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FINAL PERFORMANCE REPORT

for

Midwest Center for Occupational Health and Safety*

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Center Director**

July 1, 1992-June 30, 1997

**Division of Environmental and Occupational Health
School of Public Health
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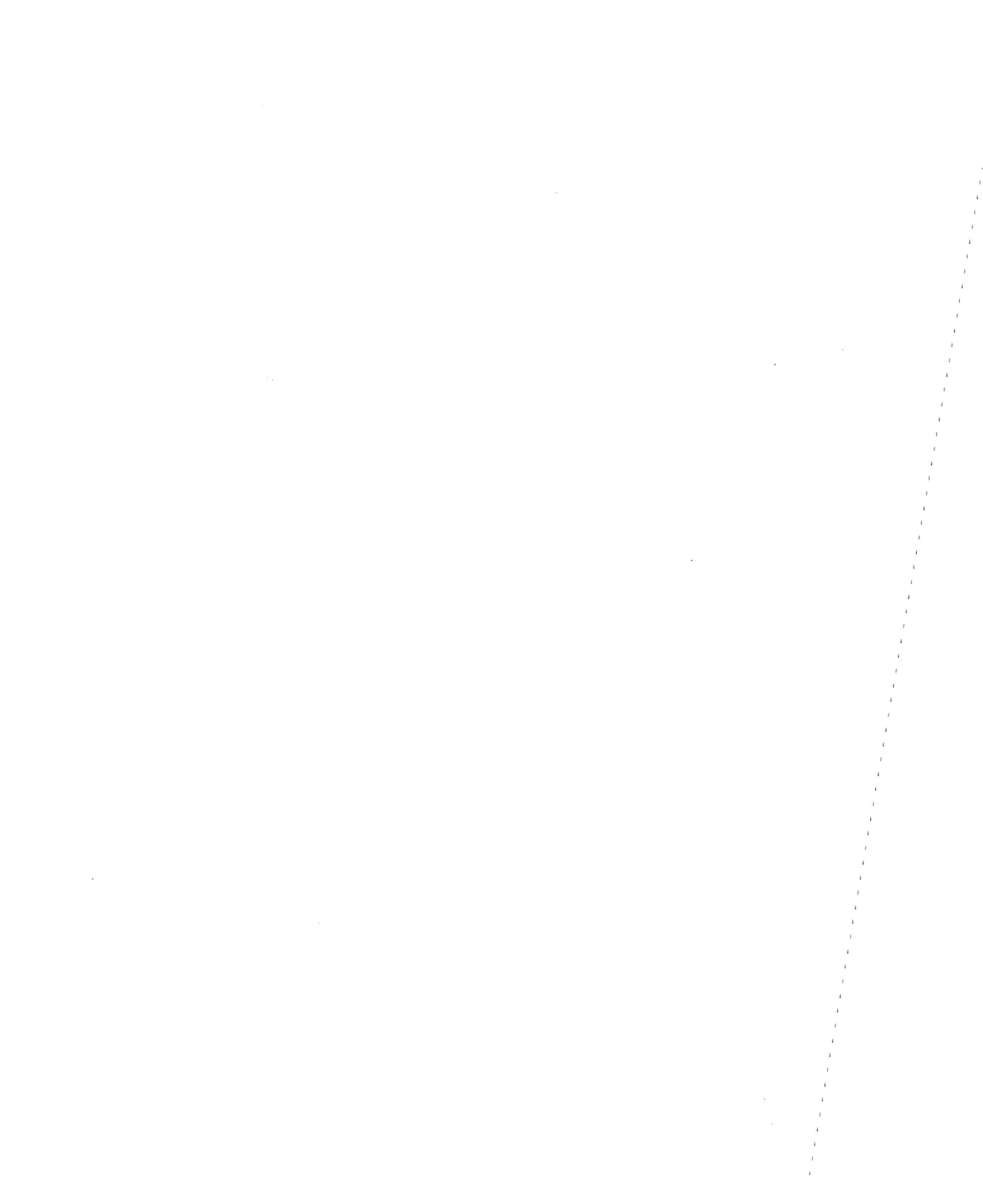
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ABSTRACT

The Midwest Center for Occupational Safety and Health is a NIOSH-funded Educational Resource Center established in 1977 to serve the educational needs of occupational health and safety professionals, workers and the general public throughout the Upper Midwest and Great Plains by providing degree programs, continuing education courses and outreach activities. During the five-year period from July 1, 1992 through June 30, 1997, the Midwest Center continued to offer core programs in industrial hygiene, occupational medicine, and occupational health nursing; developed further the supplementary programs in occupational injury epidemiology and prevention, and agricultural health and safety; initiated an academic training program in hazardous substance management; maintained continuing education efforts in traditional program areas and developed new initiatives in lead abatement and hazardous substance training, and became an OSHA-certified center for delivery of OSHA courses. During this five-year period, a total of 78 new trainees were enrolled of whom 29 received their graduate degrees; a further 38 degrees were awarded to trainees who commenced their programs before July, 1992. The Continuing Education Program offered a total 474 courses that were attended by 12,246 participants. Faculty in each of the Midwest Center's programs continued to provide outreach to other departments of the University, to other educational institutions, voluntary organizations, professional associations, governmental agencies and the general public throughout the region.



MIDWEST CENTER FOR OCCUPATIONAL HEALTH AND SAFETY

I. INTRODUCTION

The mission of the Midwest Center for Occupational Health and Safety (MCOHS) is to serve the educational needs of occupational health and safety professionals, workers, and the general public throughout the Upper Midwest and Great Plains by providing degree programs, continuing education, and outreach activities. The Midwest Center functions as a regional resource for industry; labor; Federal, state and local government agencies; agriculture; professional organizations; and other parties interested in occupational health and safety and the welfare of working people. In addition, the Midwest Center strives to be a focal point for research in occupational health and safety in the Midwest and Great Plains.

II. HISTORICAL BACKGROUND

Instruction relating to industrial health and safety began in the School of Public Health at the University of Minnesota as early as 1944. This instruction was expanded into a full graduate program in 1969 and centered in the Division of Environmental Health. Collaborative arrangements were established between the division and departments in the school and the university, including chemical, environmental and mechanical engineering programs in the Institute of Technology; with programs in the School of Nursing, the Medical School, and the School of Veterinary Medicine.

In response to the announcement by the National Institute for Occupational Safety and Health (NIOSH) of training grants for centers in occupational safety and health, the School of Public Health took the lead in creating the Midwest Center for Occupational Health and Safety and responded successfully to this RFP. The Midwest Center was originally established as a consortium between the University of Minnesota, the University of Iowa, Mayo Clinic, and St Paul Ramsey Medical Center. Over the years, this consortium has contracted to the University of Minnesota and St Paul Ramsey Medical Center.

III. CENTER ADMINISTRATION

The MCOHS is officially located in the Division of Environmental and Occupational Health in the School of Public Health. The center is directed by Dr Ian Greaves, who succeeded Dr Robert O. Mulhausen in 1990. The deputy director since 1977 has been Mr Rexford Singer, who retired in 1996 and was succeeded by Ms Debra Olson; Ms Jeanne Ayers was appointed assistant director for the Center in 1996. The director is responsible for the overall administration, programmatic planning, and the financial management of the center; he is assisted by the deputy and assistant directors who are largely responsible for the day-to-day administration and management of the center. An executive committee, comprising the program directors of each of the principal and supplementary core programs, and an external advisory committee provide important insight and perspective for the direction of the center and its management. The external advisory group is drawn from members of industry, organized labor, academia, professional organizations, and government agencies.

IV. GENERAL ACCOMPLISHMENTS

The Center has continued to offer core professional education programs in industrial hygiene, occupational medicine, and occupational health nursing, as well as supplementary programs in occupational injury epidemiology and control, agricultural safety and health, and hazardous substance academic training. Each program has been evaluated during the recent five-year period and undergone changes. Key changes and developments have included the following.

The industrial hygiene program has been rebuilt in the last five years. Entirely new faculty (Professors Vincent and Brosseau in 1991; Ramachandran in 1995) were recruited and the

program redesigned, moving from a one-year to two-year masters degree program in 1993. Research emphases on aerosol behavior, respiratory protection, and bioaerosols were established and a rapid expansion in students has occurred. The industrial hygiene program was evaluated and approved by the American Board of Engineering Training (ABET) in 1996. The program graduated 32 masters and doctoral students in the last five-year period.

The occupational medicine program was redefined and strengthened under its new director, Dr Bill Lohman (appointed residency director in 1993). The subsequent addition of Drs Samuel Hall, Steven Kirkhorn, and Beth Baker, and the high level of support offered by the St Paul Ramsey Medical Center (and subsequently by Health Partners), have greatly strengthened this program. The residency has focused on clinical competence and applied research, emphasizing repetitive strain injuries, occupational toxicology, and implementation of occupational medicine programs in various settings. The program graduated 13 residents in the last five-year period, and also graduated its first PhD student in 1995.

The occupational health nursing (OHN) program strengthened its relationship with the School of Nursing in 1993 through the development of a dual-degree program [MPH and MS(Nursing)], which has increased the opportunities available to OHN trainees. A doctoral program was added for the OHN track in 1995. There are now four doctoral students enrolled. The program graduated 16 masters students in the last five-year period.

The occupational injury epidemiology and control program has continued to consolidate its strong research-based activities, graduating six masters and doctoral students in the last five-year period.

The agricultural safety and health (ASH) program continued its strong outreach and continuing education efforts, and in 1995 started a new minor program. To date, the ASH program has had three masters students take this minor concentration. A new director of this program, Dr John Shutske, was appointed in 1996, replacing Dr Ian Greaves.

Continuing education efforts have been directed from the Continuing Education Office at St Paul Ramsey Medical Center. The program offered 474 courses in the last five-year period with a total enrollment of 12,246; this is an average of about 95 courses and 2,500 attendees annually, up considerably from an average of 60 courses and 1,500 attendees annually during the previous five-year period.

As in previous years, faculty in each of the Center's programs continued to provide outreach activities by working with faculty and students in other parts of the university, and with numerous colleges and universities in the region. Consultations, lectures, and presentations have been delivered to various professional groups, state agencies, voluntary organizations, safety councils and a host of other formal and informal settings.

The Midwest Center has continued its tradition of serving the needs of the Upper Midwest and Plains States. In the last five years, every program within the Center has been strengthened and has been more productive than in the previous five years.

TABLE 1. TRAINEES ENTERING AND/OR GRADUATING DURING 7/1/92-6/30/97

Program	Trainees Entering 7/1/97-6/30/97				Trainees Entering Prior to 7/1/92		
	Number Entered	Number Graduated	Number Completing Residency	Number with NIOSH Support	Number Graduated	Number Completing Residency	Number with NIOSH Support
Industrial Hygiene	35	14 (2 PhD)	--	29	57 (8 PhD)	--	52
Occupational Health Nursing	24	6	--	24	31	--	42
Occupational Injury Epidemiology and Control (Occupational Injury Prevention and Safety)	7	1	--	6	11 (4 PhD)	--	12
Occupational Medicine							
MPH/Residency	10	8	9	10	8	7	12
MPH Only	--	-	--	--	8	--	--
Residency Only	2	0	2	2	--	2	1
	12	8	11	12	16	9	13
TOTAL	78	29 (2 PhD)	11	71	115	9	119

TABLE 2. CONTINUING EDUCATION PARTICIPANTS (7/1/92-6/30/97)

Program Area	Number of Coursed						Total
		GP & OM Physicians	Occupational Health Nurse	Industrial Hygiene	Safety	Other	
Industrial Hygiene	104	24	78	383	419	1620	2628
Occupational Health Nursing	96	33	853	5	37	364	1388
Occupational Injury Prevention and Safety	122	10	16	81	676	1844	2749
Occupational Medicine	65	821	817	36	78	706	2523
Interdisciplinary	59	251	729	197	384	944	2564
Hazardous Substance Training	29	0	0	8	236	155	428
Grand Total	475	1139	2493	710	1830	5633	12280

V. Center Programs

A. Continuing Education and Outreach

Overview

The Continuing Education (CE) Program of the Midwest Center for Occupational Health and Safety completed its seventeenth year of operation June 30, 1996. National evaluations have described it as an active, energetic program conducting outstanding work. The program has consistently maintained its national reputation, high quality of courses, substantial enrollments, curriculum development, faculty commitment, unique and innovative approaches, and considerable outreach efforts.

With a respected reputation for an ambitious array of courses covering both core general and specialty interests, staff develop innovative educational formats by working with advisory boards and planning committees. A pioneer of unique approaches such as the Annual Occupational Health and Safety Institute and the Annual Occupational Health Nursing Symposium; and new efforts such as the Harvest of Pain video tape series, a Spanish-Language course, and interactive TV broadcast of Agricultural Health and Safety to rural areas; the Program provides a model for assessing and responding to regional educational needs. Innovative teaching methods are employed to encourage critical thinking and skill-building including extensive use of hands-on workshops, simulations, case studies and debate. This constant effort to assess educational needs and serve as a true regional educational resource center has consistently led to impressive attendance figures.

Since 1978, over 31,131 students have enrolled in Continuing Education courses in the Midwest Center (12,128 over the past five years). A majority of students (86%) are from Midwestern states, the Center's service region. The CE program also attracts participants from the entire continental US, Canada, and foreign countries. Currently, the CE Program conducts 80-100 short courses annually

The program has a track record of extensive cooperative working relationships with federal, state, and local agencies, various industries, labor groups and professional organizations. Over the past few years, the network of relationships expanded to include organizations dealing with hazardous substances, agricultural health and safety, lead, and asbestos industries.

The Center's history of outreach to professional associations and other organizations is substantial. They pioneered a unique interdisciplinary effort on Team Approach to Occupational Health and Safety which is now sponsored annually by the four core professional associations, the MN Safety Council and the Midwest Center, resulting in numerous spin-off cooperative efforts. In the last few years the Center has significantly increased outreach efforts to labor groups such as the International Association of Firefighters, United Brotherhood of Carpenters, Minnesota Nurses Association, Minnesota Farmers Union, AFSCME (International and Local units) and Local 70 of the Stationary Operating Engineers.

In 1995 the Program led a new outreach effort entitled the Great Lakes OSHA Training Consortium with the Minnesota Safety Council, the University of Cincinnati, and the OSHA Training Institute. New alliances and outreach efforts were developed with the Alice Hamilton Occupational Health Center, Minnesota Department of Economic Security, the Housing Finance Agency, Minnesota Department of Health, Minnesota Department of Public Safety, Minnesota Department of Commerce, St Paul Fire Department, Cities of Duluth, River Falls, Wisconsin, Workplace Action Team of the Violence Prevention Initiative in Ramsey County, Illinois and Minnesota Community Action Programs, Chippewa Nation, State Legislators, US Department of Agriculture, St Paul Ecumenical Alliance of Congregations (Spanish speaking worker coalition), Minnesota Extension Service, Marshfield Clinic Agricultural Health and Safety Center in Wisconsin, St Paul Technical College, Department of Veteran's Affairs, Minnesota Lung Association and HealthPartners, a major Health Maintenance Organization.

Organization

The Program in Continuing Education is a self-standing program within the Midwest Center Consortium. It has a separate budget and is responsible administratively to the Center Director and programatically to the core directors. Jeanne F. Ayers, the Continuing Education Director, is Assistant Director of the Midwest Center and a member of the Center's Executive Board.

A feature unique to the CE Program is its position in a broader department of Continuing Education and Continuing Medical Education (CME) at St Paul-Ramsey Medical Center. This enables the CE Program to share space, equipment, staff, and other resources. Major investments in computerization made by St Paul-Ramsey Medical Center demonstrate strong institutional support of the Program and the Midwest Center. The CME program provides training to over 9200 physicians annually and is also the vehicle for obtaining AMA category I credit for physician education. The department is a nationally accredited provider of continuing medical education, lending credibility within the medical community.

While the Executive and Advisory Boards of the Center and Core Discipline Focus Groups provide general guidance to CE, the staff use community-based planning committees to develop content, curriculum and publicity strategies for CE courses. The use of individual planning committees for each course expands the organization into a broad network of experts spanning academia, business, industry and government. These committees assist in all facets of program development, promotion, delivery and evaluation resulting in courses having a balanced perspective, definite focus, and community support.

Since 1981 program goals and objectives are guided by the mission statement. With support from NIOSH, the CE Program is a visible outreach link between academic core directors and practicing specialists on a local, regional, and national basis. The mission of the Program in Continuing Education of the Midwest Center is to improve occupational/environmental health and safety through the transmission of knowledge, skill and understanding to those responsible for workplace health and safety.

Staffing

The Midwest Center is unique in the depth and expertise of staff. The Department is committed to maintaining a strong staff including 5 professional and 6 full-time support staff. This team represents extensive managerial, occupational health and safety and educational expertise. The Program has a director, an assistant director, two full-time and one part-time (.8 FTE), education specialists, two full-time program assistants, a marketing assistant/registrar, two secretaries, and an office manager. In addition, there is a designated Continuing Education and Outreach (CEO) person in the occupational health nursing program in the School of Public Health (Debra Olson). The CE Program staff are profiled below:

Jeanne F. Ayers, MPH, RN, is the full-time Director of Continuing Education for the Midwest Center and Continuing Education/CME for St Paul-Ramsey Medical Center. She was recently named Assistant Director of the Midwest Center. Ms Ayers was hired in 1988 and has served the Center for over eight years. She is a graduate of the Occupational Health Nurse Specialist Program (University of Minnesota) and has more than 18 years of experience in consultation, marketing, program development and management of occupational health services for a wide range of industries. She has nine years of experience in adult education, continuing education and needs assessment. She is also recognized as an expert in continuing medical education. Ms Ayers has an appointment as an Adjunct Instructor in the University of Minnesota School of Public Health. Ms Ayers' community contacts, breadth of experience with a wide range of industries, managerial experience and administrative expertise have enhanced and strengthened the CE Program.

Professional staff include: *Mary Hoepfner MS, EdD, RN*, who serves as Assistant Director. *Susan Larson, MPH, RN* who is an Education Specialist for the CE Program and is a graduate of the Occupational Health Nursing Specialist Program (University of Minnesota), *Susan Miller, MPH, RN*, is an Education Specialist and a graduate of the Occupational Health Nursing Specialist program (University of Minnesota), *Kevin Randolph, BS, MS* also serves as an Education Specialist and holds a

MS degree with a specialization in industrial hygiene and hazardous substances management at the University of Minnesota.

During the past five-year funding cycle the CE Program of the Midwest Center continued to enjoy the involvement and commitment of the core program directors and other related faculty from the School of Public Health. Faculty may be included at any or all of these different levels: as members of planning committees; as instructors in courses; or as members of advisory or focus groups. A particularly fine example of faculty commitment is found in the Annual Occupational Health and Safety Institute during which virtually every faculty member is directly or indirectly involved.

School of Public Health Faculty represent a broad range of experience, interest and skill. This range is further broadened through the use of adjunct faculty (with appointments in Public Health) and community professionals in the delivery of CE courses. In this manner, course content can be expanded to areas outside a particular Public Health Faculty's expertise. As the curriculum is broadened, so too are the core programs, the core faculty, and the students in their programs. Over 200 professionals are involved in planning, curriculum development and as instructors. These faculty represent practicing professionals not only in the traditional fields of occupational health and safety but also in over 30 subspecialties. This reciprocity between the school and the community, facilitated by CE, has been a gratifying result of the ERC concept. Course evaluation data consistently supports this approach as an unique strength of the Midwest Center's CE Program.

Progress on Goals

The program set goals in five areas, curriculum development and planned growth, delivery of course offerings throughout the region, course evaluation and instructional methods, development and improvement of instructional materials, and exploring and developing outreach activities. The program has long been a leader in implementing unique and innovative approaches to continuing education and outreach. This tradition continues this 5 year period with the CE Program embarking on new educational initiatives, new training methods and implementing research and quality improvement efforts. The following summary highlights activities of the Program which cut across all of these goals.

- **Educational initiatives and outreach**

The program, unique in its involvement in a number of training initiatives, holds two additional NIOSH grants; one in Hazardous Substance Training for professionals and state, local and federal personnel; one in Agricultural Health and Safety. The national ERC Schedule and needs assessment report are produced annually by this center. In 1995, the center planned and implemented the Annual HST/HSAT Grantees Workshop and recently was selected to participate in a NIOSH evaluation study of HST training programs to field test a program evaluation template. The center is an NIEHS grantee with the Midwest Consortium for Hazardous Waste Worker Training. In 1992, the US EPA designated the Midwest Center as a *Regional Lead Training Center*. In October, 1994 the Program received a grant from the EPA to train communities of color and economically disadvantaged communities on the hazards of working with lead paint. In 1995, the center assumed the lead role in development of the Great Lakes OSHA Training Consortium that was selected subsequently to be a Region V OSHA Training Center.

The courses Agricultural Medicine: Caring for Farm Families, Occupational Health Nursing Theory and Practice, Municipal Emergency Response, Hazardous Waste Site Worker, Technician Level Oil Spill Response, Bloodborne Pathogens in the Workplace and Laboratory Safety have been taken out of the twin cities metropolitan area during this reporting period. A distance learning course was offered in Agricultural Health and Safety to remote locations in Duluth and Crookston Minnesota through interactive TV with financial support from Minnesota Extension Service. We hope to be able to continue to use this learning medium. A HomePage was set up to provide information about the Center's services and to provide linkages to NIOSH and other occupational and public health agencies.

- **Training methods and formats**

The program implemented innovative formats to meet a variety of learning needs identified through needs assessments. Assessments demonstrated occupational health and safety professionals'

learning needs were individualized and grounded in the need for practical application. Additionally, data indicated increasing need for fiscal restraint from industry and healthcare organizations. The Center responded by developing innovative formats for programming. The Annual Occupational Health and Safety Institute, the first such institute established nationally, offers courses for both graduate and continuing education credit and remains a popular and successful venture. The Nursing Symposium is also a unique and successful response. The Symposium offers broad-based introductory as well as advanced courses. In depth, five-day courses are available as well as half-day or single day programs, allowing courses to be offered which would have prohibitively low enrollment if held independently. A number of course topics are successfully presented for very low enrollment groups through this unique modular design, which is reflected in one week, two weeks, day time or evening schedules for the Institute. It is also apparent in the offering of the early morning breakfast series, which has been attended over the last five years by an annual average of 400 health and safety professionals. Affording these learners opportunity to dialogue with national leaders about emerging trends and areas of concern, this series is an innovative, valued aspect of the Institute. Feedback from those who attend these courses reflect their appreciation of the tailored approach offered by the program.

The program consciously resolved to improve training methods and curriculum. Staffing the center with a team of specialists in education and occupational health and safety makes this possible. These professionals attend each course offering as expert evaluators, support development of a learning environment, and identify alternative teaching methodologies. An emphasis is placed on methods encouraging skill building and problem based learning. Hands on learning, simulations, role play, case studies, and point/counter point presentations of controversies in care foster dialogue and reflective action. Industrial hygiene monitoring equipment and personal protective equipment is used at all courses where appropriate to the content. The commitment to hands-on learning carries over into courses such as Spirometry and Hearing Conservation. Student evaluations repeatedly reflect the unique opportunity presented to use a variety of equipment in an environment supportive to learning.

- **Quality improvement**

The Midwest Center is deeply committed to quality in the training experienced by learners. This commitment led to the implementation in 1993 of a Continuous Quality Improvement Program (CQI) which integrates participant feedback, on site evaluation by the center's professional staff, and the experience and observations of the content experts teaching in the programs. Using these evaluation strategies, and implementing individualized consultation with faculty, 75 percent of the faculty who had a demonstrated opportunity for improvement in teaching either maintained or improved the quality of instruction offered.

The program's dedication to quality and assuring that offerings are relevant to audience need is demonstrated through accreditation of each course by the appropriate boards or professional societies including, ABIH, CSP, AAOHN and AMA Category I, as well as pertinent specialty societies. A formal process of internal auditing has been implemented to insure all necessary documentation is in place. The extensive recordkeeping system allows for systematic evaluation of courses and programs and lays the groundwork for the Continuous Quality Improvement program that was implemented in 1993.

Testament to the quality of the educational programming is the successful application to the Accreditation Council for Continuing Medical Education (ACCME) as a sponsor of continuing medical education. The accreditation process requires extensive program review, oversight and peer review with accreditation team site visits. The CE/CME Program was re-accredited in June, 1995 for a period of four years. Maintaining accreditation as an ACCME provider of AMA category I credits is an innovative way of establishing and maintaining credibility as a medical education provider for physicians. The program is unique in this approach among NIOSH Educational Resource Centers.

- **Needs assessment**

The Midwest Center Program in Continuing Education uses multiple methods to assess educational needs of the region. Needs assessments consistently demonstrate the diversity in practice settings and educational needs of practitioners regionally and nationally. Occupational health and safety profes-

sionals entering the field, practitioners planning to become certified, and those with expanding responsibilities see the Midwest Center as a reliable, consistent training provider. Needs for advanced and specialized courses are identified on a regular basis, and the Midwest Center is a pioneer in its efforts and commitment to address these needs.

- **Content and Course Statistics**

The CE program has successfully conducted 80-100 courses annually. These courses are based on results obtained from course evaluations; needs assessments; national occupational and public health priorities such as Healthy People 2000, NIOSH's National Occupational Research Agenda, NIOSH's Top 10 Priorities and OSHA's priority areas; and by keeping abreast of new laws and regulations. Annual attendance figures (approximately 2400) have historically exceeded both the NIOSH target of 400 trainees and the program's target of 1,200-1,700.

During the five year reporting period July 1, 1992- June 30, 1997, the CE Program conducted, either directly or through co-sponsorship, 475 open enrollment and contract courses, with a total enrollment of 12,128. The majority of students (86%) are from Midwestern states, the Center's service region. However participants also come from every state in the Union and from foreign countries such as Thailand, Jamaica, Arabia, Japan, Bermuda, Korea, Malaysia, Iran, Italy, Panama, Philippines, England and Puerto Rico.

The Midwest Center has traditionally offered courses in each core discipline as well as offering a broad spectrum of interdisciplinary courses. The specialty distribution can be found in Table 2.

Most programs were marketed regionally and nationally. The geographic distribution illustrates that participants were willing to travel to obtain quality educational programming that might be unavailable in their region.

- **Types of courses**

Continuing education courses are targeted toward needs of occupational medicine physicians, family practice physicians, other primary care physicians, occupational health nurses, industrial hygienists, safety professionals, local, state and federal environmental health and safety personnel, and labor and management personnel.

As the occupational health and safety community has matured and diversified so has the Center's long-standing commitment to multidisciplinary and multilevel training. Programs cover a wide spectrum of interests and levels, including:

- Introductory or overview courses in core disciplines for professionals new to the field.
- Interdisciplinary courses for audiences of labor and management personnel, insurance representatives, rehabilitation consultants, and others dealing with workplace problems which cannot be solved by any single discipline.
- Industry specific courses for audiences traditionally not connected to the occupational health and safety field (i.e. health care organizations, construction companies and agricultural organizations). In some cases, "custom designed" contract courses are provided.
- Hazard-specific courses are based on regional need. These courses create the opportunity to develop a series of hazard specific courses with special target audiences. The resulting in-depth expertise and expanded community contacts increases the reputation and strength of the Center. Hazard-specific courses target 1 or 2 core disciplines and simultaneously reach new audiences. An example of this is the program on blood borne pathogens which met training needs for occupational health physicians, nurses and safety professionals, and reached out to new audiences of morticians, emergency services and residential care providers. Other hazard specific programs include occupational infectious diseases, lead paint, asbestos and hazardous materials.

- The Center offers advanced programs as a resource to experienced practicing professionals. Examples of efforts at this level include The Occupational Health and Safety Breakfast Series, Fitness for Duty and Advanced Medical Case Management courses, Industrial Hygiene Update, Advanced Topics in Occupational Health Nursing Management, Trainer courses in Safety for General Industry and Construction Industry, policy and regulatory updates, and incorporation of nationally recognized speakers into regional offerings.
- Annual Review and Update Courses. The Midwest Center offers courses that serve as reviews or updates for occupational health and safety professionals, including the Annual Occupational Medicine Update, Annual Occupational Health Nursing Review, and Comprehensive Industrial Hygiene Review Course
- Annual Occupational Health and Safety Institute. The Continuing Education Program has for 13 years conducted this unique Institute. Courses are offered for graduate level academic or continuing education credit. This Institute offers twelve to eighteen individual courses one and two week in length to students across the United States and foreign countries. These courses target practicing professionals in the four core disciplines needing certification or advanced specialty courses and students entering the field requiring basic or introductory information. The Institute provides an excellent opportunity for cross-fertilization of course content and ideas between disciplines through an interdisciplinary set of course offerings.
- The Occupational Health & Safety Breakfast Series occurs in conjunction with the Occupational Health & Safety Institute. This interdisciplinary breakfast series is redeveloped annually to respond to the latest concerns and needs of the occupational health and safety community. International, national or local experts are invited to make presentations at a series of four to six breakfast seminars taking place during the two-week Institute. These sessions are offered to an audience of occupational health and safety professionals representing a broad array of industries, labor groups and agencies. The series provides a unique opportunity to meet face-to-face with policy makers, researchers and professionals of national stature in the occupational and environmental health field.
- Annual Occupational Health Nursing Symposium -- Specifically tailored to occupational health nursing professionals it was the first such offering of its kind in the nation. During the Symposium, a variety of courses are presented which complement each other. This cluster of programs provides an intensive and exciting opportunity for exchange of information between peers throughout the US. Needs assessments of the occupational health nurses in the region have indicated a diverse range of educational needs, which is reflected in the combination of broad-based introductory courses and advanced courses are offered. In-depth 5 day courses as well as 1/2 day and 1 day programs have been developed.
- Hazardous Substances Training Program -- NIOSH-sponsored hazardous substance training courses offered during this 5 year period include: 13 offerings of the 24 Hour; 8 offerings of the 40 hour Health and Safety for Hazardous Waste Site Workers; 12 offerings of the Hazardous Waste Site 8 hour Refresher; 3 offerings of a new Emergency Response Technician (Special) course and a course on the Chemistry of Hazardous Waste.
- Asbestos Abatement Training Program -- This program, initiated in 1988, offers an array of 10 courses ranging from professional courses to abatement courses for workers and contractors. Initial and refresher training courses are EPA accredited and Minnesota-approved where applicable.
- Lead Training Program -- The Center has developed initial and refresher training programs in Lead Inspection, as well as courses for Risk Assessor, Supervisor/Contractors and Workers. Varying in length from one to four days, these EPA model courses cover sources of lead, lead health effects and medical monitoring, worker protection, protective clothing, state and federal regulations, inspection procedures, site safety, and lead inspection and abatement techniques. Specific emphasis is placed on supervision and engineering controls as recommended by NIOSH in Health Hazard Evaluations. During

this five year period, 1,375 persons attended courses offered as part of this series, including one course conducted in Spanish.

Outreach

In addition to the outreach efforts described above in the hazardous substance and agricultural health and safety areas and the center's work as the lead agency with the Great Lakes OSHA Training Consortium, the center works cooperatively with federal, state, and local agencies, various industries, labor groups and professional organizations. The center increased outreach efforts to labor groups (International Association of Firefighters, United Brotherhood of Carpenters, Minnesota Nurses Association, Minnesota Farmers Union, AFSCME [International and Local units], Local 70 of the Stationary Operating Engineers). Alliances were developed with the Alice Hamilton Occupational Health Center, Minnesota Department of Economic Security, Housing Finance Agency, Minnesota Department of Health, Minnesota Department of Public Safety, Minnesota Department of Commerce, St. Paul Fire Department, Cities of Duluth and River Falls, Wisconsin, Ramsey County, Illinois and Minnesota Community Action Programs, Chippewa Nation, State Legislators, US Department of Agriculture, St. Paul Ecumenical Alliance of Congregations (Spanish speaking worker coalition), Minnesota Extension Service, Marshfield Clinic Agricultural Health and Safety Center in Wisconsin, St. Paul Technical College, Department of Veteran's Affairs, Minnesota Lung Association and HealthPartners, a major Health Maintenance Organization.

The Center, with the University of Cincinnati, University of Illinois at Chicago, the Cleveland, Ohio Health Department, and AFSCME, form the Great Lakes Regional Lead Training Center, a U.S. Regional Lead Training Center for Region V. An agreement with the Minnesota Department of Health to provide Lead Inspector Training to Community Health Service Agency personnel and the Minnesota Department of Jobs and Training (DJT) led to lead training courses for these groups. The Center hosted Minnesota Housing Finance Agency training for Swab Teams as part of Minnesota's HUD-financed lead abatement program. A grantee from the EPA to train Illinois and Minnesota communities of color/economically disadvantaged communities on the hazards of lead paint, the Center worked with the Alice Hamilton Center to conduct a Spanish-language Lead Worker course. Relationships were established with the Minnesota and Illinois Community Action Alliances and the Minnesota Ecumenical Alliance of Congregations. A grant extension expanded this effort to students in construction and painting trades and union apprenticeship programs via collaboration with the St. Paul Technical College. This extension also allows previous trainees from communities of color/economically disadvantaged communities to advance or maintain their skills.

The center works with professional associations representing the four core disciplines. Staff served on committees and the board of the Minnesota Association of Occupational Health Nurses (MAOHN) and are members of AIHA (American Industrial Hygiene Association) and ASSE (American Society of Safety Engineers). Jointly sponsored receptions are held with AIHA, MAOHN, and the North Central Chapter of the American Occupational and Environmental Medicine Association (NCOEMA) at national conferences. The Occupational Health and Safety Team Meeting is co-sponsored by the Center, NCOEMA, MAOHN, local sections of AIHA and ASSE, and the Minnesota Safety Council. The Midwest Center exhibited at local and national conferences such as MAOHN, AOHC and AIHC and co-sponsored Keys to Empowerment: Practical Legislative and Regulatory Strategies Conference with MAOHN.

Midwest Center staff are members of the Ramsey County Workplace Action Team, a nationally recognized effort to stop workplace violence that is part of a broad community-wide initiative.

Jeanne Ayers and Susan Larson worked with the Department of Veterans Affairs at the Minneapolis Regional Medical Education Center (RMEC) to develop occupational health programs in four medical sites and to assist them in developing an assessment tool.

Through internships, a graduate student in the U of M School of Public Health Occupational Health Nursing Program participated in needs assessment, curriculum and program development, and implementation. The Outreach Coordinator for Minnesota OSHA; a graduate student at the University of St Thomas; reviewed needs assessment data, coordinated a focus group, and developed a teaching plan integrating interactive teaching methodologies and embedded evaluation techniques for a Train the Trainer course.

The Center produces the NIOSH catalog, which facilitates a national needs assessment. The Center publishes its own catalog and mails it to a list of 15,000 organizations/individuals.

Continuing medical education courses reach over 9,200 physicians annually. Many incorporate content specific to infection control and injury prevention. Courses such as Agricultural Medicine, Environmental Medicine, Workers Compensation, Pathogens, and an Overview of Tuberculosis offer information updates on health issues.

In 1996, the Center launched its HomePage on the Internet, informing net browsers of courses available through the Center, and providing linkages to other venues for Occupational Health and Safety such as NIOSH, NIEHS and OSHA. Information about graduate and undergraduate programs at the University of Minnesota was included, as well as information about continuing medical education.

Conclusion

The Midwest Center has clearly demonstrated the ability to produce high quality educational and outreach programs and the need for this type of training is apparent from enrollment statistics. This need is further documented through the needs assessment tools the program has consistently utilized. The Center is committed to continue to provide a diverse selection of short courses to respond to the wide range of needs of the occupational health and safety community.

A.i. Hazardous Substances Training Program

Overview

The Continuing Education Program of the Midwest Center has conducted training in hazardous substances since 1984. Hazardous Substance Training (HST) efforts were further enhanced through a NIOSH HST grant award beginning in 1988. Over the past 5 years, the program has trained a total of 797 individuals through 41 courses designed to promote the health and safety of those working with hazardous materials. Targeted within the grant efforts have been public sector employees and others engaged in the management of hazardous materials. Under this grant, NIOSH tuition support funds have been used to subsidize the training for 245 state and local health and environmental agency personnel during this 5 year period.

Staff

Fay M. Thompson, PhD, Assistant Professor of Environmental and Occupational Health and Director of Environmental Health and Safety, University of Minnesota, is the Technical Director for this program. The Project Director is Jeanne Ayers, MPH, RN, Director of Continuing Education for the Midwest Center and Adjunct Instructor, School of Public Health, University of Minnesota. The program coordinator on this project is Susan Larson, MPH, RN, who serves as an Education Specialist within the Midwest Center. An advisory group comprised of representatives from business, governmental agencies and academic institutions with expertise in hazardous substance operations, provide guidance related to program direction. Course faculty contribute both practical experience and training expertise to the classroom and field exercise opportunities offered by the Center.

Progress on Goals

Annual course and program goals have been directed toward meeting the identified needs of the target audience within the region through high quality educational opportunities and outreach.

The HST training offered during this period included 8 hour refresher, 24 hour and 40 hour courses designed to meet the OSHA training requirements under 1910.120 as well as other programs created in response to identified needs. The Center employed a multi-method approach in the assessment of training needs that included: a regional key informant telephone survey, polling of attendees, advisory group input, mail survey, faculty and planning committee input, ongoing discussion with key informants, and telephone and written requests. Based on an identified need, the Midwest Center, in cooperation with the Emergency response commission of the Minnesota Department of Public Safety, sponsored an Emergency Response Leadership Workshop in August of 1993. Over 40 individuals from state agencies involved in chemical emergency preparedness, fire and emergency response units, consulting firms and industrial facilities were in attendance. In June of 1997, a new course on the chemistry of hazardous materials was piloted based on a need identified in large part through discussion with past participants of required regulatory courses.

In addition to open-enrollment courses, the Center is able to provide contract training designed to meet the training needs of the specific contracting group. Five HST contract courses have been conducted under this NIOSH grant since 1992. Courses offered within a related but separate program of the Midwest Center, the NIEHS-sponsored Hazardous Waste Worker Training Grant, further facilitated the Center's ability to meet a wide array of training needs.

The Center has dedicated considerable energy to the development of educational programming evaluation strategies. Goals related to program quality have been addressed through a variety of means including specific course evaluation by the participants, informal feedback from participants and faculty, course planning committee meetings, and on-site coordination and evaluation by Education Specialists. In 1993, a Continuous Quality Improvement Program was implemented with well-defined program improvement criteria. A new evaluation process, implemented in 1996 through work with the University of Kentucky Behavioral Research Aspects of Safety and Health (BRASH) Group, consists of three short questionnaires. The first questionnaire was completed by all participants at the beginning of the course to determine the individuals' work roles and course

expectations. Participants completed a second, parallel form at the end of the course soliciting feedback on how well the course met their expectations. A third form was mailed to participants and completed 2-3 months following course completion to assess their judgment of the job-related value or impact of the course. This approach promises to be a valuable addition to the existing evaluation processes. In addition, other aspects of a more comprehensive evaluation template have been integrated into existing programming..

Important ties with a number of agencies and organizations have been supported as a result of the Center's outreach, training and planning efforts throughout the last 5 years. Representatives of state agencies have been involved with the program at the advisory, planning and faculty levels. The Center worked with a number of local and state government groups in providing contract courses tailored to meet organization-specific needs. The Midwest Center developed and coordinated the 1995 Annual NIOSH Hazardous Substance Training Meeting in California, working with representatives from NIOSH, the Educational Resource Centers, OSHA, EPA, ATSDR, DOE, NIEHS in the planning process.

Conclusion

The Midwest Center is committed to providing high quality hazardous substance training based on identified needs. To this end, the Center will continue to work collaboratively with representatives of the target audience and to utilize a variety of approaches in program planning, implementation and evaluation.

B. Industrial Hygiene Core Program

Overview

Industrial hygienists represent an important professional group that anticipates, recognizes, evaluates and controls environmental hazards in a wide variety of workplace and environmental settings. Their education links the basic science and engineering disciplines with those of medicine and public health in a unique way. Through discussion with alumni, members of the Industrial Hygiene Advisory Forum (see below) and employers, we have come to appreciate that the preparation of modern Masters' and Doctoral level industrial hygienists requires increasing depth and breadth, coupled with a strong component of hands-on, "real-world" problem solving. So our primary goal has been the development of a Program which provides graduates who can bring the required knowledge and expertise to the field, and exert the necessary leadership with authority and poise. The Industrial Hygiene Program encompasses all students of industrial hygiene, including those interested in the comprehensive general study of the subject as well as those interested specifically in hazardous substances. For the latter, there exists a Hazardous Substances Sub-Program within the Industrial Hygiene Program, and this emphasis is funded and led separately.

There has continued to be a great need for new professional practitioners in industrial hygiene, both regionally and nationally. This is evidenced by the continuing demand reflected by the numbers of job opportunities listed at the annual American Industrial Hygiene Conference and Exposition (AIHCE) and by the numbers of direct requests to our program seeking well-qualified applicants for industrial hygiene positions in industry, government and academe. So a major part of the Industrial Hygiene Program has been aimed primarily at the education and training of professional industrial hygienists at the Masters' level, MS or MPH. Many of our graduates have gone on further to qualify as Certified Industrial Hygienists (CIH). Indeed, one recent student had already achieved this certification prior to entry into the program, and another had qualified as a Certified Safety Professional (CSP) prior to entry and has since achieved the CIH prior to re-admission as a Doctoral student.

In addition to the Masters-level training, the need has continued for appropriately-trained industrial hygiene researchers at the Doctoral level (PhD), and this aspect of the Program has been enhanced greatly during the past five years, with the development of a strong and diverse research agenda and the successful graduation of a number of PhDs.

In response to the continuing demand for advanced industrial hygiene specialists, the decision was made in 1990, jointly by the Division of Environmental and Occupational Health and the School of Public Health, to invest heavily in the Industrial Hygiene Program by recruiting new faculty and providing the necessary resources. Aided by these enhanced faculty resources, industrial hygiene training at the Masters level has evolved during the past five years from the original one-year curriculum (45 required course work credits) to one of fully two years (a minimum of 70 required course work credits plus practicum and research project). The students admitted in Fall 1995 were the first to embark on the new expanded curriculum. The new curriculum, with its strong emphasis on science, enables students to engage in a program of study that fully encompasses the range of important, multidisciplinary topics central to industrial hygiene.

This systematic development of the new program over the past five years was carried out with the strong support and guidance of the Industrial Hygiene Advisory Forum, a group of distinguished local industrial hygienists which was assembled to provide ongoing critical, yet constructive, appraisal of the program's progress. Accreditation of the industrial hygiene program by the American Board for Engineering and Technology (ABET) was applied for in 1995 and granted at the first attempt.

Faculty

During the major part of the five-year period of this report, the main effort in the Industrial Hygiene Program has been provided by four faculty. These have included *Professor James H. Vincent, PhD, DSc* (Director of the Industrial Hygiene Program) and *Assistant Professor Lisa Brosseau, ScD, CIH*, both of whom arrived early in 1991 following the decision to invest in the Program. The industrial hygiene faculty also included *Professor Donald E. Barber, PhD, CHP, CSP* and *Assistant Professor Gurumurthy Ramachandran, PhD*. Of these, Dr Ramachandran was recruited in 1994. Dr. Barber

retired in December 1996 and a search is currently under way to replace him. These faculty are responsible for the core industrial hygiene courses .

The program has a strong group of active adjunct faculty who have made substantial commitments to academic training. *Adjunct Assistant Professor Charles E. McJilton, PhD, CIH* is a former full-time faculty member who now works outside the University as an industrial hygiene consultant. His role continues to be important in parts of the main industrial program of coursework, the advising of students, helping with practicum experiences, and providing an invaluable source of local information and contacts. *Adjunct Assistant Professor John R. Mulhausen, PhD, CIH*, a former graduate of the industrial hygiene program and now a prominent member of the industrial hygiene staff of the 3M Corporation, plays a similar role and, during recent years, has substantially expanded his role in Continuing Education. *Adjunct Assistant Professor Gary Olmstead, PhD, CSP, CIH* brings his extensive experience as Director of Health and Safety at General Mills to his teaching of the required course on occupational safety. *Adjunct Assistant Professor Fay Thompson, PhD, CIH* is Director of the University's Department of Environmental Health and Safety, and has been a key participant in the required courses on hazardous materials. In addition, contact with several of her staff has provided excellent opportunities for our students to obtain practical industrial hygiene experience in their research and project work. *Adjunct Professor W. Dixon Ward, PhD*, having recently retired from the Department of Otolaryngology, taught an important course on noise in the workplace. Sadly, Dr. Ward passed away in December 1996.

Many other faculty play important roles in the Environmental Health Major and hence in the teaching of industrial hygiene students. A few key contributions are mentioned. *Associate Professor Jan A. Greaves, MD* is Director of the ERC, and has interacted directly with industrial hygiene students in several interdisciplinary courses. All students in the Environmental Health major, including the industrial hygiene students, are required to take the 3-credit introductory course in toxicology taught by *Assistant Professor Elizabeth E. Wattenberg, PhD*. *Associate Professor Deborah Swackhamer, PhD*, in combination with *Professor Peter McMurry, PhD* from the Department of Mechanical Engineering, teach the required course on air pollution, as well as the recommended course work on environmental chemistry. *Professor Donald Vesley, PhD* provides the required course on general environmental health as well as courses in environmental microbiology and biological safety which many industrial hygiene students have taken as electives. He has worked closely with industrial hygiene students (at both the Masters' and Doctoral levels) on several projects where there has been a microbiological component. *Instructor Debra Olson, RN, MPH* teaches the important required course which deals with field problems in occupational health and which brings together students from the individual occupational health areas. *Professor Ken Sexton, ScD*, teaches required and elective courses in health risk assessment and environmental health policy. *Professor Jack Mandel, PhD* and *Assistant Professor George Maldonado, PhD* provide elective coursework in occupational epidemiology. *Associate Professor Susan G. Gerberich, PhD* teaches elective courses in injury epidemiology and prevention.

Strong links have been forged between the Industrial Hygiene Program and the Department of Mechanical Engineering during the past five years. *Professors Benjamin Y.H. Liu, PhD, Virgil A. Marple, PhD, Peter H. McMurry, PhD, David Y.H. Pui, PhD* and *Thomas H. Kuehn, PhD* have offered courses on particle technology, air pollution and air measurement within the Department of Mechanical Engineering which have been either required (as in air pollution) or recommended as electives to industrial hygiene students. The interaction with Mechanical Engineering has been particularly fruitful in providing excellent opportunities for our faculty and students to collaborate in engineering-related teaching and research. For example, one graduate student registered in Mechanical Engineering completed his PhD research in the Industrial Hygiene Laboratory under Dr Vincent's guidance in 1994, two others similarly completed their Masters research in 1995, and one more in 1996. The presence of such engineering students in the Industrial Hygiene Laboratory has been extremely beneficial to students registered in the Industrial Hygiene Program. While Dr Vincent has sat on numerous examination committees for graduate students in Mechanical Engineering and contributed to courses in that department, faculty of the Department of Mechanical Engineering have appeared with equal regularity on the examination committees of our industrial hygiene students. Similar links have been forged with faculty in other departments, including *Professor Kevin Janni, PhD*, *Associate Professor John Schutzke, PhD* and *Associate Professor Larry Jacobsen, PhD* in Agricultural Engineering.

Progress on Goals

The first objective has been the development of the industrial hygiene training program. Towards the end of the previous reporting period, the need was identified to develop an extended curriculum commensurate with the changing requirements of industrial practice and the industrial hygiene profession. This in turn highlighted the need for greater breadth as well as depth, together with an enhanced outside component reflecting the practice of industrial hygiene in the real world. The outcome was a revised program of Masters-level training which increased in duration and scope from one originally comprising a one-year program requiring a minimum of 45 quarter course credits to one now comprising a two-year program requiring a minimum of 70 quarter course credits (plus practicum and project work). The program has evolved accordingly during the past five years, and the students admitted in Fall 1995 were the first to embark upon the full new program of training.

The overall goal in developing the new industrial hygiene program has been to provide a source of well-qualified, well-rounded professional industrial hygienists to meet the continuing needs of industry and society, both in the region served by the program and nationally. The specific objectives have been: (a) to recruit applicants with strong backgrounds in the sciences or engineering and who display the motivation and potential to become outstanding professional practitioners and leaders in the field of industrial hygiene; (b) to provide a program containing an academic curriculum which addresses in breadth and depth the essential scientific elements in the multidisciplinary field of industrial hygiene while maintaining a strong emphasis on practical applications in the real world; (c) to provide opportunities for project and research work which enables students to develop their investigative skills; (d) to provide opportunities for communication and dissemination of industrial hygiene-related information through both the written and the spoken word; and (e) to ensure that the academic curriculum and research are complemented by meaningful practical experience in the professional industrial hygiene setting. These objectives are achieved through multidisciplinary course work which covers in depth the major scientific areas of importance to industrial hygiene, dealing with the nature, effects, measurement and control of physical, chemical and biological agents and issues of occupational safety, and linking up with the wider discipline of public health. Here, the primary core courses in public and environmental health provide the overall context for occupational health and industrial hygiene. Within industrial hygiene, more specialized core courses provide the basic 'building blocks' upon which the development of the industrial hygiene discipline and philosophy are based, in turn providing students with the preparation and perspective which will be carried forward into their project work and internships, and ultimately to their professional careers.

The new curriculum is based firmly on the philosophy that industrial hygiene is a multidisciplinary, scientifically-based field that touches on, and is essential to, all the other disciplines concerned with occupational health. This notion follows from the fact that workers' exposures to potentially harmful substances and agents are the central element around which the classical industrial hygiene functions of anticipation, recognition, evaluation and control revolve.

This integrated approach has been carried through into the research - and in turn the research training - within the Industrial Hygiene Program. Here, during the past five years, the research emphasis in industrial hygiene at the University of Minnesota has been greatly expanded. In this, the aim has been to provide training at an advanced level, not only for potential industrial hygiene practitioners but for those who wish to become researchers, academics, leaders, policy makers, and high-level managers in the field of industrial hygiene. Such research training research has increasingly come to be seen as an important feature of the backgrounds of individuals in the highest levels of industrial hygiene practice and decision making. Again the need for individuals trained at the Doctoral level has been reflected in the inquiries that come from industry and, in particular, academic institutions.

The research training program is necessarily built around the expertise of the faculty and the extensive facilities and equipment acquired during the past five years in the Industrial Hygiene Laboratory as part of the strategic research planning of the Division and School. As a result, a very broad program of exposure-based research has touched on issues ranging from basic industrial hygiene science to applications in technology and occupational health policy. These activities have placed us in the forefront of current discussions about new national and international occupational health standards. Such a program of research gains further strength from its interactions with other scientific disciplines, both within and outside the Division. For the latter, many working

arrangements are already in place, most notably - as already mentioned - with colleagues in Mechanical Engineering, but increasingly with others elsewhere, including in the Minnesota Department of Health.

Specific research areas that have been developed include studies of:

- the basic properties, behavior and transport of aerosols in the workplace and ambient atmospheres;
- the development of new sampling instrumentation and new sampler testing methods;
- the sampling and health-related assessment of workplace and ambient atmospheric aerosols(including metals);
- current and retrospective aerosols exposures of workers for applications in epidemiology;
- the effects and dosimetry of inhaled aerosols;
- technical control and containment of aerosol exposures in workplaces;
- intervention strategies for controlling ill health among workers;
- occupational health in small and medium-sized enterprises;
- basic characteristics of personal respiratory protection apparatus for controlling workplace aerosol exposure;
- the performance characteristics of respiratory protection equipment specifically in relation to bioaerosol hazards (including *Mycobacterium tuberculosis*);
- ventilation methods for controlling exposures in workplaces and other indoor environments to aerosols and gases and vapors; and
- the characterization and control of indoor chemical spills.

During the past five years, this broad-based program of research has been successful in attracting funding from both government and private sources. Its content is broadly consistent with many of the research priorities outlined in the National Occupational Research Agenda (NORA), for example: (a) with specific emphases on aspects of the work environment, notably inorganic dusts, mixed exposures, health care workers, indoor air, PM10, small businesses, organization of work, pesticides, etc.; (b) relevant to diseases such as airway/pulmonary disease and occupational cancers and asthma; and (c) using exposure assessment methods and engineering/technological solutions.

The breadth and depth of our research are indicated by the burgeoning list of publications that has grown out of the program (from both its faculty and its students) during the past five years, when about 40 new papers have appeared in 13 top-class peer-reviewed journals. Most of that research may be described as "applied science". However, more recently, an increasing proportion has been directed towards the process by which occupational health standards are set. So this is opening up a new dimension at the interface between occupational health science and policy, particularly as they relate to standards. In this regard it is relevant that Dr Vincent serves as Chair of the Air Sampling Procedures Committee of the American Conference of Governmental Industrial Hygienists (ACGIH), and Dr Brosseau serves a member of the ACGIH Committee on Threshold Limit Values. These efforts, together with the formation of a new Center for Environmental Health Policy in the Division of Environmental and Occupational Health, are stimulating research with special emphases on occupational health policy, and it is expected that these research directions will develop further in the years ahead, whilst maintaining our established strong lines of scientific research.

During the past five years, 35 new students have been admitted to the Industrial Hygiene Program. There have been 22 graduates at the Masters level and 5 at the PhD level. We have continued to be successful in attracting very high quality applicants. This is reflected not only the in high academic performance indices for the students admitted, but also in the fact that, during the period in question, five students were awarded prestigious 3M Industrial Hygiene Scholarships (where, it should be noted, only three are awarded each year nationally), and four have been awarded equally prestigious Department of Energy Industrial Hygiene Fellowships. Recruitment of new students has been achieved through mailings of promotional materials. "Word-of-mouth" publicity through alumni has continued to be a significant factor. So too has the presence of faculty and current students at national meetings (such as the American Industrial Hygiene Conference and Exposition) which are considered to be "showcases" for the field and the profession.

Outreach has continued to be a major priority for the Industrial Hygiene Program. Its faculty has been active in the local industrial hygiene community, through their involvement with Continuing

Education and through student internship and project-related contacts. In this, the Industrial Hygiene Advisory Forum has played a strong and constructive role. The faculty and students have also been highly visible in national scientific and professional societies, through various leadership and committee assignments. The research of the faculty and students has featured strongly in many national and international meetings.

Conclusions

During the next five years and beyond, it is planned to consolidate on the program already developed, regarding what has been achieved during the past five years as a starting rather than an end-point. Further improvements are envisaged, including the inclusion into the curriculum of new emerging industrial hygiene ideas and concepts, closer integration between existing courses and the introduction of new learning technologies. Such improvements are always apt since the field of industrial hygiene is constantly changing. During the next few years, the time will be ripe for the introduction of such improvements as the University of Minnesota undergoes the transition from the "Quarter" to the "Semester" system which, in itself, will require substantial structural changes. It is also planned to further develop links with industry and the community at large in the Upper Midwest region that this ERC serves in order to maintain and increase the relevance of industrial hygiene training to societal needs. This will be achieved through further expansion of our Industrial Hygiene Advisory Forum, and the extension of our research into the industry of the region.

B.i. Hazardous Substance Academic Training Program

Overview

At present, masters students are trained in Hazardous Substances as specialists within the Industrial Hygiene Core Program. This masters-level Hazardous Substances Academic Training (HSAT) Program has been in existence since 1993 supported by a NIOSH Hazardous Substances Academic Training Program Grant; funds are presently used to provide tuition and stipend to two first-year and tuition for two second-year masters students. The Program Director, Dr. Lisa M. Brosseau, receives salary support from this training grant; an adjunct faculty (Dr. Fay Thompson) receives a small amount of salary support as well. These funds support advising, teaching, and administrative activities related to the Hazardous Substances Academic Training masters program.

To-date, four students have completed and received a masters degree from this program. Three students are presently finishing their thesis work and plan their oral defenses for this summer. Three students are continuing the second year of their studies in September 1997 and two new students will begin their studies at this time.

Briefly, the masters program in Hazardous Substances, which is considered a specialty within the Industrial Hygiene program, has course and other requirements which are similar to those of the Industrial Hygiene program, with some exceptions. Students in each of these programs must complete a 70-credit program, which is expected to take a full two years of course and research project time. A practicum or internship is generally pursued in the summer between the first and second years. Students in the Hazardous Substances program must also complete a 40-hr Hazardous Waste Worker or Emergency Response Training Course.

In addition to those courses required by the Industrial Hygiene Program, students must take two required courses in Hazardous Waste Management (taught by Dr Thompson) and Hazardous Materials Management (taught by Dr Brosseau). They must also select 9 credits of electives in coursework relevant to the hazardous substances field. The masters thesis project is usually begun in the late spring or summer of the first year and may be combined with the internship. Thesis and internship credits do not count toward the 70-credit requirement. The masters thesis project must contain elements of hazardous substance or waste management, in addition to the traditional industrial hygiene components.

The goal of the Hazardous Substances masters program is to educate professional industrial hygienists as specialists in hazardous substance management. In regulatory agencies and smaller to medium-sized companies, the duties of an industrial hygienist often combine occupational health with environmental health compliance. The former primarily concerns worker health and safety, while the latter is focused on health and safety of the surrounding community and environment. Because industrial hygienists are well-trained in the recognition, evaluation and control of hazards, the additional duties of compliance with and awareness of environmental regulations seems a logical extension of traditional industrial hygiene activities. For example, most industrial hygienists are responsible for assuring worker training in chemical hazards ("right-to-know") and emergency response. It would follow that industrial hygienists should also become involved in efforts to comply with the Toxic Substances Control Act regulations concerning the health effects of new chemicals, the control and reporting of air and water pollution, the management of hazardous materials and waste storage, and spill and emergency response planning. The masters program in Hazardous Substances recognizes the need to expand the traditional role of industrial hygienists in order to prepare them for future job requirements and expectations.

Faculty

The Hazardous Substances masters program is directed by *Lisa M. Brosseau, Sc.D, CIH*. She has been directing this program since its inception in 1993. Dr. Brosseau received her masters and doctoral degrees in industrial hygiene from the Harvard University School of Public Health and completed a postdoctoral research fellowship in industrial hygiene at New York University prior to her present position as an Assistant Professor in the University of Minnesota Industrial Hygiene Program. Dr. Brosseau has considerable teaching and research expertise in the industrial hygiene field; she is sole instructor of the Industrial Hygiene Applications course, and co-instructs Analysis of Airborne

Contaminants and Field Problems in Occupational Health courses; all of these courses are required for the Industrial Hygiene and Hazardous Substances masters programs. Since 1993, Dr. Brosseau has been teaching a new course, Hazardous Materials Management, developed in response to needs of the new academic training program in Hazardous Substances.

The core, supporting and adjunct faculty associated with the masters program in Hazardous Substances are described below.

As Director of the Hazardous Substances Program, Dr. Brosseau advises all masters students in the Program, in addition to students in the Industrial Hygiene Program. In this capacity, she meets with advisees regularly to discuss their courses, projects, and internships.

James H. Vincent, Ph.D., D.Sc. is Director of the Industrial Hygiene Program. He advises students on coursework, internships, and masters thesis work for this program; he also interacts with students in the HSAT Program both formally within the classroom and informally as an additional advisor. Dr. Vincent has considerable research and teaching expertise in a variety of areas related to industrial hygiene. He holds degrees in Physics from Durham University, England. He has carried out research in industry, taught physics at the PhD level, and headed a large research group at an independent research concerned with occupational health (Institute of Occupational Medicine, Edinburgh). During the past 25 years, much of Dr. Vincent's research has been relevant to industrial hygiene, and he is a recognized authority in a number of branches of the subject, including physics, fluid mechanics, ventilation and industrial hygiene itself. Dr. Vincent leads a vigorous research program in these (and other relevant) areas. He has developed extensive collaborations with other faculty at the University, particularly in the Mechanical Engineering Particle Technology Laboratory. Dr. Vincent is Editor-in-Chief of the Journal of Aerosol Science and is frequently invited as a speaker to conferences throughout the world to address a variety of occupational health and industrial hygiene issues.

Fay Thompson, Ph.D., CIH is an adjunct professor in the Division of Environmental and Occupational Health. Dr. Thompson is employed full-time as the Director of the University of Minnesota Department of Environmental Health and Safety; she teaches a course required of all industrial hygiene students (Hazardous Waste Management). This course is offered through the Extension School and attracts a large number of students from elsewhere in the University as well as from outside the University. Dr. Thompson has direct responsibility for the Minnesota Technical Assistance Program (MnTAP), an EOH Division-related group which advises Minnesota companies on waste minimization and control issues. Dr. Thompson's staff have been excellent collaborators with the Hazardous Substance and Industrial Hygiene programs. One staff member, in particular, who directs the Environmental Management Section within the Department of Environmental Health and Safety, has given advice and help with course and program development; he also lectures in the Hazardous Materials Management course on emergency response.

Cindy McComas, M.S. has been the Director of the Minnesota Technical Assistance Program (MnTAP) since its creation in 1985. MnTAP operates under the direction of the Minnesota Office of Waste Management. With the passage of the 1990 Minnesota Toxic Pollution Prevention Act, MnTAP's responsibility and resources were expanded to provide assistance to businesses regardless of size or generator classification for releases of pollutants to all media, including air emissions, wastewater discharges, and industrial wastes. MnTAP's mission is to assist all Minnesota businesses and business organizations with pollution prevention, industrial waste and emissions reduction, and proper waste management. Ms. McComas is currently working with the Hazardous Substances masters program to find ways to involve students in MnTAP projects which would combine occupational health and safety with pollution prevention. Cindy provides ad-hoc assistance to the Hazardous Substances masters program on an as-needed basis.

Ken Sexton, Sc.D., M.B.A., is a professor in the Division of Environmental and Occupational Health. He is the Director of the Minnesota Center for Environment and Health Policy (CEHP) and his research interests focus on environmental decision making in both the public and private sectors. The CEHP is dedicated to helping elected officials, government agencies, businesses, advocacy groups, communities, and citizens make well-considered environmental decisions. A new initiative within the Center, entitled the Strategic Environmental Management program, is a multidisciplinary effort to promote the development, implementation, and evaluation of innovative, cost-effective strategies for corporate environmental management. As part of this initiative, Dr. Sexton will be teaching a new

course (Spring 1997) in Pollution Prevention: Innovative Approaches to Environmental Management with a team consisting of instructors from MnTAP, the School of Management, and the Humphrey Policy Institute. Dr. Sexton's commitment to the Hazardous Substance masters program is as an adviser to and collaborator with Dr. Brosseau in her efforts to further expand her research efforts into the environmental arena. He serves as an informal adviser to masters students in this program, as well.

Jan Greaves, M.D. is the Director of the Educational Resource Center, within which the Hazardous Substances Program is administratively located. Dr. Greaves also serves as an adviser to the Hazardous Substances Program, assuring that its direction is appropriate and that the activities within the Program meet the needs and requirements of the Division. Dr. Greaves has had extensive experience in advising industrial hygiene postgraduate students. He provides an essential bridge between industrial hygiene and occupational medicine. He is a noted educator in the field of occupational health, well-known for his breadth of vision and appreciation of the multi- and interdisciplinary facets of the field. His research interests include the effects of air contaminants on the respiratory system, where he has established a considerable personal reputation.

Progress on Goals

The objectives of this program since its inception in 1993 and progress to date in accomplishing these goals are as follows:

- **Training of industrial hygiene masters students in hazardous substances**

While only those masters students enrolled in the Hazardous Substances Academic Training program are required to take the two-course sequence of hazardous materials and waste courses, all students from the industrial hygiene program have been encouraged to enroll in these courses as well. Many of them have done so; in addition, these courses attract undergraduate students from the College of Natural Resources and non-matriculated students who are working in the environmental or health and safety fields.

All graduated students have been successful in finding work in the field of industrial hygiene; several of them have found jobs which require an understanding of both environmental and occupational health issues. For example, one student is managing response teams at a spill response company; another is responsible for continuing education courses in hazardous substances. A third has enrolled in the doctoral program and is pursuing research which predicts airborne concentrations from chemical spills.

- **Obtaining support for a doctoral-training program in Hazardous Substances**

Approval was recently gained for supporting doctoral research within the Hazardous Substances Academic Training, beginning in September 1997. This will be used to support tuition and stipend for one doctoral student who is presently investigating predictive models of airborne concentrations for indoor solvent spills.

- **Consulting with an advisory group with representatives from industry, government and academia**

The Hazardous Substances Advisory Board has been actively involved in the development and implementation of this program since its start in 1993. At least one meeting with the advisory board has been held each year during the course of this program. Members of the Advisory Board have been instrumental in the development of the new Hazardous Materials Management course. They have helped determine the direction of the curriculum (both coursework and internship experiences) and have given excellent advice for the continued success of this program. They will continue to be involved in the program as a doctoral research program is begun.

- **Developing a new course in Hazardous Materials Management**

With assistance from Advisory Board members, adjunct faculty, and other experts in hazardous materials, this course was first offered in spring 1994. It has been offered every year since then and

has regularly attracted 15-25 students. This 10-week course is offered for 3 hrs every Monday evening from 4 to 7 PM, which allows better access for non-matriculated students. Each week consists of a guest lecturer and a workshop, organized around the different OSHA and EPA regulations concerned with hazardous materials. Students write papers each week on a question related to the theme of that week's class. A final team project is presented to the class.

- **Conducting a needs assessment**

Prior to the development of the HSAT Program curriculum, a needs assessment was conducted with members of the Hazardous Waste committees from the American Industrial Hygiene Association. Experts in hazardous materials and hazardous waste management were asked their opinion about the inclusion of different topics into the traditional industrial hygiene curriculum. The data gathered from these questionnaires were used to guide the curriculum requirements for masters students in the HSAT Program.

The needs assessment results indicated that Hazardous Substance Academic Training Programs must consider offering coursework and practical experience in a number of areas, including 1) an understanding of the relevant regulations, 2) communication skills for training workers, and 3) technical skills for the problems encountered in their work. The results of this survey have been published in the *American Industrial Hygiene Association Journal*.

Conclusion

The future for masters and doctoral students in the Hazardous Substances Academic Training Program continues to look bright. The Advisory Board will continue in its advisory role concerning the recruitment, training and placement of students; this Board will also assist in recognizing new trends in professional and other requirements.

C. Occupational Health Nursing Core Program

Overview

The Occupational Health Nursing (OHN) Core Program has a 20 year history of providing interdisciplinary academic education in occupational health and safety. Three masters' degree options and a doctoral degree plan exist. A minimum of five full-time equivalent students are enrolled each year in the OHN Program, as either MPH, MPH-MS or MS candidates. The MPH academic program for OHN trainees entails five or more quarters of full-time enrollment and the completion of 61 academic credits, excluding electives and the masters' research project. The MPH curriculum prepares qualified nurses to function in a managerial capacity as occupational health specialists in business, industrial or health care settings. The dual degree option entails completion of 85 credits (excluding masters research projects) taken over seven or more academic quarters. The MPH-MS curriculum prepares qualified nurses for occupational health specialist positions in public health agencies, and if the student intends to pursue doctoral training following completion of their masters degrees, prepares students for a faculty role in a nursing school. The MS degree option entails 68 credits, (excluding thesis credits) taken over seven or more academic quarters. It is designed for OHN students interested in pursuing doctoral education in public health, or conducting applied research on occupational and public health problems. It is distinguished from the other two options by more course work in epidemiology and biostatistics and less course work in management and nursing theory.

A doctoral degree option for OHNs was offered for the first time in Fall, 1996. Funding from the National Institutes for Occupational Safety and Health (NIOSH) for this initiative was requested for funding cycle beginning year 21. The doctoral degree program entails 48 credits (excluding pre-requisite and dissertation credits) taken over three or more years. It is designed for well qualified occupational health nurses and it provides a rigorous, multidisciplinary education in health services research and occupational health policy. The goal of this program is to prepare OHNs to design and evaluate occupational health policies, programs, and services, for purposes of preventing occupational injuries and illness, minimizing associated costs, and promoting quality of care to workers, employing the methods of health services research. The curriculum offers flexibility to students by providing them a doctorate in environmental health with options for supporting programs or minors in health services research or nursing.

Within the School of Public Health, all OHN students are admitted into the Division of Environmental and Occupational Health (EOH). The dual degree students are also admitted to the Graduate School and the School of Nursing, and the MS and PhD degree students are also admitted to the Graduate School.

Interdisciplinary interaction occurs throughout the OHN Program. Students and faculty interact in course work, seminars, and selected research endeavors. OHN students are required to take a total of 37 course credits of interdisciplinary course work for the MPH the MPH-MS degrees, and 48 credits for the MS degree, as identified in Appendix x. Through these courses students learn the critical issues and analytic frameworks used by other disciplines. An overview of two key interdisciplinary experiences, the field problems class, and environmental health seminar, follow.

Internship and practicum experiences for master's-level OHN students involve completion of at least four quarter credits (PubH 5154), including a one-credit experience involving collaboration with OM faculty and residents at Health Partners-Ramsey Clinic (faculty include McGovern, Lohman, Christensen).

The OHN students rotate through Ramsey Clinic Occupational Medicine Services for a one credit internship. Historically they have conducted an administrative project involving occupational medicine consultation. Over the past few years students projects have involved quality improvement and health education initiatives. For example, the quality improvement projects have involved evaluation of key clinical activities relative to a treatment protocol or benchmark from the literature on topics such as low back pain and carpal tunnel syndrome, medical surveillance, preplacement exams, and physician compliance with workers' compensation managed care procedures.

The three credit internship experience (PubH 5154) is individually designed by Dr McGovern, the OHN student, and the community preceptor—usually a masters' prepared, community based OHN. The purpose of this experience is for the student to synthesize and apply their course work to a real world

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occupational health setting to test out career options and network, while gaining substantive and process expertise on an administrative project addressing an important occupational health and safety problem.

Faculty

Patricia McGovern, PhD, MPH, RN (Director, OHN Program) is responsible for the development, management and evaluation of this graduate training program which provides breadth and depth in OHN. Dr McGovern teaches an advanced course for occupational health nursing and medicine (PubH 5166, Employee Health Programs and Health Care Cost Management), and develops/coordinates all student internships (PubH 5154, Field Experience, 4-6 credits). She is also collaborating with Ken Sexton, PhD, Director, Environmental Health Policy Center to develop curricula and resources in occupational and environmental health policy, including a new required course for all division students first offered winter, 1997. Dr McGovern's expertise addresses the organization of work (e.g., the postpartum health of employed women and the effects of family leave policies), infectious diseases (e.g., the compliance of health care workers with universal precautions) and injury prevention (for example, work-related assaults). Her training in health services research and policy provides methods for evaluating occupational health policies and programs in relation to health outcomes, cost, and quality of care.

Debra Olson, MPH, RN, COHN-S (Instructor and ERC Deputy Director) has led the OHN Program's efforts in continuing education and outreach to national recognition, in addition to being responsible for graduate teaching and publishing. She is the course director of the team taught class, Field Problems in Occupational Health (PubH 5218), which is required for all students in the occupational health and safety (OHS) core disciplines, as well as an interdisciplinary introductory course, *Theory and Practice of Occupational Health* (PubH 5167), and an associated field experience (PubH 5168). Instructor Olson leads the division's efforts in designing course work in innovative formats. She also leads the School's Diversity Committee providing opportunities for research and teaching with special populations (e.g., women, minorities and those with disabilities). She teaches an environmental health course for non-majors, *Issues in Environmental and Occupational Health* (PubH 5155). She is also collaborating with experts in alternative education (W. Greaves, MD, MSPH, and V. Weckwerth, PhD) regarding the development of a distance education option in OHN. Ms Olson's expertise addresses agricultural health and safety (health hazards affecting the animal confinement worker), injury prevention (health care worker incidents in rural health facilities), and evaluation of OHN education/practice.

While many faculty and staff participate in the OHN Program, key collaborators that contribute effort to the program are described next.

LaVohn Josten, RN, PhD (Associate Professor; Coordinator, Public Health Nursing, School of Nursing) contributes through course work (Nurs 8040, 5963, and 5964), student advising, and administrative support on relations between the OHN and Public Health Nursing Programs.

Laura Kochevar, PhD (Education Specialist, Environmental and Occupational Health) has expertise in measurement, and social science methodology. She is also an applications programmer/analyst. She co-advises masters' students and consults with OHN faculty in regards to study design, measurement issues, programming and data analyses.

Lisa Brousseau, PhD (Assistant Professor, Environmental and Occupational Health) teaches an introductory interdisciplinary industrial hygiene course (PubH 5210), and facilitates team projects in the field problems course (PubH 5215).

Susan Gerberich, PhD (Associate Professor, Environmental and Occupational Health) teaches the required interdisciplinary course in injury prevention (PubH 5194), facilitates team projects in the field problems course (PubH 5215), collaborates on research efforts addressing rural injury prevention with Ms Olson, and violence prevention and control with McGovern.

William Lohman, MD (Director, Occupational Medicine Residency Program) teaches the required interdisciplinary occupational medicine (OM) course (PubH 5251), collaborates with Dr McGovern for the OHN's field experience with OM residents (PubH 5154), facilitates team projects in the required

interdisciplinary field problems course (PubH 5215), and leads the monthly OM community grand rounds which nurses and residents are required to attend. He also collaborates with OHN faculty and students on projects relevant to the MN Department of Labor and Industry, Workers' Compensation Division.

Donald Vesley, PhD (Professor, Environmental and Occupational Health), an environmental microbiologist, advises OHN faculty and students on issues related to infectious disease and hospital employee health programs. He is collaborating with Dr McGovern and students on research addressing health care worker compliance with universal precautions.

All individuals noted below contribute by providing their expertise on an individualized basis to OHN students and faculty, in the context of research projects or selected classes. Specific contributions are described.

Bryan Dowd, PhD (Professor and Director of Graduate Studies for Health Services Research and Policy) is an expert in economic and statistical modeling for health policy analysis. He teaches a methods sequence that will be required for students in the research training program (PubH 8810, 8811, 8812). He has advised Dr McGovern on research regarding women's postpartum health and maternity leave policies.

George Maldonado, PhD (Assistant Professor, Environmental and Occupational Health) is an expert in methods for evaluating the validity of epidemiological studies. He co-teaches with Dr Gerberich a research seminar (PubH 8192, 8193, 8194) that OHN doctoral students will be required to take. He also consults with Dr McGovern on selected research projects—for example, health care worker compliance with universal precautions, and evaluation of OHN preplacement assessments.

Ken Sexton PhD (Professor, Environmental and Occupational Health) is collaborating with Dr McGovern to develop curricula and resources addressing occupational and environmental health policy; winter of 1997 was the first offering of their new course on occupational and environmental policy. He is also collaborating with Ms. Olson on a partnership with the Fond de Lac Tribal and Community College to develop research and teaching opportunities for Native Americans.

John Nyman, PhD (Associate Professor, Health Services Research and Policy) teaches a course on health economics and insurance, required for OHNs in the proposed doctoral program, and collaborates with Dr McGovern on research estimating the costs of occupational assaults in Minnesota.

Elizabeth Wattenberg, PhD (Assistant Professor, Environmental and Occupational Health) has expertise in toxicology and risk assessment and teaches the introductory toxicology course (PubH 5267).

Vernon Weckwerth, PhD (Professor, Health Care Management and Policy, and Director, ISP Executive Study Programs) has expertise in alternative educational models and multi-method learning approaches. He will contribute through development of delivery methods and course materials for a distance education option for OHNs

Adjunct faculty with substantial involvement with the OHN program include the following.

Ms Christensen, Workers' Compensation Managed Care Plan Manager, Health Partners, consults with Dr McGovern and Dr Lohman in coordinating an internship for OHN students involving OM residents (PubH 5154), supervising all on-site activity.

Ms Bey, Health Services Manager, Honeywell, frequently provides guest lectures for graduate and CE classes on medical case management, cost management and health promotion programs. She also mentors students in three credit internship experiences (PubH 5154), and serves on the OHN advisory board.

Ms Hunt Vice President, Risk Management, BHK & R Insurance is also an adjunct instructor, and frequently provides guest lectures for graduate and CE classes on workers' compensation case and program management.

Progress on Goals

In the last five-year period, the OHN program has achieved several programmatic goals and objectives that include the following.

- ***Institute a dual degree curriculum option for selected OHN students***

In response to previous site reviewers' recommendations that OHN faculty explore options for National League for Nursing (NLN) accreditation of the OHN curriculum, this faculty worked with the School of Nursing faculty to create a dual degree program that enables selected students to complete both the standard MPH program for OHN, and an MS degree option through the Program in Public Health Nursing whose educational programs are accredited by the NLN. Dr Josten, School of Nursing, directs the project, *Education of Public Health Nurses for Leadership in Official Public Health Agencies*, funded by the Division of Nursing, Health Resources and Services Administration, DHHS (1993-present).

The project is designed to educate nurses for leadership roles in public health agencies enabling them to address major public health problems within interdisciplinary teams. Two models of education enable nurses to gain the prerequisite knowledge, skills, and attitudes: an MS degree in Nursing with a graduate minor in Public Health, and an MS-MPH option which allows a student to pursue dual masters degrees focusing in either environmental and occupational health, or other subspecialties. This dual degree option allows students to complete each degree separately. Dr McGovern has been partially funded on the project grant (1993-1996) to coordinate efforts in the School of Public Health. Since Fall, 1993 six OHN students have elected this option. One student graduated in 1995 (D. Muhovich), two graduated in 1997 (L. Chelstrom, L. Walch) and three are completing their coursework requirements (S. Folken, A. Lundvall, J. Rossman). Faculty from both schools will continue to actively recruit and mentor students for this option.

- ***Promote leadership development within the OHN community***

Ms Olson has been highly active in the development of leadership among occupational health nurses in the community. Elected to the Board of Directors of the American Association of Occupational Health Nurses (AAOHN) 1995-1997, Ms Olson provides direction in the national arena as a member of the Professional Affairs Committee, chair of the Subcommittee on Research and Ethics, member of the Credentialing Ad Hoc Committee and co-chair of the Foundation Feasibility Ad Hoc Committee. She continues to participate actively in the state Association. As chair (1994-1995) of the MAOHN Awards Committee, she assisted in the development and presentation of the Emerging Leader Award given as recognition to an individual who is beginning to develop strong leadership skills in OHN.

Dr McGovern participates as a member (1993-1997) and secretary (1995-1996) of the MAOHN Governmental Affairs Committee. In this capacity she co-authored several publications, including member newsletter articles designed to promote knowledge and skills for political participation, and the monthly governmental affairs legislative update to members which tracks state and federal regulations and legislation. In 1997 she developed the annual governmental affairs educational program for the state membership. It addressed complex case management involving the application of employment law issues to workers compensation claims. At the 1995 American Occupational Health Conference (AOHC) she was elected to a two-year term as secretary, AAOHN special practice group for educators. In 1996 she accepted an invitation from the AAOHN President, to serve as member, American Occupational Health Conference Education Program, charged with evaluating all CE proposals for the 1997 AOHC.

Dr McGovern, and Sue Larson, MPH, Midwest Center Continuing Education staff, co-direct a continuing education (CE) course on business and management skills for OHNs, *Advanced Topics in Occupational Health Nursing*, a two-day course offered at the *Annual OHN Symposium*. A planning group develops the curriculum content and selects speakers. In recent years, topics included health care costs and methods of control, principals of successful workers' compensation and medical case management, preplacement programs, regulatory trends, and the role of health promotion in comprehensive OHS programs. The success of this program is reflected by consistently high participant evaluations.

- **Facilitate the development of innovative, interdisciplinary graduate and continuing education offerings**

A collaborative project, chaired by Ms Olson, involving the University of Minnesota School of Public Health, University of Minnesota Crookston Outreach Office, University of Minnesota Duluth Distance Learning Center, and the Minnesota Extension Service resulted in a new interdisciplinary offering in Agricultural Health and Safety at the 13th Annual Occupational Health and Safety Institute (1995). This project sought to provide maximum flexibility for students by providing the option of three sections offered simultaneously at the Twin Cities with interactive video links to out state centers. A pilot to place the agricultural health and safety course content on the Internet was initiated by Ms Olson in Fall, 1996 in collaboration with the Department of Biosystems and Agricultural Engineering and the Minnesota Extension Service.

A new initiative involves the development of graduate and continuing education opportunities in occupational and environmental health policy being developed by Dr McGovern in collaboration with Dr Sexton (environmental policy). In response to pressures for regulatory reform, fiscal conservatism, and the increasing demand for OSH policies and programs to be justified not only by health outcomes but also by information on costs and risk assessment, this division is launching a major new initiative on environmental and occupational health policy. It will involve the development of course work, program plans and resources to enhance the students' knowledge and skills in formulating, implementing and evaluating policies and regulatory programs. Drs Sexton and McGovern developed a 3 credit course on environmental and occupational policy that was first offered as an elective Winter, 1997, and are designing a minor program in EOH policy and decision making.

Dr McGovern is also working with Jeanne Ayers, Director, Continuing Education, to develop an interdisciplinary course, *Occupational Health Policies: Legal Implications for OHS Practitioners*. This course is being developed in topical modules for the Annual OHN Symposium that will eventually be integrated and offered as a week long course in 1999 at the Annual Graduate Occupational Health and Safety Institute. The first two modules, already piloted, address the federal Family Medical Leave Act and the Americans with Disabilities Act. Co-taught by Dr McGovern, and a lawyer specializing in employment law, the modules were successfully piloted in October, 1995. A third module was piloted in October 1996; it addressed complex case management in workers' compensation and applications of employment law. It was taught by Ms Hunt, (Adjunct OHN faculty) and a lawyer specializing in an employment law. Subsequent modules will be defined by a planning group.

- **Create innovative outreach activities to promote understanding of occupational health and safety principles by diverse audiences**

Ms Olson redesigned *Issues in Environmental and Occupational Health* (PubH 5155) in 1992, and teaches it annually on the Twin Cities campus and, in cooperation with the School of Nursing, by interactive television to the University of Minnesota, Duluth. This course, attended by 35 to 55 nutrition, health administration and nursing students annually, increases students' ability to identify EOH problems and interventions. New in 1996 is the use of Internet discussion groups allowing students and faculty to share course content and experiences, without the confines of location and time.

Ms Olson is also developing a new distance education option for OHNs. Two programs, each using alternative pathways to acquiring a masters' degree in public health, have been reviewed. The ISP Executive Study Program in Health Services Administration, University of Minnesota, Division of Health Management and Policy offers a masters' degree option in three areas for employed health care executives in the US and the Medical College of Wisconsin at Milwaukee hosts an alternative program for a masters' degree in public health for occupational health physicians. A review of these two programs will offer an opportunity to develop distance education methods for OHNs based on already successful models.

- **Assist baccalaureate nursing programs to introduce occupational health and safety material into undergraduate curricula.**

The OHN Program continues to assist undergraduate nursing programs by providing highly successful instructional materials. The slide and tape presentation, *Occupational Health Nursing: Meeting the Challenge*, developed by Ms Olson in 1987 has been viewed by undergraduate nursing students in more than 36 schools in 26 states, with permission granted for reproduction. Many schools maintain their own copy. Ms Olson continues to update and distribute resources to undergraduate programs.

- **Develop a standing OHN advisory committee**

A standing OHN Advisory Board was first convened in May, 1995 in response to advice from previous site visitors. Membership on the committee includes representatives of OHN, medicine, industrial hygiene, risk management, management and labor, urban and ex-urban providers, and SON faculty. In addition to faculty updating committee members on OHN programmatic issues, member input has been sought on: strategies for employer financial support of OHN students, substantive issues to integrate into the curriculum, a proposed doctoral-level curriculum for OHNs, and design of an impact evaluation study for the ERC. This advisory board meets annually.

- **Develop an agricultural health and safety minor**

Two OHN students participated in the Agricultural Health and Safety minor, under the direction of Ms. Olson, completing the required course (PubH 5216), and focusing their internship and masters research project on agricultural health and safety. For example, students' masters projects include: *Assessment of Health and Safety Needs of Swine Confinement Workers in Minnesota* (R. Tripp, MPH candidate), and *Costs and Determinants of Hazard Remediation in Wisconsin Farm Equipment*, (J. Lincoln, MPH candidate). These students have had their academic experiences evolve into part-time jobs with collaborating faculty, respectively, in the agricultural schools at the University of Minnesota and the University of Wisconsin, Madison.

Conclusion

This OHN program has a 20 year history of offering a rigorous, interdisciplinary program of study to qualified nurses. Given the location of the program in a division of environmental and occupational health in a school of public health, the curriculum is well grounded in the environmental and public health sciences. It also has a history of close collaboration with the university's school of nursing to ensure integration of nursing theory and master's-level research methods. Currently the program offers both master's-level and doctoral level education. Graduates assume leadership positions in an administrative role in industry, insurance and health care settings. The program's faculty have impressive track records as leaders in the field of OHN education.

D. Occupational Injury Epidemiology and Control Program (OIECP)

Overview

The Occupational Injury Epidemiology and Control Program (funded in 1993), that was developed to meet existing needs at the regional and national levels, was built on extensive training and research experiences dating back to 1980. This program, recognized nationally and internationally, provides numerous opportunities for late education to prepare professional leaders who work to prevent and control hazardous and injurious occupational problems.

Unintentional injuries continue to rank number one in terms of working years of life lost in the United States. Combined sources of injury data (9) indicated that occupational injuries accounted for 10 percent of all deaths from unintentional injuries and 18 percent of all disabling injuries in 1993; these injuries resulted in 115 million lost work days during 1993, and an estimated 120 million future work days lost. The total direct and indirect costs of work-related injuries are conservatively estimated at \$111 billion (National Safety Council. Accident Facts. Chicago 1994).

Intentional injuries have also been identified recently as a major problem in the workplace. Little is known about non-fatal, intentional injuries in the workplace, but homicide is the second major cause of occupational injury death and is the primary cause of death among female workers; 11 percent of all traumatic occupational fatalities are the result of homicides (CDC: MMWR 39(32), 1990).

This program provides a multifaceted approach to academic and research training in the prevention and control of injuries by utilizing an epidemiological framework that considers the worker, hazardous agents and energies, and the respective vehicles of these agents within the environment. The program further incorporates specific strategies involving engineering and technology, education, and legislative approaches in its overall framework. Degree options, available at the masters' and doctoral levels, enable students to build on their basic knowledge and skills through course work, field work, specific projects and research endeavors.

This graduate program is administered through the Division of Environmental and Occupational Health under the management of the Director, Dr Gerberich, and Co-Director, Dr Maldonado and supported by staff in the division. A Scientific Advisory Council is involved in the ongoing review and evaluation of the program.

Faculty

Susan Goodwin Gerberich PhD (Associate Professor, Environmental and Occupational Health; OIECP Director) has served as a major program director as well as a center director. She has a national and international reputation in the area of injury epidemiology and control, and has consulted for local and national agencies, including the Centers for Disease Control and Prevention's (CDCP) National Center for Injury Prevention and Control (NCICP) and National Institute for Occupational Safety and Health (NIOSH). She was recently invited to serve on a national 30-member panel to discuss methodological challenges to the study of occupational injuries. Dr Gerberich continues to be involved in a broad range of research investigations through the Regional Injury Prevention Research Center that attract national and international attention; these address work-related problems identified as high priorities by NIOSH (such as musculoskeletal injuries, amputations, traumatic deaths) and include the area of agriculture. She has also been successful in obtaining funding for an interdisciplinary Center for Violence Prevention and Control and several associated studies; in particular, her focus within this Center is on work-related violence, also a high NIOSH priority. Recently, she was invited to serve on the Governor's Task Force on Violence that is responsible for setting research priorities. She publishes extensively in national and international peer-reviewed journals, and participates regularly in national and international conferences. In addition to advising and other major teaching responsibilities for the program, she participates with Drs Maldonado and Kochevar in the weekly research seminars that enable students to develop and carry out required projects for masters' and doctoral degrees.

George Maldonado, PhD (Associate Professor, Environmental and Occupational Health; OIECP Co-Director), whose expertise is in epidemiology methodology and statistics, has been responsible for developing course work and facilitating seminars pertinent to research methods that aid students in

the design, conduct, and analysis of epidemiologic projects for masters' and doctoral study. His involvement, which includes advising OIECP students, is important for growth in the scientific rigor of both the academic and research training components of the OIECP. Dr Maldonado brings a creative viewpoint and talented mind to the investigation of injuries and hazardous events among working populations, and is developing a national reputation for his approaches to the design and study of occupational injury problems. He was also invited to serve on the national 30-member panel to discuss methodologic challenges in studying occupational injuries. Since Fall Quarter 1991, Dr Maldonado has supervised a research seminar in collaboration with Dr Gerberich that has been very successful and has been involved as a co-advisor with Dr Gerberich for students involved in major occupational injury epidemiology projects. In spring 1993, he initiated a new course on research methodology that is required for the doctoral students and recommended for masters' students, as appropriate. During 1996-1997, he implemented a doctoral seminar, together with two other methodologists on the faculty, that has further strengthened the program.

Laura Kochevar, PhD (Educational Specialist-Environmental and Occupational Health) has extensive experience in measurement and social science methodology, as an applications programmer and analyst; she has been involved in co-advising students in project proposal development and in the intricacies of data management, programming, and analysis relevant to the massive and complex data sets that are utilized as a basis for both academic and research training. Recently, she was also invited to serve on the Governor's Task Force on Violence committee pertinent to data quality that is responsible for setting research priorities.

Other faculty and key collaborators that contributed effort to the program were:

Arthur Erdman, PhD (Professor, Mechanical Engineering and Head of Bioengineering) has an extensive national and international reputation, with particular expertise in mechanical design analysis and bioengineering. His continued research and development in the area of computer-aided design, an approach essential to the study of human responses to physical energies as well as the study of machinery and alternative designs, is extremely important to the academic and research training programs. Dr Erdman is a Fellow of the American Society of Mechanical Engineers (ASME), served as the Chairperson of the ASME Bioengineering Division and has received numerous "best paper awards" for his research efforts. His publications, presentations and involvement on professional committees are extensive. He has taught ME 5190, designed for students without an engineering background, to provide a basic understanding in physics and kinetics. These are areas critical to understanding injurious outcomes and to the overall epidemiologic approach to injury prevention and control. In addition, he serves on student committees and as an advisor, as appropriate, and as a collaborator in research efforts involving epidemiologic and engineering applications that provide a basis for academic and research training.

Tarald O. Kvålseth, PhD (Professor-Mechanical Engineering and Industrial Engineering) has written several text books in addition to other peer-reviewed publications; he has served on the Nordic Ergonomics Committee and has been Vice-President of the International Ergonomics Association. His primary expertise is in the area of ergonomics and he has been concerned with the various safety aspects of products and workplaces. He was recently awarded a U.S. patent for a product safety device. He teaches IEOR 5070, which is a required course for the OIECP students; this is necessary to their understanding of the interaction of the host/worker within the environment, in concert with the epidemiological model. He also teaches IEOR 5321, *Industrial Safety*, and has participated with numerous groups of students in course work related to ergonomic and safety analyses and design of industrial work settings and products. For those students who wish to pursue projects or research efforts in this area, he serves in an advisory capacity and collaborates with other faculty on relevant projects and to ensure integrity of the program.

John Shutske, PhD (Associate Professor, Agricultural Engineering and Environmental and Occupational Health) is the Safety Specialist in the Minnesota Extension Service. He has a background in fire safety and has worked with machine designers and operators to introduce equipment changes to reduce this important hazard. Dr Shutske collaborates with OIECP faculty on research training efforts that provide basic concepts in engineering controls -- essential to the understanding of relevant strategies within the epidemiologic framework.

Debra K. Olson, MPH (Instructor, Environmental and Occupational Health), who has expertise in injury prevention and control and co-authored a chapter on rural penetrating injury with *Dr Gerberich*, will continue to be involved in teaching activities in the core courses and in the overall ongoing program development and recruitment efforts. She is a major asset to the OIECP through her innovative efforts with the community and in continuing education and outreach activities pertinent to occupational injury prevention and control.

Gary Olmstead, PhD (Adjunct Assistant Professor, Environmental and Occupational Health and Director of Health and Safety Programs, General Mills) has extensive experience in development and administration of corporate health and safety programs and at the national level relevant to standards setting for the Occupational Safety and Health Administration. His expertise is especially important as a basis for the course he teaches (PubH 5192, *Occupational Safety*) and providing the context for administration of safety programs and integrating academic knowledge with practice. He is also involved in facilitating internship opportunities for the students in the program.

Leon S. Robertson, PhD (Consultant) is an extensively published and internationally renowned specialist in the field of injury epidemiology and control who has provided major contributions to the center in the past, both in academic and research training. He is a nationally recognized expert in the injury epidemiology and control area and is well known for his research efforts and associated methodologies. Dr Robertson has been collaborating with Dr Gerberich and other colleagues on a national research effort; additional efforts have been proposed, all of which will provide opportunities for further academic and research training. His continued involvement, including teaching in PubH 5194, *Injury Prevention...*, is important to the overall program.

Jess F. Kraus, PhD (Consultant) is a Professor at the University of California, Los Angeles and Director of the Southern California Injury Prevention Research Center. His work has greatly enhanced past academic and research training in this center. He has an international reputation as a teacher and researcher, and has provided a major contribution to the OIECP through consultation to the program in both academic and research training.

David Parker, MD, MPH (Adjunct Assistant Professor, Environmental and Occupational Health) is an occupational physician and epidemiologist at the Minnesota Department of Health who is also engaged in private clinical occupational medicine practice and serves as a consultant to Minnesota OSHA. Dr Parker is a significant contributor to the academic and research training programs and participates in several courses required for the OIECP. He also collaborates in several research efforts with Dr Gerberich and her colleagues, involving students. Dr Parker's research interests have included occupational lead exposure, alcohol abuse, and occupational injuries, including research that focused specifically on highway maintenance workers and adolescent workers; current studies, including a Fatal Assessment and Control Evaluation (FACE) project and a Sentinel Event Notification System for Occupational Risks (SENSOR) project provide research/project opportunities for students in the OIECP. He is well known nationally for his research efforts relevant to child and adolescent work-related injuries, among numerous others. He continues to teach in OIECP required courses, including PubH 5194 and 5195. In addition, he advises students in various project and research efforts and participates in the weekly research seminars, as appropriate.

These faculty members, with teaching and research expertise in the program area, provide a strong and unique combination that provide great breadth and depth in the field of occupational injury epidemiology and control; they are responsible for the continued growth, enhancement, and evaluation of the program. In addition to the faculty identified above, there are numerous faculty both at the local and national levels who contribute to the teaching effort in courses, PubH 5194, "Injury Prevention..." and PubH 5195, "Occupational Safety."

Progress on Goals

The primary goal of the *Occupational Injury Epidemiology and Control Program* is to prevent and control occupational injuries through the training of professionals who: can lead injury prevention programs in academia, business, industry, labor, government, or insurance; are skilled in the development of effective programs and design strategies for the purpose of reducing the incidence and severity of occupational injuries; can implement state-of-the-art approaches to minimize occupational injury hazards; have a strong knowledge base of human-machine-environment

interactions as a key to risk reduction; can help to increase company's productivity and control health care costs; can aid in compliance with governmental health and safety regulations; and are skilled in working as part of a multidisciplinary team.

The following have been identified as the primary objectives for the OIECP:

- **Maintain vigorous recruitment**

Although this program was initially funded July 1, 1993, there have been five to seven full-time students enrolled at the Master's level and seven to eight at the Doctoral level as a result of recruitment efforts. Recruitment strategies for the OIECP have involved: national and local advertising in selected journals and publications; dissemination of brochures and comprehensive program booklets at national and international injury conferences, safety meetings, American Public Health Association, and through colleagues in the field. In addition to the Director's and core faculty efforts and those by the Scientific Advisory Council, the School of Public Health Dean's office and the Midwest Center Continuing Education Program staff have been continually involved in dissemination activities. Recent activities that have also enhanced inquiries and applications, involve the Internet; a web site has been developed for the Midwest Center that provides information on each program and a web site that identifies activities of the Regional Injury Prevention Research Center and the Center for Violence Prevention and Control together with the OIECP, is in progress. A new recruitment endeavor will be through the collaboration with the Center for American Indian and Minority Health to attract qualified students to the OIECP. One of the most important sources for recruitment is the OIECP alumnae who continue to direct highly qualified applicants to the program.

- **Enhance OIECP development**

Course work requirements have been further strengthened to provide a sound scientific base for training. In concert with the comprehensive program effort, faculty have been involved in establishing liaisons with a variety of industries and agencies to ensure quality internships and to provide opportunities for unique projects that will impact the occupational injury problem.

- **Provide opportunities for student projects and theses**

The OIECP faculty have been funded for numerous research efforts and projects that provide training opportunities for students and address numerous occupational injury problems that are among the NIOSH priorities. Dr Gerberich and her colleagues developed a five-state (Minnesota, Wisconsin, North Dakota, South Dakota, and Nebraska) network through the Regional Injury Prevention Research Center that has enabled several occupational studies that serve as a basis for training; these include a focus on: machinery-related injuries; injuries among children and adolescents; general farm-related injuries; and injury surveillance efforts. The major Agricultural Injury Intervention Strategy Workshop sponsored by the Center, in which the U.S. Surgeon General was involved, enabled application of the data from the five state Regional Rural Injury Study to the development of specific state action plans for prevention and control. The recent funding of the Center for Violence Prevention and Control has enabled several endeavors in which students have been involved pertinent to work-related violence; one of these students is being advised jointly by Drs Gerberich and Lohman (Occupational Medicine). Both of these Centers have a major commitment to interdisciplinary collaboration in graduate education and quality research and provide a further resource to the OIECP training efforts. Additional contributions, by the faculty in collaboration with the students, include several investigations of outbreaks of cumulative trauma disorder. Other efforts have involved general ergonomically-related investigations of workplaces, including attention to back injuries.

Students have also made important contributions to the protection of workers through their research and internship projects. Examples include: development of a safety program for a major university laboratory; identification of potential risk factors among workers in child care facilities; analyses of risk factors for cattle operation-related injuries in a five state region; identification of risk factors for intentional violent work-related injuries in the United States; investigation of the impact of insurance incentives on farm safety; identification of risk factors for farming operation-related injuries; analyses of work-related amputation injuries; identification of risk factors for injuries among Veterinarians; analysis of work-related assaults in Minnesota; and identification of

machinery-related injury risk factors. Collaborative efforts with the NIOSH Division of Safety Research, the Minnesota Department of Health and numerous agencies and institutions have facilitated many of these efforts; a newly proposed collaboration with the Center for American Indian and Minority Health will enable us to address additional NIOSH priorities through the OIECP training efforts. Data from many of the efforts identified have been presented at major professional meetings and will be used to develop recommendations and specific prevention and control efforts, as appropriate, that can have an important impact on worker safety.

- **Disseminate research and relevant project findings**

Both students and faculty have been actively involved in authorship in peer-reviewed publications and the presentation of research findings at major professional meetings at the local, national and international levels, accounting for approximately 40 presentations and 50 publications a year since the inception of the program. (Refer to publications and presentations.)

- **Provide outreach activities**

During the past five years, OIECP faculty have been involved in presentations, lectures, and seminars at the local, national, and international levels, with a large proportion of these being invited. Extensive consultations, largely unpaid, have been provided for various corporations, agencies, and institutions at the local and national levels. This includes recommendations and presentations to several local industrial firms, based on projects conducted. In addition, the program faculty have contributed significantly through their involvement with committees at the local, regional, national, and international levels that provide important recognition and visibility for the OIECP. Dr Gerberich has been serving on national blue ribbon committees; most recently, she was invited to serve on a Panel charged to investigate methodological challenges to the study of occupational injuries, co-sponsored by NIOSH, Liberty Mutual Research Center, and Harvard University. She also serves on the Governor's Task Force on Violence committee on data quality. Drs. Maldonado, Kochevar, Erdman, Kvålseth, Shutske, and Olmstead, as well as Ms. Olson and Drs. Parker, Robertson and Kraus, have also been involved in important national and international outreach efforts. Ms. Olson's liaison work with multiple professional groups in the community is also essential in facilitating outreach efforts for the OIECP Program.

- **Promote job opportunities for graduates of the OIECP**

Efforts in identifying job opportunities have been consistently positive with all graduates obtaining significant positions relevant to the field; these include positions in major corporations, health agencies, and other institutions.

Conclusion

The uniqueness of the OIECP is evidenced not only by the highly qualified faculty and expertise essential to this endeavor, but also by the quality of the academic and research training programs that have been developed to provide a comprehensive, current approach to occupational injury epidemiology and control. This program has a strong record in related research that has been presented at national and international levels and published in peer-reviewed journals. In addition, ongoing research efforts, currently supported by other sources of funding, provide a strong base for the research and education/training activities identified for this program. Most important, are the excellent academic and research training opportunities. Through this program, a unique, multidisciplinary approach enables a significant contribution to the field.

E. Occupational Medicine

Overview

The Occupational Medicine Program is a clinically-oriented, community-based training experience that emphasizes the delivery of high quality, state-of-the-art services to workers and employers. Its goals are to prepare physicians who can practice in any venue - government agency, corporate health department, clinical practice, or academia.

Within its service area, the Occupational Medicine Residency Training Program continues to be confronted with a severe shortage of residency-trained occupational medicine physicians. Not only is there a shortage of occupational medicine physicians for academic and government positions, but there is also a severe shortage of residency-trained physicians for positions in private practice and corporate settings. In particular, the Dakotas, Iowa, and Nebraska have very few Board Certified Occupational Medicine physicians. The program at the Midwest Center is the only residency training program in the Upper Midwest.

The last five years have been a period during which the Occupational Medicine Residency Training Program has consolidated its academic and clinical training goals. The program offers a well-defined two year experience combining an academic year at the Minnesota School of Public Health leading to the degree of Master of Public Health, with a practicum year based at St. Paul-Ramsey Medical Center. These two experiences are integrated by the resident's research project which culminates in a research paper suitable for presentation to a peer-reviewed journal.

The academic year has a standardized curriculum in which each resident is required to complete at least 45 credit hours. All residents receive their MPH training in the Department of Environmental and Occupational Health. The practicum year also has a standardized curriculum. Each resident completes four months of core industrial rotations in the Medical Departments of participating Minnesota corporations. Residents are also required to demonstrate clinical competence in occupational medicine. Primary care training in occupational medicine is provided at the Occupational & Environmental Medicine Clinic at St. Paul-Ramsey Medical Center. Elective rotations are available in various private practices in occupational medicine in the Twin Cities as well as at various corporations and government agencies.

The residency program has well established and formal relationships with participating corporations which serve as the sites of industrial rotations. In addition, through Drs. Parker and Lohman, the program has ties with the Minnesota Department of Health and the Minnesota Department of Labor and Industry, including Minnesota OSHA. Residents therefore have access to all of the major venues of occupational medicine practice: academics, hospital-based practice, private practice, corporate practice, and government agencies.

Training in occupational medicine at St. Paul-Ramsey Medical Center has been possible since 1977. The program is fully accredited by the Accreditation Council for Graduate Medical Education. The Occupational Medicine Residency Training Program has always been centered within the Section of Occupational & Environmental Medicine of the Department of Medicine at St. Paul-Ramsey Medical Center. As a member of the Department of Internal Medicine, the Program Director has an appointment at the School of Medicine as well as an appointment at the School of Public Health. The University of Minnesota School of Public Health has provided the academic training for occupational medicine residents through the Department of Environmental and Occupational Health.

Besides the considerable clinical resources available within St. Paul-Ramsey Medical Center, the Occupational Medicine Residency Training Program has been able to call upon its strong relations with Twin City corporations and Minnesota State agencies to provide a well rounded training experience.

Faculty

Core Faculty

William H. Lohman, M.D. is board certified in Internal Medicine and Occupational Medicine. Since November 1992 he has been the Program Director. He is a graduate of the Midwest Center's Occupational Medicine Residency Training Program. He had five years' experience in the private practice of occupational medicine before joining the faculty at St. Paul-Ramsey Medical Center in September of 1989. He is the consultant to the Minnesota Department of Labor and Industry (40% time) as well as to numerous corporations in the Twin City area. He has been very involved in educational efforts not only in clinical training of occupational medicine residents but in occupational medicine training of internal medicine residents, family practice residents, medical students, continuing medical education, and graduate education. His areas of expertise are musculoskeletal disorders, disability evaluation, and Workers' Compensation. He is Adjunct Assistant Professor at the School of Public Health and Assistant Professor at the School of Medicine.

Samuel Hall, M.D. is board certified in Occupational Medicine, Internal Medicine and Medical Toxicology. He is the Chief of the Section of Occupational & Environmental Medicine, and the Medical Director of the Minnesota Regional Poison Center. Dr. Hall has extensive background in medical education as well as numerous publications in the fields of medical toxicology and substance abuse. He has worked extensively with the residency program in toxicology training and serves as preceptor for the Toxicology Clinic. His areas of expertise are medical toxicology, hazard communication, and right-to-know training. He is Assistant Professor at the School of Medicine.

Steve Kirkhorn, M.D. is board certified in Occupational Medicine and Family Practice. He is a graduate of the Midwest Center's Occupational Medicine Residency Training Program. Dr. Kirkhorn is the Medical Director and the rotation coordinator for resident rotations at Employee Health at Saint Paul Ramsey Medical Center and the Minneapolis Veterans' Administration Medical Center. He is faculty for PubH 5281 "Introduction to Occupational Medicine" and in Clinical Medicine I and IV at the School of Medicine. During the practicum year he is also a preceptor for clinical and research training. Dr. Kirkhorn has extensive experience in rural practice and agricultural health issues. He participates actively in the clinical and didactic training of residents in occupational medicine and family practice. His areas of expertise are hospital employee health and agricultural medicine. He is Assistant Professor at the School of Medicine. Dr. Kirkhorn is beginning a one year fellowship to develop a curriculum and program in agricultural medicine.

Beth Baker, M.D., M.P.H. is board certified in Occupational Medicine and Internal Medicine. She is a graduate of the Midwest Center's Occupational Medicine Residency Training Program. Dr. Baker has extensive experience in the private practice of occupational medicine and is the medical director of a number of Twin City corporations. She participates in the clinical and didactic training of residents in occupational medicine and internal medicine, as well as medical students. Dr. Baker is also the rotation coordinator for the industrial rotation at Ashland Oil Refinery. She is faculty for PubH 5281 "Introduction to Occupational Medicine" and in Clinical Medicine I and IV at the School of Medicine. During the practicum year she is rotation coordinator for Quality Assurance projects and the Preplacement / Surveillance Program Reviews. Dr. Baker's areas of special interest are occupational toxicology, reproductive effects of occupational exposures, and investigation of illness / injury clusters.

The program is steadily increasing its research emphasis and focus through the efforts of all faculty, especially Drs. *Jack Mandel* and *Ian Greaves*. Jack Mandel, Ph.D., Professor of Environmental and Occupational Health and Chair of the Division of Environmental and Occupational Health at the University of Minnesota School of Public Health plays an important role in advising and teaching residents research methodology. He also teaches occupational epidemiology during the academic year. Dr. Mandel is a nationally known epidemiologist with considerable experience in occupational epidemiology. Dr. Ian Greaves, Director of the Midwest Center for Occupational Health and Safety,

serves as the adviser to residents in their academic year of training and also helps direct the research efforts of residents. He also teaches a course on occupational and environmental disease during the academic year.

The Occupational Medicine Residency Training Program continues to benefit from its relationships with government agencies to enhance both training and research. Dr. *David Parker* is a board certified Occupational Medicine physician who is a member of the Division of Chronic and Environmental Diseases of the Minnesota Department of Health. Dr. Parker serves not only as a preceptor for elective resident rotations at the Department of Health, but as a research adviser for residents doing projects in collaboration with the Department of Health.

Clinical Faculty

Jeffrey Mandel, M.D., M.P.H. is board certified in occupational medicine and internal medicine. From May 1987 through January 1991 he served as the Program Director of the Occupational Medicine Residency Training Program. He is now a member of the Medical Department at 3M Corporation and continues to work with the residency program as a preceptor for resident rotations at 3M and facilitates research training done in collaboration with 3M.

David Zanick, M.D., M.P.H. is board certified in occupational medicine and is President of the Airport Medical Clinic. Dr. Zanick serves as preceptor for resident rotations at the Airport Clinic and at Northwest Airlines where he is Medical Director. Dr. Zanick is also a key participant in the weekly resident clinical conference and Chair of the Residency Advisory Committee.

Larry Zobel, M.D., M.P.H. is board certified in occupational medicine and internal medicine and is Medical Director at 3M Corporation. Dr. Zobel serves as a preceptor for resident rotations at 3M and as a member of the Residency Advisory Committee.

Connie Pries, M.D., M.P.H. is board certified in occupational medicine and internal medicine. Dr. Pries serves as a preceptor for resident rotations at Park Nicollet Medical Clinic and as a member of the Residency Advisory Committee.

James Craig, M.D., M.P.H. is board certified in occupational medicine and family practice, and the Vice President for Health and Human Services for the General Mills Company. He serves as preceptor for resident rotations at General Mills and as a member of the Residency Advisory Committee.

Progress on Goals

During the last five years, the OM Program has met many of its previous goals:

The OM Program now has a Program Director whose five-year tenure to date has contributed to continuity and stability in the organization and operation of the program through continuous incremental improvement (CQI). The core faculty has been increased both by additions in the Section of Occupational and Environmental Medicine at SPRMC (Drs. Kirkhorn and Baker), and by closer integration of faculty at SPH in the operation of the OM Program.

The OM Program now has firmly established financial support from the sponsoring institution (SPRMC) for subsidization of resident salaries and expenses (including tuition at SPH), teaching activities of the core faculty at SPRMC, and administrative expenses.

The OM Program has a well established program of training in occupational toxicology in both the academic and practicum years which is not only improving the preparation of residents for practice in the field, but is now serving as a source of research opportunities.

The OM Program has increased the level of interdisciplinary training both within the ERC, and within the University, both in practical training and in research efforts. We have accomplished our stated goal of establishing Occupational Health and Safety as a regular, mandatory part of undergraduate medical education at the School of Medicine, and have dramatically expanded the role of Occupational Medicine in graduate medical education in primary care.

More importantly, during the last five years the OM Program has made research training a regular part of the residency experience. Research training in Occupational Medicine is the result of careful collaboration between the academic institutions and various private and government agencies. It continues to attract significant support, most notably from SPH, SPRMC, the Minnesota Department of Health, and the Minnesota Department of Labor and Industry. All residents must complete an independent research project as a requirement for completion of the residency. In addition, research techniques and methodologies are widely incorporated into various residency activities and rotations.

Research is now a key component of residency training throughout the program. Research training begins in the academic year with coursework on research methods and analytic techniques. By the end of the academic year, the resident has developed a research plan under the supervision of Drs. Lohman, Greaves, and Mandel. The research project is completed in the practicum year and the resident prepares a research report which is suitable for presentation to a peer-reviewed journal.

In addition, research methodologies and techniques are widely applied in other training activities. During the practicum year all residents participate in Quality Assurance rounds which require the use of statistical methods to sample and analyze clinic charts. Residents are also assigned to review medical surveillance programs conducted by OEM at SPRMC which requires the analysis of group medical data and correlation with exposure data. The Journal Club emphasizes quantitative review of the medical literature, while the resident Case Conference employs an evidence-based approach to clinical problem-solving.

Coordination of the resident's research activities is the responsibility of the Program Director who has overall oversight of the planning, execution, and completion of projects within the context and time parameters of the training program. Dr. Lohman is assisted by Drs. Greaves and Mandel at SPH.

The Occupational Medicine Residency Training Program has offered residents the opportunity to receive training within all of the major venues of occupational medicine practice. The resident is extensively exposed to academic occupational medicine during the academic year and during their research project. Clinical practice in occupational medicine is pursued both in hospital-based settings and in private clinic settings. Residents are exposed to various types of corporate medical departments during the industrial rotations, and to several state agencies that affect occupational safety and health, most importantly Minnesota OSHA. The availability and integration of these various training experiences provides the occupational medicine resident at the Midwest Center with a unique grasp of the field of occupational medicine.

Through these various training experiences, the occupational medicine resident also learns to interact with numerous other professional groups important to occupational health and safety. In the academic setting and during the research project, residents work closely with epidemiologists and biostatisticians. Residents collaborate with researchers at the School of Public Health, the Minnesota Department of Health, and the Minnesota Department of Labor and Industry. In the clinical setting, residents interact with lawyers, corporate management, rehabilitation specialists, allied health personnel, insurers, and medical/surgical specialists. In the corporate setting, residents work with industrial hygienists, safety professionals, toxicologists, occupational health nurses, labor representatives, and corporate management. During rotations at government agencies, the residents meet with policy analysts, regulators, lawyers, and legislators.

The comprehensive training made available to residents at the Midwest Center involves their participation in the entire range of activities within occupational medicine. Clinically, they provide longitudinal care of injured and ill workers. They also perform preplacement examinations, medical surveillance, disability evaluations, medical-legal consultations, and specialty consultations, such as the assessment of chronic toxic exposures. In the corporate and government settings, residents participate in risk assessments, policy reviews, and policy development. Rotations in corporate settings allow residents to participate in health promotion and employee assistance activities as well as occupational surveillance and screening projects. The weekly schedule of residents' conferences serve as a forum where experiences from these diverse settings and perspectives are integrated into a comprehensive view of occupational medicine.

Conclusion

Through the ongoing addition of staff and resources by St. Paul-Ramsey Medical Center and the "continuing quality improvement" efforts by the faculty, the Occupational Medicine Residency Training Program continues to refine its curriculum and expand the scope of training it offers to aspiring occupational health physicians.

F. Agricultural Safety and Health

The Agricultural Safety and Health (ASH) Program of the Midwest Center began in September, 1990 and is now completing its seventh year of activity. During the past five years, the primary activities of the ASH program have included:

- Providing a structure whereby students pursuing a Master of Public Health (MPH) or a Master of Science (MS) can receive a "minor" in Agricultural Safety and Health.
- Developing and delivering outreach activities and materials geared toward health professionals and educators on agricultural health and safety topics via conferences, a seminar series, newsletters, Internet World Wide Web pages, videotapes, and distance education offerings.
- Cooperation in and facilitation of multi-disciplinary research projects in areas that include: machinery-related injury epidemiology; measurement of air quality in swine confinement facilities; communication patterns and strategies to enhance interventions for migrant farmworkers; and skin cancer prevention intervention evaluation for school-aged children.

The ASH program has become highly interdisciplinary in nature as is reflected by the heavy involvement and current leadership (as of 6/96) by Dr. John Shutske, Associate Professor in the College of Agriculture, Food, and Environmental Sciences as well as other faculty and stakeholders representing other disciplines and practices. Other University of Minnesota units that have participated in ASH activities and efforts have included: the Medical School, College of Human Ecology; Veterinary Medicine; and Institute of Technology. During the five-year reporting period, the ASH program also worked to develop the Minnesota Center for Research in Agricultural Safety and Health (MN-CRASH). This center was developed following a legislative mandate by the state of Minnesota in 1991 and facilitated numerous activities including the publication of a research newsletter (Farm Safety and Health Digest); a six-month seminar series on agricultural health and safety issues; and numerous other outreach, education, and research activities.

Faculty

John Shutske, PhD is an Associate Professor in the Department of Biosystems and Agricultural Engineering, within the College of Agriculture, Food, and Environmental Sciences (COAFES). He has been responsible for the overall management of the ASH Program since June 1996. Dr. Shutske holds an adjunct appointment in the School of Public Health, teaches courses in the Department of Mechanical Engineering, and is the Agricultural Safety Specialist of the Minnesota Extension Service. Dr. Shutske also serves as the Deputy Director of the Minnesota Center for Research in Agricultural Safety and Health. Shutske's doctoral degree research at Purdue University included development of fire detection and control systems for mobile farm equipment. While at Purdue, he also participated in numerous farm injury intervention activities. His present research focus is in agricultural injury prevention including development of prototype electronic sensors and engineering control systems to prevent entanglement of rotating farm equipment, determination of lost production costs resulting from farming injuries, development of confined space entry protocol for rural communities, and investigation of the impact of insurance industry based hazard inspections and incentives. Dr. Shutske has taught a significant portion of the *Agricultural Safety and Health* (PubH 5214) as well as numerous guest lectures in Agriculture, Veterinary Medicine, and the Medical School. In the winter of 1997, Shutske developed a new course offering through COAFES for students in agriculture, public health, veterinary medicine, nursing, and education. He is also a speaker and coordinator of numerous workshops, lectures, and seminars throughout Minnesota and other states with primary audiences including farmers, agribusinesses, health professionals and educators. Dr. Shutske is a member of the National Institute for Farm Safety, the National Safety Council's Agricultural Division, and the Society for Engineering in Agricultural, Food, and Biological Systems.

Ian Greaves, MD is an Associate Professor of Environmental and Occupational Health and directs the Midwest Center. He is a pulmonary physician and physiologist who has a particular interest in agricultural health problems of airborne exposures to organic and vegetable aerosols. He is the faculty member responsible for coordinating the *Agricultural Safety and Health* (PubH 5214) course. During the reporting period, Dr. Greaves has also become heavily involved in numerous other educational

offerings including serving as a guest speaker on chronic health effects of pesticide exposures for over 2,000 professional pesticide applicators.

Susan Goodwin Gerberich, PhD, RN has a broad range of injury-related projects on which she is working currently. She assists in teaching elective and required materials relating to the epidemiology, causes, and prevention of rural injuries. Dr. Gerberich has substantial knowledge and national recognition in the area of agricultural trauma. Among her principal research studies are the Olmsted Agricultural Trauma Study and the Regional Rural Injury Study, both of which investigate the causes of farm-related and farm-unrelated injuries among rural populations. The extensive network of health and safety professionals developed by Dr. Gerberich in neighboring states serves as a model for networking the present ASH efforts among the same states. Over the last seven years, Dr. Gerberich has developed a strong research training program in injury epidemiology and control at the University of Minnesota, with a particular focus on farm-related injuries.

Debra Olson, MPH, RN provides important leadership to the occupational health nursing program in regard to continuing education and outreach. She has considerable experience in rural health: she spent six years as a public health nurse in rural Minnesota (3 years in Winona County, 3 years in Dakota County). She has expertise in applied toxicology research, community-based program development, and information systems; she has recently completed a needs assessment for occupational health nursing in the upper Midwest, and supervised the needs assessment for agricultural safety and health in Minnesota and neighboring states. She analyzed the findings of the assessment performed in Year 1 to determine the educational needs of physicians, community health nurses, county extension officers, and farm workers; she also helps coordinate curriculum development for the course, *Agricultural Safety and Health*. Ms Olson is responsible for determining the content and relevance of the educational materials for the respective audiences.

Jeanne Ayers, MPH, RN is an Adjunct Instructor in the Division of Environmental and Occupational Health and directs the Continuing Education Office of the Minnesota ERC. These activities are performed through the Midwest Center for Occupational Health and Safety. Ms Ayers is a graduate of the Midwest Center's occupational health nursing program and has extensive experience in consultation, marketing, program development, and management of occupational health services. She also has a very strong rural background, having grown up on a farm in Minnesota, been a member of 4-H and has seen many of the severe hardships of agricultural injuries and health problems. She worked on an in-depth needs assessment of health providers and other rural professionals pertaining to agricultural health and safety in conjunction with Ms Olson, and in the development of educational materials for the ASH program.

Susan M. Miller, RN, MPH is an education specialist with the Midwest Center for Occupational Health and Safety's Program in Continuing Education. Miller is a graduate of the Midwest Center's occupational health nursing program. Miller's presentations and course work while in the program included Agricultural Health and Safety with a strong emphasis on respiratory health of farm workers. In her MPH research, she conducted a secondary analysis of the respiratory health of swine confinement workers using data collected by the Minnesota Farming Health Project. Miller's current responsibilities at the Midwest Center include program development, marketing, and coordination of Agricultural Medicine: Caring for Farm Families.

Progress on Goals

- **Development of a Minor Program for MPH/MS Students**

A minor program was planned and developed for students in Environmental and Occupational Health with specialized interests in ASH. Students pursuing the ASH minor can now participate if they are studying in the fields of industrial hygiene, occupational health nursing, injury epidemiology, or occupational medicine. The minor consists of coursework (Public Health 5214 or Agricultural Engineering Technology 5200); a seminar prepared and presented by the student pertaining to an agricultural health and/or safety topic; part of the student's internship must address a specific agricultural occupational health/safety issue; and, the student must have a Plan B research project on a topic that pertains to an agricultural occupational health or safety issue.

The initial course offered to meet the needs of students in the ASH minors was Public Health 5214, *Agricultural Health and Safety*, offered first during the summer Occupational Safety and Health Institute in 1991. A total of six students participated in the course during that first year including students representing the fields of medicine, nursing, and safety/loss control. The course was offered again in 1995 as a modified version of the original *Agricultural Health and Safety* course, and again was conducted through the summer Occupational Safety and Health Institute. The production of the 1995 course offering was supported by a training grant from the Minnesota Extension Service Intercollegiate Leadership Program for \$20,000. Extensive planning was necessary for this effort, largely because the course was offered in three modules and through interactive television.

The lectures were offered as continuing education units to those who wished to obtain just the didactic information and participate in class discussion. This approach met the needs of extension agents who take the course through interactive television. A total of 6 students participated in this course offering in 1995, including 2 students who participated via I-TV from Crookston, Minnesota.

As a follow-up to this activity, the ASH program received a small grant to develop an additional distance education tool to provide a basic introduction on agricultural safety and health issues. A two-hour module that captures the introductory information that had been presented by Dr. Shutske in PubH 5214 can now be accessed by students through the Internet's World Wide Web. The module includes graphics, text, data, and the opportunity for direct interaction with ASH faculty via e-mail and can be viewed at <http://www.bae.umn.edu/~fs/module/>

In the winter of 1997, Dr. Shutske developed a second course which is offered through the College of Agriculture, Food, and Environmental Sciences. This course (designated as Agricultural Engineering Technology 5200) is titled "*Safety and Health Issues in Agricultural Work Environments.*" It contains much of the same injury and disease prevention material as PubH 5214, but now also includes units on safety issues associated with biotechnology, environmental impact of livestock production and pesticide use, and unique risks for migrant workers, pregnant women working in livestock production, and children.

Additional courses that have content helpful to students pursuing the ASH minor are available. These courses build knowledge in several areas including injury control, respiratory disease and protection, toxic effects of agricultural chemicals, and control methods. Students presently select additional courses as electives to match their particular programs and needs. In addition, the masters' project (3-6 credits) pertaining to agricultural safety/health issues is required, for a total of 18-24 credits that comprise the "minor." Masters' students taking this series of courses and a project in agricultural safety and health are eligible for stipend and tuition funding from the ASH core up to 50 percent of their total allotted stipend and up to 50 percent of their total tuition; the remaining funding for their stipend and tuition would come from the "major" program in which they are enrolled (occupational health nursing, injury epidemiology, industrial hygiene, or occupational medicine).

Currently, there are three students pursuing the ASH minor. Two of these students will complete their MPH programs in the Fall of 1997, and the third will complete within the coming year. Ruth Tripp is an MPH student in Occupational Health Nursing studying the changing occupational safety and health service needs of employers in the rapidly consolidating swine industry. Jeanne Lincoln, another OHN student is studying the costs of remediation of used farm equipment in Wisconsin in cooperation with Dr. Mark Purschwitz at the University of Wisconsin at Madison. Ann Lundvall (OHN) has research interests in childhood agricultural injury prevention and implementation of community based programs.

In addition to these three students, two additional students completed graduate work within the Division during the time that the development of the ASH minor was in progress. Sue Miller (MPH) and Mark Werner (PhD) both completed programs with an ASH theme and as graduate students, each co-authored a journal article for the AAOHN with Ms. Olson. Miller continues to pursue ASH interests as a program coordinator with the Midwest Center and she has provided leadership in developing the Caring For Farm Families conference which will be described shortly.

- **Outreach and Classroom Education of Health and Other Rural Professionals**

An in-depth needs assessment survey was conducted and published in 1992 (published in 1994) to help set the direction for continuing education offerings and formats for professionals working in rural Minnesota. This needs assessment was administered to several groups including: physicians, public health nurses, chiropractors, extension educators, and machinery dealers. This study yielded interesting results. First, there were clear and strong interests in a variety of agricultural health and safety issues ranging from respiratory disease to machinery injuries to occupationally-related stress and mental health. Data were also collected related to favored format for information delivery among these various audiences. As a result of this assessment, the plans which had been proposed for the reporting period described in this summary report included development of specialized educational materials and offerings consistent with those determined in the needs assessment

One major outreach offering that resulted from the needs assessment was, *Agricultural Medicine: Caring for Farm Families*, has been offered annually from 1994 to 1997. A total of approximately 211 physicians, nurses, emergency technicians and extension agents have attended the course since 1994, which offers both CEU and CME credits. The course presents the most current information regarding farming health and safety hazards, and outlines the role of the primary care provider in risk detection, treatment, and prevention. In April 1997, this course was offered in Rochester, Minnesota which a rural center and hub of medical activity southeast of the Twin Cities and home to the Mayo Clinic. In 1996, the course was offered in St. Cloud located in the heart of the state's biggest agricultural county. In the two prior years (94 & 95) the course was offered in St. Paul.

Another major effort that resulted from the above mentioned needs assessment was the development of a specialized ASH newsletter. From 1992 until 1996, the ASH program has published quarterly editions (2,000 copies per edition) of the *Farm Safety and Health Digest*. The digest is distributed to rural health professionals, farm equipment dealers, agribusinesses, farming associations, academics interested in agricultural safety and health, community leaders in farming communities, and directly to farmers themselves. The digest is supported jointly by the MES. In late-1996, the decision was made to temporarily suspend publication of the digest and investigate the feasibility of publishing a similar document of equal quality via the Internet. As a result, the most recent print version of the Digest has been translated as a World Wide Web document and is available at: http://www.bae.umn.edu/~fs/digest12/d12_p1.htm

The next Web-based issue of the newsletter will be disseminated electronically in mid-September, 1997. Additionally, to support outreach activities to health professional audiences with ASH interests, Dr. Shutske and his staff have developed the *Farm Safety and Health in Minnesota* homepage at: <http://www.bae.umn.edu/~fs/>. This page receives approximately 150-200 "hits" weekly and tracking software indicates that individuals from throughout the US and internationally are accessing content.

In another effort to be responsive to needs identified in the needs assessment, an eight-part seminar series, *Harvest of Pain*, was developed and presented on the Minneapolis campus of the University of Minnesota and at St. Paul Ramsey Hospital in St. Paul. The seminar series was videotaped and has been distributed widely with the assistance of the Minnesota Farmers' Union and other agricultural organizations in the state. Seminar topics included: chronic health effects of respiratory contaminants and pesticides, enforcement strategies in injury control, and an overview of successful intervention programs in rural communities.

Over the years represented in this reporting period, the Midwest Center established closer connections with the Minnesota Department of Agriculture. In meetings with representative from this state organization, the Center identified training needs for extension service employees and pesticide regulators in the area of pesticide application. As a result, a conference titled Pesticides: Health Effects From Work Exposures in the Upper Midwest was presented to a multi-disciplinary audience of 58 physicians, nurses, academics, and agricultural extension educators. The planning committee worked for nine months and was comprised of representative from: industry, the Minnesota Extension Service, Department of Agriculture, Department of Health, the NIOSH-sponsored OHNAC project, Minnesota Poison Control Agency, and the American Lung Association. Topics covered included clinical pesticide toxicology, identification of populations at risk, diagnosis and treatment of chronic and acute exposures, prevention, and risk communication.

ASH staff including Dr. Shutske and Patricia Ohmans, MPH were also instrumental in developing a much needed effort focusing on the development of leadership skills among key individuals in rural communities around agricultural occupational safety and health issues. From 1993-1995, Shutske and Ohmans successfully obtained funds for the "Minnesota Farm Safety and Health Leadership Team." This group of approximately 25 individuals represented innovative, enthusiastic, self-identified leaders with clear interests in helping their communities develop and deliver sound intervention programs using techniques that included traditional education as well as engineering and policy-based solutions. Specialized training for team members included case studies incorporating the "3-E's" of safety, and child development applications in child safety. The program went without additional state funding in 1996, but in mid-1997 was re-funded by the state legislature. The team represents an important rural constituency of the ASH program and its graduates and will be called on frequently as a sounding board for future efforts.

There are several other outreach efforts worth mentioning that ASH staff have participated in. Each year since 1991, the ASH Program has assisted with educational materials and presentations at training programs for those people requiring licenses to purchase and apply pesticides. In 1995-1996 a total of 8,182 pesticide applicators received instruction using materials developed by the Midwest Center and MN-CRASH.

Through his work with the Minnesota Extension Service, Dr. John Shutske delivers an additional 40 to 50 presentations annually for various groups that include farmers, health professionals, agricultural suppliers, insurance staff, and commercial herbicide applicators. The total audience for Dr. Shutske's outreach education averages approximately 6,500-7,500 people per year. Members of the Midwest Center presented lectures on agricultural health and safety, and attended numerous meetings that included state officials, representatives of local farming organizations, academic investigators, machinery and chemical manufacturers/distributors, and members of the state legislature.

Additionally, Dr. Shutske has served as a lecturer for the past four years in the Family Practice program's Community Health residency rotation in the Medical School. This rotation occurs twice each year, and residents receive 1.5 hours of information and discussion regarding agricultural health and safety issues with a focus on the physician's role in prevention. This component of the rotation is consistently rated highly by the residents, and ASH staff feel it is important since nearly 50% of each class plan to practice within a rural area.

Research projects conducted by ASH faculty, staff and students have included: an epidemiological research and demonstration project of cancer among farm families; a multicenter study of brain cancer among farmers; investigation of protective clothing and use of personal protective equipment among pesticide applicators; epidemiological surveys of injuries to farm workers and children; studies of animal-related farming injuries; an anthropological evaluation of farm cultures in relation to safety information; investigation of the airborne exposures and respiratory health of poultry confinement and hog confinement workers; investigation of the engineering controls used in confinement farming to control toxic gases and dusts, and their emission from confinement facilities; and applied research on safety engineering involving reducing risks of explosion when jump starting vehicles, electronic sensing units aimed at decreasing the risk of rear-end collisions with slow moving vehicles, roll-over protection and guarding of power take-off shafts.

Several of these projects were completed under the umbrella and guidance of the Minnesota Center for Research in Agricultural Safety and Health (MN-CRASH), a center created in 1991 by the Minnesota legislature. The MN-CRASH center was developed in an effort to support and promote research that addresses the most immediate and serious health problems of agricultural workers; focuses on high-risk and/or underserved populations—specifically children living and working on farms; minority and migrant farm workers; considers safety and health problems from a multidisciplinary perspective. A pilot research grant program sponsored by the Minnesota Department of Agriculture was administered by MN-CRASH in 1993-1994 and supported four projects: 1) Children's Perceptions of the Risk of Skin Cancer, Protective Behaviors and Strategies for Intervention; 2) A Study of Risk Factors for Agricultural Machine-Related Injuries; 3) Measurement of Air Quality Inside Minnesota Pig Finishing Facilities; 4) Agricultural Safety Conversations in Farm and Migrant Agricultural Worker Families.

Additional research projects involving the Midwest Center faculty have been conducted in Minnesota and neighboring states. Prominent among these are the research efforts of Dr. Shutske in numerous research initiatives designed to prevent agricultural injuries through the use of engineered interventions and community building; Dr. Gerberich in the area of rural injury identification and prevention; and Dr. Mandel's group in the areas of pesticide exposures, cancer epidemiology, and cancer prevention among farming populations.

Dr. John Shutske's work has included the Farm Insurance Safety Audit Project; numerous child safety initiatives including community based programs and evaluations, the National Childhood Agricultural Injury Prevention Symposium, and the National Committee for Childhood Agricultural Injury Prevention; the Engineering and Ergonomic Control Technology project funded by NIOSH through the National Farm Medicine Center; research dealing with issues and costs associated with confined space entry in agriculture; and application of engineered interventions and sensors to prevent fire losses and injuries on farms; numerous community-based farm safety and health leadership initiatives including the Minnesota Farm Safety & Health Leadership Team. Dr. Shutske has had a close cooperative relationship in research, intervention programs, and graduate level education with groups including the Minnesota NIOSH-funded OHNAC project; the National Farm Medicine Centers various projects and outreach initiatives; the Minnesota FACE injury surveillance project; the University of Minnesota's Schools of Medicine and Public Health, Veterinary Medicine, and College of Agriculture, Food, and Environmental Sciences.

Currently, Dr. Shutske is working with MPH student Ruth Tripp in the development of a needs assessment survey to document the health and safety service needs of large/growing swine producers in Minnesota and North Carolina. The project will include a mail survey of approximately 600 large scale producers in Minnesota and North Carolina. The North Carolina sample was included since North Carolina has transitioned previously from small to large scale production and has addressed some of the occupational safety and health needs faced by producers such as regulatory compliance, rising workers compensation costs, and worker training.

Conclusion

During the past five years, the ASH component of the Midwest Center has developed significantly and currently serves as an important catalyst in the region for agricultural health and safety outreach, research, and educational activities for students, health professionals and faculty with interests in this vital area. As a result of the 1996 site visit by NIOSH, continued emphasis will be placed by Midwest Center faculty on the development and promotion of the academic minor program. Hopefully in the future, resources will be made available to build the program with expanded offerings for physicians, nurses, and other health and safety professionals who can bring their expertise and knowledge base to bear on the important problem of agricultural injury and disease.

Industrial Hygiene Program Students/Graduates and their Current Employment
7/1/92-6/30/97

<u>Name</u>	<u>Degree Program</u>	<u>Date Entered</u>	<u>Date of Degree</u>	<u>Current Employment</u>
*† Atassi, Houssam	MPH	9/23/91	2/28/94	Department of Labor 4 W. Edenton St. Raleigh NC 27601
Beedle, Michael	PhD	1/6/97		Withdrew from program.
* Betsinger, Geoffrey	MS	9/21/95	7/31/97	US Navy 3869 Laurel Court Eagan, MN 55122 (612) 405-0874
Black, Elisabeth	MS	9/22/94		Hart Crowser, Inc. 1910 Fairview Avenue East Seattle, WA 98102-3699
Blodgett, Timothy	MS	6/15/96		Current student
Brewer, Sarah	MS	9/23/93		Honeywell Inc. 8840 Evergreen Blvd. MN 51-3100 Coon Rapids MN 55433 612/957-4433 (phone)
† Brondum, Jack	PhD	9/22/88	6/30/95	
† Dalhoff, Jeffrey J.	MPH	9/23/91	12/11/93	OSHA Department of Labor 4 West Edenton St. Raleigh, NC 27601
† Denman, Walter R. III	MS	9/1/89	8/31/92	Midwest Environmental Control Corp. 411 Central Ave. NE Columbia Heights, MN 55421
Dugan, Siobhan	MPH	9/21/95		Current student
† Dymond, Mary D.	MPH	9/22/88	7/21/92	Barr Engineering Company 7803 Glenroy Rd. Bloomington, MN 55435

Name	Degree Program	Date Entered	Date of Degree	Current Employment
* England, Ellen, CIH	MS	9/22/94	5/31/96	U.S. Air Force 20113 County Rd. 50 Hamel, MN 55340 612/420-6089 (phone)
*† Fipp (Rosenfield), Barbara A.	MS	9/21/89	5/31/95	3M Company Bldg. 220-2E-02 PO Box 33220 St. Paul, MN 55133
Garletts, Gabriel	MPH	9/22/94		Environment & Energy Center 427 St. Clair Avenue St. Paul, MN 55102
† Grant, Judy (Gronquist) C.	MS	9/9/85	6/30/94	Northern States Power Company 414 Nicollet Mall Minneapolis, MN 55401 612/330-6342 (phone) 612/330-5721 (fax)
Henckel, C. Leslie	MPH	9/26/97		Current student
Isaacson, Nancy (Cowan)	MS	9/24/92		Current student
† Iverson, Lisa R.	MPH	9/23/91	7/21/92	Los Alamos National Laboratories Los Alamos, NM 87544 313/663-4925 (phone)
* Johnson, Brian	MPH	9/22/94		3M Company St. Paul, MN 55144-100 (612) 736-3402
Kelly, Nancy	MS	9/26/96		Current student
Kendig, Marla	MS	9/23/93	6/30/97	ALZA 8295 Central Ave. NE Minneapolis, MN 55432 (612) 785-6820
Kerr, Steven, CIH, CSP	MS PhD	9/22/94 9/26/96	3/31/97	Current PhD student Bay West 5 Empire Drive St. Paul, MN 55103 (612) 291-0456

Name	Degree Program	Date Entered	Date of Degree	Current Employment
Klancher, Joseph	MPH	9/23/93		Hennepin County 647 Lincoln Ave., Unit F St. Paul, MN 55105 612/348-8492 (phone) 612/348-3492 (fax)
Kornfeld, Linda	MS	9/22/94		Peace Corps PO Box 208 Lilongwe, Malawi AFRICA
Kubisiak, James	MS	9/23/93		MN Dept. of Employee Relations 12933 Germane Ave. Apple Valley, MN 55124 612/294-8006 (phone)
Lai, Jilly	MS	9/24/92	12/30/93	Council of Labor Affairs Taipei, Taiwan
Longo, Anastasia	MS	7/23/93	8/31/95	Advanced Micro Devices 3816 So. Lamar Blvd., #2418 Austin, TX 78704
† Lori, Ann M	MS	3/15/87	5/31/95	3M Company 3M Center Bldg. 220-2E-02 St. Paul, MN 55144-1000 612/733-5482 (phone) 612/733-1773 (fax)
Marchetti, Judith	MS	9/21/95		Current student
McLinn, Christopher	MPH	9/21/95		Hennepin County Minneapolis, MN (612) 348-6026
McCullough, Nicole (Vars)	MS PhD	9/24/92 1/3/94	7/29/94 12/31/96	3M Company 3M Center #260-3B-08 St. Paul, MN 55144-1000 (612) 575-8294
Mujumdar, Anita	MPH	9/21/95		Current student
† Northrop, Daniel R.	MS	9/1/89	3/31/93	EBI Companies 3410 Oakwood Mall Dr. Eau Claire, WI 54701 715/833-8711

Name	Degree Program	Date Entered	Date of Degree	Current Employment
Purcell, David	MS	6/15/93		Imation Company 333 So. 7 th Street, Suite 2105 Minneapolis, MN 55402
Randolph, Kevin	MS	6/14/94	12/31/96	Midwest Center for Cont. Edu. 640 Jackson Street St. Paul, MN 55101 (612) 221-3992
Reinke, Patricia H.	MS PhD	9/23/91 9/22/94	12/29/94	Current PhD student
*† Resner, Lauren J.	MPH	9/21/89	8/26/92	3M Company 3M Center #220-2E-02 St. Paul, MN 55144-1000
Rosauer, Sara	MS	6/21/95		Current student
† Ruenger, Eugene L., CIH	PhD	1/5/81	9/30/94	University of Wisconsin-Stout 303 D. Science Wing Menonenee, WI 54751 715/232-2148 (phone) 715/665-2231 (fax)
† Schowalter, Debra A.	MS	3/30/87	1/31/94	Wacker Electronics Industry 7285 SW 84th St. Portland, OR 97223 503/452-0286 (phone)
† Senechal, Cheryl K.	MS	6/16/92	2/28/94	Federal Cartridge 900 Ehlen Drive Anoka, MN 55303 612/323-3864 (phone) 612/323-2421 (fax)
† Spear, Terrance M., CIH	MS PhD	9/24/79 9/1/88	12/17/80 1/31/96	Montana Tech of University of Montana 1300 W. Park Butte, MT 59701-8997
* Sreenath, Avula	PhD	1/2/95		Current PhD student
† Traubel, Kris T. (Schueth)	MS	9/23/91	10/31/94	Iowa State University 118 Agronomy Lab Ames, IA 50011 515/294-2009 (phone)

Name	Degree Program	Date Entered	Date of Degree	Current Employment
*† Tsai, Perng-Jy	MS PhD	9/23/91 3/30/92	2/28/95	Dept. of Env. & Occ. Health Medical College National Cheng-Kung University Shang-Li Road Tainan 70428, Taiwan
† Wahl, George L.	MPH	9/23/91	3/31/95	MN Department of Health 717 Delaware St. SE PO Box 9441 Minneapolis, MN 55440
* Weiby, Gary	MS	9/21/95	6/11/97	US Airforce 8799 Indian Blvd. Cottage Grove, MN 55016 (612) 458-909
* Werner, Mark A.	MS PhD	9/24/90 6/15/93	11/30/92 8/30/96	Division of Respiratory Disease Studies (Epi Investigation Branch) NIOSH 1095 Willowdale Road Morgantown, WV 26505
† Williams, Allan N.	MPH PhD	9/29/80 9/30/85	8/20/82 6/30/94	MN Department of Health Minneapolis, MN 55440
Wilsey, Peter	MS	9/23/93	11/30/95	Department of Labor, OSHA 71 Stevenson, Suite 420 San Francisco, CA 94105
Wolf, Diana	MPH	6/17/97		Current student
Wolff, David	MPH	9/24/92	6/11/94	Dept. of Environmental Health and Safety Iowa State University Ames, IA
* Yamada, Nobuhiko	MS	9/22/94	5/31/96	Sumitomo 3M Ltd. 33-1 Tamagawadai 2-Chome, Setagyaku Tokyo, Japan

CIH = Certified Industrial Hygienist

* Those who did not receive NIOSH funding

† Those admitted prior to 7/1/92 but graduated 7/1/92 – 6/30/97

Occupational Medicine Program Students/Graduates and their Current Employment
7/1/92-6/30/97

Name	Degree	Date Entered	Date of Degree	Completed Residency	Current Employment
Badroos, Peter	MPH	7/1/96			Current student
† Brown, Joyce	--	6/30/92	--	12/29/93	Tulsa, Oklahoma
Gibson, Barbara	MPH	7/1/94	7/16/96	6/30/96	OEM Ramsey St. Paul, MN
† Gilliland, Frank	MPH PHD	7/1/89 9/24/90	12/15/90 9/30/92	12/31/92	Univ. of New Mexico School of Medicine Albuquerque, NM
Gregor, Gail	MPH	7/1/96			Current student
Harkins, Deanna	MPH	7/1/95		6/30/97	Current resident
Hewitt, David	--	8/21/95	--		Current resident
Kesler, Denece	MPH	7/1/94	7/16/96	6/30/96	OEM Ramsey St. Paul, MN
† Kirkhorn, Steven	MPH	1/1/90	3/31/97	12/31/92	OEM Ramsey St. Paul, MN
LaMar, Wanda	MPH	7/1/93	6/14/97	6/30/95	Health Works Occ. Medicine Bloomington, MN
† Leonard, Pamela	MPH	9/1/89	6/8/91	6/30/94	St. Cloud, MN
Mann, Orrin	--	8/1/92	--	7/31/93	MultiCare Associates Roseville, MN
Mikhail, Sherief	MPH	7/1/96			Current student
† Miller, Ray	MPH	6/30/90	7/21/92	6/29/92	Iowa Medical Clinic
Ramphal-Naley, Lilly	MPH	8/23/93	3/18/95	6/30/95	WNJ Workmed Occ. Medicine Sherman, TX
Schumpert, John	MPH	8/21/95			Current resident
Wall, Kevin	MPH	7/1/94	7/16/96	6/30/96	OEM Ramsey St. Paul, MN

† Those admitted prior to 7/1/92 but graduated 7/1/92 – 6/30/97

**Occupational Health Nursing Students/Graduates and their Current Employment
7/1/92-6/30/97**

<u>*Name</u>	<u>Degree Program</u>	<u>Date Entered</u>	<u>Date of Degree</u>	<u>Current Employment</u>
Anderson, Elizabeth	MPH	9/1/95	6/14/97	Currently enrolled
Andrews, Deborah	MPH	9/1/94		Currently enrolled OHN, Allina Minneapolis, MN
Birkholz, Brenda M.	post-graduate work	9/1/92		Occupational Health Specialist Hutchinson Area Health Care Hutchinson, MN 55350
Bulen, Patsy	MPH	9/1/92		Mercy Hospital
†Burris, Jean M.	MPH	9/21/89	7/21/92	Occupational Health Analyst 3M Center St. Paul, MN
Carlson, Virginia	MPH	9/1/93		Community Occupational Health and Safety Specialist Park Nicollet-Airport Medical Clinic Minneapolis, MN
Chelstrom, Laurel	MPH	9/1/92	6/14/97	MN State Health Department Minneapolis, MN
†Dembosky, Diane M.	MPH	6/11/91	6/12/93	Occupational Health Manager North Region Allina Allina Health System Mercy Hospital Coon Rapids, MN
English, Naomi	MPH	6/17/97		Midway Hospital St. Paul, MN
Ferrara, Karen	MPH	9/1/92	7/16/96	Currently enrolled HealthPartners Account Consultant WorkSite Health Department Minneapolis, MN
Finndorf-Dennis, Mary	MPH PhD	9/1/93 9/24/96		Currently enrolled
Folken, Sandra	MPH	9/1/94		Currently enrolled
†Hayden, Geralyn J.	MPH	9/10/84	3/19/94	Director of Operations RTW, Inc. Minneapolis, MN

<u>Name</u>	<u>Degree Program</u>	<u>Date Entered</u>	<u>Date of Degree</u>	<u>Current Employment</u>
†Kopfer, Angela M.	MPH	9/1/91	3/20/93	Program Manager Occupational Health System Minnesota Minneapolis, MN
Kraut, Connie	MPH	9/1/94		Currently enrolled Supervisor, Employee Health Services Fairview Riverside Medical Center 612/672-6474
†Larson, Karen L.	MPH	9/1/89	6/12/93	
Lincoln, Jeanne	MPH	9/1/94		currently enrolled Associate Research Specialist, University of WI-Madison, Biological Systems Engineering
Lundvall, Ann	MPH	9/1/96		Currently enrolled
†Matter, Dawn L.	MPH	9/1/90	3/18/95	Nurse Epidemiologist Children's Hospital St. Paul, MN
†Mike, Debra K.	MPH	9/1/90	6/12/93	
Miller, Susan M. (Bark)	MPH	3/30/92	6/8/96	(completing research requirements) Education Coordinator Midwest Center for Occupational Health and Safety St. Paul, MN
Muhovich, David	MPH/MS	9/1/92	8/23/95	Instructor of Nursing Bethel College St. Paul, MN
Nachreiner, Nancy	MPH PhD	9/1/94 9/24/96		Currently enrolled Occupational Health Nurse Business Health Services Waconia, MN
†Nelson (Lowe), Mary L.	MPH	9/19/87	6/11/94	Infection Control Practitioner St. Joseph's Medical Center Brainerd, MN
Nelson, Wendie	MPH	3/27/95		Currently enrolled
O'Donald, Jenie	MPH	9/1/94		Currently enrolled OHN Manager, Upper Level, Honeywell-Golden Valley
†Peterson, Eileen H.	MS	9/26/86	12/30/94	Director of Health System Evaluations United HealthCare Corporation Minneapolis, MN

<u>Name</u>	<u>Degree Program</u>	<u>Date Entered</u>	<u>Date of Degree</u>	<u>Current Employment</u>
Porta, Carolyn	MN	6/17/97		Currently enrolled
†Roberts, Cecilia R.	MPH	9/1/90	6/12/93	Prevention Project Manager Regions 7&8 HSO Colorado Springs, CO
Rozman, John	MPH	3/22/97		Currently enrolled
Schmitz, Laurie	MPH	9/1/94		Currently enrolled Employee Health Services Nurse, HealthSystem Minnesota
Temanson, Nancy	MPH	9/1/93		Currently enrolled
Trainor, Linda J.	MPH	9/1/90		Currently enrolled Loss Control Manager Carlson Companies Minneapolis, MN
Tripp, Ruth	MPH	9/1/94		Currently enrolled Research Assistant, Univ. MN, Biosystems and Agricultural Engineering

† Those admitted prior to 7/1/92 but graduating 7/1/92-6/30/97

**Occupational Injury Prevention and Safety Program Students/Graduates and their
Current Employment
7/1/92-6/30/97**

Name	Degree Program	Date Entered	Date of Degree	Current Employment
† Boyle, Debora	PhD	1/1/91	4/28/95	MN Department of Health Minneapolis, MN 55440
† Brown, (Zeug) Margaret	MPH	9/1/89	8/26/92	MN Department of Health Minneapolis, MN 55440
Dolan, Terri	MPH	9/21/95		Physical Therapist University of Minnesota Hospital Minneapolis, MN
Gabel, Christine	PhD	9/23/93		Current student
Jacobs, Philip	MPH	6/20/95		Current student Jacobs Consulting, Ltd. St. Paul, MN
† Klein, Patti J.	PhD	9/1/88	8/31/94	Dow Corning Company Midland, MI
* Lee, Su-hsing	MPH PhD	3/26/90 9/23/93	8/21/91	Current student
Pessoa-Branda, Luisa	MS PhD	9/1/96 6/17/97		Current student MN Department of Health Minneapolis, MN
Rodiles, Jane	MPH	9/23/93	12/14/96	Lecturer, University of Minnesota/Violence Prevention Specialist -ReMax Realty Bloomington, MN
Ross, Nina	MPH	9/23/93		MN Department of Health Minneapolis, MN 55440
† Sullivan, Paul	MS PhD	9/1/87 1/2/92	9/28/90 4/28/95	Engineer/Safety - Unknown

* Those who did not receive NIOSH funding

† Those admitted prior to 7/1/92 but graduated 7/1/92 – 6/30/97