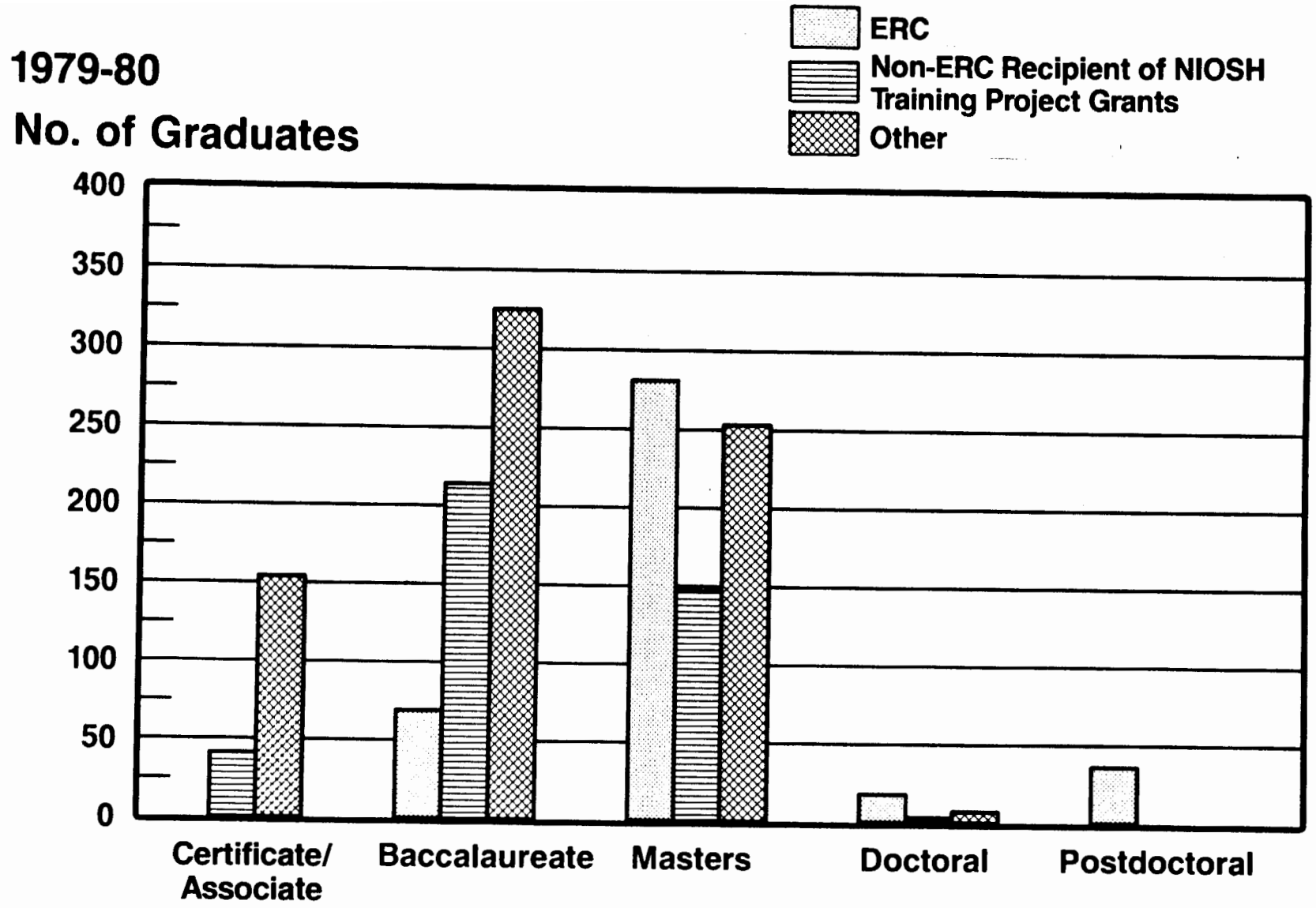

Figure 1. Number of 1979-80 Graduates, by Degree Level and Funding Source Category.

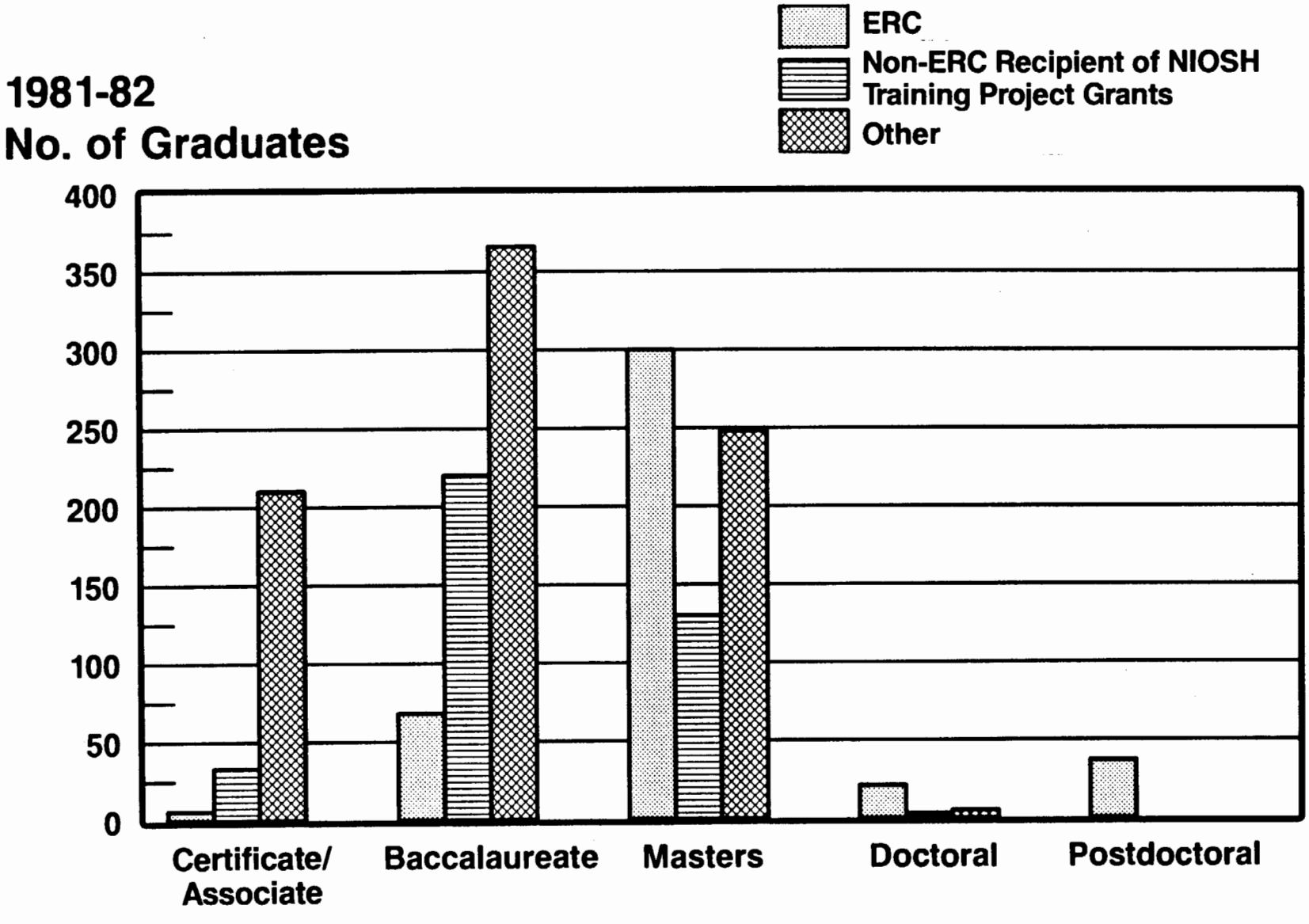

Figure 2. Number of 1981-82 Graduates, by Degree Level and Funding Source Category.

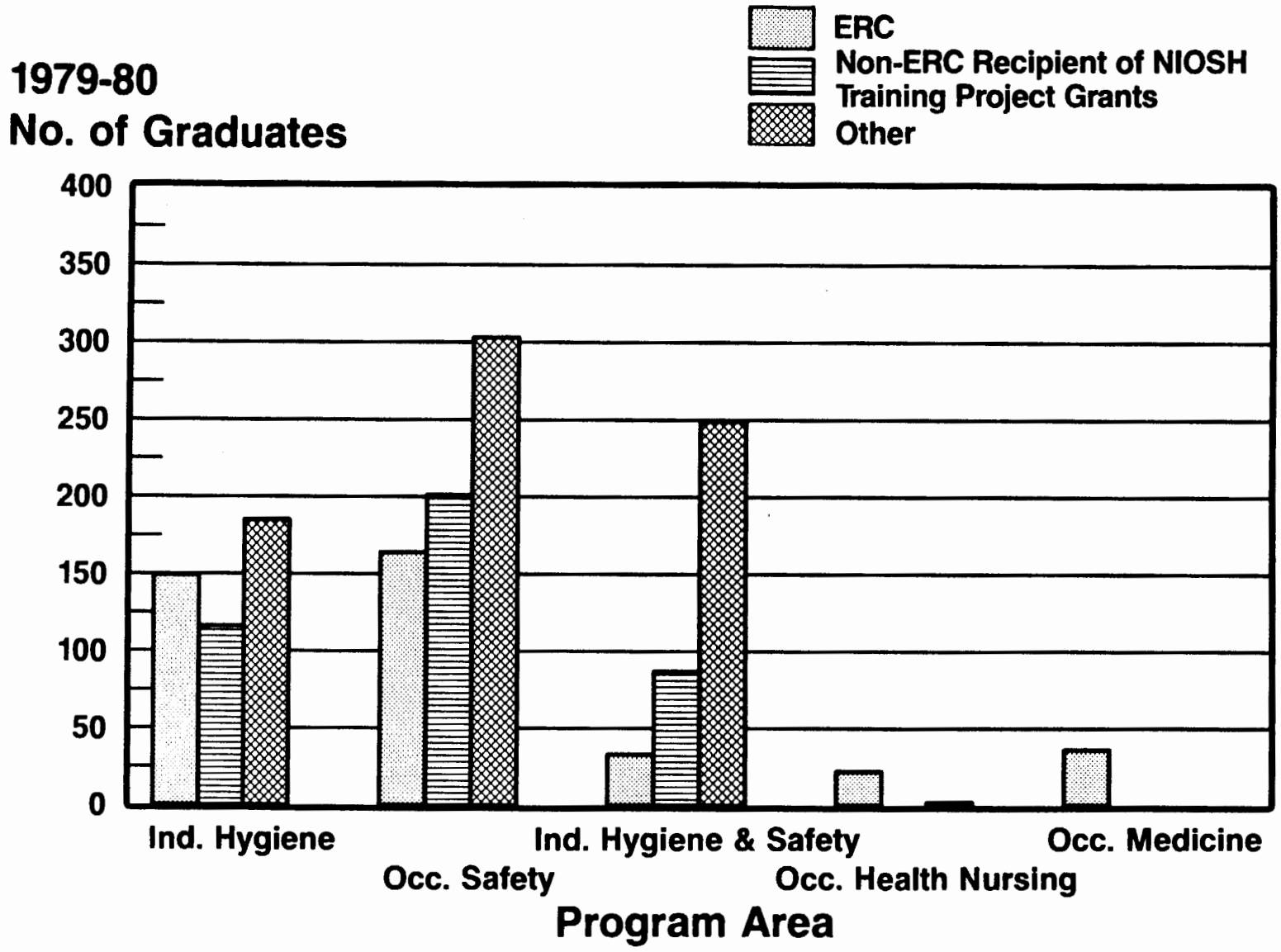

Figure 3. Number of 1979-80 Graduates, by Program Area and Funding Source Category.

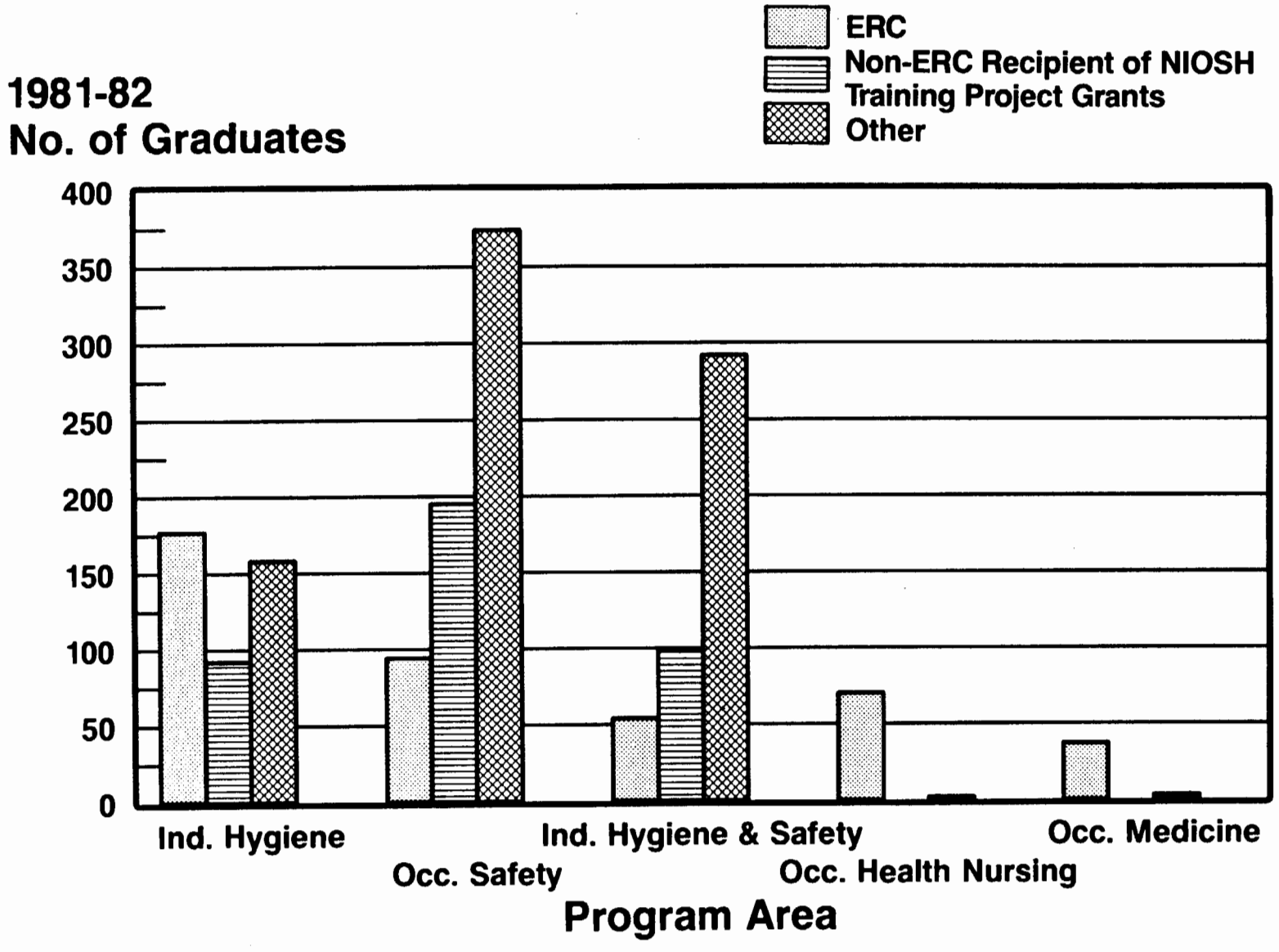

Figure 4. Number of 1981-82 Graduates, by Program Area and Funding Source Category.

Projections of numbers of OSH graduates were complicated by changes over the past 15 years in several critical factors. The enactment of the Occupational Safety and Health Act of 1970 (Public Law 91-596) signaled a decade of high interest in occupational safety and health. One manifestation of this interest was the increased number of college and university programs for training OSH professionals and paraprofessionals. Once the expanded demand for OSH professionals and paraprofessionals was reasonably met, demand for certain categories of OSH-trained personnel leveled off or decreased. Emphasis apparently began to change from quantity of trained personnel to quality of training. Coinciding with some of the changes was the general decline in the Nation's economy in the early 1980s that resulted in even further leveling off or decline in employment opportunities in certain OSH categories. One result of these latter changes was that a number of academic programs (as noted in the previous subsection), particularly at the community college level, ceased operating. A number of additional programs reported a deemphasis of their OSH training activities. While this downward trend in emphasis on OSH academic programs may have leveled off during the latest economic recovery, no large-scale movement to begin new programs or enlarge existing ones has been noted.

In an attempt to obtain some trend data regarding numbers of graduates, the 1979-80 and 1981-82 data discussed above were supplemented by requesting from the 15 ERCs the numbers of their graduates for each of the past two years (1982-83 and 1983-84). These data are reported in Figure 3. As may be noted, the numbers of graduates have been relatively stable over the past five years except for those from occupational safety which show a rather sharp decline. Discussions with the ERCs indicated that the ERC programs have become better known and better established, factors that would tend to increase enrollment. On the other hand, reduced federal support for the programs has worked to depress growth. As a result of these and other factors (such as a reported shortage of personnel with appropriate research training to fill faculty positions), the supply of ERC graduates is reported to be expected to remain at about the 1982-84 level for the foreseeable future.

Informal contacts with personnel of several of the larger (in terms of numbers of graduates) none-ERC programs indicated a decline from the 1979-80 and 1981-82 levels in the numbers of industrial hygiene, occupational safety, and industrial hygiene and safety graduates at the associates, baccalaureate, and master's degree levels. These none-ERC programs reported that this reduced level of activity was expected to continue for the foreseeable future.

The reported graduation patterns in the ERCs combined with the decrease in OSH programs and program emphasis in non-ERC academic institutions indicate that (1) the overall near-future annual supply of graduates in occupational health nursing and occupational medicine (disciplines in which a great majority of graduates are produced by the ERCs) will remain at about the 1982-84 level (as shown in Figure 5), and (2) the annual supply of occupation safety and, to a lesser degree, industrial hygiene graduates currently is considerably lower than the 1979-80 and 1981-82 levels and likely will continue at this lower level for the foreseeable future. This reduced supply of graduates is likely to be particularly noticeable at the paraprofessional level where a number of 2-year colleges have discontinued programs.

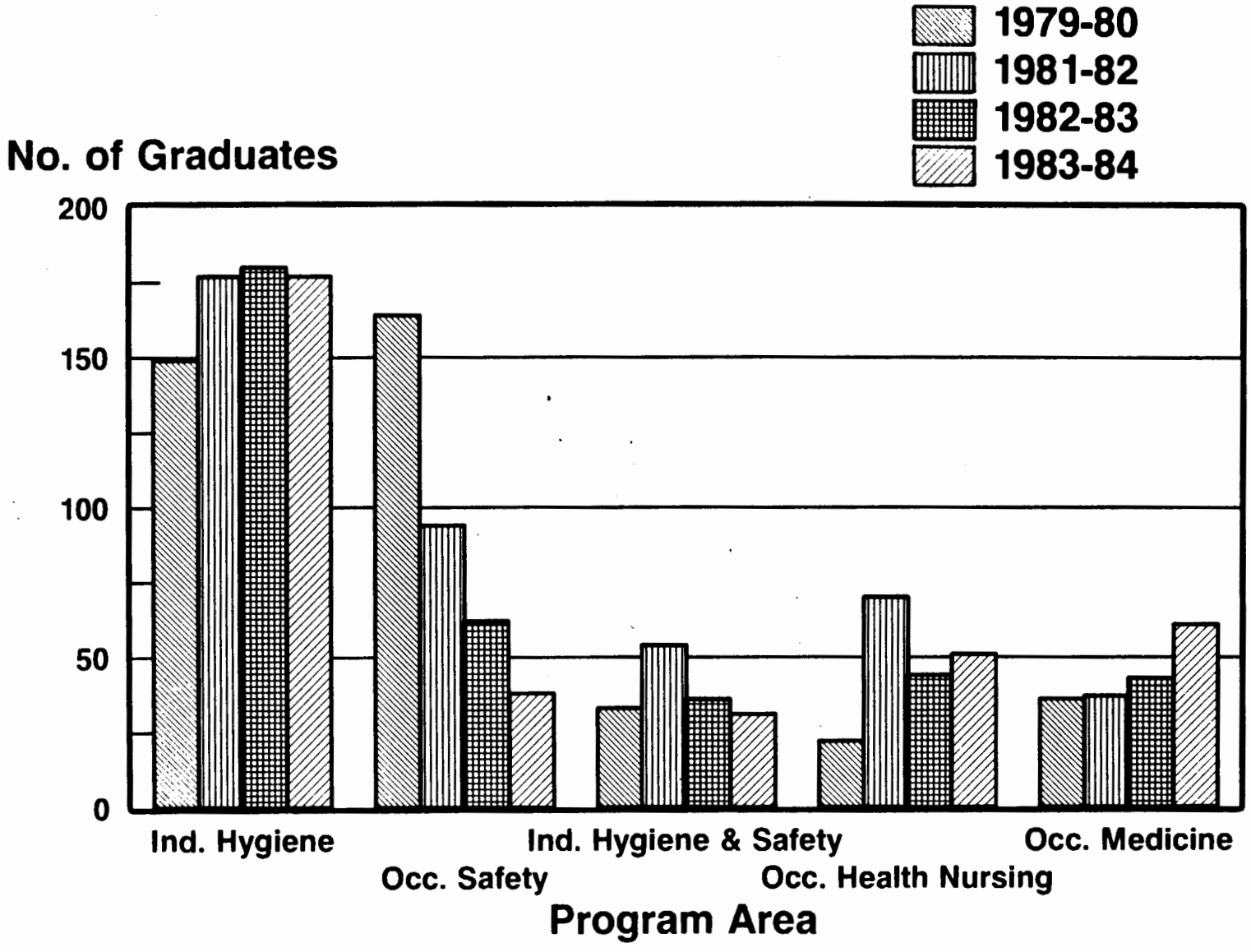

Figure 5. Number of ERC Graduates.

III. EMPLOYMENT/EDUCATIONAL EXPERIENCES OF OCCUPATIONAL SAFETY AND HEALTH GRADUATES

A. Methodology for Collecting Employment/Educational Experience Data

In the absence of OMB approval for conducting a national survey of recent OSH graduates (see Subsection I.C), the best known alternative for obtaining current information regarding the employment and educational experiences of OSH graduates was exercised. Since (1) the 15 ERCs represented the major NIOSH investment in training grant funding, (2) the ERCs produced (as noted in the previous subsection) almost half of the 1979-80 and 1981-82 completers of postgraduate OSH programs, and (3) many ERC programs routinely contacted/surveyed their graduates regarding after-graduation experiences, we considered the ERCs to be a logical source of information about OSH graduates.

The 15 ERCs were contacted regarding their interest in using a standard questionnaire and standard procedures for followup of their graduates; fourteen of the ERCs expressed interest. A questionnaire (see Appendix B) and set of procedures (see Appendix C) were developed and the 14 ERCs conducted surveys (in the Fall of 1984) of their 1981-82, 1982-83, and 1983-84 OSH graduates. The completed questionnaires were forwarded to RTI for analysis and reporting. The reported numbers of graduates and numbers of respondents, by OSH program area, are provided as Table 11. We were unable to calculate a conventional response rate since the individual ERCs did not send questionnaires to graduates whose current addresses were unknown or to foreign graduates known to have returned to their country of origin. Therefore, the "response" rates shown in Table 11, which are based on the numbers of graduates (regardless of whether or not they were mailed a questionnaire), are lower than the true response rates.

The questionnaire data for each OSH program area for each ERC were tabulated separately and returned to the sponsoring ERC. The across-site analyses, by program areas, are discussed in the next subsection.

B. Description of Employment/Educational Experiences of 1981-82, 1982-83, and 1983-84 Graduates

Following are summaries of the major findings based on analysis of OSH graduate questionnaires provided by the 14 participating ERCs. The data were for 1981-82, 1982-83, and 1983-84 graduates from the five OSH program areas of interest: industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, and occupational medicine. Summaries of findings for each of these program areas are reported below; the actual tabulated data for each program area are provided as Appendix A, and the questionnaire used to collect the data is included as Appendix B.

1. Employment/Educational Experiences of Industrial Hygiene Graduates

The following summary of findings is based on questionnaire responses from 310 graduates from 10 ERC industrial hygiene academic programs. Four of the graduates were baccalaureate level, 285 were masters level, and 21 were doctoral level. Sixty-six percent were males; 34 percent were females.

Table 11

NUMBER AND PERCENTAGES OF RESPONDENTS

Program Area	Number of Graduates	Number of Respondents	"Response" Rate[a/]
Industrial Hygiene	357	256[b/]	72%
Occupational Safety	100	61	61%
Industrial Hygiene and Safety	67	53	79%
Occupational Health Nursing	95	64	67%
Occupational Medicine	104	67	64%
Total	723	501[a]	69%

a/ As noted in the text, since questionnaires were not mailed to all graduates, the true response rates were somewhat higher than those shown.

b/ An additional 54 1980-81 industrial hygiene graduates were included for a total response of 555. While these 54 are not included in the response rates noted above, they are included in the data analysis (combined with the 1981-82 graduates).

a. Employment Experience

Ninety percent of the 310 graduates were currently employed, 270 (87 percent) full time and 11 (three percent) part time. Of note is that 10 of the 11 part-time employees were enrolled in school (nine full time; one part time); the other apparently worked part time by choice. Of the 29 unemployed graduates, 16 were enrolled in school (15 full time; one part time), eight were females who had dropped out of the work force, three were females who apparently had not sought employment, and the remaining two were 1983-84 graduates who had sought employment but had not yet accepted a position.

About half (49 percent) of the employed graduates were employed in the private sector, 21 percent were employed in non-military government, 14 percent in academic institutions, and 11 percent in the military. Eighty-eight percent of the employed graduates were filling occupational safety and health positions. Of those graduates employed as OSH professionals, almost half (46 percent) were employed by organizations with total employment of more than 1,000; 19 percent were employed by organizations with total employment of 50 or less. Fifteen percent of those employed as OSH professionals worked for organizations employing more than 50 OSH professionals; 38 percent worked for organizations employing five or fewer OSH professionals.

The mean beginning salary for graduates employed as OSH professionals was about $25,000 per year, slightly higher than the salary of non-OSH employed graduates. Reported current or ending salary showed a gain of about $13,000 for graduates employed two or more years. OSH-employed graduates reported considerably higher current (or ending) salary levels than did non-OSH employed graduates.

Over three-fourths (79 percent) of the OSH-employed graduates reported spending between 76 and 100 percent of their working time performing OSH-related activities. The principal reported OSH activities included: performing plant surveys and inspections (44 percent), planning and developing programs (14 percent), performing administrative duties (14 percent), and training/educating (14 percent). Fifty-nine percent of graduates employed as OSH professionals reported that they did not supervise any employees; 33 percent supervised one to five employees. Sixty-four percent of the OSH-employed graduates reported being responsible for the safety and health of over 1,000 persons. These data must be viewed with some reservations, since most graduates apparently considered themselves to be responsible for all the persons employed by the organization regardless of whether or not the employees were located elsewhere.

The majority of the employed graduates (61 percent) reported having only one employer since graduation; of the remainder, 46 percent of the 1981-82 graduates, 36 percent of the 1982-83 graduates, and 19 percent of the 1983-84 graduates reported having had more than one employer.

Only six percent of the graduates employed as OSH professionals indicated that they had not obtained what they considered to be suitable employment. An additional 16 percent indicated having had great difficulty in finding suitable employment. On the other hand, 40 percent reported having had no difficulty in finding suitable OSH employment, and 38 percent reported having only moderate difficulty.

The primary reasons given by graduates employed as OSH professionals for accepting their current (or latest) job included: "It was the type of job sought" (84 percent), "It was the type of job for which trained" (84 percent), "Job offered career growth" (76 percent), and "It was the type of work desired" (57 percent). Three percent of the graduates indicated not having sufficient training for the desired job, 9 percent reported that they could not find the desired job.

Graduates employed as OSH professionals reported relatively high satisfaction with their current (or latest) employment. Areas in which graduates indicated the greatest satisfaction included: opportunities for self-direction, the challenge of the position, and the opportunity to contribute to occupational safety and health.

b. Academic Experiences

Twenty-seven (nine percent) of the graduates were currently enrolled full time in school; 26 (8 percent) were enrolled part time. Twenty-one of these graduates were enrolled in the ERC from which they received their original degree; two were enrolled in at different ERCs. Forty of the currently enrolled graduates were seeking masters or doctoral degrees. Twenty-one were continuing study in OSH areas.

When asked about job placement assistance they had received from the academic institution from which they graduated, 12 percent reported the institution placement office to be helpful; 43 percent reported that the faculty had been helpful. Twenty-nine percent reported not asking for assistance because they did not need it; 29 percent reported not seeking assistance because they already had a job.

Thirty-nine percent of the OSH graduates had enrolled in OSH-related continuing education or special courses since graduation. The major reported subject areas were toxicology, hazardous waste control and management, ventilation, and noise control/hearing protection. About half (49 percent) of the graduates not currently enrolled full time in an academic program expressed need for continuing education courses. The major indicated areas of need were ventilation, radiation, hazardous waste control and management, toxicology, computer use, and safety management.

The primary reasons reported by graduates for enrolling in the particular ERC program from which they graduated were program quality, program reputation, geographical location, and availability of financial aid. Graduates' perceptions of the general quality of the educational experience was quite positive. Graduates gave high ratings to overall program content and scientific aspects, and lower ratings to research and clinic aspects.

Graduates' recommendations for improving the training programs were: increase "hands on" experience (e.g., field training/experience, current practices, practical problem solving) (suggested by 93 graduates), increase advance toxicology coursework (recommended by 26 graduates), and increase practical business management courses (recommended by 22 graduates).

The primary reasons given by graduates employed as OSH professionals for accepting their current (or latest) job included: "It was the type of job sought" (92 percent), "It was the type of job for which trained" (86 percent), "Job offered career growth" (80 percent), and "It was the type of work desired" (60 percent). Six percent of the graduates indicated not having sufficient training for the desired job, and 14 percent reported that they could not get the kind of job they wanted.

Graduates employed as OSH professionals reported relatively high satisfaction with their current (or latest) employment. Areas in which graduates indicated the greatest satisfaction included: opportunities for self-direction, importance and challenge of the work, opportunities to use their academic training, and opportunities to make positive contributions to occupational safety and health.

b. Academic Experiences

Six (10 percent) of the graduates were currently enrolled part time in school; one (2 percent) was enrolled full time. Three of these currently enrolled graduates were continuing their education at the ERC where they received their original degree (two in OSH-related studies; one in an unrelated area); one graduate was continuing his OSH education at a different ERC. Three graduates were in non-degree programs at other-than-ERC institutions; one of these programs was OSH-related.

When asked about job placement assistance they had received from the academic institutions from which they graduated, only 8 percent reported the institutions' placement offices to be helpful; however, 62 percent indicated that the faculties had been helpful. Thirty percent noted that they had not asked for assistance since they did not need it. Sixteen percent reported not seeking assistance because they already had a job.

Twenty-five percent of the OSH graduates had enrolled in OSH-related continuing education or special courses since graduation. The major reported subject areas were industrial hygiene review, risk evaluation and management, and radiation studies. Over half (51 percent) of the graduates not currently enrolled in an academic program expressed need for continuing education courses. The major indicated subject areas of need were personal computer use, toxicology, and ventilation design.

The primary reasons reported by graduates for enrolling in the particular ERC programs from which they graduated were geographical location, program quality, program reputation, cost of attending, and availability of financial aid. Graduates' perceptions of the general quality of the educational experience were quite positive with regard to the overall content and scientific aspects of the program. Responses to the research and clinical aspects of the programs were less positive. This may have resulted from the general nature of the question (intended to apply to all OSH disciplines) and to a tendency on the part of occupational safety graduates to respond even though their program might not have had a research or clinical focus.

Graduates' recommendations for improving the training program focused on increased opportunities for direct application of the training. Ten of the graduates recommended more "hands on" training (e.g., field training, current practices, practical problem solving), while three wanted more training in "state of the art" techniques. An additional three suggested the inclusion of training in business organization.

c. Relationships Between Academic Training and Work Experience

When asked how the academic program from which they graduated related to their experiences in their current (or latest) job, the graduates employed as OSH professionals reported that: "Enrolling in the OSH academic program was a wise choice" (94 percent), "Can apply most of what I learned" (74 percent), "Most of what I do on the job was learned during my OSH academic training" (58 percent). On the other hand, graduates reported that they: "Had taken some course work that was not helpful in job performance" (34 percent), and "Would have liked more job-related training before I started work" (26 percent).

Graduates reported that the most useful courses they took in the ERC academic program were: industrial hygiene fundamentals, OSHA/EPA compliance, OSH standards, safety management, and ventilation. Graduates reported the least useful courses to be: traffic and fleet safety, emergency planning and preparation, and legal implications of safety. The activities graduates reported being least prepared to perform were: inspecting conditions of safety and health, interpreting OSHA/EPA regulations, negotiating workman's compensation insurance, and writing technical and research reports.

The 11 graduates not employed as OSH professionals described their experiences since graduation as follows: five reported that they found a better job outside of the OSH field, three reported that they could not find an OSH job; four reported that there were no suitable OSH job openings in their geographic area; one reported leaving the OSH field due to inadequate salary; and one reported returning to school full time.

3. Employment/Educational Experiences of Industrial Hygiene and Safety Graduates

The following summary of findings is based on questionnaire responses from 53 graduates from four ERC industrial hygiene and safety academic programs. Nine of the graduates were baccalaureate level, 37 were master's level, and seven were doctoral level. Thirty-eight were males; 15 were females.

a. Employment Experience

Ninety-two percent of the 53 graduates were currently employed, 47 (89 percent) full time and two (four percent) part time. Two of the currently unemployed were recent (1983-84) graduates; all of the remaining unemployed and part-time employed were enrolled full time in school in pursuit of advanced OSH academic degrees.

Thirty-three (67 percent) of the employed graduates were employed in the private sector, 7 (14 percent) were employed by academic institutions, and 7 (14 percent) in non-military government. Forty-one (84 percent) of the 49 employed graduates were filling occupational safety and health positions. Of those graduates employed as OSH professionals, over half (51 percent) were

employed by firms with total employment of more than 500. Thirty-six percent were employed by firms with total employment of 50 or fewer. Thirteen percent of those employed as OSH professionals worked for firms employing more than 50 OSH professionals. Fifty-one percent worked for firms employing five or fewer OSH professionals.

The mean beginning salary for graduates employed as OSH professionals was about $25,000 per year, slightly higher than the salary of non-OSH employed graduates. Reported current or ending salary showed a gain of five or six thousands dollars for graduates employed two or more years. In general, OSH-employed graduates reported slightly higher beginning and current (or ending) salary levels than did non-OSH employed graduates.

Over three-fourths (78 percent) of the OSH-employed graduates reported spending between 76 and 100 percent of their working time performing OSH-related activities. The principal reported OSH activities included: performing plant surveys and inspections (56 percent), planning and developing programs (17 percent) and performing administrative duties (15 percent). Sixty-eight percent of graduates employed as OSH professionals reported that they did not supervise any employees. Twenty-four percent supervised one to five employees; the remaining graduates reported supervising six to ten persons. Sixty-three percent of the OSH-employed graduates reported being responsible for the safety and health of over 1,000 persons. These data must be viewed with some reservations, since most graduates considered themselves to be responsible for all the persons employed by the firm regardless of whether the employees of the firm were located elsewhere.

The majority of the employed graduates (68 percent) reported having only one employer since graduation; of the remainder, 35 percent of the 1981-82 graduates, and 33 percent of the 1982-83 graduates reported having had more than one employer.

Only five percent of the graduates employed as OSH professionals indicated that they had not obtained what they considered to be suitable employment. An additional five percent indicated having had great difficulty in finding suitable employment. On the other hand, more than half (51 percent) reported having had no difficulty in finding suitable OSH employment, and 39 percent reported having only moderate difficulty.

The primary reasons given by graduates employed as OSH professionals for accepting their current (or latest) employment included: "It was the type of job sought" (90 percent), "It was the type of job for which trained" (88 percent), "The job offered career growth" (73 percent), and "It was the type of job desired" (51 percent). Ten percent of the graduates indicated not having sufficient training for the desired job. Fifteen percent reported that they could not find the desired type of job. Fifteen percent reported their current (or latest) job to be the only one they found.

Graduates employed as OSH professionals reported relatively high satisfaction with their current (or latest) employment. Areas in which graduates indicated the greatest satisfaction included: self-direction opportunities, opportunities to work as part of a team, opportunities to participate in decision making, and opportunities for advancement.

b. Academic Experience

Five (9 percent) of the graduates were currently enrolled full time in school; four (8 percent) were enrolled part time. Four of these nine graduates were enrolled in the ERC from which they received their original degree; two were enrolled in a different ERC. Five of the nine were enrolled in programs to earn more advanced OSH degrees.

When asked about job placement assistance they had received from the academic institutions from which they graduated, only seven percent reported the institutions' placement offices to be helpful; however, 41 percent reported that the faculties had been helpful. Twenty-four percent reported not asking for assistance because they did not need it; 22 percent reported not seeking assistance because they already had a job.

Twenty-six percent of the OSH graduates had enrolled in OSH-related continuing education or special courses since graduation. The major reported subject areas were micro/computer use, risk management, ergonomics, ventilation, and professional organization-sponsored courses. Over half (59 percent) of the graduates not currently enrolled full time in an academic program expressed need for continuing education courses. The major indicated areas of need were radiation, safety, toxicology, ventilation, computer use, and air pollution.

The primary reasons reported by graduates for enrolling in the particular ERC program from which they graduated were program quality, program reputation, availability of financial aid, and geographical location. Graduates' perceptions of the general quality of the educational experience were quite positive. Graduates gave high ratings to overall program content, and scientific and clinical aspects of their programs.

Graduates' recommendations for improving the training programs were: increase "hands on" experience (e.g., field training/experience, current practice, practical problem solving) (suggested by 15 graduates), increase advanced toxicology coursework (recommended by 4 graduates), and increase practical business management course work (recommended by 3 graduates).

c. Relationships Between Academic Training and Work Experience

When asked how the academic programs from which they graduated related to their experiences in their current (or latest) job, the graduates employed as OSH professionals reported that: "Enrolling in the OSH academic program was a wise choice" (90 percent), "Can apply most of what I learned" (83 percent), and "Most of what I do on the job was learned during my OSH academic training" (49 percent); on the other hand, graduates reported that they: "Had taken some coursework that was not helpful in job performance" (44 percent), and "Would have liked more job-related training before I started work" (39 percent).

Graduates reported that the most useful courses they took in the ERC academic program were: industrial hygiene principles, safety management, industrial hygiene laboratory, toxicology, and ventilation.

They reported that the least useful courses were: statistics, recognition/control of carcinogens, safety management/systems safety, and psychological

foundations of safety. The activities graduates reported being the least prepared to perform were: work site surveys/hazard evaluation, program management and budgeting, and technical report writing.

The 12 graduates not employed as OSH professionals described their experiences since graduation as follows. Seven reported that they could not find what they considered to be a suitable OSH position, either in their geographical areas or elsewhere; six reported finding a better job in a non-OSH area; and four reported dropping out of the work force to attend school full time.

4. Employment/Educational Experiences of Occupational Health Nurse Graduates

The following summary of findings is based on questionnaire responses from 64 graduates from ten ERC occupational health nurse academic programs. Fifty of the graduates were masters level, eight were baccalaureate level, one was doctoral level, and five were certificate level. Sixty-one were females; three were males.

a. Employment Experience

Ninety-five percent of the 64 graduates were currently employed, 53 (83 percent) full time and eight (12 percent) part time. Two of the three unemployed graduate and half of the eight part-time employees were 1984-85 graduates. Two of the part-time employees were currently enrolled in advanced degree occupational health nursing programs in the same ERCs from which they received the initial academic degree.

Thirty-six (59 percent) of the employed graduates were employed in the private sector, 9 (15 percent) were employed in non-military government, one (2 percent) in the military, and 8 (13 percent) in academic institutions. Forty-five (74 percent) of the 61 employed graduates reported filling occupational safety and health positions. An additional 23 percent of the employed graduates reported being employed in the general nursing profession.

Of those graduates employed as OSH professionals, about half were employed by organizations with total employment of more than 1000. Nineteen percent were employed by organizations with total employment of 50 or fewer. Eight percent of those employed as OSH professionals worked for organizations employing more than 50 OSH professionals. Sixty percent worked for organizations employing five or fewer OSH professionals.

The mean starting salary for graduates employed as OSH professional was about $25,000 per year, about the same as the beginning salary of non-OSH-employed graduates. Reported current or ending OSH salary showed a gain of about six thousand dollars for graduates employed two or more years. OSH-employed graduates with less work experience showed, as would be expected, more modest salary gains. On the average, OSH-employed graduates reports about the same current (or ending) salary levels as did non-OSH employed graduates.

Almost half (48 percent) of the OSH-employed graduates reported spending between 76 and 100 percent of their working time performing OSH-related activities. Training/education was the primary OSH activity of OSH graduates; 26 percent of the OSH-employed graduates indicated this as a primary activity.

Other primary activities included performing physical examinations (15 percent), treating injuries (10 percent), and planning or developing programs (10 percent).

Most graduates (60 percent) reported that they did not supervise any employees. Thirty-three percent reported supervising one to five employees. Fifty-nine percent of the OSH professionals reported being responsible for over 1,000 people's safety and health.

The majority of the employed graduates (69 percent) had had only one employer since graduation; of the remainder, 53 percent of the 1981-82 graduates, 8 percent of the 1982-83 graduates, and 27 percent of the 1983-84 graduates reported having had more than one employer.

Eighteen percent of the graduates employed as OSH professionals indicated that they had not obtained what they considered to be suitable employment. An additional 16 percent indicated having had great difficulty in finding suitable employment. On the other hand, 47 percent reported having had no difficulty in finding suitable OSH employment, and 20 percent reported having had only moderate difficulty.

The primary reasons given by graduates employed as OSH professionals for accepting their current (or latest) job included: "It was the type of job sought" (73 percent), "It was the type of job for which trained" (62 percent), "Job offered career growth" (60 percent), and "It was the type of work desired" (51 percent). Thirteen percent of the graduates indicated that it was the only job found, and 22 percent reported that they could not get the kind of job they wanted.

Graduates employed as OSH professionals reported relatively high satisfaction with their current (or latest) employment. Areas in which graduates indicated the greatest satisfaction included: importance and challenge of the work, opportunities for self-direction, opportunities to use their academic training, opportunities to make a positive contribution to occupational safety and health, and opportunities to work as part of a team.

b. Academic Experiences

Thirteen (20 percent) of the graduates were currently enrolled part time in school; one (2 percent) was enrolled full time. Eight (57 percent) of these currently enrolled graduates were continuing their education at the ERC from which they received their original degree (all in OSH-related studies); one graduate was continuing her OSH education at a different ERC. Five graduates were enrolled in programs at other-than-ERC institutions; two of these programs were OSH-related.

When asked about job placement assistance they had received from the academic institutions from which they graduated, only 4 percent reported the institutions' placement offices to be helpful; however, 24 percent indicated that the faculties had been helpful. Twenty-nine percent noted that they had not asked for assistance because they did not need it. Thirty-eight percent reported not seeking assistance since they already had a job.

Forty percent of the OSH graduates had enrolled in OSH-related continuing education or special courses since graduation. The major reported subject areas were NIOSH/professional association seminars, emergency care seminars, and workman's compensation reviews. Forty-four percent of the graduates not currently enrolled full time in an academic program expressed need for continuing education courses. The major indicated subject areas of need were toxcology, spirometry, industrial hygiene review, and workman's compensation review.

The primary reasons reported by graduates for enrolling in the particular ERC programs from which they graduated included geographical location, program quality, program reputation, availability of financial aid, and cost of attending. Graduates' perceptions of the general quality of the educational experience were quite positive with regard to the overall content, scientific aspects, and clinical aspects of the program.

Graduates' recommendations for improving the training program included more "hands on" training (e.g., on-site clinical experience, on-job-training, pairing with experienced practitioner), (10 graduates), training in business organization (6 graduates), training in toxicology (6 graduates), and increased training in research methods (6 graduates).

c. Relationships Between Academic Training and Work Experience

When asked how the academic program from which they graduated related to their experiences in their current (or latest) job, the graduates employed as OSH professionals reported that: "Enrolling in the OSH academic program was a wise choice" (87 percent), "Can apply most of what I learned" (58 percent), and "Most of what I do on the job was learned during my OSH academic training" (40 percent). On the other hand, graduates reported that they: "Had taken some course work that was not helpful in job performance" (38 percent), and "Did not need OSH training to get current job" (38 percent).

Graduates reported that the most useful courses they took in the ERC academic programs were: administration and management, OHN seminars, toxicology, research methods and statistics, and epidemiology. Graduates reported the least useful courses to be: toxicology, industrial hygiene, nursing theory, and epidemiology. The fact that some graduates indicated certain courses (e.g., epidemiology) to be the most useful, while other graduates indicated the same courses to be the least useful, likely reflects differences in job requirements. Of note is that graduates did not state that the "least helpful" courses should not have been taught; they simply were indicating those courses that had proven to be most helpful and least helpful considering their responsibilities in their current or latest job.

The activities graduates reported being least prepared to perform included: administration and management, "marketing" programs, budget preparations, and physical assessments.

The 19 graduates not employed as OSH professionals described their experiences since graduation as follows: nine reported that they found a better job outside of the OSH field, 11 reported that there were no suitable OSH jobs in their geographic area, and nine reported that they could not find an OSH job

regardless of the location. Eight graduates reported leaving the OSH field due to inadequate salary. Three went back to school full time.

5. Employment/Educational Experiences of Occupational Medicine Graduates

The following summary of findings is based on questionnaire responses from 67 graduates from nine ERC occupational medicine academic programs. These programs were post-doctoral programs (typically for holders of MD degrees). Completers often (but not always) were awarded a Master of Public Health degree. Fifty-four of the graduates were males; 13 were females.

a. Employment Experience

Ninety-eight percent of the 67 graduates were currently employed, 61 (91 percent) full time and five (seven percent) part time. The single unemployed graduate and one of the five part-time employees were currently enrolled in post-doctoral epidemiology programs in the same ERCs from which they recently completed the occupational medicine program. The remaining four part-time employees appeared to work part-time from choice rather than because of unavailability of full-time positions. Eighteen (28 percent) of the employed graduates were employed in the private sector, seven (11 percent) were employed by non-military government, 11 (17 percent) by the military, and 21 (32 percent) by academic institutions. All but two of the 66 employed graduates were filling occupational safety and health positions. The two exceptions were employed in other medical fields.

Of those graduates employed as OSH professionals, about half (47 percent) were employed by firms with total employment of more than 500. Thirty-three percent were employed by firms with total employment of 50 or fewer. Twenty-two percent of those employed as OSH professionals worked for firms employing more than 50 OSH professionals. Thirty-three percent worked for firms employing five or fewer OSH professionals.

The mean starting salary for graduates employed as OSH professionals was about $48,000 per year, considerably higher than the salary of non-OSH-employed graduates. Reported current or ending OSH salaries showed a gain of about eight thousand dollars for graduates employed two or more years. OSH-employed graduates with less than two year's work experience showed, as would be expected, more modest salary gains.

Almost two-thirds (61 percent) of the OSH-employed graduates reported spending between 76 and 100 percent of their working time performing OSH-related activities. Administering and directing was the primary activity of OSH graduates; 34 percent of the OSH-employed graduates indicated this as a primary activity. Other primary activities included: performing research (20 percent), treating illnesses (19 percent), and consulting (16 percent).

Twenty-three percent of the OSH-employed graduates reported that they did not supervise any employees. Twenty-nine percent reported supervising one to five employees; another 18 percent supervised 6 to 25 employees. Fifty-eight percent of the OSH professionals reported being responsible for over 1,000 people's safety and health. These data must be viewed with some reservations due to an apparent tendency of graduates to consider themselves responsible

for the safety and health of all employees of the organization regardless of the number and location of the organization's sites.

The majority of the employed graduates (70 percent) had had only one employer since graduation; of the remainder, 39 percent of the 1981-82 graduates, 31 percent of the 1982-83 graduates, and seven percent of the 1983-84 graduates reported having more than one employer.

Only one of the graduates employed as OSH professionals indicated that he had not obtained what he considered to be suitable employment. None reported having great difficulty in finding suitable employment. Nineteen percent indicated having had moderate difficulty in finding suitable OSH employment while 79 percent reported having had no difficulty.

The primary reasons given by graduates employed as OSH professionals for accepting their current (or latest) job included: "It was the type of job sought" (78 percent), "It was the type of job for which trained" (73 percent), "Job offered career growth" (77 percent), and "It was the type of work desired" (52 percent). Three percent of the graduates indicated that their current job was the only job they found; three percent reported not finding the desired type of job.

Graduates employed as OSH professionals reported very high satisfaction with their current (or latest) employment. Areas in which graduates indicated the greatest satisfaction included: the challenge of the position, opportunities for self-direction, opportunities to work as part of a team, opportunities to use their academic training, and opportunity to make a positive contribution to occupational safety and health.

b. Academic Experiences

Two of the graduates were currently enrolled part time in school; two more were enrolled full time. Two of these currently enrolled graduates were continuing their education (in epidemiology) at the ERC where they completed their post-doctorate in occupational medicine; one graduate was continuing his OSH education (in toxicology) at a different ERC. One graduate was studying mathematics at an other-than-ERC institutions.

When asked about job placement assistance they had received from the academic institutions from which they graduated, only five percent reported the institutions placement offices to be helpful; however, 33 percent indicated that the faculties had been helpful. Forty-four percent noted that they had not asked for assistance since they did not need it. Fifty-three percent reported not seeking assistance since they already had a job.

Over half (51 percent) of the OSH graduates had enrolled in OSH-related continuing education or special courses since graduation. The major reported subject areas were professional association/NIOSH seminars, occupational/internal medicine reviews, and medical screening of employees. Thirty-four percent of the graduates not currently enrolled in an academic program expressed need for continuing education courses. The major indicated subject areas of need were special topics (e.g., back pain, eye injury, dermatology), legal issues in occupational medicine, and administration and management.

The primary reasons reported by graduates for enrolling in the particular ERC program from which they graduated included geographical location, program quality, and program reputation. Graduates' perceptions of the general quality of the educational experiences were quite positive with regard to the overall content and scientific aspects of the programs. Responses to the research and clinical aspects of the programs were less positive.

Graduates' recommendations for improving the training program included increased clinical experience (reported by 10 graduates), increased training in administration and management (reported by 5 graduates), and increased training in academics/industry relationships (reported by 5 graduates).

c. Relationships Between Academic Training and Work Experience

When asked how the academic program from which they graduated related to their experiences in their current (or latest) job, the graduates employed as OSH professionals reported that: "Enrolling in the OSH academic program was a wise choice" (92 percent), "Can apply most of what I learned" (73 percent), and "Most of what I do on the job was learned during my OSH academic training" (38 percent). On the other hand, graduates reported that they: "Had taken some course work that was not helpful in job performance" (39 percent), and "Would have liked more job-related training before I started work" (27 percent).

Graduates reported that the most useful courses they took in the ERC academic programs were: epidemiology, toxicology, industrial hygiene, biostatistics, and occupational medicine/disease. Graduates reported the least useful courses to be: biostatistics, toxicology, public health/hospital administration, and public health theory and history. The fact that some graduates indicated certain courses (e.g., toxicology, biostatistics) to be the most useful, while other graduates indicated the same courses to be the least useful, likely reflects differences in job requirements. Of note is that graduates did not state that the "least helpful" courses should not have been taught; they simply were indicating those courses that had proven to be most helpful and least helpful considering their responsibilities in their current or latest jobs.

The activities graduates reported being least prepared to perform were: administration and management, clinical evaluation of disability, and program design and management.

IV. EMPLOYER PERSPECTIVES REGARDING EMPLOYMENT OF OCCUPATIONAL SAFETY AND HEALTH PROFESSIONALS

A. Methodology for Collecting Employer Information

As noted in Subsection I.D, information was collected from a limited number of employers of OSH professionals primarily to verify or validate related information collected from graduates of occupational safety and health academic programs. To facilitate the collection of employer information, a data collection instrument was developed (see Appendix C, pp.C.13-C.17) that was suitable for use as a mail questionnaire or as the basis for telephone interviews. Information to be obtained included general descriptive information (i.e., industry category, number of total employees, number of employees in the particular OSH area of interest[9]), number of position openings and the manner in which the positions are filled, educational/experience requirements for the positions, employer assessment of the adequacy of the skills of new OSH employees, reasons for hiring particular applicants, and employer projections of demand for OSH professionals.

The selection of employers to be contacted was based primarily on employer information provided by graduates of OSH academic programs. As a part of the surveys of their graduates conducted by the ERCs, graduates were asked to provide the names and addresses of their current employers, the industry categories of the companies/institutions, the sizes of the organizations as reflected in total employment, and the numbers of OSH employees. This list of employers was augmented by recommendations from representatives of OSH professional organizations (e.g., the American Industrial Hygiene Association, the American Society of Safety Engineers, the American Association of Occupational Health Nurses, the American Occupational Medicine Association) and of Study Advisory Panel members regarding organizations that were major or typical employers of OSH professionals.

The resultant list of employers for each occupational category (i.e., industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, and occupational medicine) were categorized by industry type and number of employed OSH professionals in that particular occupational category. Since the number of employers to be contacted was limited (as discussed in Subsections I.C and I.D) to nine or fewer organizations within each occupational category, the primary emphasis was on selecting the larger employers of OSH professionals. Secondary attention was given to selections within each industry category (e.g., federal nonmilitary, military, academic institution, private sector). Such a selection strategy may raise questions of representativeness and generalizability of results. Clearly the selected employers should not be considered completely representative of the range of potential occupational safety and health employers, and any generalization of findings should be done with caution. Nevertheless, since larger organizations within each category are more likely to employ greater numbers of occupational safety and health professionals and are more likely to be industry trend setters, the typical patterns of employment, degree requirements, expected demand,

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[9] I.e., industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, or occupational medicine.

etc., reported by the contacted organizations should adequately serve the intended purposes of validating related data obtained from graduates.

The initial data collection plan was to contact each employer and identify an individual within the organization who would be willing to complete a mail questionnaire. Most contacted persons, however, were very willing to discuss over the telephone the issues referred to in the data collection instrument. Since an interview format provided an opportunity to collect more in-depth information, clarify provided answers, and explore additional topics raised by the informants, most of the information was collected during the initial or subsequent telephone contacts. In the remaining cases, the questionnaire was mailed to the employer representative for completion. All employer contacts were made in early 1985.

The findings from interviews and returned questionnaires are summarized separately for industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, and occupational medicine.

B. Recent and Projected Employment Patterns

1. Employment Patterns for Industrial Hygienists

Two of the contacted employers of industrial hygienists were state occupational health and safety departments, the remainder were in the private sector. Of those companies in the private sector, four were primarily manufacturing organizations (although they often had wholesale or retail trade divisions), two were for-profit consulting firms, one was a not-for-profit research and consulting firm, and one was primarily a large scale construction company. The manufacturing companies ranged in size from 9,000 to 30,000 employees, with a mean of 15,500 employees. Three of these firms reported no change in size during the past year, one reported growth of 1,000 employees. The organization in the construction industry reported a stable workforce over the past year of 12,000 employees. The remaining organizations/institutions ranged in size from 40 to 400 employees, with a mean of 221 employees. Two of these organizations had experienced growth in the workforce during the past year of 25 to 50 employees.

Among the nine contacted organizations, a total of 89 industrial hygiene professionals were reported to be employed. This represented an expansion during the past year of 21 filled positions. The mean number of industrial hygienic professionals employed per organization was 9.8, with a range of 2 to 24. Of the 89 industrial hygienists currently employed, 37 (41 percent) were recent (within the past 5 years) graduates of academic programs.

Respondents reported a total of 38 industrial hygiene positions having been vacant at any time during the past year. Of these openings, 22 were reported to be due to the creation of new positions; 16 were due to employee turnover. Seven of these positions were reported to be filled by transfer or promotion, four remained vacant at the time of the interview, and the remainder had been filled by new hires. The average length of time any position had remained vacant was 1.6 months.

Two of the respondents reported what they considered to be some shortage of qualified applicants to fill available positions; two respondents believed there was a surplus of applicants, while the remaining respondents considered the supply of applicants to be adequate. The respondents who reported a surplus of applicants were with large organizations in the south and southeast.

The primary means of identifying candidates for available positions was stated to be to advertise in local and regional newspapers. Contacted organizations also reported relying on personal contacts with the faculty of academic training institutions for recommendations regarding candidates for positions. Employers expressed a high degree of satisfaction regarding the match between the academic training and skills of new hires and the requirements of the job for which they were hired. Seven respondents considered the match to be excellent, while two reported a satisfactory match.

While the respondents were satisfied with the training and skills of industrial hygiene employees hired during the past year, they did offer several suggestions for improving academic training programs. The most frequent suggestion was to increase the amount of "hands-on" training and practical experience of students. One means suggested for accomplishing this goal was to provide internship programs. Two employers suggested that, since the economy may be entering a period of deindustrialization, it might be appropriate for training institutions to begin to move away from an almost exclusive focus on "classic" manufacturing industries toward technological and chemical industries. Two employers noted that while candidates often had well-developed technical skills, they often were lacking in effective oral and written communication skills. They indicated that what is needed is the ability to prepare reports and discuss research findings and analysis with clients who are not technically trained in industrial hygiene. Of note is that these same types of needs were indicated by graduates from academic programs.

The primary reasons identified for hiring one individual rather than another were that the hired individuals were the most qualified applicants, graduated from excellent schools, and had academic training and a broad range of experiences that matched company needs. Factors that were not generally considered reasons for hiring the particular applicants included the selected person's being the only qualified applicant, more qualified applicants not applying, the specialization in an area considered important, or the person's already living in the area. Three organizations noted that it was company policy to hire from within the company if a qualified employee applied for the position. Thus the fact that a person worked for the organization was a factor in some cases.

In all but one organization, respondents anticipated that the number of industrial hygienists employed by the organization would increase during the next five years. For the eight organizations anticipating an increase, a total increase of 36 positions was expected. This represented a projected 40 percent increase in industrial hygiene employment over the next five years for these particular organizations. The level of internal funding or contract/ grant support and the regulatory/ enforcement climate were the most frequently cited bases for increase.

Expansion of market-place demand and the general level of the economy were generally thought to be lesser influences on the numbers of positions. Economic expansion was thought to allow the funding of needed positions. That is, regardless of need for industrial hygienists, positions were reported not to be funded during periods of economic decline or stagnation. Conversely the mere fact of economic growth was not considered sufficient to drive an expansion in the number of industrial hygienists employed. Recognition of the need for industrial hygienists was thought to be influenced primarily by political factors such as regulatory and enforcement climate and by social factors such as increased public awareness of the need to control toxic and hazardous materials. Respondents indicated that while the rate of increase in the number of industrial hygienists should remain strong over the next five years, two conditions suggest a limit on prolonged growth. One is that the demand for industrial hygienists fell during the late 1970's and early 1980's. Expansion in the number of industrial hygienists during the past one to two years may represent merely a return to earlier levels, at which point reduced growth might be experienced. Second, recent legislative action (e.g., employee right-to-know regulations) may have stimulated a one-time boost in the employment rate.

In summary, the employers reported the current demand for industrial hygienists to be quite strong and the content of current training programs to be adequate. Projected demand appeared to be strong, assuming a continuing high level of internal funding or contract/grant support and a continuing strong regulatory/enforcement climate. This projected demand appeared to represent some expansion in the current industrial hygiene work force in addition to routine replacement needs.

2. Employment Patterns for Occupational Safety Professionals

Two of the contacted employers of occupational safety professionals were state agencies (an occupational safety department and a safety division of a department of transportation), one organization was a private utility, and the remaining were in the mining, construction, or manufacturing industries. Total current employment in the contacted organizations ranged from 137 to 5,000, with a mean total employment of 1,937 persons. Only one organization reported recent change in total employment. This was a small company that reported a decline in total employment from 180 persons one year ago to 160 at present.

Among all contacted employers of occupational safety professionals, a total of 302 occupational safety professionals were reported to be employed. The mean per employer was 37.75. This represented a slight increase over the previous year's level of 289 occupational safety employees. Three organizations reported no change in the number of occupational safety employees over the past year; two had experienced a decline in occupational safety employment, and three had experienced an increase. In most cases, the level of employment of graduate-level occupational safety professionals had remained stable; variations in employment rates were largely confined to entry level inspection positions.

In general, the current demand for occupational safety professionals did not appear to be strong. Half of the respondents reported a surplus of occupational safety applicants; the remaining organizations noted that the supply was adequate. Assessment of the employment picture was complicated by two

related factors. First, in the contacted traditional manufacturing industries, occupational safety personnel reportedly often did not have specialized academic degrees in occupational safety. Rather they had moved up through the ranks within the company, perhaps having taken special training courses in safety topics or perhaps merely receiving on-the-job training. At the same time, according to respondents, the requirements for safety training are increasing and it is likely that future safety professionals will need formal, advanced safety training. This latter factor is due largely to changes in the nature of industrial production and in the increased use of toxic chemicals in the workplace. Along these lines, it is important to note that two respondents stated that recent hires in their occupational safety departments held degrees in industrial hygiene or engineering and were brought into the company primarily because of their training in general industrial hygiene and engineering rather than because of their training in safety. This would indicate that, in general, for the short term, combined safety and industrial hygiene or combined safety and engineering academic training may maximize the employability of safety graduates. One company which was engaged primarily in research in the mining industry noted, however, that they had shifted orientation from applied research to basic research, and that this shift in orientation produced the need for more advanced training in occupational safety. Thus, in some cases, one may expect continued need for specialized occupational safety training without the need for additional training in industrial hygiene.

Among the contacted organizations, 25 (8 percent) of the occupational safety employees were recent (within the past five years) graduates of academic programs. Three organizations reported that employment openings had occurred due to the creation of new positions. Four reported that openings had occurred due to employee turnover. Only one company reported that openings during the past year were filled by transfer or promotion. The remaining openings, which were largely entry level positions, were filled by new hires. No respondents reported having positions still open, although one state agency did note that six positions for safety inspectors were vacant but that funds were not available to support the positions.

The means of identifying candidates for available positions varied among the reporting organizations. The most common means was to advertise in local and regional newspapers. This was especially true for entry level inspector positions. Research and administrative positions were filled by announcing the positions in national newspapers and trade journals and contacting academic institutions. The minimum qualifications for positions varied. For entry level inspectors, a bachelors degree or comparable experience was required. For research and administrative positions, a masters degree or considerable relevant experience was necessary.

In general, respondents reported a satisfactory match between academic training and job requirements of their recent hires. Of those respondents offering recommendations for improving academic training programs in safety, the most frequent recommendation was for increased hands on experience, especially in instrumentation. One respondent was of the opinion that, in the future, most occupational safety professionals also would need a good basic grounding in chemistry and engineering.

In describing their organization's reasons for hiring one person rather than another, none of the respondents stated that the person hired was the only qualified applicant or that a person was hired because he or she already lived in the area. Only one respondent noted that more qualified applicants would not accept the position. About half of the respondents took into consideration the reputation of the applicants' schools in making hiring decisions; however, they were more likely to consider applicants' general academic training, regardless of school reputation, or whether or not the applicants' past experiences matched company needs. In two companies, an important consideration was whether or not suitable applicants for promotion were available within the company.

Three of the contacted organizations anticipated an increase in the number of occupational safety positions during the next five years. No respondents anticipated a decline in positions. Among the factors identified as likely to contribute to an increase in positions were changes in the demand of the market, the level of the economy, the level of contract/grant support, and regulation/enforcement requirements. Only one respondent stated that the availability of support personnel might be a factor. No respondent reported that availability of facilities or equipment would be a relevant factor. The level of internal funding or contract/grant support was considered the most important factor driving demand. The next most important factor was change in the regulatory climate, followed by changes in the economy and market conditions. The reported importance of state and federal legislative action in affecting funding support levels and regulation/enforcement policies indicated that employees' and the general public's concern for safety was considered to be a primary factor in determining demand. Employee right-to-know legislation was reported as one example of such concerns.

In summary, based on employer reports, the field of occupational safety appeared to be undergoing a period of transition due in large part to the increased use of toxic chemicals and hazardous materials during the manufacturing process. Current demand for occupational safety professionals did not appear particularly strong and was not expected to increase appreciably during the next five years. The expressed need for safety professionals with training in chemistry and engineering may indicate the need for academic institutions to reconsider the curricular focus of their occupational safety programs.

3. Employment Patterns for Industrial Hygiene and Safety Professionals

Two of the contacted employers of industrial hygiene and safety (IH/S) professionals were state agencies, the remainder were in the private sector. The contacted organizations ranged in total current employment from 40 to 70,000, with a mean total current employment of 9,000. Among all contacted organizations, there was a total net loss of 9,000 employment positions from the previous year's employment.

A total current employment of 435 IH/S personnel were reported by the nine contacted organizations. Of this total, about 10 percent were recent (within the past five years) graduates of academic programs. The mean number of IH/S employees was 48. The largest employer of IH/S professionals was a state institution that reported having 250 IH/S employees. When this unusually

large number of IH/S employees is excluded, the mean number of IH/S employees falls to 27, with a range of 7 to 80 IH/S employees.

The contacted state occupational safety and health departments did not report large numbers of total employees but a majority of those employees were considered to spend 50 percent or more of their time on industrial hygiene and safety activities. In large private sector companies, the number of IH/S employees appeared to be directly related to the type of industry group. That is, organizations with a greater degree of involvement in hazardous chemical and hazardous waste management were more likely to have a larger IH/S staff than other organizations regardless of size of the organization.

While the total number of employees in the contacted organizations had decreased over the past year, the number of IH/S employees had increased from 379 to 435. This should not, however, be taken as an indication of widespread demand for IH/S employees. Two organizations accounted for 50 of the 56 new positions. In one of these companies, expansion was due to creation of a new special studies unit. The other company had recently received a federal contract which lead to the creation of 28 new positions during the past 12 months. This company was experiencing a period of rapid growth and the demand was for electrical or mechanical engineers with some industrial hygiene and safety training. Due to the highly technical nature of the work performed by this company, they had developed their own training program for their engineering staff; few of the employees performing industrial hygiene and safety activities had been selected primarily on the basis of their industrial hygiene and safety training.

Another factor to consider in interpreting the growth of IH/S employees relative to total employment is what several respondents referred to as "delayed satisfaction of demand." One respondent noted that industrial hygiene and safety employees were the "last hired, first fired" during periods of economic downswing. This was stated to be especially true if no problems had been experienced recently with regard to safety and health issues. One factor leading to recent expansion of the IH/S staffs appeared to be enactment of employee right-to-know legislation. This had created a situation in which company demand for IH/S-trained personnel was increasing following a period in which the number of IH/S staff was allowed to decline. Once the immediate need for IH/S staff is satisfied, the current rate of growth may not continue.

Employers reported a total of 72 IH/S position openings during the past 12 months. Of these, 62 were openings resulting from the creation of new positions; 16 resulted from employee turnover. Seven of these positions were filled by transfer or promotion, 61 were filled by new hires, 22 positions remained vacant. The figure of 22 vacant positions does not necessarily indicate a general shortage of qualified applicants since, as noted above, 20 of these vacant positions were reported by one organization with rather unique qualification requirements. Most contacted company representatives indicated that positions that became available were filled rather quickly; the average length of time a position remained vacant was 2.7 months. Much of this time lag between announcing a position and filling it could be attributed to company policy regarding announcement procedures, affirmative action compliance, interviewing processes, etc. rather than to a shortage of

qualified applicants. Most representatives indicated that the supply of qualified applicants was adequate, two indicated that there may be a surplus of qualified applicants, three indicated some degree of shortage. Those who indicated a shortage of qualified applicants tended to qualify their statement, however, by reference to unique conditions operative in their company (e.g., low salary, need for engineers with safety training, need for personal relations skills for consulting) rather than by attributing the shortage to the number of technically qualified applicants.

The method of identifying candidates for open positions varied greatly among contacted organizations. Further, most organizations did not rely primarily on a single method. The typical pattern for announcing a position was to advertise in local and regional newspapers. Some organizations also would post announcements in national trade and professional association publications. Many respondents also reported that they maintained contact with professors who would recommend graduates as needed.

One contacted employer had no minimum requirements for IH/S professionals since they provided on-the-job training. Four organizations required a minimum of a masters degree but did not specify experience requirements. The remaining organizations varied in their degree requirements between masters and bachelors degrees but all required three or more years of experience. There was a general feeling among employers that the academic training programs were doing a good job in providing technical skills training to their students. Most employers also recommended, however, that a greater emphasis be placed upon students' obtaining summer internships or other forms of "hands on" experience prior to entry into the labor force.

When asked why one individual rather than another was hired by a company, none of the respondents reported that their reasons were that the person hired was the only qualified applicant or that the person was hired because they already lived in the area. In only one case did a respondent report that more qualified applicants would not accept the position, and this statement was qualified by the recognition that salary levels within the company were considerably lower than for similar positions in other companies in the area. In most cases, the person hired was considered to be the most qualified applicant, and had applicable academic and work experience. About half the respondents took into consideration the academic reputation of the institution from which the applicant had received a degree, but this was seldom considered to be a major factor in selection. Rather, it was taken as an indication of the type of training the individual was likely to have received. Some companies were required to hire from within the company if suitable candidates were available, thus, the fact that a person already worked for the company was significant in three of the nine contacted organizations. Only three of the nine contacted organizations indicated that specialization was an important consideration. Conversely all but one respondent indicated that an applicant's range of skills was an important consideration.

Of note is that the contacted employers of IH/S professionals typically did not maintain a clear distinction between IH/S professionals, industrial hygienists, and occupational safety professionals. While they were comfortable with the IH/S designation for their employees, based on the job require-

ments that included the performance of both industrial hygiene and occupational safety tasks, they noted that graduates of industrial hygiene programs or occupational safety programs also were considered to be suitable candidates for position. These employers did, however, noted that given a choice between an industrial hygiene graduate, an occupational safety graduate, or an IH/S graduate, they would tend to hire the person with at least some industrial hygiene training. This appeared to be based on an employer assumption that the required safety training could be provided on the job but that the industrial hygiene training would require a more formal training setting.

Five of the nine contacted organizations indicated that they anticipated the creation of new positions during the next five yers, the remaining organizations anticipated no change. None of the respondents anticipated a reducation in the IH/S workforce. The two companies that accounted for most of the recent new hires also anticipated further expansion during the next five years by 37 and 50 positions. The three remaining companies anticipating creation of new positions expected to add three, seven, and 10 positions.

The primary factors identified as likely to drive either a decline or increase in the anticipated number of IH/S positions included, in order of perceived importance, the regulatory climate, the general level of the economy, and demands of the marketplace. Among these factors, the recent development of right-to-know laws was considered important with regard to the anticipated number of IH/S positions. This change was expected to increase the current workload of IH/S employees through compliance, answering employee requests for information, etc., and to increase the future workload as employees become more aware of workplace hazards. This latter change in employee consciousness also was thought to generalize to other areas, thus, stimulating more widespread safety and health hazard awareness and perhaps further driving the demand for IH/S positions.

In summary, there appeared to be a reasonable balance between current supply and demand, and projected demand indicated a modest increase over the next five years in the number of employed IH/S professionals.

4. Employment Patterns for Occupational Health Nurses

Four of the employers of occupational health nurses were manufacturing organizations, two were insurance companies, two were telecommunications companies, and one was a food processor. Total current employment ranged from 500 to 38,000 employees, with a mean of 10,950 employees. Two of the organizations had experienced a decline in total employment from the previous year. The remaining reported no change in total employment.

Among the nine contacted employers of occupational health nurses, a total of 128 occupational health nurses were currently employed, with a mean of 14.2 nurses. This represented an increase of 16 positions over the previous year's level. Six of the nine contacted organizations reported hiring occupational health nurses during the past year. None of the respondents reported a decline in the number of occupational health nurses. Among the contacted organizations, 17 percent of the nurses were recent (within the past five years) graduates of occupational health nursing academic programs.

The contacted organizations reported that 16 positions were open during the past year as a result of the creation of new positions; six positions were open as a result of employee turnover. Three positions were filled by transfer or promotion, 17 positions were filled by new hires, and two positions were still open. On the average, positions remained vacant slightly over one month before being filled. Most respondents reported a shortage of qualified applicants. One respondent, who had recently completed a search for an occupational health nurse to fill an upper level administrative position, estimated that there were only about 100 people in the United States with the necessary training and experience to qualify for the position. Other respondents noted that changes in the nature of occupational health nursing practice within industry required that applicants possess strong managerial and communications abilities. Many applicants reportedly possessed adequate clinical skills but lacked the ability to direct programs. Respondents suggested that traditional occupational health nursing practice tended to be limited to providing first aid but that industry was beginning to adopt a different model of occupational health nursing based upon the prevention of illness and injury. They noted that this requires that nurses in industry be able to provide wellness training and consultation with employees, develop health promotion programs, and assess a variety of health risks; that is, occupational health nursing now requires that nurses be self-directed and possess additional skills beyond those required for traditional clinical practice.

About half of the contacted organizations required that new hires have an MS degree (but not necessarily in occupational health nursing), the remaining organizations required a minimum of a BS degree. Only one organization required certification in occupational health nursing. Organizations varied greatly with regard to experience requirements. One organization required a minimum of five year's experience in occupational health nursing-related activity; another organization required three to five years experience in occupational, community, or adult nursing. The remaining organizations had no minimum experience requirements but desired experience in occupational, community, or adult nursing. One respondent reported preferring that new hires not have previous experience in occupational health nursing settings for fear that they would have developed an "old style" (first-aid based) occupational health nursing orientation.

Most of the contacted organizations reported that the primary method for identifying candidates for open positions was to advertise in local newspapers, regional newspapers, and newsletters, and national newspapers and journals. One company's primary method of recruitment was to visit campuses to interview students. Another respondent reported that personal contacts and networks were primary. Although respondents reported a shortage of qualified applicants, all but one reported an excellent match between new hires' academic training and the requirements for the job. Principal recommendations for improving academic training included increasing the focus on business and management, increasing the focus on health promotion and community health, and developing greater communications skills.

Most respondents reported that one person was hired rather than another because they were the most qualified applicant, possessed a broad range of skills, and had prior training and experience in occupational, community, or

adult nursing. About half of the contacted organizations included as reasons for hiring that the applicant graduated from an excellent school. None of the respondents included as reasons that the candidate was the only qualified applicant or that he or she already lived in the area. Only two respondents reported hiring because the person already worked for the company.

Six of the contacted organizations anticipated an increase in the number of occupational health nursing positions during the next five years. Among these organizations, a total of 11 new positions were anticipated. The remaining organizations anticipated no change. Among the factors identified as affecting the number of occupational health nursing positions were the level of the economy and market conditions, requirements for regulation/enforcement, and the attitude of management toward occupational health nursing. The level of the economy and market conditions were important in that expansion here may lead to increases in total employment for the organizations. The number of occupational health nurses employed tended to be directly related to total employment in that each organization tended to develop what they considered to be "acceptable" nurse-employee ratios. In organizations that were subject to environmental and health regulation, changes in the regulatory climate were reported to have an immediate impact on the number of occupational health nurses employed. Several respondents reported that the orientation of management toward occupational health nursing was an important factor in expansion. Where management encouraged an attitude of health promotion, expansion was likely to occur; where the prevailing attitude was one of treatment of illness and injury, little expansion was likely.

In summary, there appeared to be no shortage of occupational health nurses with the clinical skills necessary to provide first aid in an occupational setting. There did appear, however, to be a shortage of nurses with the communication skills and managerial training necessary to plan and develop progressive, wellness-oriented programs. Overall, the demand for occupational health nurses did not appear to be as strong as is the demand, for example, for industrial hygienists. One reason for this relatively weak demand may be that management has not been educated to appreciate the cost savings of wellness programs and injury prevention. To the extent that the focus of occupational health nursing remains primarily on treatment of injury and illness, respondents did not anticipate marked changes in the level of employment.

5. Employment Patterns for Occupational Medicine Professionals

Two of the nine contacted employers of occupational medicine professionals reported their primary business activities to be manufacturing, five provided clinical services in a hospital or clinic setting, one provided consulting services, and one organization's primary business activity was oil refining. The manufacturing and oil refining companies reported a total employment ranging from 4,000 to 38,000 employees. The remaining organizations ranged in employment from 12 to 1,900 persons. Two of the organizations were newly created during the past year to provide clinical services; these had quite small total employment. One large manufacturing organization reported a decline in total employment of 3,000 persons. All other respondents reported either an increase or no change in total employment.

Among all nine contacted organizations, a total of 65 occupational medicine professionals were reported to be employed, with a mean of 7.2. This represented an increase from the previous year's level of 48 total occupational medicine professionals. All but one respondent reported an increase in the number of occupational medicine professionals; none of the respondents reported a decline. Among the contacted organizations, 37 percent of the occupational medicine professionals were recent (within the past five years) graduates of an occupational medicine academic program.

All but one respondent reported hiring occupational medicine professionals during the past year. The respondents reported 17 openings resulting from the creation of new positions and four openings resulting from employee turnover. All of the open positions were filled by new hires. None of the respondents reported that a position remained unfilled. The average length of time a position remained vacant was slightly over one month. In filling occupational medicine positions, five organizations reported a shortage of qualified applicants, three reported that the supply of qualified applicants was adequate, while one had no opinion about the supply of applicants.

The academic degree and experience requirements for persons employed as occupational medicine professionals varied among the contacted organizations. Three organizations desired persons board certified or board eligible in occupational medicine, two desired persons board certified or eligible in internal medicine or family practice. Three desired that applicants have an MPH degree in addition to occupational medicine, internal medicine, or family practice training. The remaining respondents reported that requirements varied dependent on the nature of the position. Training in toxicology, epidemiology, and statistics were identified as desirable. One respondent reported that most organizations required only one board certified or eligible occupational medicine physician; other physicians were needed more for their general clinical ability. It was reported likely, however, that if more physicians with occupational medicine and public health training were available, such training would become a formal requirement for more employers.

Methods for identifying candidates for open positions generally took a variety of forms. Most of the contacted organizations would post announcements in regional newspapers and journals, contact faculty members for recommendations, and use contacts made at professional conferences. In general, employers were well-satisfied that the academic training and experience of persons hired during the past year matched the requirements of the job for which they were hired. Some respondents reported that the match was excellent, the remaining reported a satisfactory match.

Six of the contacted organizations made no suggestions for change in education or training for occupational medicine professionals. One respondent recommended increased training in toxicology; one recommended increased emphasis on health promotion rather than treatment of injury or illness; and one recommended increased training in administration and management.

Among the contacted organizations, reasons for hiring one person rather than another included: the person hired was the most qualified, their academic training and experience matched company needs, and they had the specialized

training and broad range of skills desired by the firm. Five of the respondents reported that graduation from an excellent school was an important factor in hiring. Reasons not included by any of the respondents for hiring one person rather than another were that the person hired was the only qualified applicant, that more qualified persons would not accept the position, or that the person already worked for the company.

Three of the contacted organizations did not anticipate change in the number of occupational medicine positions during the next five years. The remaining respondents anticipated an increase during the next five years of from one to ten positions, with a mean of three new positions. In making these projections, two respondents assumed a moderate increase in the level of contract or grant support, four assumed an increase in market demand, three assumed an increase in the general level of the economy, and two assumed an increase in requirements for regulation/enforcement. In addition, two respondents assumed an increase in the availability of facilities and three assumed an increase in the availability of support personnel. Factors most often identified as primary in driving demand for occupational medicine professionals included demands of the market place and the general level of the economy. The level of contract/grant support was listed as primary by two respondents, the requirements for regulation/enforcement was listed as primary by one company. Two of the contacted hospitals and clinics listed the availability of facilities and support personnel as important; most organizations, however, did not consider these factors to be important.

In summary, the demand for occupational medicine professionals appeared to be strong; there appeared to be a shortage of qualified applicants. If, as reported, most organizations do not need more than one occupational medicine professional, it may be possible to satisfy part of the demand through the addition of support personnel (e.g., occupational health nurses, physician's assistants) and through the movement of physicians with internal medicine and family practice clinical training into occupational settings. Nevertheless, the reported desire by some organizations for applicants to be board certified or eligible in occupational medicine and the desire by others that occupational medicine professionals have public health training, indicates a continuing need to increase the present level of occupational medicine training.

V. CONCLUSIONS

The major conclusions of the study are listed below as they apply to each of the first three of the four study objectives. The fourth study objective is discussed in the next section.

(a) Conclusions related to the first study objective, the determination of the nature and number of OSH academic programs, and the estimation of the current and projected numbers of graduates from OSH academic programs, are as follows:

- In the spring of 1984, 136 academic institutions in the United States offered academic programs in one or more of the five major OSH disciplines (i.e., industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, and occupational medicine). A total of 241 degree programs (i.e., a program offered by a particular academic institution leading to a particular degree level in one of the OSH disciplines noted above) were in operation.
- The earned degree levels of the 241 OSH academic programs offered were associate or certificate (16 percent of the programs), baccalaureate (29 percent of the programs), masters (36 percent of the programs), doctoral (14 percent of the programs), and post-doctoral (six percent of the programs). Thirty percent of the offered programs were in industrial hygiene, 26 percent in occupational safety, 31 percent in industrial hygiene and safety, six percent in occupational health nursing, and seven percent in occupational medicine.
- Fifty-six percent of all graduate-level OSH academic programs were sponsored by the 15 ERCs.
- In each of the academic years of 1979-80 and 1981-82, approximately 1,600 persons completed OSH academic degree programs. Fourteen percent of these earned certificates or associate degrees, 40 percent earned baccalaureate degrees, 43 percent earned masters degrees, two percent earned doctoral degrees, and two percent completed post-doctoral programs. Twenty-seven percent of the graduates were in industrial hygiene, 42 percent were in occupational safety, 25 percent were in industrial hygiene and safety, three percent were in occupational health nursing, and two percent were in occupational medicine.
- The ERCs produced 37 percent of the industrial hygiene graduates, 19 percent of the occupational safety graduates, 11 percent of the industrial hygiene and safety graduates, and 96 percent of the occupational health nursing and occupational medicine graduates. At the graduate level (masters level or higher), almost half (47 percent) of all completers of OSH graduate programs came from the 15 ERCs. This included 42 percent of the industrial hygiene graduates, 38 percent of the occupational safety graduates, 49 percent of the industrial hygiene and safety graduates, and 96 percent of the occupational health nursing and occupational medicine graduates.
- The numbers of graduates from the ERCs have been stable over the past five years (1979-80 through 1983-84) except in the case of occupational safety graduates where the numbers have shown a sharp

decline. The annual numbers of ERC graduates are expected to stay at about their 1982-84 level for the near future. The numbers of graduates from non-ERC programs are thought to have declined since 1979-80 and 1981-82, particularly at the certificate and associate degree levels. Because of the number of non-ERC OSH programs known to have ceased operation and the indicated deemphasis of other OSH programs, the numbers of OSH graduates from non-ERC programs are projected to be somewhat smaller than the 1978-80 and 1981-82 levels.

(b) Conclusions related to the second study objective, the determination of OSH graduates' success in obtaining suitable OSH employment and the relationship between skills that graduates obtained in the OSH academic programs and skills needed in the workplace are as follows: (Because of certain methodological limitations noted previously, this objective is addressed only from the perspective of graduates of ERC programs.)

- Ninety-eight percent of the OSH graduates reported being employed, in school, or not in the work force by choice. Ninety-one percent of the employed OSH graduates reporting being employed in the OSH field. An additional five percent reported working in a closely related area (e.g., ergonomics, general nursing, general medicine).
- Forty-six percent of the employed OSH graduates reported having no difficulty in obtaining what they considered to be suitable employment, 34 percent reported having moderate difficulty, 13 percent reported having great difficulty, and seven percent reported not having found a suitable position.
- Fifty-one percent of the graduates employed as OSH professionals reported being employed in the private sector; 18 percent were employed in non-military government, 10 percent in the military, 15 percent in academic institutions, and seven percent in other situations.
- Ninety-four percent of the graduates employed as OSH professionals reported that they considered taking OSH training to have been a wise choice, 75 percent reported they could apply on the job what they had learned during their training, and 50 percent reported that most of what they do on the job was learned during their OSH training. On the other hand, 41 percent reported that they had taken some coursework that they did not consider to be helpful on their current or latest job, and 37 percent reported that they would have liked to have had more job-related training.
- The above and other collected data indicated that graduates were highly successful in obtaining suitable employment, generally were employed in the field for which they were trained, and considered their OSH training to be highly applicable to on-the-job needs.

(c) Conclusions related to the third study objective, determination of current and projected employer demand for OSH professionals, were as follows: (Of note is that these conclusions are based on contacts with only a small group of employers; thus, any generalization must be undertaken with caution.)

- Employers reported a shortage of occupational health nurses and occupational medicine professionals. The supply of industrial

hygienists and industrial hygiene and safety professionals reported to be reasonably adequate while the supply of occupational safety professionals was considered to be sufficiently adequate to indicate some surplus.

- o A considerable increase over the next five years in numbers of industrial hygiene related positions was projected by employers. The projected increase for occupational health nurses and occupational medicine professionals also was quite high; the projected demand for occupational safety professionals was considerably lower.
- o Based upon employer reports, the demand for industrial hygiene and safety graduates may be increasing at the expense of occupational safety graduates. Such a shift in emphasis appears likely in some cases in view of employer perceptions of needs for generalists to perform both industrial hygiene and occupational safety tasks.
- o Employers considered the training level of their new hires to range from satisfactory to excellent.
- o Employers, in general, indicated that recent economic recovery and a reasonably high level of industry/general public concern for occupational safety and health had resulted in a trend toward increasing OSH employment. Employers suggested that a plateau may have been reached and that near future expansion in the OSH work force may proceed at a slower pace than in the recent past. This trend was suggested particularly for occupational safety positions.

(d) Several conclusions based on the relationship between the expected supply of OSH graduates, OSH graduates' responses, and employer responses are as follows:

- o A projected fairly stable number of industrial hygiene and safety indutrial hygiene and safety graduates appears capable of satisfying employer needs assuming continuation of the current economic level and enforcement climate. Any reduction in the current numbers of graduates, particularly in advanced degree programs, likely would result in a shortage of trained personnel.
- o A projected low number (as compared with 1979-80 and 1981-82) of occupational safety graduates appears likely to coincide with relatively soft demand for such graduates. Continuation of current trends should result in a reasonably stable supply-demand relationship.
- o The demand of occupational safety and health nurses and, particularly, for occupational medicine professionals appears to remain high with some current shortages reported. This shortage appears likely to continue unless the numbers of graduates increase beyond the presently projected levels.

VI. RECOMMENDATIONS: PROPOSED MONITORING SYSTEM

A. Introduction

While activities and outcomes reported in the first five sections of this report provide information regarding both the qualitative and quantitative relationships between the supply for occupational safety and health (OSH) professionals and the needs/demands of such professionals, there is a need for these relationships to be continuously or periodically monitored to ensure the optimum response by the educational community to the needs for OSH professionals. More specifically, academic programs need to be provided with a continuing flow of information regarding the extent of the demand for graduates and the skills required of these graduates, in order to continuously regulate the size and content of their OSH academic programs. Moreover, NIOSH needs supply and demand information for making decisions regarding the advisability of funding training programs to increase the supply and/or level of training of OSH professionals.

The objective of the activities and outcomes reported in this section was to recommend an economical and effective system for continuously monitoring supply and demand. Details of the bases for the recommendations are provided in the following Subsection B; the resultant recommended monitoring system is described in Subsection C. Additional details of the system are provided as Appendix C.

B. Basis for Recommendations

The recommended monitoring system described in Subsection C was developed based upon (1) communications with the Study Advisory Panel members; (2) discussions with OSH professional organizations; (3) outcomes of a monitoring system planning meeting between the RTI project staff, the NIOSH Project Officer, and a small group of OSH Educational Resource Center personnel; and (4) outcomes of the study activities noted in Sections I through V of this report. The major information from these sources is summarized as follows.

- The ideal source for data regarding the quantitative and qualitative match between OSH graduates and workplace needs for OSH graduates appears to be the graduates and the workplaces. An ideal sample for data collection purposes would include both recent OSH graduates (since their skills would more nearly reflect current academic program curriculum) and graduates who have been in the work force for a year or more since graduating (since they would have been on the job for sufficient time to respond to ongoing workplace demands). Also, an ideal sample would include a wide range of employers of OSH graduates.
- The ideal means for acquiring needed information from graduates and employers would involve a direct partnership between industry groups and training institutions that does not involve federal agencies. However, there does not currently exist any suitable formal organizational mechanism for academia and industry to communicate and engage in mutual feedback. While informal, personal relationships between faculty members and employers may exist on a regional level, these types of relationships are not reliable sources of information regarding national needs and priorities.

- A monitoring system should provide two different but related types of information. First, information should be provided that may reasonably be related to the content of specific academic programs so as to allow programmatic adjustments to those programs. Second, generalizable supply and demand information should be provided to allow a reasonable national estimate of the supply-demand relationship.
- Existing sources of national industry statistics are not likely to contribute greatly to the monitoring of supply and demand for OSH professionals because of the uniqueness of the OSH professional job categories involved and because the supply and demand for OSH professionals appear to be impacted greatly by factors (e.g., the enforcement climate) other than the industry growth rates which are the basis for most demand projections.
- While academic programs receiving NIOSH training grant support are required to submit annual program reports and five-year grant renewal proposals that include some supply information, such reports have but limited usefulness in monitoring supply and demand on a national basis. There currently is considerable variation in the nature of the submitted progress reports, program directors may have only limited knowledge of industry needs, and program offerings may represent faculty interests to a greater extent than they reflect national industry or public priorities.
- While OSH professional organizations might contribute to maintaining a monitoring system, they currently do not (and have no particular motivation to) collect the types of information from their membership or industry groups necessary for effective monitoring of supply and demand. There is no concensus among industry groups, training institutions, and graduates regarding whose "problem" the lack of a monitoring system represents. In the absence of such consensus, it is unlikely that a comprehensive and sustained monitoring effort will emerge without the efforts of an outside agency.
- While the lack of formal organizational relationships between industry and academics indicates that one should not expect industry and academic linkage to emerge without external encouragement, one long-term step in that direction may be for NIOSH to sponsor an Industry and Academics Symposium on Training and Needs. Such a symposium could discuss issues of mutual concern and set an agenda for the future; it might serve to generate awareness of mutual need and lead to establishment of an organizational linkage between industry and training institutions from which a monitoring system eventually could emerge.
- NIOSH could play a central role (as a part of their mandate through the 1970 OSH Act) in coordinating and possibly funding a monitoring system effort, at least in the short term, as described below.
- The recent study conducted by RTI (and reported herein) appeared to contain all of the major elements needed for an ongoing monitoring system. While the willingness of ERCs to conduct a continuing annual survey of all of their graduates for the past three years was questionable, a survey of one or two year's graduates likely would be acceptable. Analysis of such data in combination with a mini-survey of OSH employers (by NIOSH or a NIOSH designee) could provide

ongoing monitoring at minimal costs. While inclusion of graduates of all OSH academic programs (whether or not funded by NIOSH) certainly would be desirable, such an approach appeared not to be feasible from a cost and logistics point of view. Furthermore, inclusion of only ERC graduates would appear to provide a reasonable sample of OSH graduates for two of the OSH disciplines; ERC graduates constitute virtually 100 percent of occupational health nurse and occupational medicine graduates. However, since ERC graduates constitute only approximately 37 percent of industrial hygiene graduates, 19 percent of occupational safety graduates, and 11 percent of industrial hygiene and safety graduates, findings based on this population would be subject to restrictions in generalizability. The percentage for the last three categories, fortunately, are considerably higher when only graduate degrees are considered. The ERCs were willing and able, as a part of the study reported herein, to survey these graduates using a standard questionnaire.

- Telephone interviews or a mail survey with a small sample (perhaps 150) employers should yield appropriate information for supporting supply/ demand projections. If this proved to be beyond resource availability, limited employer information could be obtained by means of telephone contacts with a small number of employers (nine or fewer for each of the employment categories of interest) as in the study reported herein.

C. Recommended Monitoring System

Based upon the above considerations, we recommend a monitoring system that consists of (1) continuing surveys of OSH graduates by the ERCs, using a standard questionnaire, (2) ERC analysis of graduate data to determine implications for program planning, (3) telephone contact (by NIOSH or a designee) with a small sample of OSH employers, and (4) NIOSH (or designee) analysis of graduate and employer data to determine supply-demand relationships. Each of these is further defined below. Of note is that all of these activities will require NIOSH to play a central coordination or funding role.

1. ERC Survey of Graduates

Since graduates who have been employed for at least a year since graduation are in better positions than recent graduates to provide "career progression" information, and since recent graduates can provide more current "ease of obtaining suitable employment" information, we suggest that the ERCs conduct an every-other-year survey of the current year's and previous year's OSH graduates. The survey would be conducted initially in the fall of 1986, and should include all recent year (1985-86) and previous year (1984-85) OSH graduates. The survey would be conducted again in 1988, 1990, etc. Survey procedures would be similar to those recently followed (as a part of the study reported herein) in the ERC surveys of graduates. These procedures are outlined in Appendix C. The recommended questionnaire (see Appendix C) is similar to but somewhat briefer than the one used in the current study (see Appendix B). We recommend that three items be deleted. These are Item 5 (information about first job in case of multiple employments since graduation), Item 9 (enrollment in continuing education or special course offerings since graduation), and Item 17 (assessment of general program

quality). Deleting these items would reduce the length of the questionnaire without loss of critical information; since respondents would have been out of school for less than two years, the deleted items would rarely apply. Revisions and deletions of original Items 4, 5, 7, and 10 have also been made in the recommended questionnaire. These revisions involved deleting parts of items found not to be useful, and clarifying items based on results of the original surveys.

2. ERC Analysis of Program-Specific Information

Since many of the items in the recommended Graduate Questionnaire are intended to provide program planning information (as opposed to supply/demand information), these items might best be analyzed by the individual ERCs. As may be noted in the questionnaire (see Appendix C), Item 4.k (principal OSH activities engaged in by employed graduate), Item 5 (graduates' perceptions of effectiveness of ERC placement services), Item 9 (needs for continuing education or special causes), Item 11 (most helpful academic courses), Item 12 (least helpful academic courses), Item 13 (job requirements for which least prepared), Item 15 (reasons for enrolling in ERC), and Item 16 (recommendations for program improvement) are intended to apply to specific programs and program components. Such items from each ERC's graduates could be reviewed by the receiving ERC and the information used internally for program planning purposes. The balance of the information, then, could be forwarded to NIOSH (or a NIOSH designee) for supply/demand analysis.

3. Employer Survey

We recommend that NIOSH (or a NIOSH designee) conduct a limited telephone or mail survey of employers. The Employer Questionnaire (see Appendix C) used in the current study is suitable for use as a basis for telephone interviews or a mail survey. The sample of employers to be interviewed could be selected from a list of employers obtained from the graduate questionnaire and/or from OSH professional organizations. A minimum sample of perhaps 150 employers is suggested. The survey could be conducted on an alternate year basis following the same time frames as the survey of graduates. If resources are not available for such a survey, interviews could be conducted with nine or fewer employers from each professional group of interest (i.e., industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, and occupational medicine). While the latter approach would have definite limitations, it would help to validate information received from graduates.

4. Supply/Demand Analysis

We recommend that NIOSH (or a NIOSH designee) carry out a cross-site analysis of supply/demand information from the Graduate Questionnaires provided by the ERCs, along with an analysis of the collected employer information. As a minimum, the following graduate information should be included in the analysis: Item 1 (whether or not employed), Item 2 (whether or not currently in school), Item 4.f and g (salary level), Item 4.h and i (employment dates), Item 4.j (percent time spent on OSH activities), Item 6 (difficulty experienced in finding suitable employment), Item 8 (job satisfaction), and Item 14 (reasons for not being employed). In total, these items will provide, for each of the five OSH professional groups of interest, a graduate perspec-

tive of the relationship between supply and demand in the marketplace. This information, along with the related employer perspective information from the survey of employers should provide a sufficiently clear national perspective of supply and demand to satisfy the related information needs of NIOSH, the ERCs, and (to some degree) other OSH academic programs.

Appendix A

Graduate Questionnaire Data

PART I.	Data Related to Industrial Hygiene Graduates
PART II.	Data Related to Occupational Safety Graduates
PART III.	Data Related to Industrial Hygiene and Safety Graduates
PART IV.	Data Related to Occupational Health Nursing Graduates
PART V.	Data Related to Occupational Medicine Graduates

Part I

Data Related to Industrial Hygiene Graduates[1]

A. Current Employment/School Enrollment Status

1. Number and percentage[2] of graduates, by employment status and year of graduation.

Employment status	1981-82		1982-83		1983-84		Total	
Employed full-time	148	(87%)	82	(93%)	40	(77%)	270	(87%)
Employed part-time	7	(4%)	2	(2%)	2	(4%)	11	(3%)
Not currently employed	15	(9%)	4	(5%)	10	(19%)	29	(9%)
Total	170	(100%)	88	(100%)	52	(100%)	310	(100%)

2. Number and percentage of graduates, by current enrollment status and year of graduation from OSH academic program.

Current enrollment status	1981-82		1982-83		1983-84		Total	
Enrolled full-time	18	(11%)	4	(5%)	5	(10%)	27	(9%)
Enrolled part-time	16	(10%)	7	(8%)	3	(6%)	26	(8%)
Not currently enrolled	133	(80%)	77	(88%)	44	(85%)	254	(83%)
Total	167	(100%)	88	(100%)	52	(100%)	307	(100%)

3. Number and percentage of graduates currently enrolled in school, by category of institution in which currently enrolled and year of graduation from OSH academic program.

Category of Institution in Which Enrolled	1981-82		1982-83		1983-84		Total	
Source ERC	12	(35%)	2	(20%)	7	(88%)	21	(40%)
Other ERC	1	(3%)	1	(10%)	0		2	(4%)
Other	21	(62%)	7	(70%)	1	(13%)	29	(56%)
Total	34	(100%)	10	(100%)	8	(100%)	52	(100%)

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[1] The Graduate Questionnaire used to obtain this data is included in Appendix B.

[2] Unless otherwise noted, percentages are based on numbers of graduates responding to the particular items rather than the total number of graduates who returned questionnaires.

4. Number and percentage of graduates currently enrolled in school, by degree sought and year of graduation from OSH academic program.

Degree sought	1981-82	1982-83	1983-84	Total
Certificate	0	1 (11%)	1 (13%)	2 (4%)
Baccalaureate	1 (3%)	2 (22%)	0	3 (6%)
Masters	10 (32%)	2 (22%)	2 (25%)	14 (29%)
Doctorate	19 (61%)	3 (33%)	4 (50%)	26 (54%)
Post-doctorate	0	0	0	0
Non-degree	1 (3%)	1 (11%)	1 (13%)	3 (6%)
Total	31 (100%)	9 (100%)	8 (100%)	48 (100%)

5. Number and percentage of graduates currently enrolled in school, by current program concentration and year of graduation from OSH academic program.

Current Academic Program Area	1981-82	1982-83	1983-84	Total
OSH area	13 (41%)	3 (33%)	5 (63%)	21 (43%)
Non-OSH area	19 (59%)	6 (67%)	3 (38%)	28 (57%)
Total	32 (100%)	9 (100%)	8 (100%)	49 (100%)

6. Number and percentage of male and female graduates, by year of graduation from OSH academic program.

	1981-82	1982-83	1983-84	Total
Male	115 (68%)	51 (58%)	38 (73%)	204 (66%)
Female	54 (32%)	37 (42%)	14 (27%)	105 (34%)
Total	169 (100%)	88 (100%)	52 (100%)	309 (100%)

B. Work History

7. Number and percentage of employed graduates, by type of employer and OSH and non-OSH employment.

Type of Employer	OSH Employment	Non-OSH Employment	Total
Private sector	128 (52%)	8 (24%)	136 (49%)
Academic institution	28 (11%)	10 (30%)	38 (14%)
Government (military)	28 (11%)	2 (6%)	30 (11%)
Government (non-military)	47 (19%)	11 (33%)	58 (21%)
Other	13 (5%)	2 (6%)	15 (5%)
Total	244 (100%)	33 (100%)	277 (100%)

8. Number and percentage of graduates employed in OSH professions, by size of employer and number of OSH employees.

Size of Employer, in Total Number of Employees	Number of OSH Employees <6	6-10	11-25	26-50	>50	Total
<51	15 (7%)	12 (5%)	12 (5%)	3 (1%)	0	42 (19%)
51-100	10 (5%)	0	4 (2%)	1 (.5%)	1 (.5%)	16 (7%)
101-250	6 (3%)	1 (.5%)	3 (1%)	2 (2%)	6 (3%)	18 (8%)
251-500	7 (3%)	0	5 (2%)	0	6 (3%)	18 (8%)
501-1000	16 (7%)	2 (1%)	2 (1%)	0	3 (1%)	23 (11%)
>1000	28 (13%)	20 (9%)	22 (10%)	13 (6%)	16 (7%)	99 (46%)
Total	82 (38%)	35 (16%)	48 (22%)	19 (9%)	32 (15%)	216 (100%)

9. Mean starting salary, by employment category and beginning of employment.

Employment Category	Beginning of Employment: One Year Ago or Less	13-24 Months Ago	More Than 24 Months Ago
OSH employment	$ 27,877	$ 23,821	$ 23,750
Non-OSH employment	$ 24,687	$ 25,400	$ 16,937

10. Mean latest salary, by employment category and length of employment.

Employment Category	Length of Employment: One Year or Less	13-24 Months	More Than 24 Months
OSH employment	$ 28,654	$ 28,045	$ 37,102
Non-OSH employment	$ 24,624	$ 27,071	$ 26,000

11. Number of hours and percentage of graduates' time spent performing OSH activities, by employment category.

Employment Category	Number of Hours and Percentage of Time Performing OSH Activities: <26	26-50	51-75	76-100	Total
OSH employment	15 (6%)	18 (7%)	8 (3%)	206 (83%)	247 (100%)
Non-OSH employment	12 (92%)	0	0	1 (8%)	13 (100%)
Total	27 (10%)	18 (7%)	8 (3%)	207 (80%)	260 (100%)

12. Principal OSH activities of graduates employed as OSH professionals, by numbers and percentages.[3]

Activity	Number and Percentage of Graduates Engaged in Activity
Administers/directs	44 (18%)
Advises management	12 (5%)
Interprets data	30 (12%)
Inspects/surveys	138 (55%)
Plans/develops programs	44 (18%)
Performs research	18 (7%)
Trains or educates	43 (17%)
Consults	22 (9%)

13. Number and percentage of graduates employed as OSH professionals, by number of employees supervised and year of graduation.

Number of Employees Supervised	1981-82	1982-83	1983-84	Total
None	78 (57%)	46 (62%)	23 (62%)	147 (59%)
1-5	48 (35%)	24 (32%)	9 (24%)	81 (33%)
6-10	8 (6%)	1 (1%)	3 (8%)	12 (5%)
11-25	0	1 (1%)	1 (3%)	2 (1%)
26-50	2 (1%)	1 (1%)	1 (3%)	4 (2%)
51-100	1 (1%)	1 (1%)	0	2 (1%)
>100	1 (1%)	0	0	1 (.5%)
Total	138 (100%)	74 (100%)	37 (100%)	249 (100%)

14. Number and percentage of graduates employed as OSH professionals, by number of persons for whom responsible and year of graduation.

Number of Persons for Whom Responsible	1981-82	1982-83	1983-84	Total
<51	13 (12%)	4 (9%)	5 (20%)	22 (12%)
51-100	1 (1%)	1 (2%)	2 (8%)	4 (2%)
101-250	3 (3%)	3 (7%)	2 (8%)	8 (4%)
251-500	8 (8%)	1 (2%)	0	9 (5%)
501-1000	10 (9%)	7 (15%)	3 (12%)	20 (11%)
>1000	71 (67%)	30 (65%)	13 (52%)	114 (64%)
Total	106 (100%)	46 (100%)	25 (100%)	177 (100%)

[3] Percentages may not equal 100 since some graduates may have listed more than one of the activities. Only activities performed by more than 5 percent of graduates are included.

15. Number and percentage of graduates (employed as OSH professionals) with one and more than one employer since graduation, by year of graduation.

Number of Employees	1981-82	1982-83	1983-84	Total
More than one	63 (46%)	27 (36%)	7 (19%)	97 (39%)
One	75 (54%)	47 (64%)	30 (81%)	152 (61%)
Total	138 (100%)	74 (100%)	37 (100%)	249 (100%)

C. Employment Experience of Graduates Employed as OSH Professionals

16. Number and percentage of graduates (employed as OSH professionals), by experience in finding employment and year of graduation.[4]

Factors experienced	1981-82	1982-83	1983-84	Total
Placement office was helpful	13 (9%)	10 (14%)	6 (16%)	29 (12%)
Faculty were helpful	60 (43%)	28 (38%)	19 (51%)	107 (43%)
Already had a job	37 (27%)	19 (26%)	16 (43%)	72 (29%)
Was not seeking a job	15 (11%)	7 (9%)	3 (8%)	25 (10%)
Did not ask for assistance	19 (14%)	5 (7%)	6 (16%)	30 (12%)
Did not need assistance	42 (30%)	11 (15%)	14 (38%)	67 (27%)
Assistance not worthwhile	18 (13%)	6 (8%)	4 (11%)	28 (11%)

17. Number and percentage of graduates (employed as OSH professionals), by difficulty in finding what they considered suitable employment and year of graduation.

Factors experienced	1981-82	1982-83	1983-84	Total
No difficulty finding suitable employment	56 (41%)	23 (32%)	20 (51%)	99 (40%)
Moderate difficulty finding suitable employment	50 (36%)	32 (45%)	12 (31%)	94 (38%)
Great difficulty finding suitable employment	22 (16%)	13 (18%)	5 (13%)	40 (16%)
Did not find suitable position	9 (7%)	3 (4%)	2 (5%)	14 (6%)
Total	137 (100%)	71 (100%)	39 (100%)	247 (100%)

[4] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are the numbers of graduates responding in the affirmative.

18. Number and percentage of graduates (employed as OSH professionals), by reason for taking current job and year of graduation.[5]

Reasons	1981-82		1982-83		1983-84		Total	
Type job for which trained	114	(83%)	65	(88%)	30	(81%)	209	(84%)
Type job sought	113	(82%)	65	(88%)	30	(81%)	208	(84%)
Type work desired	80	(58%)	42	(57%)	19	(51%)	141	(57%)
Could not find desired job	12	(9%)	6	(13%)	5	(14%)	23	(9%)
Best paying job	53	(38%)	29	(39%)	12	(32%)	94	(38%)
Job security	69	(50%)	29	(39%)	16	(43%)	114	(46%)
Best job without relocating	39	(28%)	23	(31%)	8	(22%)	70	(28%)
Only job found	18	(13%)	13	(18%)	4	(11%)	35	(14%)
Insufficient training for desired job	4	(3%)	2	(3%)	1	(3%)	8	(3%)
Job offered career growth	104	(75%)	54	(73%)	31	(84%)	189	(76%)

19. Mean rating on "satisfaction with aspects of current job," by year of graduation.[6]

Satisfaction factors	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Challenge	1.5	1.6	1.3	1.5
Opportunity with employer	2.1	2.1	1.8	2.1
Opportunity in field	2.0	2.0	1.5	1.9
Use academic training	1.5	1.7	1.4	1.6
Contribution to OSH	1.5	1.7	1.5	1.5
Participate in decision making	1.7	1.8	1.7	1.7
Self-direction opportunities	1.5	1.6	1.4	1.5
Opportunity to work as team	1.7	1.9	1.5	1.7

[5] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are the numbers of graduates responding in the affirmative.

[6] Scores range from 1 (very satisfied) to 5 (very dissatisfied).

D. Academic Experience

20. Number and percentage of graduates, by status of enrollment in OSH-related continuing education programs and year of graduation.

Enrollment status	1981-82	1982-83	1983-84	Total
Have enrolled	65 (41%)	35 (41%)	12 (29%)	112 (39%)
Have not enrolled	95 (59%)	50 (59%)	30 (71%)	175 (61%)
Total	160 (100%)	85 (100%)	42 (100%)	287 (100%)

21. Principal subject areas of OSH-related continuing education by numbers and percentages of graduates indicating continuing education enrollment.

Subject area	Number and Percentage of Graduates Indicating Enrollment
Toxicology	21 (19%)
Hazardous waste control and management	21 (19%)
Ventilation	21 (19%)
Respirtory protection	15 (13%)
Radiation safety and management	15 (13%)
Noise control/hearing protection	16 (14%)
Certification review	11 (10%)
OSHA training programs	10 (9%)
Safety management	10 (9%)
Program management	10 (9%)
Computer use	8 (7%)
Asbestos control	7 (6%)
Industrial hygiene review	7 (6%)

22. Mean number of hours of OSH-related continuing education attendance, by employment category and year of graduation.

	1981-82	1982-83	1983-84	Total
Program areas	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
OSH employment	62	52	52	58
Non-OSH employment	11	26	0	20

23. Number and percentage of graduates (not currently enrolled full time in school), by opinion as to need for continuing education and by year of graduation.

	1981-82	1982-83	1983-84	Total
Need cont. ed.	77 (51%)	40 (49%)	16 (39%)	133 (49%)
Do not need	74 (49%)	41 (51%)	25 (61%)	140 (51%)
Total	151 (100%)	81 (100%)	41 (100%)	273 (100%)

24. Principal subject areas needed for continuing education, by number and percentage of graduates expressing each need (based on responses of graduates expressing such need).

Subject area	Number and Percentage of Graduates Indicating This Need
Ventilation	20 (15%)
Radiation safety and management	19 (14%)
Hazardous waste control	13 (10%)
Toxicology	12 (9%)
Safety management	12 (9%)
computer use	11 (8%)
Program management	10 (8%)
Industrial hygiene review	8 (6%)
Noise control	8 (6%)
Certification review	6 (5%)
Respiratory protection	6 (5%)
OSHA regulations	6 (5%)
Industrial hygiene sampling and analysis	6 (5%)

25. Mean rating on "reasons for attendance" factors, by year of graduation.[7]

	1981-82	1982-83	1983-84	Total
Factors	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
Cost	2.4	2.1	2.0	2.2
Financial aid	2.1	2.1	2.0	2.1
Professors	2.5	2.5	2.7	2.6
Program quality	1.9	1.8	2.0	1.9
Program reputation	1.9	1.9	2.0	1.9
Research reputation	2.7	2.7	2.8	2.8
Entry requirements	2.4	2.6	2.5	2.5
Geographic location	1.9	1.7	1.9	1.9
Proximity to employment	3.2	3.0	3.0	3.1
Proximity to spouse's work/school	3.3	3.2	3.1	3.3
Financial aid from employer	3.2	3.3	3.2	3.2

[7] Scores range from 1 (was determining factor) to 4 (did not consider).

26. Mean rating on "general quality of educational experience," by year of graduation.[8]

Factors	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Overall content	1.8	1.8	1.9	1.8
Scientific aspects	1.8	1.9	2.0	1.9
Research aspects	2.3	2.3	2.3	2.3
Clinical aspects	2.5	2.6	2.5	2.5

27. Principal recommendations for improving OSH training, by frequencies and percentages.[9]

Recommendation	Frequency and Percentage
More "hands on "experience	93 (37%)
Increase focus on practical program management	26 (10%)
Increase focus on practical applications in coursework	22 (9%)

E. Relationship Between Academic Training and Work Experience

28. Number and percentage of graduates (employed as OSH professionals), by academic program/job experiences and year of graduation.

Experience	1981-82		1982-83		1983-84		Total	
Can apply what was learned	103	(75%)	57	(77%)	30	(81%)	190	(76%)
Wanted more job-related training	64	(46%)	33	(45%)	13	(35%)	110	(44%)
Job done differently than trained	31	(22%)	18	(24%)	5	(14%)	54	(22%)
Don't use tools trained to use	22	(16%)	11	(15%)	7	(19%)	40	(16%)
Didn't need OSH training to gain job	22	(16%)	9	(12%)	3	(8%)	34	(14%)
Took some OSH coursework not relevant to job	66	(48%)	26	(35%)	12	(32%)	104	(42%)
Learned applied job skills in ERC	62	(45%)	41	(55%)	26	(70%)	129	(52%)
Needed on-the-job training	37	(27%)	18	(24%)	3	(8%)	58	(23%)
Needed special training	37	(27%)	14	(19%)	6	(16%)	57	(23%)
Taking OSH training was wise choice	129	(93%)	71	(96%)	34	(92%)	234	(94%)
Advancement would be better if trained in a different institution	8	(6%)	4	(5%)	2	(5%)	14	(6%)

[8] Scores range from 1 (excellent) to 4 (poor).
[9] Percentages are based on the number of graduates employed as OSH professionals.

29. Most helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Toxicology	133 (53%)
Basic industrial hygiene	111 (45%)
Ventilation	86 (35%)
Statistics	51 (20%)
Epidemiology	56 (22%)
Industrial hygiene lab	60 (24%)
Air sampling	44 (18%)
Radiation	23 (9%)
Safety and health	28 (11%)
Occupational disease	28 (11%)
Physical agents	20 (8%)
Noise monitoring and control	20 (8%)
Hazardous materials	18 (7%)

30. Least helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Statistics	59 (24%)
Epidemiology	59 (24%)
Health organization and administration	30 (12%)
Air pollution	27 (11%)
Public health administration	27 (11%)
Safety and health	22 (9%)
Toxicology	22 (9%)
Environmental health	22 (9%)
Principles of public health	20 (8%)
Aerosol technology	19 (8%)
Occupational medicine	18 (7%)
Radiation	15 (6%)

[10] Percentages are based on number employed as OSH professionals.

31. OSH activities for which graduates were least prepared, by frequencies and percentages.[11]

Activities	Frequency and Percentage
Administration and management	62 (25%)
Development and management of programs	32 (13%)
Interpretation of laws (EPA, OSHA)	28 (11%)
Technical/report writing	28 (11%)
Safety hazard management	28 (11%)
Development of training programs	22 (9%)
Sampling	21 (8%)
Ventilation system design	20 (8%)
Radiation monitoring	20 (8%)
Noise control	18 (7%)
Prescribing protective equipment	14 (6%)
Hazardous waste management	14 (6%)

32. Number and percentage of graduates (not employed or not employed as OSH professionals), by experiences since graduation and year of graduation.

Experiences	1981-82	1982-83	1983-84	Total
Went back to school	17 (53%)	5 (36%)	4 (27%)	26 (43%)
Found a better job	12 (38%)	8 (57%)	2 (13%)	22 (36%)
Couldn't find OSH job	7 (22%)	7 (50%)	4 (27%)	18 (30%)
No suitable OSH jobs in geographical area	9 (28%)	5 (36%)	5 (33%)	19 (31%)
Left OSH job for another field	5 (16%)	3 (21%)	1 (7%)	9 (15%)
Left OSH career field	4 (13%)	3 (21%)	0	7 (11%)
Salary too low	3 (9%)	0	2 (13%)	5 (8%)
Dropped out of work force	4 (13%)	0	4 (27%)	8 (13%)

[11] Percentages are based on number employed as OSH professionals.

PART II

Data Related to Occupational Safety Graduates[1]

A. Current Employment/School Enrollment Status

1. Number and percentage[2] of graduates, by employment status and year of graduation.

Employment status	1981-82	1982-83	1983-84	Total
Employed full-time	18 (95%)	21 (100%)	17 (81%)	56 (92%)
Employed part-time	1 (5%)	0	3 (14%)	4 (7%)
Not currently employed	0	0	1 (5%)	1 (2%)
Total	19 (100%)	21 (100%)	21 (100%)	61 (100%)

2. Number and percentage of graduates, by current enrollment status and year of graduation from OSH academic program.

Current enrollment status	1981-82	1982-83	1983-84	Total
Enrolled full-time	0	0	1 (5%)	1 (2%)
Enrolled part-time	1 (5%)	3 (14%)	2 (10%)	6 (10%)
Not currently enrolled	18 (95%)	18 (86%)	18 (86%)	54 (89%)
Total	19 (100%)	21 (100%)	21 (100%)	61 (100%)

3. Number and percentage of graduates currently enrolled in school, by category of institution in which currently enrolled and year of graduation from OSH academic program.

Category of Institution in Which Enrolled	1981-82	1982-83	1983-84	Total
Source ERC	0	1 (33%)	3 (100%)	4 (57%)
Other ERC	0	1 (33%)	0	1 (14%)
Other	1 (100%)	1 (33%)	0	2 (29%)
Total	1 (100%)	3 (100%)	3 (100%)	7 (100%)

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[1] The Graduate Questionnaire used to obtain these data is included as Appendix B.

[2] Unless otherwise noted, percentages are based on numbers of graduates responding to the particular items rather than the total number of graduates who returned questionnaires.

4. Number and percentage of graduates currently enrolled in school, by degree sought and year of graduation from OSH academic program.

Degree sought	1981-82	1982-83	1983-84	Total
Certificate	1 (100%)	1 (33%)	0	2 (29%)
Baccalaureate	0	0	0	0
Masters	0	0	2 (67%)	2 (29%)
Doctorate	0	0	0	0
Post-doctorate	0	0	0	0
Non-degree	0	2 (67%)	1 (33%)	3 (43%)
Total	1 (100%)	3 (100%)	3 (100%)	7 (100%)

5. Number and percentage of graduates currently enrolled in school, by current program concentration and year of graduation from OSH academic program.

Current Academic Program Area	1981-82	1982-83	1983-84	Total
OSH area	1 (100%)	1 (33%)	3 (100%)	3 (43%)
Non-OSH area	0	2 (67%)	0	4 (57%)
Total	1 (100%)	3 (100%)	3 (100%)	7 (100%)

6. Number and percentage of male and female graduates, by year of graduation from OSH academic program.

	1981-82	1982-83	1983-84	Total
Male	16 (84%)	20 (95%)	17 (81%)	53 (87%)
Female	3 (16%)	1 (5%)	4 (19%)	8 (13%)
Total	19 (100%)	21 (100%)	21 (100%)	61 (100%)

B. Work History

7. Number and percentage of employed graduates, by type of employer and OSH and non-OSH employment.

Type of Employer	OSH Employment	Non-OSH Employment	Total
Private sector	31 (62%)	5 (50%)	36 (60%)
Academic institution	3 (6%)	1 (10%)	4 (7%)
Government (military)	5 (10%)	2 (20%)	7 (12%)
Government (non-military)	9 (18%)	1 (10%)	10 (17%)
Other	2 (4%)	1 (10%)	3 (5%)
Total	50 (100%)	10 (100%)	60 (100%)

8. Number and percentage of graduates employed in OSH professions, by size of employer and number of OSH employees.

Size of Employer, in Total Number of Employees	Number of OSH Employees <6	6-10	11-25	26-50	>50	Total
<51	5 (11%)	1 (2%)	2 (4%)	0	0	8 (18%)
51-100	1 (2%)	0	0	1 (2%)	0	2 (4%)
101-250	4 (9%)	0	0	0	1 (2%)	5 (11%)
251-500	3 (7%)	0	0	0	0	3 (7%)
501-1000	2 (5%)	2 (4%)	0	0	0	4 (9%)
>1000	15 (33%)	4 (9%)	2 (4%)	1 (2%)	1 (2%)	23 (51%)
Total	32 (71%)	7 (16%)	4 (9%)	2 (4%)	2 (4%)	45 (100%)

9. Mean starting salary, by employment category and beginning of employment.

Employment Category	Beginning of Employment: One Year Ago or Less	13-24 Months Ago	More Than 24 Months Ago
OSH employment	$ 24,915	$ 24,038	$ 23,100
Non-OSH employment	$ 23,166	$ 18,500	$ 19,966

10. Mean latest salary, by employment category and length of employment.

Employment Category	Length of Employment: One Year or Less	13-24 Months	More Than 24 Months
OSH employment	$ 26,588	$ 28,056	$ 28,333
Non-OSH employment	$ 22,250	$ 25,000	$ 29,166

11. Number of hours and percentage of graduates' time spent performing OSH activities, by employment category.

Employment Category	Number of hours and Percentage of Time Performing OSH Activities: <26	26-50	51-75	76-100	Total
OSH employment	1 (2%)	8 (17%)	1 (2%)	38 (79%)	48 (100%)
Non-OSH employment	7 (100%)	0	0	0	7 (100%)
Total	8 (15%)	8 (15%)	1 (2%)	38 (69%)	55 (100%)

12. Principal OSH activities of graduates employed as OSH professionals, by numbers and percentages.[3]

Activity	Number and Percentage of Graduates Engaged in Activity
Administers/directs	12 (24%)
Interprets data	6 (12%)
Inspects/surveys	23 (26%)
Plans/develops programs	7 (14%)
Trains or educates	10 (20%)

13. Number and percentage of graduates employed as OSH professionals, by number of employees supervised and year of graduation.

Number of Employees Supervised	1981-82	1982-83	1983-84	Total
None	12 (63%)	9 (56%)	15 (100%)	36 (76%)
1-5	4 (21%)	6 (38%)	0	10 (20%)
6-10	2 (11%)	0	0	2 (4%)
11-25	0	1 (6%)	0	1 (2%)
26-50	1 (5%)	0	0	1 (2%)
Total	19 (100%)	16 (100%)	15 (100%)	50 (100%)

14. Number and percentage of graduates employed as OSH professionals, by number of persons for whom responsible and year of graduation.

Number of Persons for Whom Responsible	1981-82	1982-83	1983-84	Total
<51	1 (7%)	1 (7%)	1 (10%)	3 (8%)
51-100	0	0	0	0
101-250	1 (7%)	1 (7%)	0	2 (5%)
251-500	2 (14%)	0	2 (20%)	4 (11%)
501-1000	1 (7%)	2 (14%)	0	3 (8%)
>1000	9 (64%)	10 (71%)	7 (70%)	26 (68%)
Total	14 (100%)	14 (100%)	10 (100%)	38 (100%)

[3] Percentages may not equal 100 since some graduates may have listed more than one of the activities. Only activities performed by more than 5 percent of graduates are included.

15. Number and percentage of graduates (employed as OSH professionals) with one and more than one employer since graduation, by year of graduation.

Number of Employers	1981-82	1982-83	1983-84	Total
More than one	6 (32%)	6 (38%)	2 (13%)	14 (28%)
One	13 (68%)	10 (63%)	13 (87%)	36 (72%)
Total	19 (100%)	16 (100%)	15 (100%)	50 (100%)

C. Employment Experience of Graduates Employed as OSH Professionals

16. Number and percentage of graduates (employed as OSH professionals), by experience in finding employment and year of graduation.[4]

Factors experienced	1981-82	1982-83	1983-84	Total
Placement office was helpful	0	3 (19%)	1 (7%)	4 (8%)
Faculty were helpful	8 (42%)	13 (81%)	10 (67%)	31 (62%)
Already had a job	4 (21%)	1 (6%)	3 (20%)	8 (16%)
Was not seeking a job	1 (5%)	1 (6%)	0	2 (4%)
Did not ask for assistance	1 (5%)	4 (25%)	2 (13%)	7 (14%)
Did not need assistance	7 (37%)	4 (25%)	4 (27%)	15 (30%)
Assistance not worthwhile	2 (11%)	5 (31%)	6 (40%)	13 (26%)

17. Number and percentage of graduates (employed as OSH professionals), by difficulty in finding what they considered suitable employment and year of graduation.

Factors experienced	1981-82	1982-83	1983-84	Total
No difficulty finding suitable employment	3 (17%)	7 (44%)	8 (53%)	18 (37%)
Moderate difficulty finding suitable employment	8 (44%)	7 (44%)	4 (27%)	19 (39%)
Great difficulty finding suitable employment	3 (17%)	2 (13%)	1 (7%)	6 (12%)
Did not find suitable position	4 (22%)	0 (0%)	2 (13%)	6 (12%)
Total	18 (100%)	16 (100%)	15 (100%)	49 (100%)

[4] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are numbers of graduates responding in the affirmative.

18. Number and percentage of graduates (employed as OSH professionals), by reason for taking current job and year of graduation.[5]

Reasons	1981-82		1982-83		1983-84		Total	
Type job for which trained	17	(89%)	14	(88%)	12	(80%)	43	(86%)
Type job sought	18	(95%)	15	(94%)	13	(87%)	46	(92%)
Type work desired	12	(63%)	10	(63%)	8	(53%)	30	(60%)
Could not find desired job	3	(16%)	2	(13%)	2	(13%)	7	(14%)
Best paying job	13	(68%)	9	(56%)	6	(40%)	28	(56%)
Job security	9	(47%)	7	(44%)	9	(60%)	25	(50%)
Best job without relocating	2	(11%)	2	(13%)	6	(40%)	10	(20%)
Only job found	4	(21%)	4	(25%)	2	(13%)	10	(20%)
Insufficient training for desired job	2	(11%)	1	(6%)	0		3	(6%)
Job offered career growth	14	(74%)	15	(94%)	11	(73%)	40	(80%)

19. Mean rating on "satisfaction with aspects of current job," by year of graduation.[6]

Satisfaction factors	1982-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Challenge	1.7	1.5	1.5	1.5
Opportunity with employer	2.1	2.0	1.7	2.0
Opportunity in field	2.0	2.0	1.6	1.9
Use academic training	1.7	1.3	1.4	1.5
Contribution to OSH	1.8	1.4	1.5	1.5
Participate in decision making	1.7	1.7	1.6	1.6
Self-direction opportunities	1.5	1.4	1.3	1.4
Opportunity to work as team	1.6	1.7	1.4	1.6

[5] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are numbers of graduates responding in the affirmative.

[6] Scores range from 1 (very satisfied) to 5 (very dissatisfied).

D. Academic Experience

20. Number and percentage of graduates, by status of enrollment in OSH-related continuing education programs and year of graduation.

Enrollment status	1981-82	1982-83	1983-84	Total
Have enrolled	8 (42%)	3 (14%)	4 (19%)	15 (25%)
Have not enrolled	11 (58%)	18 (86%)	17 (81%)	46 (75%)
Total	19 (100%)	21 (100%)	21 (100%)	61 (100%)

21. Principal subject areas of OSH-related continuing education, by numbers and percentages of graduates indicating continuing education enrollment.

Subject area	Number and Percentage of Graduates Indicating Enrollment
Industrial hygiene review	3 (20%)
Risk evaluation and management	3 (20%)
Radiation	2 (13%)

22. Mean number of hours of OSH-related continuing education attendance, by employment category and year of graduation.

Program areas	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
OSH employment	126.2	35.66	66.25	83.58
Non-OSH employment	0	0	0	0

23. Number and percentage of graduates (not currently enrolled full time in school), by opinion as to need for continuing education and by year of graduation.

	1981-82	1982-83	1983-84	Total
Need cont. ed.	6 (38%)	10 (53%)	11 (61%)	27 (51%)
Do not need	10 (63%)	9 (47%)	7 (39%)	26 (49%)
Total	16 (100%)	19 (100%)	18 (100%)	53 (100%)

24. Principal subject areas needed for continuing education, by number and percentage of graduates expressing each need (based on responses of graduates expressing such needs).

Subject area	Number and Percentage of Graduates Indicating This Need
Personal Computer Use	2 (7%)
Toxicology	2 (7%)
Ventilation Design	2 (7%)

25. Mean rating on "reasons for attendance" factors, by year of graduation.[7]

Factors	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Cost	2.1	2.7	2.1	2.3
Financial aid	2.3	2.4	2.4	2.4
Professors	3.0	2.8	2.5	2.8
Program quality	1.5	1.7	1.8	1.7
Program reputation	1.5	1.6	1.9	1.7
Research reputation	3.1	2.8	3.1	3.0
Entry requirements	2.1	2.4	2.3	2.3
Geographic location	1.5	1.5	1.4	1.5
Proximity to employment	2.8	2.5	3.0	2.8
Proximity to spouse's work/school	3.1	3.2	3.0	3.1
Financial aid from employer	3.2	3.5	3.4	3.4

26. Mean rating on "general quality of educational experience," by year of graduation.[8]

Factors	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Overall content	1.6	1.5	1.4	1.5
Scientific aspects	2.0	1.8	1.8	1.8
Research aspects	2.8	2.8	2.5	2.7
Clinical aspects	2.5	2.3	2.2	2.3

27. Principal recommendations for improving OSH training, by frequencies and percentages.[9]

Recommendation	Frequency and Percentage
More "hands on" experience	10 (20%)
Increase "state of the art" focus of courses	3 (6%)
Include training in business organization	3 (6%)

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[7] Scores range from 1 (was determining factor) to 4 (did not consider).

[8] Scores range from 1 (excellent) to 4 (poor).

[9] Percentages are based on the number of graduates employed as OSH professionals.

E. Relationship Between Academic Training and Work Experience

28. Number and percentage of graduates employed as OSH professionals, by academic program/job experiences and year of graduation.

Experience	1981-82	1982-83	1983-84	Total
Can apply what was learned	14 (74%)	13 (81%)	10 (67%)	37 (74%)
Wanted more job-related training	6 (32%)	3 (19%)	4 (27%)	13 (26%)
Job done differently than trained	3 (16%)	1 (6%)	3 (20%)	7 (14%)
Don't use tools trained to use	3 (16%)	2 (13%)	2 (13%)	7 (14%)
Didn't need OSH training to gain job	4 (21%)	1 (6%)	2 (13%)	7 (14%)
Took some OSH coursework not relevant to job	6 (32%)	7 (44%)	4 (27%)	17 (34%)
Learned applied job skills in ERC	12 (63%)	10 (63%)	7 (47%)	29 (58%)
Needed on-the-job training	4 (21%)	3 (19%)	2 (13%)	9 (18%)
Needed special training	3 (16%)	2 (13%)	3 (20%)	8 (16%)
Taking OSH training was wise choice	17 (89%)	15 (94%)	15 (100%)	47 (94%)
Advancement would be better if trained in a different institution	1 (5%)	2 (13%)	0	3 (6%)

29. Most helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Industrial hygiene fundamentals	24 (48%)
OSHA/EPA compliance	24 (48%)
Safety management	19 (38%)
Ventilation	17 (34%)
OSH standards	12 (24%)
Administration and management	11 (22%)
Toxicology	10 (20%)
Physical hazard control	10 (20%)
Risk evaluation and management	9 (18%)
Noise control/hearing conservation	8 (16%)
Construction safety	7 (14%)
Fire safety and control	7 (14%)

[10] Percentages are based on number employed as OSH professionals.

30. Least helpful OSH courses, by frequencies and percentages.[11]

Course topics	Frequency and Percentage
Traffic and fleet safety	13 (26%)
Emergency planning and Preparation	12 (24%)
Legal implications of safety	11 (22%)
Marketing	9 (18%)
Situation analysis	9 (18%)
Statistics	9 (18%)
Economics	8 (16%)
Fire prevention	7 (14%)

31. OSH activities performed for which graduates were least prepared, by frequencies and percentages.[11]

Activities	Frequency and Percentage
Safety and health inspection	10 (20%)
interpreting OSHA/EPA regulations	9 (18%)
Negotiating workerman's compensation insurance	8 (16%)
Technical/report writing	8 (16%)
Administration and management	7 (14%)
Budget preparation	5 (10%)

32. Number and percentage of graduates (not employed or not employed as OSH professionals), by experiences since graduation and year of graduation.

Experiences	1981-82	1982-83	1983-84	Total
Went back to school	0	1 (20%)	0	1 (9%)
Found a better job	0	2 (40%)	3 (50%)	5 (45%)
Couldn't find OSH job	0	1 (20%)	2 (33%)	3 (27%)
No suitable OSH jobs in geographical area	0	2 (40%)	2 (33%)	4 (36%)
Left OSH job for another field	0	0	0	0
Left OSH career field	0	0	0	0
Salary too low	0	1 (20%)	0	1 (9%)
Dropped out of work force	0	0	0	0

[11] Percentages are based on number employed as OSH professionals.

Part III

Data Related to Industrial Hygiene and Safety Graduates[1]

A. Current Employment/School Enrollment Status

1. Number and percentage[2] of graduates, by employment status and year of graduation.

Employment status	1981-82	1982-83	1983-84	Total
Employed full-time	31 (89%)	13 (100%)	3 (60%)	47 (89%)
Employed part-time	2 (6%)	0	0	2 (4%)
Not currently employed	2 (6%)	0	2 (40%)	4 (8%)
Total	35 (100%)	13 (100%)	5 (100%)	53 (100%)

2. Number and percentage of graduates, by current enrollment status and year of graduation from OSH academic program.

Current enrollment	1981-82	1982-83	1983-84	Total
Enrolled full-time	5 (14%)	0	0	5 (9%)
Enrolled part-time	2 (6%)	2 (15%)	0	4 (8%)
Not currently enrolled	28 (80%)	11 (85%)	5 (100%)	44 (83%)
Total	35 (100%)	13 (100%)	5 (100%)	53 (100%)

3. Number and percentage of graduates currently enrolled in school, by category of institution in which currently enrolled and year of graduation from OSH academic program.

Category of Institution in Which Enrolled	1981-82	1982-83	1983-84	Total
Source ERC	4 (57%)	0	0	4 (44%)
Other ERC	2 (29%)	0	0	2 (22%)
Other	1 (14%)	2 (100%)	0	3 (33%)
Total	7 (100%)	2 (100%)	0	9 (100%)

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[1] The Graduate Questionnaire used to obtain these data is included as Appendix B.

[2] Unless otherwise noted, percentages are based on numbers of graduates responding to the particular items rather than the total number of graduates who returned questionnaires.

4. Number and percentage of graduates currently enrolled in school, by degree sought and year of graduation from OSH academic program.

Degree sought	1981-82	1982-83	1983-84	Total
Certificate	0	0	0	0
Baccalaureate	1 (14%)	0	0	1 (11%)
Masters	2 (29%)	0	0	2 (22%)
Doctorate	4 (57%)	0	0	4 (44%)
Post-doctorate	0	0	0	0
Non-degree	0	2 (100%)	0	2 (22%)
Total	7 (100%)	2 (100%)	0	9 (100%)

5. Number and percentage of graduates currently enrolled in school, by current program concentration and year of graduation from OSH academic program.

Current Academic Program Area	1981-82	1982-83	1983-84	Total
OSH area	5 (71%)	0	0	5 (56%)
Non-OSH area	2 (29%)	2 (100%)	0	4 (44%)
Total	7 (100%)	2 (100%)	0	9 (100%)

6. Number and percentage of male and female graduates, by year of graduation from OSH academic program.

	1981-82	1982-83	1983-84	Total
Male	28 (80%)	7 (54%)	3 (60%)	38 (72%)
Female	7 (20%)	6 (46%)	2 (40%)	15 (28%)
Total	35 (100%)	13 (100%)	5 (100%)	53 (100%)

B. Work History

7. Number and percentage of employed graduates, by type of employer and OSH and non-OSH employment.

Type of Employer	OSH Employment	Non-OSH Employment	Total
Private sector	28 (68%)	5 (63%)	33 (67%)
Academic institution	6 (15%)	1 (13%)	7 (14%)
Government (military)	1 (2%)	0	1 (2%)
Government (non-military)	6 (15%)	1 (13%)	7 (14%)
Other	0	1 (13%)	1 (2%)
Total	41 (100%)	8 (100%)	49 (100%)

8. Number and percentage of graduates employed in OSH professions, by size of employer and number of OSH employees.

Size of Employer, in Total Number of Employees	Number of OSH Employees <6	6-10	11-25	26-50	>50	Total
<51	8 (21%)	2 (5%)	2 (5%)	2 (5%)	0	14 (36%)
51-100	1 (3%)	0	0	0	0	1 (3%)
101-250	2 (5%)	0	0	1 (3%)	0	3 (8%)
251-500	1 (3%)	0	0	0	0	1 (3%)
501-1000	2 (5%)	1 (3%)	0	0	1 (3%)	4 (10%)
>1000	6 (15%)	3 (8%)	3 (8%)	0	4 (10%)	16 (41%)
Total	20 (51%)	6 (15%)	5 (13%)	3 (8%)	5 (13%)	39 (100%)

9. Mean starting salary, by employment category and beginning of employment.

Employment Category	Beginning of Employment: One Year Ago or Less	13-24 Months Ago	More Than 24 Months Ago
OSH employment	$ 27,818	$ 25,500	$ 21,789
Non-OSH employment	$ 24,550	$ 13,750	$ 18,000

10. Mean latest salary, by employment category and length of employment.

Employment Category	Length of Employment: One Year or Less	13-24 Months	More Than 24 Months
OSH employment	$ 27,021	$ 28,875	$ 29,972
Non-OSH employment	$ 26,500	$ 19,250	$ 29,000

11. Number of hours and percentage of graduates' time spent performing OSH activities, by employment category.

Employment Category	Number of Hours and Percentage of Time Performing OSH Activities: <26	26-50	51-75	76-100	Total
OSH employment	5 (12%)	1 (2%)	2 (5%)	33 (80%)	41 (100%)
Non-OSH employment	2 (100%)	0	0	0	2 (100%)
Total	7 (16%)	1 (2%)	2 (5%)	33 (78%)	43 (100%)

12. Principal OSH activities of graduates employed as OSH professionals, by numbers and percentages.[3]

Activity	Number and Percentage of Graduates Engaged in Activity
Administers/directs	6 (15%)
Designs equipment	3 (7%)
Interprets data	5 (12%)
Inspects/surveys	23 (56%)
Plans/develops programs	7 (17%)
Performs research	4 (10%)
Trains or educates	4 (10%)

13. Number and percentage of graduates employed as OSH professionals, by number of employees supervised and year of graduation.

Number of Employees Supervised	1981-82	1982-83	1983-84	Total
None	17 (65%)	8 (67%)	3 (100%)	28 (68%)
1-5	6 (23%)	4 (33%)	0	10 (24%)
6-10	3 (12%)	0	0	3 (7%)
Total	26 (100%)	12 (100%)	3 (100%)	41 (100%)

14. Number and percentage of graduates employed as OSH professionals, by number of persons for whom responsible and year of graduation.

Number of Persons for Whom Responsible	1981-82	1982-83	1983-84	Total
<51	5 (25%)	1 (11%)	1 (100%)	7 (23%)
51-100	3 (15%)	0	0	3 (10%)
101-250	0	0	0	0
251-500	0	1 (11%)	0	1 (3%)
501-1000	0	0	0	0
>1000	12 (60%)	7 (78%)	0	19 (63%)
Total	20 (100%)	9 (100%)	1 (100%)	30 (100%)

[3] Percentages may not equal 100 since some graduates may have listed more than one of the activities. Only activities performed by more than 5 percent of graduates are included.

15. Number and percentage of graduates (employed as OSH professionals) with one and more than one employer since graduation, by year of graduation.

Number of Employers	1981-82	1982-83	1983-84	Total
More than one	9 (35%)	4 (33%)	0	13 (32%)
One	17 (65%)	8 (67%)	3 (100%)	28 (68%)
Total	26 (100%)	12 (100%)	3 (100%)	41 (100%)

C. Employment Experience of Graduates Employed as OSH Professionals

16. Number and percentage of graduates (employed as OSH professionals), by experience in finding employment and year of graduation.[3]

Factors experienced	1981-82	1982-83	1983-84	Total
Placement office was helpful	2 (8%)	1 (8%)	1 (33%)	3 (7%)
Faculty were helpful	10 (38%)	7 (58%)	2 (67%)	17 (41%)
Already had a job	5 (19%)	4 (33%)	0	9 (22%)
Was not seeking a job	3 (12%)	2 (17%)	0	5 (12%)
Did not ask for assistance	3 (12%)	0	0	3 (7%)
Did not need assistance	8 (31%)	2 (17%)	0	10 (24%)
Assistance not worthwhile	3 (12%)	1 (8%)	0	4 (10%)

17. Number and percentage of graduates (employed as OSH professionals), by difficulty in finding what they considered suitable employment and year of graduation.

Factors experienced	1981-82	1982-83	1983-84	Total
No difficulty finding suitable employment	12 (46%)	8 (67%)	1 (33%)	21 (51%)
Moderate difficulty finding suitable employment	12 (46%)	2 (17%)	2 (67%)	16 (39%)
Great difficulty finding suitable employment	1 (4%)	1 (8%)	0	2 (5%)
Did not find suitable position	1 (4%)	1 (8%)	0	2 (5%)
Total	26 (100%)	12 (100%)	3 (100%)	41 (100%)

[3] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are the numbers of graduates responding in the affirmative.

18. Number and percentage of graduates (employed as OSH professionals), by reason for taking current job and year of graduation.[5]

Reasons	1981-82	1982-83	1983-84	Total
Type job for which trained	22 (85%)	12 (100%)	2 (67%)	36 (88%)
Type job sought	24 (92%)	12 (100%)	1 (33%)	37 (90%)
Type work desired	14 (54%)	7 (58%)	0	21 (51%)
Could not find desired job	3 (12%)	2 (17%)	1 (33%)	6 (15%)
Best paying job	9 (35%)	4 (33%)	1 (33%)	14 (34%)
Job security	10 (38%)	8 (67%)	0	18 (44%)
Best job without relocating	8 (31%)	4 (33%)	0	12 (29%)
Only job found	4 (15%)	2 (17%)	0	6 (15%)
Insufficient training for desired job	4 (15%)	0	0	4 (10%)
Job offered career growth	21 (81%)	8 (67%)	1 (33%)	30 (73%)

19. Mean rating on "satisfaction with aspects of current job," by year of graduation.[6]

Satisfaction factors	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Challenge	1.4	1.6	2.5	2.0
Opportunity with employer	2.3	1.9	4.0	2.7
Opportunity in field	1.9	1.9	2.5	2.0
Use academic training	1.4	1.6	1.5	2.7
Contribution to OSH	1.2	1.4	1.5	3.0
Participate in decision making	1.9	1.7	1.0	1.7
Self-direction opportunities	1.4	1.7	2.0	1.3
Opportunity to work as team	1.7	1.5	1.5	1.7

[5] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are the numbers of graduates responding in the affirmative.

[6] Scores range from 1 (very satisfied) to 5 (very dissatisfied).

D. Academic Experience

20. Number and percentage of graduates, by status of enrollment in OSH-related continuing education programs and year of graduation.

Enrollment status	1981-82	1982-83	1983-84	Total
Have enrolled	8 (23%)	5 (38%)	1 (20%)	14 (26%)
Have not enrolled	27 (77%)	8 (62%)	4 (80%)	39 (74%)
Total	35 (100%)	13 (100%)	5 (100%)	53 (100%)

21. Principal subject areas of OSH-related continuing education by numbers and percentages of graduates indicating continuing education enrollment.

Subject area	Number and Percentage of Graduates Indicating Enrollment
Micro/computer use	3 (21%)
Professional association sponsored courses	2 (14%)
Risk management	2 (14%)
Ergonomics	2 (14%)
Ventilation	2 (14%)

22. Mean number of hours of OSH-related continuing education attendance, by employment category and year of graduation.

	1981-82	1982-83	1983-84	Total
Program areas	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
OSH employment	28.66	67.25	0	0
Non-OSH employment	0	0	0	0

23. Number and percentage of graduates (not currently enrolled full time in school), by opinion as to need for continuing education and by year of graduation.

	1981-82	1982-83	1983-84	Total
Need cont. ed.	15 (54%)	9 (82%)	2 (40%)	26 (59%)
Do not need	13 (46%)	2 (18%)	3 (60%)	18 (41%)
Total	28 (100%)	11 (100%)	5 (100%)	44 (100%)

24. Principal subject areas needed for continuing education, by number and percentage of graduates expressing each need (based on responses of graduates expressing such needs).

Subject area	Number and Percentage of Graduates Indicating This Need
Radiation	5 (19%)
Safety	4 (15%)
Toxicology	4 (15%)
Ventilation	3 (12%)
Computer Use	3 (12%)
Air Pollution	2 (8%)

25. Mean rating on "reasons for attendance" factors, by year of graduation.[7]

	1981-82	1982-83	1983-84	Total
Factors	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
Cost	2.1	2.3	2.2	2.2
Financial aid	1.8	2.3	2.7	2.0
Professors	2.5	2.8	2.2	2.6
Program quality	1.8	1.7	1.6	1.8
Program reputation	1.9	1.8	2.0	1.9
Research reputation	2.7	2.7	2.7	2.7
Entry requirements	2.2	2.2	2.0	2.2
Geographic location	2.0	2.2	1.7	2.0
Proximity to employment	3.1	3.3	3.2	3.2
Proximity to spouse's work/school	3.3	3.4	3.7	3.4
Financial aid from employer	3.2	3.4	3.2	3.3

26. Mean rating on "general quality of educational experience," by year of graduation.[8]

	1981-82	1982-83	1983-84	Total
Factors	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
Overall content	1.7	1.6	2.0	1.7
Scientific aspects	1.7	1.8	2.0	1.7
Research aspects	2.2	2.2	2.7	2.2
Clinical aspects	2.5	2.1	2.0	2.3

[7] Scores range from 1 (was determining factor) to 4 (did not consider).

[8] Scores range from 1 (excellent) to 4 (poor).

27. Principal recommendations for improving OSH training, by frequencies and percentages.[9]

Recommendation	Frequency and Percentage
Increase "hands on" experience	15 (37%)
Increase advanced toxicology coursework	4 (10%)
Increase practical business management courses	3 (7%)
Increase advanced epidemiology coursework	2 (5%)
Increase focus on noise control	2 (5%)
Increase focus on radiation	2 (5%)
Increase focus on report preparation and technical writing	2 (5%)

E. Relationship Between Academic Training and Work Experience

28. Number and percentage of graduates (employed as OSH professionals), by academic program/job experiences and year of graduation.

Experience	1981-82	1982-83	1983-84	Total
Can apply what was learned	23 (88%)	9 (75%)	2 (67%)	34 (83%)
Wanted more job-related training	10 (38%)	5 (42%)	1 (33%)	16 (39%)
Job done differently than trained	6 (23%)	1 (8%)	1 (33%)	8 (20%)
Don't use tools trained to use	4 (15%)	2 (17%)	2 (67%)	8 (20%)
Didn't need OSH training to gain job	5 (19%)	1 (8%)	1 (33%)	7 (17%)
Took some OSH coursework not relevant to job	11 (42%)	4 (33%)	3 (100%)	18 (44%)
Learned applied job skills in ERC	13 (50%)	7 (58%)	0	20 (49%)
Needed on-the-job training	4 (15%)	2 (17%)	1 (33%)	7 (17%)
Needed special training	4 (15%)	1 (8%)	0	5 (12%)
Taking OSH training was wise choice	23 (88%)	12 (100%)	2 (67%)	37 (90%)
Advancement would be better if trained in a different institution	0	1 (8%)	0	1 (2%)

[9] Percentages are based on the number of graduates employed as OSH professionals.

29. Most helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Industrial hygiene principles	19 (46%)
Safety management	19 (46%)
Industrial hygiene lab	16 (39%)
toxicology	12 (29%)
Ventilation	8 (20%)
Human factors/accident causation	7 (17%)
Industrial hygiene sampling	6 (15%)
Statistics	6 (15%)
Environmental chemistry	6 (15%)

30. Least helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Statistics	9 (22%)
Recognition/control of carcinogens	8 (20%)
Safety management/ systems safety	7 (17%)
Psychological foundations of safety	7 (17%)
Epidemiology	6 (15%)
Research methods/design	4 (10%)
Radiation	4 (10%)

31. OSH activities for which graduates were least prepared, by frequencies and percentages.[10]

Activities	Frequency and Percentage
Work site surveys/ hazard evaluation	12 (29%)
Program management and budgeting	11 (27%)
Technical/report writing	10 (24%)
Toxicity assessment	6 (15%)
Radiation control	5 (12%)
Ergonomics/evaluating equipment and use	5 (12%)
Interpreting OSHA/EPA regulations	3 (7%)
Hazardous waste control and management	3 (7%)

[10] Percentages are based on number employed as OSH professionals.

32. Number and percentage of graduates (not employed or not employed as OSH professionals), by experiences since graduation and year of graduation.

Experiences	1981-82	1982-83	1983-84	Total
Went back to school	4 (44%)	0	0	4 (33%)
Found a better job	5 (56%)	1 (100%)	0	6 (50%)
Couldn't find OSH job	3 (33%)	0	2 (100%)	5 (42%)
No suitable OSH jobs in geographical area	3 (33%)	0	2 (100%)	5 (42%)
Left OSH job for another field	0	0	0	0
Left OSH career field	0	0	0	0
Salary too low	0	0	0	0
Dropped out of work force	0	0	1 (50%)	1 (8%)

PART IV

Data Related to[1]
Occupational Health Nursing Graduates

A. Current Employment/School Enrollment Status

1. Number and percentage[2] of graduates, by employment status and year of graduation.

Employment status	1981-82	1982-83	1983-84	Total
Employed full-time	21 (81%)	14 (100%)	18 (75%)	53 (83%)
Employed part-time	4 (15%)	0	4 (17%)	8 (12%)
Not currently employed	1 (4%)	0	2 (8%)	3 (5%)
Total	26 (100%)	14 (100%)	24 (100%)	64 (100%)

2. Number and percentage of graduates, by current enrollment status and year of graduation from OSH academic program.

Current enrollment status	1981-82	1982-83	1983-84	Total
Enrolled full-time	1 (4%)	0	0	1 (2%)
Enrolled part-time	6 (23%)	0	7 (29%)	13 (20%)
Not currently enrolled	19 (73%)	14 (100%)	17 (71%)	50 (78%)
Total	26 (100%)	14 (100%)	24 (100%)	64 (100%)

3. Number and percentage of graduates currently enrolled in school, by category of institution in which currently enrolled and year of graduation from OSH academic program.

Category of Institution in Which Enrolled	1981-82	1982-83	1983-84	Total
Source ERC	3 (43%)	0	5 (71%)	8 (57%)
Other ERC	1 (14%)	0	0	1 (8%)
Other	3 (43%)	0	2 (29%)	5 (36%)
Total	7 (100%)	0	7 (100%)	14 (100%)

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[1] The Graduate Questionnaire used to obtain these data is included as Appendix B.

[2] Unless otherwise noted, percentages are based on numbers of graduates responding to the particular items rather than the total number of graduates who returned questionnaires.

4. Number and percentage of graduates currently enrolled in school, by degree sought and year of graduation from OSH academic program.

Degree sought	1981-82	1982-83	1983-84	Total
Certificate	0	0	0	0
Baccalaureate	2 (33%)	0	1 (17%)	3 (25%)
Masters	4 (67%)	0	5 (83%)	9 (75%)
Doctorate	0	0	0	0
Post-doctorate	0	0	0	0
Non-degree	0	0	0	0
Total	6 (100%)	0	6 (100%)	12 (100%)

5. Number and percentage of graduates currently enrolled in school, by current program concentration and year of graduation from OSH academic program.

Current Academic Program Area	1981-82	1982-83	1983-84	Total
OSH area	5 (71%)	0	6 (86%)	11 (79%)
Non-OSH area	2 (29%)	0	1 (14%)	3 (21%)
Total	7 (100%)	0	7 (100%)	14 (100%)

6. Number and percentage of male and female graduates, by year of graduation from OSH academic program.

	1981-82	1982-83	1983-84	Total
Male	2 (8%)	1 (7%)	0	3 (5%)
Female	24 (92%)	13 (93%)	24 (100%)	61 (95%)
Total	26 (100%)	14 (100%)	24 (100%)	64 (100%)

B. Work History

7. Number and percentage of employed graduates, by type of employer and OSH and non-OSH employment.

Type of Employer	OSH Employment	Non-OSH Employment	Total
Private sector	25 (56%)	11 (69%)	36 (59%)
Academic institution	5 (11%)	3 (19%)	8 (13%)
Government (military)	1 (2%)	0	1 (2%)
Government (non-military)	8 (18%)	1 (6%)	9 (15%)
Other	6 (13%)	1 (6%)	7 (11%)
Total	45 (100%)	16 (100%)	61 (100%)

8. Number and percentage of graduates employed in OSH professions, by size of employer and number of OSH employees.

Size of Employer, in Total Number of Employees	Number of OSH Employees <6	6-10	11-25	26-50	>50	Total
<51	5 (14%)	0	0	1 (3%)	1 (3%)	7 (19%)
51-100	1 (3%)	0	0	0	0	1 (3%)
101-250	0	1 (3%)	0	0	0	1 (3%)
251-500	3 (8%)	0	0	0	0	3 (8%)
501-1000	2 (6%)	1 (3%)	1 (3%)	0	2 (6%)	6 (17%)
>1000	10 (28%)	5 (14%)	2 (6%)	0	1 (3%)	18 (51%)
Total	21 (60%)	7 (20%)	3 (8%)	1 (3%)	3 (8%)	35 (100%)

9. Mean starting salary, by employment category and beginning of employment.

Employment Category	Beginning of Employment: One Year Ago or Less	13-24 Months Ago	More Than 24 Months Ago
OSH employment	$ 24,840	$ 31,495	$ 20,288
Non-OSH employment	$ 23,940	$ 29,666	$ 23,398

10. Mean latest salary, by employment category and length of employment.

Employment Category	Length of Employment: One Year or Less	13-24 Months	More Than 24 Months
OSH employment	$ 26,657	$ 34,520	$ 26,412
Non-OSH employment	$ 26,035	$ 33,300	$ 31,982

11. Number of hours and percentage of graduates' time spent performing OSH activities, by employment category.

Employment Category	Number of Hours and Percentage of Time Performing OSH Activities: <26	26-50	51-75	76-100	Total
OSH employment	9 (21%)	5 (12%)	3 (7%)	26 (60%)	43 (100%)
Non-OSH employment	10 (91%)	1 (9%)	0	0	11 (100%)
Total	19 (35%)	6 (11%)	3 (5%)	26 (48%)	54 (100%)

12. Principal OSH activities of graduates employed as OSH professionals, by numbers and percentages.[3]

Activity	Number and Percentage of Graduates Engaged in Activity
Administers/directs	4 (9%)
Gives physicals	10 (22%)
Treats injury	7 (16%)
Inspects/surveys	6 (13%)
Plans/develops programs	7 (16%)
Trains or educates	18 (40%)
Consults	5 (11%)

13. Number and percentage of graduates employed as OSH professionals, by number of employees supervised and year of graduation.

Number of Employees Supervised	1981-82	1982-83	1983-84	Total
None	10 (59%)	7 (54%)	10 (67%)	27 (60%)
1-5	7 (41%)	5 (38%)	3 (20%)	15 (33%)
6-10	0	1 (8%)	0	1 (2%)
11-25	0	0	0	0
26-50	0	0	2 (13%)	2 (4%)
Total	17 (100%)	13 (100%)	15 (100%)	45 (100%)

14. Number and percentage of graduates employed as OSH professionals, by number of persons for whom responsible and year of graduation.

Number of Persons for Whom Responsible	1981-82	1982-83	1983-84	Total
<51	4 (40%)	0	0	4 (18%)
51-100	0	0	0	0
101-250	0	1 (20%)	0	1 (4%)
251-500	1 (10%)	0	1 (14%)	2 (9%)
501-1000	0	1 (20%)	1 (14%)	2 (9%)
>1000	5 (50%)	3 (60%)	5 (71%)	13 (59%)
Total	10 (100%)	5 (100%)	7 (100%)	22 (100%)

[3] Percentages may not equal 100 since some graduates may have listed more than one of the activities. Only activities performed by more than 5 percent of graduates are included.

15. Number and percentage of graduates (employed as OSH professionals) with one and more than one employer since graduation, by year of graduation.

Number of Employers	1981-82	1982-83	1983-84	Total
More than one	9 (53%)	1 (8%)	4 (27%)	14 (31%)
One	8 (47%)	12 (92%)	11 (73%)	31 (69%)
Total	17 (100%)	13 (100%)	15 (100%)	45 (100%)

C. Employment Experience of Graduates Employed as OSH Professionals

16. Number and percentage of graduates, by experience in finding employment and year of graduation.[4]

Factors experienced	1981-82	1982-83	1983-84	Total
Placement office was helpful	1 (6%)	0	1 (7%)	2 (4%)
Faculty were helpful	5 (29%)	2 (15%)	4 (27%)	11 (24%)
Already had a job	9 (53%)	4 (31%)	4 (27%)	17 (38%)
Was not seeking a job	2 (12%)	1 (8%)	1 (7%)	4 (9%)
Did not ask for assistance	1 (6%)	1 (8%)	0	2 (4%)
Did not need assistance	7 (41%)	2 (15%)	4 (27%)	13 (29%)
Assistance not worthwhile	4 (24%)	1 (8%)	2 (13%)	7 (16%)

17. Number and percentage of graduates (employed as OSH professionals), by difficulty in finding what they considered suitable employment and year of graduation.

Factors experienced	1981-82	1982-83	1983-84	Total
No difficulty finding suitable employment	9 (53%)	6 (46%)	6 (40%)	21 (47%)
Moderate difficulty finding suitable employment	4 (24%)	3 (23%)	2 (13%)	9 (20%)
Great difficulty finding suitable employment	2 (12%)	2 (15%)	3 (20%)	7 (16%)
Did not find suitable position	2 (12%)	2 (15%)	4 (27%)	8 (18%)
Total	17 (100%)	13 (100%)	15 (100%)	45 (100%)

[4] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are the numbers of graduates responding in the affirmative.

18. Number and percentage of graduates (employed as OSH professionals), by reason for taking current job and year of graduation.[5]

Reasons	1981-82		1982-83		1983-84		Total	
Type job for which trained	9	(53%)	11	(85%)	8	(53%)	28	(62%)
Type job sought	11	(65%)	11	(85%)	11	(73%)	33	(73%)
Type work desired	8	(47%)	7	(54%)	8	(53%)	23	(51%)
Could not find desired job	4	(24%)	3	(23%)	3	(20%)	10	(22%)
Best paying job	8	(47%)	3	(23%)	5	(33%)	16	(36%)
Job security	10	(59%)	5	(38%)	5	(33%)	20	(44%)
Best job without relocating	6	(35%)	5	(38%)	4	(27%)	15	(33%)
Only job found	1	(6%)	4	(31%)	1	(7%)	6	(13%)
Insufficient training for desired job	0		0		0		0	
Job offered career growth	12	(71%)	5	(38%)	10	(67%)	27	(60%)

19. Mean rating on "satisfaction with aspects of current job," by year of graduation.[6]

	1981-82	1982-83	1983-84	Total
Satisfaction factors	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
Challenge	1.7	1.9	1.6	1.7
Opportunity with employer	2.7	2.3	2.2	2.4
Opportunity in field	2.4	2.2	2.0	2.2
Use academic training	2.2	1.8	1.7	1.9
Contribution to OSH	2.1	2.1	1.8	2.0
Participate in decision making	2.2	2.1	1.9	2.1
Self-direction opportunities	1.9	2.0	1.6	1.8
Opportunity to work as team	2.1	2.2	1.8	2.0

[5] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are the numbers of graduates responding in the affirmative.

[6] Scores range from 1 (very satisfied) to 5 (very dissatisfied).

D. Academic Experience

20. Number and percentage of graduates, by status of enrollment in OSH-related continuing education programs and year of graduation.

Enrollment status	1981-82	1982-83	1983-84	Total
Have enrolled	12 (46%)	5 (36%)	8 (36%)	25 (40%)
Have not enrolled	14 (54%)	9 (64%)	14 (64%)	37 (60%)
Total	26 (100%)	14 (100%)	22 (100%)	62 (100%)

21. Principal subject areas of OSH-related continuing education by numbers and percentages of graduates indicating continuing education enrollment.

Subject area	Number and Percentage of Graduates Indicating Enrollment
NIOSH/professional Association seminars	10 (40%)
Emergency care seminars	4 (16%)
Workman's comp. review	3 (12%)
Legal issues for OHN	2 (8%)

22. Mean number of hours of OSH-related continuing education attendance, by employment category and year of graduation.

	1981-82	1982-83	1983-84	Total
Program areas	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
OSH employment	37.25	13.50	30.40	29.64
Non-OSH employment	44.00	0	32.00	38.00

23. Number and percentage of graduates (not currently enrolled full time in school), by opinion as to need for continuing education and year of graduation.

	1981-82	1982-83	1983-84	Total
Need cont. ed.	10 (53%)	5 (36%)	7 (41%)	22 (44%)
Do not need	9 (47%)	9 (64%)	10 (59%)	28 (56%)
Total	19 (100%)	14 (100%)	17 (100%)	50 (100%)

24. Principal subject areas needed for continuing education, by number and percentage of graduates expressing each need (based on responses of graduates expressing such needs).

Subject area	Number and Percentage of Graduates Indicating This Need
Toxicology	5 (23%)
Spirometry	3 (14%)
Industrial hygiene review	3 (14%)
Workerman's comp. regulations	3 (14%)
Certification review	2 (9%)
OHN review	2 (9%)
Administration and management	2 (9%)

25. Mean rating on "reasons for attendance" factors, by year of graduation.[7]

Factors	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Cost	2.1	1.6	2.0	2.0
Financial aid	2.1	1.7	1.9	1.9
Professors	2.9	3.0	2.3	2.7
Program quality	1.8	1.5	1.7	1.7
Program reputation	2.0	1.8	1.8	1.9
Research reputation	2.9	3.0	2.4	2.7
Entry requirements	2.1	2.2	2.5	2.3
Geographic location	1.6	1.5	1.5	1.5
Proximity to employment	2.6	2.5	2.8	2.7
Proximity to spouse's work/school	3.2	2.8	3.5	3.2
Financial aid from employer	3.2	3.3	3.3	3.3

26. Mean rating on "general quality of educational experience," by year of graduation.[8]

Factors	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Overall content	1.6	1.5	1.5	1.6
Scientific aspects	1.8	1.9	1.7	1.8
Research aspects	2.0	2.1	1.9	2.0
Clinical aspects	1.6	2.1	1.9	1.8

[7] Scores range from 1 (was determining factor) to 4 (did not consider).

[8] Scores range from 1 (excellent) to 4 (poor).

27. Principal recommendations for improving OSH training, by frequencies and percentages.[9]

Recommendation	Frequency and Percentage
Increase "Hands On" Experience	10 (22%)
Increase Administration/ Management Training	6 (13%)
Increase Toxicology Training	6 (13%)
Increase Research Methods Training	6 (13%)
Increase Industrial Hygiene Training	3 (7%)

E. Relationship Between Academic Training and Work Experience

28. Number and percentage of graduates employed as OSH professionals, by academic program/job experiences and year of graduation.

Experience	1981-82	1982-83	1983-84	Total
Can apply what was learned	7 (41%)	8 (62%)	11 (73%)	26 (58%)
Wanted more job-related training	3 (18%)	4 (31%)	2 (13%)	9 (20%)
Job done differently than trained	3 (18%)	4 (31%)	3 (20%)	10 (22%)
Don't use tools trained to use	5 (29%)	2 (15%)	3 (20%)	10 (22%)
Didn't need OSH training to gain job	7 (41%)	3 (23%)	7 (47%)	17 (38%)
Took some OSH coursework not relevant to job	7 (41%)	5 (38%)	5 (33%)	17 (38%)
Learned applied job skills in ERC	5 (29%)	7 (54%)	6 (40%)	18 (40%)
Needed on-the-job training	5 (29%)	4 (31%)	2 (13%)	11 (24%)
Needed special training	6 (35%)	4 (31%)	2 (13%)	12 (27%)
Taking OSH training was wise choice	14 (82%)	12 (92%)	13 (87%)	39 (87%)
Advancement would be better if trained in a different institution	2 (12%)	0	1 (7%)	3 (7%)

[9] Percentages are based on the number of graduates employed as OSH professionals.

29. Most helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Administration and management	17 (38%)
OHN seminars	17 (38%)
toxicology	15 (33%)
Research methods and statistics	12 (27%)
Epidemiology	11 (24%)
Industrial hygiene principles	9 (20%)
Physical assessment	9 (20%)
Occupational medicine	5 (11%)

30. Least helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Toxicology	7 (16%)
Industrial hygiene	6 (13%)
Nursing theory	5 (11%)
Epidemiology	4 (9%)
Public health nursing	4 (9%)

31. OSH activities for which graduates were least prepared, by frequencies and percentages.[10]

Activities	Frequency and Percentage
Administration and management	17 (38%)
"Marketing" programs	10 (22%)
Budget preparation	7 (16%)
Physical assessment	5 (11%)
Emergency care	3 (7%)

32. Number and percentage of graduates (not employed or not employed as OSH professionals), by experiences since graduation and year of graduation.

Experiences	1981-82	1982-83	1983-84	Total
Went back to school	2 (22%)	0	1 (11%)	3 (16%)
Found a better job	7 (78%)	1 (100%)	1 (11%)	9 (47%)
Couldn't find OSH job	4 (44%)	0	5 (56%)	9 (47%)
No suitable OSH jobs in geographical area	4 (44%)	1 (100%)	6 (67%)	11 (58%)
Left OSH job for another field	1 (11%)	0	0	1 (5%)
Left OSH career field	0	0	0	0
Salary too low	3 (33%)	0	5 (56%)	8 (42%)
Dropped out of work force	1 (11%)	0	0	1 (5%)

[10] Percentages are based on number employed as OSH professionals.

PART V

Data Related to Occupational Medicine Graduates[1]

A. Personal Background

1. Number and percentage[2] of graduates, by employment status and year of graduation.

Employment status	1981-82	1982-83	1983-84	Total
Employed full-time	33 (89%)	12 (92%)	16 (94%)	61 (91%)
Employed part-time	3 (8%)	1 (8%)	1 (6%)	5 (7%)
Not currently employed	1 (3%)	0	0	1 (2%)
Total	37 (100%)	13 (100%)	17 (100%)	67 (100%)

2. Number and percentage of graduates, by current enrollment status and year of graduation from OSH academic program.

Current enrollment status	1981-82	1982-83	1983-84	Total
Enrolled full-time	1 (3%)	0	1 (6%)	2 (3%)
Enrolled part-time	0	1 (8%)	1 (6%)	2 (3%)
Not currently enrolled	35 (97%)	11 (92%)	15 (88%)	61 (94%)
Total	36 (100%)	12 (100%)	17 (100%)	65 (100%)

3. Number and percentage of graduates currently enrolled in school, by category of institution in which currently enrolled and year of graduation from OSH academic program.

Category of Institution in Which Enrolled	1981-82	1982-83	1983-84	Total
Source ERC	1 (100%)	1 (100%)	0	2 (50%)
Other ERC	0	0	1 (50%)	1 (25%)
Other	0	0	1 (50%)	1 (25%)
Total	1 (100%)	1 (100%)	2 (100%)	4 (100%)

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[1] The Graduate Questionnaire used to obtain these data is included as Appendix B.

[2] Unless otherwise noted, percentages are based on numbers of graduates responding to the particular items rather than the total number of graduates who returned questionnaires.

4. Number and percentage of graduates currently enrolled in school, by degree sought and year of graduation from OSH academic program.

Degree sought	1981-82	1982-83	1983-84	Total
Baccalaureate	0	0	1 (50%)	1 (25%)
Masters	0	0	0	0
Doctorate	0	0	0	0
Post-doctorate	1 (100%)	1 (100%)	1 (50%)	3 (75%)
Non-degree	0	0	0	0
Total	1 (100%)	1 (100%)	2 (100%)	4 (100%)

5. Number and percentage of graduates currently enrolled in school, by current program concentration and year of graduation from OSH academic program.

Current Academic Program Area	1981-82	1982-83	1983-84	Total
OSH area	1 (100%)	0	1 (50%)	2 (50%)
Non-OSH area	0	1 (100%)	1 (50%)	2 (50%)
Total	1 (100%)	1 (100%)	2 (100%)	4 (100%)

6. Number and percentage of male and female graduates, by year of graduation from OSH academic program.

	1981-82	1982-83	1983-84	Total
Male	30 (81%)	11 (85%)	13 (76%)	54 (81%)
Female	7 (19%)	2 (15%)	4 (24%)	13 (19%)
Total	37 (100%)	13 (100%)	17 (100%)	67 (100%)

B. Work History

7. Number and percentage of employed graduates, by type of employer and OSH and non-OSH employment.

Type of Employer	OSH Employment	Non-OSH Employment	Total
Private sector	18 (29%)	0	18 (28%)
Academic institution	20 (32%)	1 (50%)	21 (32%)
Government (military)	11 (17%)	0	11 (17%)
Government (non-military)	7 (11%)	0	7 (11%)
Other	7 (11%)	1 (50%)	8 (12%)
Total	63 (100%)	2 (100%)	65 (100%)

8. Number and percentage of graduates employed in OSH professions, by size of employer and number of OSH employees.

Size of Employer, in Total Number of Employees	Number of OSH Employees <6	6-10	11-25	26-50	>50	Total
<51	8 (16%)	2 (4%)	4 (8%)	2 (4%)	0	16 (33%)
51-100	0	0	0	0	1 (2%)	1 (2%)
101-250	3 (6%)	0	1 (2%)	1 (2%)	1 (2%)	6 (12%)
251-500	0	0	1 (2%)	0	2 (4%)	3 (6%)
501-1000	1 (2%)	0	1 (2%)	0	5 (10%)	7 (14%)
>1000	4 (8%)	6 (12%)	2 (4%)	2 (4%)	2 (4%)	16 (33%)
Total	16 (33%)	8 (16%)	9 (18%)	5 (10%)	11 (22%)	49 (100%)

9. Mean starting salary, by employment category and beginning of employment.

Employment Category	Beginning of Employment: One Year Ago or Less	13-24 Months Ago	More Than 24 Months Ago
OSH employment	$ 50,522	$ 46,000	$ 48,468
Non-OSH employment	$ 26,500	$ -	$ -

10. Mean latest salary, by employment category and length of employment.

Employment Category	Length of Employment: One Year or Less	13-24 Months	More Than 24 Months
OSH employment	$ 48,275	$ 55,600	$ 56,578
Non-OSH employment	$ 27,500	$ -	$ -

11. Number of hours and percentage of graduates' time spent performing OSH activities, by employment category.

Employment Category	Number of Hours and Percentage of Time Performing OSH Activities: <26	26-50	51-75	76-100	Total
OSH employment	10(16%)	11 (18%)	3 (5%)	38 (61%)	62 (100%)
Non-OSH employment	0	0	0	0	0

12. Principal OSH activities of graduates employed as OSH professionals, by numbers and percentages.[3]

Activity	Number and Percentage of Graduates Engaged in Activity
Administers/directs	22 (34%)
Inspects/surveys	5 (8%)
Plans/develops programs	4 (6%)
Performs research	13 (20%)
Trains or Educates	10 (16%)
Consult	11 (17%)
Treats illness	12 (19%)

13. Number and percentage of graduates employed as OSH professionals, by number of employees supervised and year of graduation.

Number of Employees Supervised	1981-82	1982-83	1983-84	Total
None	10 (28%)	5 (42%)	8 (53%)	23 (37%)
1-5	12 (33%)	4 (33%)	2 (13%)	18 (29%)
6-10	8 (22%)	2 (17%)	2 (13%)	12 (19%)
11-25	4 (11%)	1 (8%)	1 (7%)	6 (10%)
26-50	1 (3%)	0	0	1 (2%)
51-100	1 (3%)	0	1 (7%)	2 (3%)
>100	0	0	1 (7%)	1 (2%)
Total	36 (100%)	12 (100%)	15 (100%)	63 (100%)

14. Number and percentage of graduates employed as OSH professionals, by number of persons for whom responsible and year of graduation.

Number of Persons for Whom Responsible	1981-82	1982-83	1983-84	Total
<51	3 (14%)	0	0	3 (8%)
51-100	1 (5%)	1 (14%)	0	2 (5%)
101-250	0	0	0	0
251-500	3 (14%)	1 (14%)	1 (14%)	5 (14%)
501-1000	2 (9%)	1 (14%)	2 (29%)	5 (14%)
>1000	13 (59%)	4 (57%)	4 (57%)	21 (58%)
Total	22 (100%)	7 (100%)	7 (100%)	36 (100%)

[3] Percentages may not equal 100 since some graduates may have listed more than one of the activities. Only activities performed by more than 5 percent of graduates are included.

15. Number and percentage of graduates (employed as OSH professionals) with one and more than one employer since graduation, by year of graduation.

Number of Employers	1981-82	1982-83	1983-84	Total
More than one	14 (39%)	4 (31%)	1 (7%)	19 (30%)
One	22 (61%)	9 (69%)	14 (93%)	45 (70%)
Total	36 (100%)	13 (100%)	15 (100%)	64 (100%)

C. Employment Experience of Graduates Employed as OSH Professionals

16. Number and percentage of graduates, by experience in finding employment and year of graduation.[4]

Factors experienced	1981-82	1982-83	1983-84	Total
Placement office was helpful	1 (3%)	1 (8%)	1 (7%)	3 (5%)
Faculty were helpful	13 (36%)	5 (38%)	3 (20%)	21 (33%)
Already had a job	16 (44%)	8 (62%)	10 (67%)	34 (53%)
Was not seeking a job	0	2 (15%)	0	2 (3%)
Did not ask for assistance	2 (6%)	0	1 (7%)	3 (5%)
Did not need assistance	20 (56%)	4 (31%)	4 (27%)	28 (44%)
Assistance not worthwhile	3 (8%)	2 (15%)	2 (13%)	7 (11%)

17. Number and percentage of graduates (employed as OSH professionals), by difficulty in finding what they considered suitable employment and year of graduation.

Factors experienced	1981-82	1982-83	1983-84	Total
No difficulty finding suitable employment	25 (81%)	12 (92%)	4 (50%)	41 (79%)
Moderate difficulty finding suitable employment	6 (19%)	1 (8%)	3 (38%)	10 (19%)
Great difficulty finding suitable employment	0	0	0	0
Did not find suitable position	0	0	1 (13%)	1 (2%)
Total	31 (100%)	13 (100%)	8 (100%)	52 (100%)

[4] Percentages are based on the total number of graduates employed as OSH professionals. Table entries are the numbers of graduates responding in the affirmative.

18. Number and percentage of graduates (employed as OSH professionals), by reason for taking current job and year of graduation.[5]

Reasons	1981-82		1982-83		1983-84		Total	
Type job for which trained	25	(69%)	12	(92%)	10	(67%)	47	(73%)
Type job sought	30	(83%)	13	(100%)	7	(47%)	50	(78%)
Type work desired	22	(61%)	6	(46%)	5	(33%)	33	(52%)
Could not find desired job	1	(3%)	0		1	(7%)	2	(3%)
Best paying job	4	(11%)	1	(8%)	2	(13%)	7	(11%)
Job security	5	(14%)	3	(23%)	4	(27%)	12	(19%)
Best job without relocating	14	(39%)	1	(8%)	5	(33%)	20	(31%)
Only job found	1	(3%)	0		1	(7%)	2	(3%)
Insufficient training for desired job	0		0		0		0	
Job offered career growth	28	(78%)	11	(85%)	10	(67%)	49	(77%)

19. Mean rating on "satisfaction with aspects of current job," by year of graduation.[6]

Satisfaction factors	1981-82 $\bar{X}$	1982-83 $\bar{X}$	1983-84 $\bar{X}$	Total $\bar{X}$
Challenge	1.2	1.3	1.6	1.3
Opportunity with employer	1.7	2.0	2.0	1.8
Opportunity in field	1.5	1.5	1.6	1.5
Use academic training	1.4	1.3	1.8	1.5
Contribution to OSH	1.5	1.3	1.7	1.5
Participate in decision making	1.5	1.5	1.7	1.6
Self-direction opportunities	1.5	1.6	1.6	1.5
Opportunity to work as team	1.4	1.4	1.6	1.5

[5] Percentages are based on the total number of graduates employed as OSH professionals responding to each item. Table entries are the numbers of graduates responding in the affirmative.

[6] Scores range from 1 (very satisfied) to 5 (very dissatisfied).

D. Academic Experience

20. Number and percentage of graduates, by status of enrollment in OSH-related continuing education programs and year of graduation.

Enrollment status	1981-82	1982-83	1983-84	Total
Have enrolled	19 (53%)	5 (38%)	9 (56%)	33 (51%)
Have not enrolled	17 (47%)	8 (62%)	7 (44%)	32 (49%)
Total	36 (100%)	13 (100%)	16 (100%)	65 (100%)

21. Principal subject areas of OSH-related continuing education, by numbers and percentages of graduates indicating continuing education enrollment.

Subject area	Number and Percentage of Graduates Indicating Enrollment
Professional association/ NIOSH seminars	7 (21%)
Occupational/internal medicine reviews	6 (18%)
Medical screening of employees	4 (12%)
Toxicology	2 (6%)
Epidemiology	2 (6%)
Workman's comp.	2 (6%)

22. Mean number of hours of OSH-related continuing education attendance, by employment category and year of graduation.

	1981-82	1982-83	1983-84	Total
Program areas	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
OSH employment	40	67	28	42
Non-OSH employment	0	0	0	0

23. Number and percentage of graduates (not currently enrolled full time in school), by opinion as to need for continuing education and by year of graduation.

	1981-82	1982-83	1983-84	Total
Need cont. ed.	12 (35%)	5 (42%)	4 (27%)	21 (34%)
Do not need	22 (65%)	7 (58%)	11 (73%)	40 (66%)
Total	34 (100%)	12 (100%)	15 (100%)	61 (100%)

24. Principal subject areas needed for continuing education, by number and percentage of graduates expressing each need (based on responses of graduates expressing such need).

Subject area	Number and Percentage of Graduates Indicating This Need
Special topics (e.g., back pain, eye injury, dermatology)	3 (14%)
Legal issues in occupational medicine	3 (14%)
Administration and management	2 (10%)
Prevention and treatment of hazard exposed workers	2 (10%)

25. Mean rating on "reasons for attendance" factors, by year of graduation.[7]

	1981-82	1982-83	1983-84	Total
Factors	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
Cost	3.1	3.5	3.0	3.1
Financial aid	2.7	3.0	3.1	2.9
Professors	2.7	2.5	2.7	2.7
Program quality	1.9	1.6	1.9	1.9
Program reputation	2.1	1.8	2.0	2.0
Research reputation	2.6	2.6	2.7	2.6
Entry requirements	2.8	3.0	2.9	2.9
Geographic location	1.5	1.5	1.7	1.5
Proximity to employment	2.8	2.3	3.0	2.7
Proximity to spouse's work/school	3.0	2.5	2.6	2.8
Financial aid from employer	3.2	2.8	3.0	3.1

26. Mean rating on "general quality of educational experience," by year of graduation.[8]

	1981-82	1982-83	1983-84	Total
Factors	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
Overall content	1.9	1.6	2.0	2.0
Scientific aspects	2.1	1.7	1.9	2.0
Research aspects	2.4	2.5	2.3	2.4
Clinical aspects	2.6	2.5	2.5	2.6

[7] Scores range from 1 (was determining factor) to 4 (did not consider).

[8] Scores range from 1 (excellent) to 4 (poor).

27. Principal recommendations for improving OSH training, by frequencies and percentages.[9]

Recommendation	Frequency and Percentage
Increase clinical experience	10 (15%)
Increase training in adminstration and management	5 (8%)
Increase Academic/ Industry Relationships	5 (8%)

E. Relationship Between Academic Training and Work Experience

28. Number and percentage of graduates (employed as OSH professionals), by academic program/job experiences and year of graduation.

Experience	1981-82	1982-83	1983-84	Total
Can apply what was learned	28 (78%)	10 (77%)	9 (60%)	47 (73%)
Wanted more job-related training	9 (25%)	3 (23%)	5 (33%)	17 (27%)
Job done differently than trained	12 (33%)	1 (8%)	4 (27%)	17 (27%)
Don't use tools trained to use	1 (3%)	1 (8%)	1 (7%)	3 (5%)
Didn't need OSH training to gain job	9 (25%)	5 (38%)	5 (33%)	19 (30%)
Took some OSH coursework not relevant to job	14 (39%)	5 (38%)	6 (40%)	25 (39%)
Learned applied job skills in ERC	10 (28%)	7 (54%)	7 (47%)	24 (38%)
Needed on-the-job training	9 (25%)	3 (23%)	3 (20%)	15 (23%)
Needed special training	8 (22%)	2 (15%)	2 (13%)	12 (19%)
Taking OSH training was wise choice	34 (94%)	13 (100%)	12 (80%)	59 (92%)
Advancement would be better if trained in a different institution	3 (8%)	0	0	3 (5%)

[9] Percentages are based on the number of graduates employed as OSH professionals.

29. Most helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Epidemiology	30 (47%)
Toxicology	24 (38%)
Occupational medicine/disease	20 (31%)
Industrial hygiene	19 (30%)
Biostatistics	15 (23%)
Safety and health surveys	5 (8%)
Pulmonary medicine	4 (6%)

30. Least helpful OSH courses, by frequencies and percentages.[10]

Course topics	Frequency and Percentage
Biostatistic	12 (19%)
Toxicology	8 (13%)
Public Health/Hospital Administration	8 (13%)
Public Health Theory and History	6 (9%)
Review of Public Health Studies/Statistics	5 (8%)

31. OSH activities for which graduates were least prepared, by frequencies and percentages.[10]

Activities	Frequency and Percentage
Administration and management	12 (19%)
Clinical evaluation of disability	10 (16%)
Program design and management	6 (9%)
Research	4 (6%)

32. Number and percentage of graduates (not employed or not employed as OSH professionals), by experiences since graduation and year of graduation.

Experiences	1981-82	1982-83	1983-84	Total
Went back to school				
Found a better job				
Couldn't find OSH job				
No suitable OSH jobs in geographical area		(No cases in sample)		
Left OSH job for another field				
Left OSH career field				
Salary too low				
Dropped out of work force				

[10] Percentages are based on number employed as OSH professionals.

Appendix B

Graduate Questionnaire Used By ERCs
to Obtain Data Reported in Appendix A

Appendix B

Graduate Questionnaire Used By ERCs
to Obtain Data Reported in Appendix A

NAME: _____

ADDRESS: _____

_____

_____

INSTITUTION: _____

PROGRAM AREA: _____

DEGREE RECEIVED _____

YEAR GRADUATED: _____

---

1. Are you currently employed (either full or part time)?

(Please circle one.)

Employed full time 1
Employed part time 2
Not currently employed 3

2. Are you currently enrolled in school (either full or part time)?

(Please circle one.)

In school full time 1
In school part time 2
Not currently enrolled in school 3

If you are currently enrolled in school (either full- or part-time), please provide the following information on the academic program in which you are enrolled:

Institution/school _____

Degree/certificate sought _____

Program concentration _____

3. Are you male, or female?

(Please circle one.)

Male 1
Female 2

4. Please provide the following information about your current or most recent job (regardless of whether or not it involves occupational safety and health work) held since graduating from the program identified in the box at the top of page 1. If you have not been employed since graduation, skip to Q. 15.

a. Company or organization: Name _____

Address _____

_____

b. Type of employer

(Please circle one.)

Private sector 1
Academic institution 2
Government (military) 3
Government (non-military) 4
Other (Please specify.) _____ . . . 5

c. Total number of employees with this employer at this location.

_____

d. Approximate number of employees with this employer at this location who spend 50 percent or more of their time conducting occupational safety and health related activities. . . . . _____

e. Your job title _____

f. Your approximate starting salary (annual) . . . . $ _____

g. Your approximate ending or current salary (annual) $ _____

h. Approximate employment starting date . . . . . ___/___/___

i. Approximate employment ending date (if not current job)
___/___/___

j. Approximate percentage of time on job spent carrying out occupational safety and health activities . . . . . _____%

k. What are (were) your principal occupational safety and health related activities?

_____

_____

l. How many employees do (did) you supervise? . . . . . _____

m. On this job, for approximately how many people do (did) you have or share responsibility for their occupational safety and health? (If you have (had) multi-location responsibilities, please check here ___ and include total number of people for whom you are (were) responsible at all locations.) . _____

5. If you have had more than one job since graduating from the program identified in the box at the top of page 1, please provide the following information about the first job you had after graduating (regardless of whether or not it involved occupational safety and health work). If you have not had more than one job, please go to the next question.

a. Company or organization: Name _____

Address _____

_____

b. Type of employer

(Please circle one.)

Private sector 1
Academic institution 2
Government (military) 3
Government (non-military) 4
Other (Please specify.) _____ . . . 5

c. Total number of employees with this employer at this location.

_____

d. Approximate number of employees with this employer at this location who spend 50 percent or more of their time conducting occupational safety and health related activities . . . . . _____

e. Your job title _____

f. Your approximate starting salary (annual) . . . . $ _____

g. Your approximate ending salary (annual) . . . . . $ _____

h. Approximate employment starting date . . . . . _____

i. Approximate employment ending date . . . . . _____

j. Approximate percentage of time on job spent carrying out occupational safety and health activities . . . . . _____%

k. What were your principal occupational safety and health related activities?

_____

_____

l. How many employees did you supervise? . . . . . _____

m. On this job, for approximately how many people did you have or share responsibility for their occupational safety and health? (If you had multi-location responsibilities, please check here ___ and include total number of people for whom you were responsible at all locations.) . . . . . _____

6. Upon completion of the academic program identified in the box at the top of page 1, what were your experiences in finding suitable employment?

(Please circle one number on each line.)

		My Experience	Not My Experience
a.	The academic institution placement office was very useful in helping me find suitable employment	1	2
b.	The faculty members were very useful in helping me find suitable employment.	1	2
c.	I did not need assistance in finding employment because I already had a job.	1	2
d.	I did not need assistance because I was not seeking a job.	1	2
e.	I needed assistance from the school in finding a job, but I did not ask for it.	1	2
f.	I did not ask for assistance from the school in finding a job because I did not think I needed it.	1	2
g.	I did not ask the school for assistance in finding a job because I was pretty sure it would not be worthwhile.	1	2
h.	I had no difficulty in finding a suitable position.	1	2
i.	Finding a suitable position was moderately difficult.	1	2
j.	I had great difficulty in finding a suitable position.	1	2
k.	In spite of all my efforts, I really did not find what I considered a suitable position.	1	2

7. When you took your current (or latest) job, what were your reasons for taking it rather than some other job?

(Please circle one number on each line.)

		My Reasons	Not My Reasons
a.	It was the kind of job for which I trained.	1	2
b.	It was pretty much the kind of job I was looking for.	1	2
c.	It was pretty much the kind of work I always wished to do.	1	2
d.	I could not get the kind of job I wanted.	1	2
e.	It was the best paying job I could find.	1	2
f.	This job offered a great deal of security	1	2
g.	It was the best job I could find without having to move to another city or state.	1	2
h.	It was the only job I could find.	1	2
i.	I did not have sufficient training to get the job I really wanted.	1	2
j.	This job offered the career growth opportunities that I expected.	1	2

8. How satisfied are you with the following aspects of your current (or latest) job?

(Please circle one number on each line.)

	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied
a. Importance and challenge of this line of work	1	2	3	4
b. Opportunity for promotion and advancement with this employer	1	2	3	4
c. Opportunity for promotion and advancement in this line of work	1	2	3	4
d. Opportunity to use past training and education	1	2	3	4
e. Opportunity to make a positive contribution to occupational safety and health	1	2	3	4
f. Opportunity to participate in the decision-making process	1	2	3	4
g. Opportunity to exercise self-direction	1	2	3	4
h. Opportunity to work as part of a team	1	2	3	4

9. Have you been, or are you currently, enrolled in continuing education or special course offerings that you think contribute substantially to success in your career in occupational safety and health?

(Please circle one.)

Yes 1
No 2

If "yes," please list the general topic(s) covered and the approximate number of hours attended.

_____ ____

_____ ____

10. Do you have a current need for enrollment in a continuing education or a special course in occupational safety and health?

(Please circle one.)

Yes 1
No 2

If "Yes," please indicate the general subject area of the need.

_____

_____

11. How did the program from which you graduated (identified in the box at the top of page 1) relate to your experiences on your current (or latest) job?

(Please circle one number on each line.)

		My Experience		Not My Experience
a.	I am able to apply most of what I learned.	1		2
b.	I would have liked more job-related training before I started work.	1		2
c.	The way the job is done is different from the way I was trained.	1		2
d.	I do not use on the job the tools and equipment I was trained to use.	1		2
e.	I could have gotten my job without the occupational safety and health training.	1		2
f.	I realize I have taken coursework associated with my occupational safety and health training which is not helpful in performing my job.	1		2
g.	Most of what I do on the job I learned to do during my occupational safety and health training.	1		2
h.	I have had to take on-the-job training because of deficiencies in my training	1		2
i.	I have had to take continuing education or special courses because of deficiencies in my training	1		2
j.	I consider going through the occupational safety and health program a wise choice.	1		2
k.	My chances for advancement would be better if I had received my training in a different academic institution.	1		2

12. Please list the <u>four</u> courses in your occupational safety and health program that you feel were the <u>most</u> helpful to you in your duties and responsibilities on your current (or latest) job.

Courses: _____

_____

_____

_____

13. Please list the four courses in your occupational safety and health program that you feel were the least helpful to you in your duties and responsibilities on your current (or latest) job.

Courses: _____

_____

_____

_____

14. Please list four activities that you perform on the job for which you were least prepared by your occupational safety and health program.

Activities: _____

_____

_____

_____

15. If you are not currently working in occupational safety and health, which of the following statements describes your experience since graduating?

(Please circle one number on each line.)

		Applies to me	Does not apply to me
a.	I went back to school and did not look for a job in occupational safety and health.	1	2
b.	I found a better job in another field.	1	2
c.	I looked for a job in occupational safety and health but could not find one.	1	2
d.	There were no suitable jobs in occupational safety and health in the geographical area in which I was looking.	1	2
e.	I had a job in occupational safety and health but decided to leave it for a job in another field.	1	2
f.	I had a job in occupational safety and health but decided not to make occupational safety and health work a career.	1	2
g.	I found a job in occupational safety and health but did not take it because the salary was too low.	1	2
h.	I dropped out of the workforce to pursue other activities.	1	2

16. How important were the following factors to your attending the degree/certification program listed in the box at the top of page 1?

(Please circle one number on each line.)

	Determining Factor	Important	Not Important	Did Not Consider
a.	Cost of attending	1	2	3	4
b.	Amount of financial aid available from program	1	2	3	4
c.	Presence of particular professor(s)	1	2	3	4
d.	General quality of program	1	2	3	4
e.	General reputation of program	1	2	3	4
f.	Program's reputation for research	1	2	3	4
g.	Program's entry requirements	1	2	3	4
h.	Geographic location of institution	1	2	3	4
i.	Proximity to place of employment	1	2	3	4
j.	Proximity to spouse's work/school	1	2	3	4
k.	Willingness of employer to provide financial aid	1	2	3	4

17. Please assess the general quality of your educational experience in the program from which you graduated (identified in the box at the top of p. 1).

(Please circle one number in each line.)

	Excellent	Good	Fair	Poor
a.	The overall content of the program	1	2	3	4
b.	The scientific aspects of the training	1	2	3	4
c.	The research aspects of the training	1	2	3	4
d.	The clinical aspects of the training	1	2	3	4

18. What recommendations would you make for improving the occupational safety and health educational/training in terms of modifications in curriculum (e.g., course additions or deletions) or in other areas?

Please summarize. _____

_____

_____

_____

THANK YOU FOR YOUR ASSISTANCE. PLEASE RETURN THE COMPLETED QUESTIONNAIRE IN THE PROVIDED PRE-STAMPED ENVELOPE.

Appendix C

Proposed Monitoring Systems:
Procedures and Instruments

Appendix C

Proposed Monitoring Systems: Procedures and Instruments

Review Survey Instrument

Because one of the major objectives of the survey of graduates is to produce a standardized core of graduate data, all items in the "standardized survey questionnaire" should be included in the questionnaire used by the ERC. However, the ERC may wish to add additional items. Each ERC should attempt to follow as faithfully as possible the schedule of survey activity as outlined. However, individual ERC differences may necessitate some modification of the described survey procedures.

Select ERC Graduates to be Surveyed

One of the first and most important tasks to be accomplished is identification of the graduates to be surveyed. Graduates with the following characteristics should be identified for inclusion:

-- Graduates currently residing in the U.S.
-- Graduates from the following OSH programs: industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, and occupational medicine.
-- Graduates of academic years 1984-85 and 1985-86.

Obtain Current Mailing Address from ERC Records

Once the graduates have been identified, obtain their current mailing addresses. If a current mailing address is unavailable in the ERC records, university alumni records or professional association membership directories may prove helpful.

Each ERC should prepare a master list of graduates who are to receive questionnaires. The master list should include the graduate's name, address, program area, and year graduated. The master list will serve as an aid in monitoring graduates' response to each phase of the mailing.

Prepare Survey Packet

Photocopy the questionnaire (see attachment) and graduate cover letter (attached copy to be modified by the ERC); prepare and address envelopes to graduates; enter appropriate information at top of page 1 of each questionnaire; prepare self-addressed, stamped return envelopes.

Conduct Initial Mailing

Mail the packet of materials to all 1984-85 and 1985-86 graduates in industrial hygiene, occupational safety, industrial hygiene and safety, occupational health nursing, and occupational medicine. This should be done during the months of October and November 1986. As completed questionnaires are returned, respondents should be identified on the master list of graduates.

Correct Addresses

Mailing addresses of questionnaires identified by the post office as not deliverable should be verified by comparing with the master list, alumni records, or OSH professional association directories. If address correction is obtained, the questionnaire should be remailed.

Follow-Up Nonrespondents

One week after the initial mailing, a thank you/reminder letter (copy attached) should be sent to all graduates.

Using these procedures generally will result in a response rate of 50 percent. To obtain a higher rate of response, the following procedures may be utilized.

One week after mailing the thank you/reminder letter, a second mailing of the questionnaire and cover letter should be made to graduates from whom a completed questionnaire has not been returned.

Ten days after the second questionnaire mailing, a third mailing of the questionnaire and cover letter by certified mail should be sent to graduates who have failed to respond.

Using these procedures generally will increase the response rate to about 80 percent.

Analyze Program-Related Information

Each ERC should analyze the program-specific information as noted in Section VI.C.2 of this report.

Forward Data to NIOSH

(a) After completing the above analysis, all completed questionnaires should be sent to NIOSH (or their designee) for tabulation and analysis of supply/demand data. Questionnaires should be forwarded to NIOSH by February 1, 1987.

(b) Forward to NIOSH either the master list of graduates or information indicating:

-- Number of questionnaires mailed.

-- Number of respondents, by year graduated and program type.

-- Number of graduates residing outside the U.S.

Approximate Timetable of Survey Activities

Identify Center Graduates	First Mailing	Reminder/ Thank You	Second Mailing	Third Mailing	Analyze Program-Related Information	Send Data to NIOSH
on or before Nov. 3	on or before Nov. 10	on or before Nov. 17	on or before Nov. 24	on or before Dec. 3	Dec. 15 through Feb. 1	on or before Feb. 1

Follow-Up Questionnaire for Graduates of Occupational Safety and Health Programs

NAME: _____

ADDRESS: _____

_____

_____

INSTITUTION: _____

PROGRAM AREA: _____

DEGREE RECEIVED _____

YEAR GRADUATED: _____

---

1. Are you currently employed (either full or part time)?

(Please circle one.)

Employed full time 1
Employed part time 2
Not currently employed 3

2. Are you currently enrolled in school (either full or part time)?

(Please circle one.)

In school full time 1
In school part time 2
Not currently enrolled in school 3

If you are currently enrolled in school (either full- or part-time), please provide the following information on the academic program in which you are enrolled:

Institution/school _____

Degree/certificate sought _____

Program concentration _____

3. Are you male, or female?

(Please circle one.)

Male 1
Female 2

4. Please provide the following information about your current or most recent job (regardless of whether or not it involves occupational safety and health work) held since graduating from the program identified in the box at the top of page 1. If you have not been employed since graduation, skip to Q. .

a. Company or organization: Name _____

Address _____

_____

b. Type of employer

(Please circle one.)

Private sector 1
Academic institution 2
Government (military) 3
Government (non-military) 4
Other (Please specify.) _____ . . . 5

c. Total number of employees with this employer at this location.

_____

d. Approximate number of employees with this employer at this location who spend 50 percent or more of their time conducting occupational safety and health related activities. . . . . _____

e. Your job title _____

f. Your approximate starting salary (annual) . . . . $ _____

g. Your approximate ending or current salary (annual) $ _____

h. Approximate employment starting date . . . . . ___/___/___

i. Approximate employment ending date (if not current job)
___/___/___

j. Approximate percentage of time on job spent carrying out occupational safety and health activities . . . . . _____%

k. What are (were) your principal occupational safety and health related activities?

_____

_____

l. How many employees do (did) you supervise? . . . . . _____

5. Upon completion of the academic program identified in the box at the top of page 1, what were your experiences in finding employment?

(Please circle one number on each line.)

		My Experience	Not My Experience
a.	The academic institution placement office was very useful in helping me find suitable employment	1	2
b.	The faculty members were very useful in helping me find suitable employment.	1	2
c.	I did not need assistance in finding employment because I already had a job.	1	2
d.	I did not need assistance because I was not seeking a job.	1	2
e.	I needed assistance from the school in finding a job, but I did not ask for it.	1	2
f.	I did not ask for assistance from the school in finding a job because I did not think I needed it.	1	2
g.	I did not ask the school for assistance in finding a job because I was pretty sure it would not be worthwhile.	1	2

6. Upon completion of the academic program identified in the box at the top of page 1, how much difficulty did you have in finding what you considered to be suitable employment?

(Please circle one.)

a.	I had no difficulty in finding a suitable position.	1
b.	Finding a suitable position was moderately difficult.	2
c.	I had great difficulty in finding a suitable position.	3
d.	In spite of all my efforts, I really did not find what I considered a suitable position.	4
e.	Not applicable because I already had a job.	5
f.	Not applicable because I did not look for a job	6

7. When you took your current (or latest) job, what were your reasons for taking it rather than some other job?

(Please circle one number on each line.)

	My Reasons	Not My Reasons
a. It was the kind of job for which I trained.	1	2
b. I could not get the kind of job I wanted.	1	2
c. It was the best paying job I could find.	1	2
d. This job offered a great deal of security	1	2
e. It was the best job I could find without having to move to another city or state.	1	2
f. It was the only job I could find.	1	2
g. This job offered the career growth opportunities that I expected.	1	2

8. How satisfied are you with the following aspects of your current (or latest) job?

(Please circle one number on each line.)

	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied
a. Importance and challenge of this line of work	1	2	3	4
b. Opportunities for promotion and advancement	1	2	3	4
c. Opportunity to use past training and education	1	2	3	4
d. Opportunity to make a positive contribution to occupational safety and health	1	2	3	4
e. Opportunity to participate in the decision-making process	1	2	3	4
f. Opportunity to exercise self-direction	1	2	3	4
g. Opportunity to work as part of a team	1	2	3	4

9. Do you have a current need for enrollment in a continuing education or a special course in occupational safety and health?

(Please circle one.)

Yes 1
No 2

If "Yes," please indicate the general subject area of the need.

_____

_____

10. How did the program from which you graduated (identified in the box at the top of page 1) relate to your experiences on your current (or latest) job?

(Please circle one number on each line.)

		My Experience		Not My Experience
a.	I am able to apply most of what I learned.	1		2
b.	I would have liked more job-related training before I started work.	1		2
c.	The way the job is done is different from the way I was trained.	1		2
d.	I do not use on the job the tools and equipment I was trained to use.	1		2
e.	I could have gotten my job without the occupational safety and health training.	1		2
f.	I realize most of the coursework associated with my occupational safety and health training is not helpful in performing my job.	1		2
g.	Most of what I do on the job I learned to do during my occupational safety and health training.	1		2
h.	I have had to take on-the-job training because of deficiencies in my training	1		2
i.	I have had to take continuing education or special courses because of deficiencies in my training	1		2
j.	I consider going through the occupational safety and health program a wise choice.	1		2

11. Please list the four courses in your occupational safety and health program that you feel were the most helpful to you in your duties and responsibilities on your current (or latest) job.

Courses: _____

_____

_____

_____

12. Please list the four courses in your occupational safety and health program that you feel were the least helpful to you in your duties and responsibilities on your current (or latest) job.

Courses: _____

_____

_____

_____

13. Please list four activities that you perform on the job for which you were <u>least</u> prepared by your occupational safety and health program.

Activities: _____

_____

_____

_____

14. If you are not currently working in occupational safety and health, which of the following statements describes your experience since graduating?

(Please circle one number on each line.)

		Applies to me	Does not apply to me
a.	I went back to school and did not look for a job in occupational safety and health.	1	2
b.	I found a better job in another field.	1	2
c.	I looked for a job in occupational safety and health but could not find one.	1	2
d.	There were no suitable jobs in occupational safety and health in the geographical area in which I was looking.	1	2
e.	I had a job in occupational safety and health but decided to leave it for a job in another field.	1	2
f.	I had a job in occupational safety and health but decided not to make occupational safety and health work a career.	1	2
g.	I found a job in occupational safety and health but did not take it because the salary was too low.	1	2
h.	I dropped out of the workforce to pursue other activities.	1	2

15. How important were the following factors to your enrolling in the OSH program listed in the box at the top of page 1?

(Please circle one number on each line.)

		Determining Factor	Important	Not Important	Did Not Consider
a.	Cost of attending	1	2	3	4
b.	Amount of financial aid available from program	1	2	3	4
c.	Presence of particular professor(s)	1	2	3	4
d.	General quality of program	1	2	3	4
e.	General reputation of program.	1	2	3	4
f.	Program's reputation for research	1	2	3	4
g.	Program's entry requirements	1	2	3	4
h.	Geographic location of institution	1	2	3	4
i.	Proximity to place of employment	1	2	3	4
j.	Proximity to spouse's work/school	1	2	3	4
k.	Willingness of employer to provide financial aid	1	2	3	4

16. What recommendations would you make for improving the occupational safety and health educational/training in terms of modifications in curriculum (e.g., course additions or deletions) or in other areas?

Please summarize. _____

_____

_____

_____

THANK YOU FOR YOUR ASSISTANCE. PLEASE RETURN THE COMPLETED QUESTIONNAIRE IN THE PROVIDED PRE-STAMPED ENVELOPE.

Cover Letter to ERC Graduates from ERCs

Dear Occupational Safety and Health Graduate:

We need your help!

One measure of the success of an academic program is the degree to which graduates succeed in using what they have learned. The (ERC) collaboration with the 14 other regional Education Resource Centers (ERCs) is conducting a survey of recent graduates from Occuaptional Safety and Health (OSH) academic programs to obtain information that may be used in planning programs that are responsive to the needs of graduates and their employers. You are in a unique position to be helpful in this undertaking, and your assistance will be greatly appreciated.

We need to know, from your present perspective, how you view our academic program and the relationship between it and your present job. This will help us to know what, if any, changes we need to make to better meet the needs of future graduates. We believe the collection of such information regarding OSH training and work also will benefit you as a professional in the field (e.g., by avoiding over-or-under supply of OSH graduates and by maintaining a high standard of professional integrity by ensuring a well-trained workforce) as well as contribute to maintaining a high standard of safety and health in the nation's workplace.

Enclosed is a questionnaire examining various aspects of your academic training, job search, and employment experience. Please complete the questionnaire and return it to (ERC) in the enclosed pre-stamped envelope. After analyzing the program-specific information for use in program planning, the (ERC) will send the questionnaires to (NIOSH or NIOSH designees) for analysis of the supply/demand information. This analysis will allow a national perspective regarding supply and demand for OSH Professionals. If you have any questions, feel free to contact (ERC contact person) at (Telephone #) .

Be assured that the information you provide will be considered confidential and that no personally identifiable information will be released or used in any manner except as noted above.

Thank you for your assistance in this important study.

Sincerely,

(ERC Contact)

THANK/YOU REMINDER

Dear Occupational Safety and Health Graduate:

Thank you for taking part in our recent survey of graduates from occupational safety and health academic programs. Your assistance in this important study will contribute substantially to the planning for occupational safety and health academic programs that are responsive to workplace needs.

If you have already mailed your questionnaire, thank you! If you have not gotten around to it yet, please fill it out and put it in the mail. Your experiences and opinions are critical to the study.

Sincerely,

(ERC Contact Person and Address)

EMPLOYER QUESTIONNAIRE (OCCUPATIONAL HEALTH NURSE PROFESSIONALS)

COMPANY/ORGANIZATION _____

ADDRESS _____

_____

_____

CONTACT PERSON _____ TELEPHONE _____

Please provide the following information about your company/organization.

1. Which of the following best describes the primary business of your company/ organization?

(Please circle one.)

Federal government (military)	1
Federal government (civilian)	2
State or local government (noneducation)	3
Educational services	4
Mining	5
Construction	6
Manufacturing	7
Transportation and public utilities	8
Wholesale or retail trade	9
Other (Please specify.) _____	10

2. What is the total current employment at this location?

(Please enter number.)

_____

3. What was the total number of employees at this location 12 months ago?

(Please enter number.)

_____

4. What is the current number of occupational health nurse professionals at this location? (An occupational health nurse is defined as one who spends 50 percent or more of the time primarily in occupational health nursing.)

(Please enter number.)

_____

NOTE: Questionnaires for employers of industrial hygienists, occupational safety professionals, industrial hygienists and safety professionals, and occupational medicine professionals would be identical to this questionnaire except for the name of the profession in the title and in Items 4-8 and 10-18.

5. What was the number of occupational health nurse professionals at this location 12 months ago?

(Please enter number.)

_____

6. Of these current occupational health nurse professionals, how many graduated from an occupational health nursing academic program since the 1980-81 school year?

(Please enter number.)

_____

7. How many occupational health nurse positions were open at any time during the past 12 months due to creation of new positions or due to employee turnover?

(Please enter number in each column.)

Openings That Resulted From Creation of New Positions	Openings That Resulted From Employee Turnover

8. How many of these openings were filled by transfer/promotion from within the company, how many were filled by hiring outside the company, and how many are still open?

(Please enter number in each column.)

Filled by Transfer/ Promotion	Filled by New Hires	Still Open

9. For each current job opening at this location in the area of occupational health nursing, what is the average length of time that each position has remained vacant?

(Please enter average number of months position[s] has [have] been vacant.)

_____

10. What was your company's/organization's experience during the last 12 months in filling positions in occupational health nursing?

(Please circle one number.)

Not applicable because did not hire during the last 12 months	Was a critical shortage of qualified applicants	Was some shortage of qualified applicants	Was an adequate supply of qualified applicants	Was a surplus of qualified applicants
0	1	2	3	4

11. What is your company's/organization's primary method for identifying candidates for occupational health nurse positions?

(Please circle one.)

Advertise in local newspapers 1
Advertise in regional newspapers/newsletters 2
Advertise in national newspapers/journals 3
Call faculty and staff of academic institutions for their recommendations 4
Send announcements of openings to academic institutions 5
Visit campuses to interview students 6
Visit professional conferences to interview students 7
Other (Please specify.) _____ 8

12. For occupational health nurse professionals, what are your company's degree/education and experience requirements (e.g., degree requirement, in what disciplines, general work experience, occupational safety and health work experience)?

_____

_____

_____

_____

13. For the occupational health nurse professionals hired by your company over the past 12 months, how well has their academic training matched the requirements of the job for which they were hired?

(Please circle one number.)

Excellent Match	Satisfactory Match	Unsatisfactory Match
1	2	3

14. For occupational health nurse professionals currently employed at this location, please summarize any recommendations for changes in education and training that would result in a better match with employer needs. For example, what training areas should be added or strengthened, what should be deleted, what should be modified?

_____

_____

_____

_____

15. What are your company's reasons for hiring a particular individual rather than some other individual to fill an open occupational health nurse position?

(Please circle one number on each line.)

		Our Reasons	Not Our Reasons
a.	They were the only qualified applicant	1	2
b.	They were the most qualified applicant	1	2
c.	They graduated from an excellent school	1	2
d.	Their academic training in occupational safety and health matched our needs	1	2
e.	They had considerable applicable experience	1	2
f.	More-qualified applicants would not accept the position	1	2
g.	They already worked for the company	1	2
h.	They specialized in an area that we consider important	1	2
i.	Their broad range of skills fitted our needs	1	2
j.	They already lived in the area	1	2
k.	Other (Please specify.) _____	1	2

_____

16. To what extent do you think the number of occupational health nursing professionals with your company/organization at this location will change over the next five years

(Please circle one.)

No particular change is anticipated 1

The number will increase by about _____ positions 2
(Please enter estimated number of positions.)

The number will decrease by about _____ positions 3
(Please enter estimated number of positions.)

17. Following are several factors that might affect the number of occupational health nursing professionals employed at this location. For each of these factors (including any that you might add), indicate your assumptions in estimating change in the number of occupational health nursing professionals indicated in Item 16 above.

(Please circle one number in each row.)

	Assumed a Major Increase	Assumed Moderate Increase	Assumed No Significant Change	Assumed Moderate Decrease	Assumed a Major Decrease
The level of grant/contract support	1	2	3	4	5
The demands of the market place	1	2	3	4	5
The general level of the economy	1	2	3	4	5
The requirements for regulation/enforcement	1	2	3	4	5
Availability of facilties or equipment	1	2	3	4	5
Availability of support personnel	1	2	3	4	5
Other (Please specify: _____)	1	2	3	4	5
Other (Please specify: _____)	1	2	3	4	5

18. Of the factors listed in Item 17 above, which ones are particularly critical in determining the number of occupational health nursing professionals at this location over the next five years? Please go back to Item 17 and indicate the critical factors by writing a "1" in front of the factor you consider most critical, a "2" in front of the factor you consider next most critical, etc.

THANK YOU FOR YOUR COOPERATION. PLEASE RETURN THE COMPLETED QUESTIONNAIRE IN THE PROVIDED POSTAGE-PAID ENVELOPE.