

NORTH CAROLINA
OCCUPATIONAL SAFETY AND HEALTH EDUCATION AND RESEARCH CENTER

ANNUAL REPORT
July 1, 2005 – June 30, 2006

NIOSH Grant # T42OH008673-02

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CHAPEL HILL, NORTH CAROLINA

November 2006

North Carolina Occupational Safety and Health Education and Research Center
Centerwide Annual Report
July 1, 2005 – June 30, 2006

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II. INTRODUCTION and EXECUTIVE SUMMARY

The purpose of the North Carolina Occupational Safety and Health Education and Research Center (NC OSHERC) is to train practitioners and researchers in the academic disciplines of Industrial Hygiene (IH), Occupational Health Nursing (OHN), Occupational Epidemiology (OE), and Health Services Research in Occupational Safety and Health (HSROSH). The program also provides continuing education for professionals in these areas who seek to maintain and update their skills as well as a hazardous substance training initiative. Program trainees will be well equipped to achieve the occupational safety and health objectives outlined in Healthy People 2010 and continue to develop skills as addressed in the IOM report: Safe Work in the 21st Century.

The NC OSHERC is administered by an Executive Committee consisting of Center Director (Bonnie Rogers, DrPH, COHN-S, LNCC, FAAN) who also serves as the Program Director for Occupational Health Nursing and the Health Services Research in Occupational Safety and Health Program; Leena Nylander-French, PhD, Industrial Hygiene Program Director; Dana Loomis, PhD, Occupational Epidemiology Program Director; Gary Mirka, PhD, Occupational Safety and Ergonomics Program Director and Kathleen Buckheit, MPH, Director of Continuing Education and Outreach and the Hazardous Substance Training Program. All programs are located at the University of North Carolina, Chapel Hill, except Occupational Safety and Ergonomics which is at North Carolina State University.

The NC OSHERC utilizes advisory boards for the overall Center and for each of the programs listed above. These committees consist of members from industry, government, and academia, and they provide the various programs with input regarding curricula; needs assessment; and regional, national, and global perspectives on occupational health and safety. Each program advisory board has a chair who serves as a representative to the Center Advisory Board. The Center Advisory Board contains an additional labor/community and government representative and it meets with the ERC Executive Committee to coordinate the advisory process, propose action items, and facilitate changes within the ERC.

This report describes major accomplishments, significant changes, and identifies the NC OSHERC website which includes links to programs and the faculty/staff directory. The period covered by this report is 7/1/05-6/30/06. During this period, the following major accomplishments have been achieved:

A. Major Accomplishments

1. The NC OSHERC completed and submitted a Competing Continuation Grant, in August 2005 and hosted a NIOSH Site Visit in February 2006.
2. The Duke University Occupational and Environmental Medicine Program submitted application as part of the NC OSHERC and was incorporated as a core program.
3. The NC OSHERC was awarded a 5 year Grant in June 2006.

4. The Occupational Health Nursing Program has received approval to establish an on-line Certificate in Occupational Health Nursing Program. The program of study is based on a total of 11 – 12 academic credits and will provide a recruitment groundfield for potential applicants to master's level degree program and/or for those needing additional knowledge related to the specialty field.
5. We conducted a survey and needs assessment of alumni and continuing education customers in 2005. The survey results were very positive and indicate high satisfaction (95%) with both academic and continuing education courses. The survey development and results are described below.

Survey Development.

A survey was developed with input from program directors including the CE director to gather data from current students, academic graduates/alumni (1999 to 2004), and users of OSHERC services about our past performance and suggestions for the future. Data were requested about 1) professional information, 2) student/academic update. 3) satisfaction with academic program of study (Occupational Health Nursing, Industrial Hygiene, Occupational Safety/Ergonomics, Occupational Epidemiology, and Health Services Research in Occupational Safety and Health), 4) Continuing Education/Outreach, and 5) future needs. The survey, sent in March 2005 with follow-ups to non-responders, was available on-line through Survey Monkey as well as an attachment to the email note. Of the 2,834 surveys sent, 91 were current students/alumni and 2,743 were users of continuing education services. The total response rate from all mailings was n=188 (7%) while the current students/alumni response rate was n=61 (67%).

Results General

Current students/alumni rated their educational experience at the OSHERC as very good to excellent (95%). When asked what courses were most useful, ENVR 423, PHNU 781/782, practicums, walkthroughs, EPID 600, PUBH 785, aerosols, and ventilation were mentioned most often. Respondents rated the SPH core courses (BIOS 600, ENVR 600, EPID 600, HBHE 600, and HPAA 600) as good to excellent (85%). They also rated satisfaction with interdisciplinary activities (orientation, NORA seminars, joint projects and research experiences, walkthroughs) as good to excellent (85%) and cognate courses (ENVR 423, ENVR 432, PHNU 787, PUBH 785, PUBH 748) as good to excellent (91%). The majority of students/alumni remarked that NIOSH funding was extremely important, as they would not have been able to attend graduate school without it (65%). When asked about major challenges in occupational health and safety, the top areas were aging workforce, bioterrorism/violence, mold/indoor air quality, repetitive stress exposures, rising health care costs, obesity/chronic diseases, recruiting new professionals to the field, and cost benefit of occupational health services. Suggestions to improve the effectiveness of the OSHERC included:

Academic: Coordinate journal club (offered at Duke), create directory of student and faculty research interests and projects, keep enhancing distance learning, create data warehouse, offer more safety/environmental internet graduate programs, continue to offer seminars, etc.

Continuing Education: Offer more business courses; develop more on-line courses; offer intermediate course work in toxicology and laser safety; more course availability and more variety, etc.

Other Comments: Opportunities for students to interact outside of seminars; shortened OHN program; and they commented that they enjoyed the services of OSHERC.

6. Outreach efforts have been outstanding by all faculty with enormous amounts of participation with community and fostering translation of research to practice. Numerous publications, collaborative sponsorships of courses, presentations, and consultations have been provided as shown in faculty program reports that practitioners, businesses, and workers have all been impacted with practice changes noted. Also, our recent NORA Interdisciplinary Seminar Series was posted via electronic forums and in one day generated much interest from outside groups. For example, we have received several email communications: from Liberty Mutual regarding obtaining Continuing Education Units (which we provide); from NIOSH, Division of Safety Research for a copy of the slide presentation for use (which we provide); from Nash County Human Resources, wanting to know if home health nurses could participate (absolutely); and from the Employee Health Medical Director, University of Michigan who will be out of the country that day and wanted to know if the webcast could be viewed later (yes!).
7. Continuing education has developed several new courses based on needs assessments. In addition, 1745 participants took 97 Continuing Education courses which is more than 4 times the required number of 400 students trained per year (by NIOSH). Professional certification or continuing education contact hours are now awarded for all courses. The Technician Certificate Program has become standardized with specific allocations of non-academic credits required. Certification review courses are offered in Occupational Health Nursing (COHN), Industrial Hygiene (CIH), Safety (CSP), Case Management (CM), Hazardous Materials Management (CHMM), and Certified Safety Manager (COHN/SM). Examinations taken for courses indicate a pass rate of 80 – 100%, which is significantly higher than national rates of 34 – 76%. One distance learning continuing education course has been developed and one is under development. The Continuing Education Program has undertaken sole sponsorship of the North Carolina State Ventilation Conference with 9 participants earning certificates after completing the 2 week-long courses and passing the examinations.

8. Academic Programs

In the Occupational Health Nursing Program 23 trainees were supported with NIOSH funding. The Occupational Health Nursing Program graduated 6 master's students. All graduates (100%) are employed. A competency matrix was developed to better guide trainees in skill development. An external review of the OHN Program was completed with an excellent evaluation. For the survey, graduates indicate a 96% satisfaction rate with the Occupation Health Nursing Program. Trainees work with faculty on several funded research projects, such as the interdisciplinary Robert Wood Johnson Ergonomics and Nurses in Hospital Environments study.

The focus in Safety during this reporting period has been on the training at the master's level, placing a heavy emphasis on research training. Trainees worked with faculty on 10 NORA related research projects which resulted in 10 publications.

In Epidemiology, 2 trainees have been supported; one of them is expected to graduate in 2007.

In Industrial Hygiene, 6 trainees were supported with NIOSH funds.

In the Health Services Research in Occupational Health and Safety 3 trainees have been supported; two of them are planning to graduate in 2007. The program will be phased out by June 20, 2007.

For all programs, faculty have secured several grants and published more than 165 articles, many with students. Numerous presentations have been given nationally and internationally.

B. Significant Changes

The North Carolina Occupational Safety and Health Education and Research Center (NC OSHERC) continues to fulfill its mission by educating occupational health professionals and researchers at all levels. The following significant items are noted:

1. Dr. Gary Greenberg, previously with Duke University Occupational and Environmental Program, has joined our faculty and teaches in several classes, both academic and continuing education.
2. Interdisciplinary efforts have increased substantially.
 - a. PUBH 785 Interdisciplinary Approaches in Occupational Health was more fully developed and one credit was added. This course is required of all NIOSH trainees and taught by a wide array of expert faculty. Content covers many topics to provide an overview of Occupational Safety and Health. The additional topics are presented by Dr. Gary Greenberg (Musculoskeletal Disorders, Respiratory

Hazards, and the Occupational Health Disaster Expert Network [OHDEN], John Staley (Risk Assessment, Management, and Communication), and Karen Mastrionni (expanded the Health Promotion classes from one to three).

- b. The NORA Interdisciplinary Seminar Series has continued to discuss research pertinent to NORA. The series has increased from 3 to 4 times per year and trainees are required to attend at least 3 sessions. Topics and the discipline responsible for presenting the seminar are listed below:

Topic	Discipline Presenting Seminar
Research Approaches to Studying Back Pain Among Nursing Personnel at a Tertiary Care Medical Center	Occupational Health Nursing/Medicine
Experimental and Computational Methods of Quantifying the Absorption and Penetration of Chemical Mixtures Through the Skin	Industrial Hygiene
Critical Windows: How Time Patterns of Exposure Influence Disease Risk	Epidemiology
Applied Ergonomic Research	Safety/Ergonomics

The seminar is developed by NC OSHERC Program Directors on a rotating basis. The series is presented on campus and webcast so that the larger Occupational Safety and Health community can participate.

- c. All cognate courses are interdisciplinary and are offered online.
3. Minority recruitment efforts have increased. For example in the Occupational Health Nursing Program contact has been made to several minority professional associations and colleges including the Black Nurses Association, Hispanic Nurses Association, the Indian Tribe Education Organization, and the American Assembly for Men in Nursing. The Occupational Health Nursing Program developed and displayed a banner recruitment advertisement on the minoritynurse.com website. The Continuing Education Program has offered tuition waivers to minorities at historically black universities. Recruitment ambassadors have been secured representing nursing alumni across the country and they will actively recruit minorities. Encouraging minorities to apply is on all brochures and the NC OSHERC website. NC OSHERC was represented at the UNC Annual Minority Health Conference in February 2006 and the Unity Tribal Health Conference in Raleigh, March 2006.

C. ERC Website

The ERC Website address is: <http://www2.sph.unc.edu/osherc/>. This address links to all programs and faculty/staff directory.

III. PROGRAM PROGRESS REPORTS

A. Program Title: Center Administration

B. Program Director: Bonnie Rogers

C. Program Description: The NC OSHERC is located at the School of Public Health with collaborating units at NC State University and Duke University. All curricular programs are accredited by the Council on Education in Public Health. The purpose of the program is to train practitioners and researchers in the disciplines of industrial hygiene (IH), occupational health nursing (OHN), safety/ergonomics (S/E), occupational epidemiology (OE), and health services research in occupational safety and health (HSROSH). We also proposed adding occupational medicine at Duke University in the competing continuation grant submitted September 2005 and it was funded in June 2006 as a core program. In addition, this overall program responds to mandates in the OSHA Act, section 2(b)(5) “by providing research in the field of occupational safety and health (OSH)... and by developing innovative methods, techniques and approaches for dealing with occupational safety and health problems” and section 2(b)(6) of the OSHA Act – “by exploring ways to discover latent diseases, establishing causal connections between diseases and work in environmental conditions, and conducting other research related to health problems...” In so doing, the National Occupational Research Agenda (NORA) is well recognized in the context of research emphasis at the Center. Program trainees will be well equipped to achieve the OSH objectives outlined in Healthy People, 2010 and continue to develop skills as addressed in the Institute of Medicine (IOM) report: *Safe Work in the 21st Century*.

Industrial hygiene trainees typically obtain a master’s degree over a 2-year course of study which includes a minimum of 30 semester hours and a thesis or technical report. The IH program offers MSEE, MSPH, and MS degrees to engineers and scientists; as well as the PhD option for qualified applicants. PhD students spend an additional three to four years beyond the master’s degree to complete original research and write a dissertation. The training objectives for the Master’s program are the education of highly qualified professional industrial hygienists with strength in the areas of exposure assessment and control technology with a strong record of placement in professional positions. At the doctoral level, industrial hygiene training and research provide the foundation for the development of new methods for exposure assessment and control and prepare scientists for research and teaching careers in OSH. Our research program provides post-doctoral students a first-class research experience and a solid foundation that strengthens their ability to become leaders in the field.

The OHN program offers MPH and MS degrees fully accredited by the National League for Nursing Accreditation Commission. The MPH program is offered on-campus and by distance education format which has been very successful. The MPH program in OHN prepares occupational health nurse specialists for positions in leadership, program planning and evaluation, or management of occupational health programs. The program leading to the MS degree prepares graduates in program planning and evaluation with emphasis

on the development of research skills as beginning researchers. The program has a large enrollment of students with approximately 20-25 students per year. We have been approved to add a certificate program which can be completed in 1 year or less with 11-12 academic credits awarded. These academic credits can be transferred into the SPH for those who wish to continue into the master's degree program.

The Occupational Safety and Ergonomics Training Program is designed to train practitioner and research engineers in the area of occupational safety and health. The focus in this particular training program is on engineering solutions to occupational safety and health and ergonomics problems. The training provided through this program is a combination of traditional classroom instruction, applied occupational safety fieldwork, and basic and applied research training. All students will participate in sponsored research projects of the core faculty members (both laboratory and field research) as well as applied practicum experience in working in industry to recognize, evaluate and control workplace hazards.

The Occupational Epidemiology program trains scientists with a high level of intellectual and technical skill, who will develop and apply the theory, methods and substance of epidemiology to engage with challenging occupational health problems and to prepare the occupational health workforce of the future. The course of study in Occupational Epidemiology is designed for trainees with a Master's degree in a related field and leads directly to the PhD. Training activities include required and elective courses, mentored research practica, a preliminary written examination, participation in faculty research, and the development and execution of the doctoral dissertation project.

The Health Services Research in Occupational Safety and Health is designed at the doctoral level to prepare researchers in this field of study. The PhD in Health Policy and Administration in this concentration is designed to provide both intensive and extensive training in research methods, subject matter, and theory appropriate to health services research with OSH integrated through coursework, seminars, research experiences, and a dissertation specific to HSROSH.

The Continuing Education (CE) Program provides education and training programs consistent with workforce needs to prepare workers for their job responsibilities and to avoid exposure to occupational hazards. The CE Program focuses on the interdisciplinary nature of the actual work roles and responsibilities of the health and safety professionals and technical employees. It provides for a strong understanding of the competencies of professions that are necessary to provide comprehensive and effective occupational health and safety programs in the public and private sectors. Continuing education is provided through short courses offered onsite and at semi-annual Institutes within the southeast region. The Industrial Hygiene, Occupational Safety, and Environmental Technician Certificate Programs require 6 units each of non-academic credits that are taken at 3 Institute meetings and focus on interdisciplinary needs of the students in courses of 2.5 or 4.5 days in length. All courses are open to anyone and are attended by students in all disciplines.

The Hazardous Substance Training Program provides continuing education that provides focused training for employees who are exposed to or need education on subjects dealing with hazardous substances. The

target audience is local and state government employees, but has been provided to all disciplines and the private sector.

All program areas participate in several required interdisciplinary activities that will continue as part of faculty and student opportunities. Students attend courses and collaborate on joint projects through interdisciplinary courses in OSH, the NORA seminar series, and orientation and update sessions. Students and faculty often work on research projects with an interdisciplinary focus. We have a strong recruitment effort including minority recruitment. Our outreach program is outstanding among our entire faculty with numerous ties to and partnerships with the community and southeast region.

Trainees: Candidates for the master's degrees typically have bachelor degrees in the health sciences physical or biological sciences, or engineering in the case of MSEE applicants. Prospective trainees for the Occupational Health Nursing Program are required to have a nursing degree, a minimum GPA of 3.0, and acceptable performance on the GRE exam. Applicants for the doctoral degree typically have master's degrees in the appropriate discipline although in some cases admission directly to the PhD is possible with a bachelor's degree. Selection is based on prior academic performance including grades and GRE scores, but also on written statements, references, and general work experience. Trainees tend to take positions with private industry, government, academia, or the military.

Training Facilities: The NC OSHERC is located about four miles from the UNC campus in a spacious environment of 8,000 sq.ft. shared with the OHN Program and CE Program. There is great classroom space, conference room, audio-visual equipment, student office space, a library, and ample parking. In 2001, the School of Public Health received a full seven-year accreditation from the Council for Education in Public Health (CEPH). Exceptional training facilities are currently available at the McGavran-Greenberg-Rosenau Hall complex at the UNC School of Public Health in Chapel Hill. Modern teaching facilities and approximately 6,000 sq.ft. of laboratory space for industrial hygiene research is available. Special equipment and facilities are available for aerosol measurement, ventilation research, biological monitoring, exposure assessment and analytical chemistry. A separate engineering laboratory is located in the Baity building adjacent to the School of Public Health, which provides an excellent site for air engineering research. The new School of Public Health Hooker Building was opened in 2005 and provides laboratory and classroom space. In addition, NCSU provides laboratory facilities for the Safety/Ergonomics students. The newly renovated Health Sciences Library is directly across the street from the School of Public Health and maintains many journals and other resources relevant to occupational health and safety, including the NIOSHTIC database. Computers for students and faculty are available and close collaboration with the North Carolina Supercomputer Center provides state of the art computational resources. Duke University in Durham is 15-20 minutes away and NC State University in Raleigh is also very convenient. Local industries e.g., GlaxoSmithKline, Replacements, and Burt's Bees provide additional resources, training sites, and opportunities for trainees.

D. Program Activities and Accomplishments: All of the established training programs are successful in that they have trained large numbers of practitioners throughout the existence of the NC OSHERC. Likewise,

the continuing education/outreach program has grown as a vehicle for training practitioners at entry-and midlevels in their careers. These independent training activities continue to be an important part of the center. However, major changes in the business and industrial environmental, both in the US and the world economy, continue to have profound implications for the field of occupational health. Technology, globalization, and downsizing are forces, which continue to shape our world and profession. Environmental and economic issues put pressure on the field to change in paradoxical ways. Not only are practitioners with a broad range of skills required, but highly specialized technical consultants are also in demand as industry out-sources many of the previous functions performed by the workplace staff. We believe our program, which offers a wide range of courses and also focuses on strong research experiences at both Master and Doctoral levels, is responsive to these market forces. In addition, we feel we are particularly well positioned to provide the highly skilled technical people needed in today's economy. Research activities by their nature cut across disciplinary boundaries and lead to collaborative projects, which are more likely to produce effective, economic solutions to occupational health problems.

E. Program Products for all individual programs are listed in the appendix.

F. Future Plans

As in the past, the Center will focus on its partnering with other institutions and agencies to provide the highest quality programs and faculty available. Therefore, seeking opportunities to increase this outreach will remain a high priority of the NC OSHERC activities. For example, collaboration with the Institute of Public Health at UNC-CH School of Public Health, particularly in the area of bioterrorism and workplace preparedness, will be an added benefit. In addition, the Center will focus on collaborating with professional associations, such as AAOHN, AIHA, ASSE, and HFES, as co-sponsors in developing online CE offerings; and developing and implementing an online course in occupational safety.

III. PROGRAM PROGRESS REPORTS

A. Program Title: Outreach

B. Program Director: Bonnie Rogers

C. Program Description

The NC OSHERC provides numerous outreach activities across program areas. We conducted a survey and needs assessment of program graduates in March 2005 and found high satisfaction with our program and also what respondents indicated about future needs and challenges for occupational safety and health (OSH) for the next 3-5 years. Faculty and trainees are engaged in numerous research, educational, service outreach activities to the broader occupational health and safety community. Duke faculty and residents participate in a number of educational outreach activities directed outward towards other institutions, business, government agencies and occupational health practitioners locally, nationally, and globally. The Duke Occupational and Environmental Medicine (DOEM) Electronic Forum is a unique resource in the field of occupational medicine. Founded in 1993 by DOEM faculty member Dr. Gary Greenberg who is now with the UNC, OHN Program, the list reaches more than 3,500 current subscribers located in more than 60 countries. The list serves occupational health professionals including physicians, nurses, industrial hygienists, government public health officials, industry groups and university researchers to provide a forum for announcements, dissemination of text files and academic discussion and allow presentation of clinical vignettes, synopses of new regulatory issues and reports of interesting items from publications elsewhere.

Each year approximately 60-hours of seminars and journal club in occupational health are offered to occupational health professionals from central North Carolina. Lecturers and participants are invited from the research facilities at Research Triangle Institute, NIEHS, Chemical Industry Institute of Toxicology, and the EPA. Industrial hygienists, safety specialists, nurses and physicians also attend these seminars which directly impact their practice, particularly translating new and innovative approaches to occupational health problem solving. Duke faculty are also involved in consultation to industry, government, other universities, and hospitals. Presentations and seminars by faculty are made to medical societies, regional and national occupational medical association meetings, and university and industry trainee groups. Continuing education programs provided by DOEM faculty over the last 5 years include the training of 6,575 occupational health professionals from medicine, nursing, safety, and industrial hygiene employed in industry, government and academia. The annual Carolinas Occupational Medicine Conference is sponsored by the NC OSHERC. Kathleen Buckheit, CE Director and Gary Greenberg, OHN faculty, are currently serving on the Board of Directors of the NC Occupational Health and Safety project (NCOSH), a worker and union worker education and health and safety advocacy group. Residents and faculty have provided seminars at the Annual Safety and Health Meeting and coordinated occupational health screening clinics for underserved workers that have an impact on worker education and empowerment when dealing with health and safety issues in the

workplace. OEM Faculty have developed academic courses for Duke and UNC medical students and residents that may impact their career choice and provide a skill set that can translate into their primary care practice. During a two to four week rotation, students participate in clinical evaluations, lectures and seminars, learn to conduct computerized database searches about occupational hazards and industrial toxicology, and visit industrial sites. Students complete at least one project focused on an occupational hazard relevant to their experiences.

In the OHN Program, OHN and Case Management Certification Review Courses have consistently documented a 96% passing rate, elevating the status of the OHN professional and preparing the OHN for more critical and complex interdisciplinary responsibilities. The OHN: Introduction to Principles and Practice Course has been reported by OHNs and employers to prepare new and experienced nurses with an expanding scope of practice. All OHN faculty teach in the OHN: Introduction to Principles and Practice co-sponsored by the NC OSHERC and the NC State Health Department. During this course the Worksite Assessment Guide (WAG) developed by Dr. Rogers is discussed and has been distributed to more than 240 OHNs. The WAG has also been distributed to OHNs across the country, and several OHN academic programs (UAR, UCLA, UAB, UMD), and is published for use in at least two books. The new OHN/Safety Management Certification Review Course was developed for certified OHNs based on needs assessments conducted by the NC OSHERC and the American Board for Occupational Health Nurses (ABOHN). It was offered in October 2006. This is the newest course developed by the academic faculty, the CE Program, and the safety consultants collaborating together with other partners.

The textbook written by Dr. Bonnie Rogers, Occupational and Environmental Health Nursing: Concepts and Practice, 2nd Edition (2003) is in use throughout the world by OHNs in practice, faculty in other universities, and other ERCs as both a required textbook and to integrate OSH principles and concepts within existing curricula. This book has also been translated into Spanish. The book co-authored by Dr. Rogers, Susan Randolph, and Karen Mastroianni, Occupational Health Nursing Guidelines for Primary Clinical Conditions, 3rd Edition (2002) is widely used as a protocol guide for OHNs and physicians in clinical practice. Several businesses have adopted these guidelines “as their own” for practitioner use by thousands of nurses. Requests for curriculum materials, such as the Worksite Assessment Guide and articles are frequently received and filled as well as reprints of the many articles authored by Dr. Rogers.

A partnership is in place with the National Council for Occupational Safety and Health (National COSH), an advocate for worker safety and health. The director, Tom O’Conner, is on the NC OSHERC Advisory Board, the Health Services Research in Occupation Safety and Health Advisory Board, Continuing Education Advisory Board, and also teaches a class on the Labor Perspective in PUBH 785, Interdisciplinary Approaches to Occupational Health. Allen McNeeley who is the Director of NC OSHA is a member of the NC OSHERC Advisory Board and also teaches a class on worker safety and health in PUBH 785. Also, Dr. Rogers volunteers with the Orange County Literacy Council, is a literacy tutor, and has provided significant

consultation to them on health literacy for workers. Dr. Rogers has also provided awareness information to St. Thomas More School on musculoskeletal injuries from students carrying heavy backpacks.

NORA related interdisciplinary seminars, described in the Interdisciplinary Section, are offered as outreach to the OSH community. Invitations are broadcast through the interdisciplinary environmental and OSH groups within the region for their members and colleagues to participate in the web casts that are presented quarterly. Continuing Education Units are available to those who request them through UNC.

OHN faculty are active and highly collaborative with professional associations, at national, state, and local levels. At the national level, Susan Randolph is the current President of the AAOHN; Kathleen Buckheit served on the Board of Directors and several national committees; Bonnie Rogers and Judy Ostendorf serve on the AAOHN Foundation Board of Trustees and on the Eastern NC Legal Nurse Consultant's Board as president and treasurer respectively, Kathleen Buckheit currently serves as secretary; Judy Ostendorf also is on the AAOHN Journal Editorial Review Panel and represents AAOHN on the ANSI Z365 Committee. Bonnie Rogers represents AAOHN on the AOHC Advisory Committee, serves on eight editorial boards, has participation on several IOM committees, the AOEC National Board, and is Chair, NORA Liaison Committee for NIOSH. At the state level faculty serve on the Awards Committee and the NCAOHN, Education and Standards Committee members and at the local level on committees such as Communications Committee, Professional Affairs and Awards Committees, Newsletter (Editor), and (Co-Chairs of the) Research Committee. OHN faculty consults with Clemson University about developing OSH courses and CE courses and also have developed and taught at their summer Clemson Institute for more than 10 years. All OHN faculty work with NCAOHN to identify current topics, lecturers, and evaluations of educational programs for the NCAOHN state conference offered semiannually and attended by over 100 OHNs each time. The NC OSHERC co-sponsors this meeting semi-annually, providing technical and on-site operational assistance. These programs have received the honor of Best Educational Offering several times by the AAOHN. These academic and adjunct faculty members are frequently asked to present topics at the meetings.

OHN faculty teach twice a year at the UNC-CH School of Nursing to the undergraduate juniors and seniors to describe and discuss the role of the OHN. They also teach about Occupational Health Nursing and consult with faculty at North Carolina Central University, a historically Black University. The DOEM Program (TPG during this reporting period) is active presenting classes in the OHN Program and the Interdisciplinary Approaches to Occupational Safety and Health. Dr. Gary Greenberg is one of the key contributors to the OHN Program as adjunct Assistant Professor and teaches in these classes as well. OHN and Safety/Ergonomics students conducted a research study on Musculoskeletal Injuries to Nurses in Hospital Environments. Fact Sheets are currently being developed specifically for both nurses and management to use to make changes in the environment.

The IH/EAC core faculty are involved in a number of educational and outreach activities at the national and international level including conference organization, grant and manuscript reviews, and consultation. Three of the core EAC faculty members are Certified Industrial Hygienists (CIHs) in Comprehensive Practice by the

American Board of Industrial Hygiene. The core faculty in the EAC focus area has published almost 500 peer-reviewed articles in scientific journals, of which 107 have been published (17 of these publications were a joint effort of the EAC faculty) since our last competitive renewal in 2002.

Dr. Gary Mirka, Safety/Ergonomics core, has presented a variety of awareness seminars that have impacted both practitioners and workers. Dr. Mirka presented a seminar to the DOEM group in May 2005 entitled "Duke Occupational Medicine Grand Rounds/Journal Club: Ergonomic Intervention Effectiveness Research". The purpose of this presentation was to inform these occupational medicine-focused faculty as to the developments and the techniques employed by engineering to combat the problems of musculoskeletal disorders. In the fall, 2005, Dr. Mirka presented a seminar to the International Woodworking Fair entitled "The Real Effects of Regulations and Legislation on your Business and Ability to Remain Competitive" and to the Central Carolina Occupational Safety and Health on back injury prevention and developing solutions. Dr. Mirka worked with the Safety Committee of the American Furniture Manufacturers Association (AFMA) to develop their "Voluntary Guidelines for the Furniture Manufacturing Industry". This project represented one of the first industry-initiated efforts to develop such a guideline, a cornerstone component of Federal OSHA's efforts in the area of ergonomics. The team that participated in the development of the guideline consisted of engineering, industrial hygiene, occupational medicine professionals.

The Safety and Ergonomics Program area has on-going interactions with the Ergonomics Center of North Carolina, a group of safety and ergonomics professionals that provide training, education, and consultative services to North Carolina Industry. These interactions have been primarily in the joint conduct of research projects. Dr. Mirka has also served as the primary mentor for a SERCA grant application submitted by the new Director of Research for the Center. From the Safety/Ergonomics area much of the current funded research conducted in the laboratory is intervention effectiveness research, and NIOSH trainees have all been involved in these projects. For example, in the 2004-2005 academic year four trainees were involved in the development and testing of a calf-lifting device designed to reduce the loading on the low back when farm workers perform this task. The end results of this project were two different mechanisms for performing this task and a publication showing these results. Another example focused on the development of ergonomic interventions for the furniture manufacturing industry. Three NIOSH Trainees participated on this project resulting in the development of an upholstery table lift assist device that is currently in production. Information provided by this manufacturer indicates that 65 of these devices are currently being used in furniture manufacturing facilities. These projects illustrate the impact of safety and engineering on the practitioner environment and community of workers as well as an impact for the engineering practitioners.

Dr. Loomis, Occupational Epidemiology, is a member of the Management Group for the Scientific Committee on Epidemiology of ICOH (the International Commission on Occupational Health), past Chair of the Safety and Occupational Health Study Section, which advises NIOSH and NIH on occupational health research, and has served on other advisory committees for NIOSH, NIH, the National Center for Environmental Health, the IOM, and other state, national and international bodies. He also serves the scientific community as

North American Editor for the journal *Occupational and Environmental Medicine*, the leading international journal of occupational safety and health research, and as a member of the editorial boards of the *Journal of Occupational and Environmental Hygiene*, *Archivos de Prevención de Riesgos Laborales*, and *Ciencia y Trabajo*. For the latter two journals, published in Spain and Chile, respectively, his charge is to assist with journal development and the dissemination of high-quality, original research in the Spanish language. He has also contributed to OSH capacity-building efforts in South America, through contributions of teaching materials for a distance-education program on occupational health in Chile and to the development of an executive Master's program in occupational health at the Federal University of Bahia in Brazil. He is on the advisory board for an industrial hygiene training program under development at the University of South Carolina.

Several epidemiology faculty fill prominent roles in scientific communication: for example, Dr. Savitz is one of the editors responsible for occupational health content in the journal *Epidemiology*; Dr. Gammon is an Associate Editor of the *American Journal of Epidemiology*; and Dr. Peden is Associate Editor in charge of occupational diseases for the *Journal of Allergy and Clinical Immunology*. The faculty are also active in professional organizations. For example, Dr. Richardson advises on occupational and environmental research development via the International Society for Environmental Epidemiology's Committee on Capacity Building in Developing Countries, and Dr. Poole and Dr. Savitz have served on the boards of the Society for Epidemiologic Research and the International Epidemiological Association, respectively. Dr. Richardson advises citizens' groups across the nation on occupational and environmental research activities related to US DOE nuclear sites as a member of the Board of Directors, Citizens' Monitoring and Technical Assessment Fund; Dr. Richardson and Dr. Wing have spoken at community workshops organized by the Institute for Energy and Environmental Research; and Dr. Dement, Duke TPG during this reporting period, serves on a committee at the Hanford nuclear site to investigate health concerns related to exposures occurring at the hazardous waste tank farms. Additionally, Dr. Chen consults with researchers at the Liberty Mutual Research Institute for Safety in connection with research evaluating whole-body vibration and its relation to lower back disorders, and analyses of a large survey on job dissatisfaction and injury risk perception in relation to contextual features of workplace and characteristics of individual workers.

Epidemiologic research on occupational safety and ergonomics sometimes provides more immediately visible practical benefits, however. For example, Dr. Marshall is Principal Investigator of a large cohort study of cadets in the US military service academies that is investigating tears and ruptures of the Anterior Cruciate Ligament, a disabling knee injury common among active-duty military personnel. The results of this study are of immediate interest to the armed services and are likely to affect the way personnel are trained. A second example is a study led by Dr. Loomis that investigated acute injuries and musculoskeletal disorders among commercial fishermen. Findings from that study are the basis for a project developed by Dr. Mirka which seeks to develop ergonomic interventions to prevent lower back disorders among these workers.

The NORA Interdisciplinary Seminars are now web cast so that distance education professionals are able to attend and actively participate. Electronic notices are listed in the School of Public Health activities of the

week which goes to all faculty, students, local public health departments, and others. We are also including notification to the NC Department of Labor, Occupational Safety and Health Division, state public health department, and universities with an OSH program. This has proven successful in that we had several people attend the August 2005 seminar by Dr. Lisa Pompeii “live” and others attended using the web cast. One strategy to increase attendance was offering continuing education units through the UNC-Chapel Hill. This was used for the first time in May 2005 and several attendees received them. The web cast seminars have been very well received. When asked if the presentation increased their understanding of the subject and relationship to OSH, 94% of the attendees strongly agreed; and 100% of the attendees felt the topic was important and relevant to OSH. Attendees commented that they liked being able to watch without having to travel to Chapel Hill; use of real life examples; discussion of interventions; being able to view the lecture at another time. One attendee commented that she shared the web cast with her peers at work, which can be considered a “snowball” outreach approach. Dr. Bonnie Rogers has provided consultation to Thailand University on health services research and OSH. Through this consultation, Yuwadee Wittayapun, a visiting doctoral student from Bangkok, Thailand worked with Dr. Rogers this past academic year on Health Services Research in Occupational Safety and Health, increasing her knowledge base and defining her research.

From HSROSH, Dr. Thomas Ricketts is President of the North Carolina Health Council; and Carol Runyan is a member of a national working group on injury and violence prevention and control infrastructure enhancement. HSROSH faculty have also made over 40 presentations over the past year. Some key presentations are listed. Susan Randolph presented “Healthy People in Healthy Places” at the Scientific Committee on Occupational Health Nursing (SCOHN) meeting held as part of the International Commission on Occupational Health (ICOH) in Milan, Italy. Bonnie Rogers presented “Women in the Workplace and Health Promotion” and “Distance Learning in Educational and Training in Occupational Health” at the Scientific Committee on Education and Training at the International Commission on Occupational Health meeting in Strasbourg, France (2005). Dr. Rogers also presented the keynote address “Environmental Health Threats: How Ready Are We?” at the NASA 2006 Occupational Health Conference.

Dr. S. Lee presented “Is Health Literacy Level Predictive of Prescription Filling Behavior or Medication Adherence?” at the Society of General Internal Medicine in Los Angeles, CA in 2006. John Staley, a student, presented “Occupational Animal Exposure as a Predictor of Allergy and Asthma – Prescription Drug Claims at the NORA Symposium in Washington DC in 2006. Dr. Norton presented “The Effects of SCHIP on Dental Care Access and Use” at the IAADR/CADR 84th General Session in Orlando FL.

The CE Director participates on the Advisory Board of the Occupational Safety Program at NC A&T State University, a historically black college, developing a partnership with a NIOSH TPG. She provides resources for equipment, contacts for faculty and students, advice on the curriculum, and free educational opportunities to help enhance the students’ college experience. This Board participation also informs faculty and students about the CE Programs. Many students have taken advantage of free tuition for the CSP Review course and invitations to attend several other courses have been extended to complement their academic courses. As a

Board member for the AAOHN, Ms. Buckheit provided information and PowerPoint presentations to OHNs throughout the region which in turn they can use at chapter meetings and workplaces. At the local level, Ms. Buckheit develops, edits, and sends out a quarterly newsletter to NCTAOHN members and contributes articles to the state NCAOHN newsletter on regulatory and practice issues. She is also an advisory board member for the NCSU Ventilation Conference and the Central Carolina Safety School; providing equipment, faculty, and materials. Dr. Rogers has also provided a PowerPoint presentation on leadership to the Director of Occupational Health and Safety at Pitt Memorial Hospital. The course materials from the CHMM Review Course were given to the Piedmont Chapter of the ACHMM for use in training their members. Ergonomic training materials were used by safety and health professionals to develop their ergonomics programs.

F. Future outreach plans include:

- Continue all professional association partnerships as described;
- Continue to develop industry relationships to translate research to practice as described here;
- Continue to provide educational lectures and curricular materials to other academic institutions, government, and industry and professional services and practical information to practitioners;
- Use list serves to communicate information to the OSH and public health community;
- Develop a NC OSHERC newsletter with topics and NORA content to the larger OHS community;
- Continue to publish in journals, publish books, and provide editorial assistance to journals;
- Continue to provide consultation to universities on OSH programs and to industry on OSH issues;
- Contact professional organizations in the southeast to develop partnerships to provide educational programs, train-the-trainer presentations for their workplace, equipment, and services to increase the level of skill and knowledge of the practitioner;
- Request links with the NC OSHERC website of these professional organizations to offer program development and services that meet their specific practitioner needs;
- Participate on college Advisory Boards, such as East Carolina University's Environmental Health Department to review curriculum and make contacts with industries and professional organizations for donations of equipment and "in-kind" services to their programs, including guest lecturers, scholarships, intern experiences, and site visits;
- Expand collaborations to allied health and safety professional organizations and practitioners throughout the Southeast region.
- Invite three visiting scholars to the OSHERC each year to provide presentations and consultations on research and teaching projects and the NORA Seminar Services;
- Fund two small student projects related to NORA.

III. PROGRAM PROGRESS REPORTS

A. Program Title: Interdisciplinary Coordination

B. Program Director: Bonnie Rogers

C. Program Description, Activities, and Accomplishments

The administrative core of the NC OSHERC fosters the interdisciplinary interaction of all programs in the training programs. Several strategies are used to accomplish this: orientation for trainees; an interdisciplinary occupational health course; integrated disciplinary coursework including field projects and class projects; NORA seminar series; interdisciplinary CE courses, and research, all of which involve program trainees and faculty.

An annual orientation/update is held usually in August for all NIOSH-funded trainees. The Center director discusses the mission of the NC OSHERC and its relationship to NIOSH, new Center initiatives, and the trainees get to meet each other and faculty in the different disciplines. In conjunction with the orientation, one of the four (increased from three last year) NORA Interdisciplinary Seminars is held. All NIOSH funded trainees are required to attend and participate in at least 3 of the NORA Interdisciplinary Seminars held each year. Each training program area (Occupational Health Nursing, Industrial Hygiene, Safety and Ergonomics, Occupational Epidemiology, Health Services Research in Occupational Safety and Health) is responsible for developing the seminar and securing a speaker on a rotating basis. Occupational Medicine will be added as a new program and participating partner in this proposal. Trainees and others in the school or community can attend the series completely onsite or online, since 2004. Susan Randolph, seminar coordinator, arranges for all seminars once the session has been developed by OSHERC faculty. The seminar is presented at the School of Public Health in the Mayes Center (temporarily relocated to the new Hooker Building during renovation) for those who wish to attend the actual sessions on campus. Seminars are also web cast so distance education students, students from NCSU (Safety and Ergonomics Program), Duke University, and others in the larger occupational safety and health community can attend and actively participate. Students attending the web cast seminar are able to ask questions using a toll-free number. Detailed information about the seminar including the web link is emailed to students. After the seminar is web cast, it is archived so it can be viewed at a later time or viewed again. The seminar gives students an opportunity to learn about NORA related topics and research, network, and develop critical questions. Since the web cast is a new methodology, trainees are asked to complete an evaluation of the seminar. The web cast seminars have been very well received. One attendee commented that she shared the web cast with her peers at work. This series will continue.

All NIOSH-funded trainees are and will continue to be required to take PUBH 785, Interdisciplinary Approaches to Occupational Health. This course is taught online; interdisciplinary students attend interdisciplinary-based lectures, conduct a virtual walk-through of an animal facility laboratory, and select an

industry or specific hazard of their interest, and research and present their findings discussing interdisciplinary roles. The groups are assigned so that different disciplines are represented in each of the groups. For example, in 2005, Katie Bland (IH), Jill Connell (OHN), Jonathan Drum (Safety/Ergonomics), and Stephanie Reid (Safety/Ergo) presented "The Industry of Quarry Mining." Also in 2005, Zewditu Demissie (Epidemiology), Jaci Freeman (Safety/Ergonomics), Andrew Imler (IH), and Shelly Johnson (OHN) discussed "Hair Salons." All papers and presentations were excellent! During this course, various faculty/professional disciplines including occupational medicine, labor, nursing, industrial hygiene, and safety and ergonomics provide lectures. For example, Tom O'Connor, MPH from the National Council for Occupational Safety and Health, discussed occupational health and labor perspectives; David Weber, MD discussed bioterrorist agents; Mike Jacobs, MD presented screening, surveillance, and biological monitoring; Karen Mastroianni, MPH, RN discussed levels of prevention, health promotion, and program design; and Carol Runyan, PhD presented evaluation. For spring 2006, the course was increased to 3 credit hours from 2 incorporating more occupational medicine-related content presented by Duke Occupational Medicine faculty (new core program) and more health promotion interjected with health protection. Allen McNeely, NC Department of Labor, Occupational Safety and Health Division will also be present to talk about government regulations and the role of OSHA for worker protection. The variety of speakers used makes the course more interesting and enhances student learning with real world examples. The course has been well received and is also open to non-trainees.

Trainee interaction occurs from attendance by industrial hygiene, occupational health nursing, and safety/ergonomics trainees in industrial hygiene, toxicology, and safety courses (PHNU 787 - industrial hygiene; ENVR 423 - Industrial Toxicology; ENVR 432 - Safety/Ergonomics; PUBH 785 - Interdisciplinary Approaches - previously described); (except safety students do not take this basic safety course). Students from other disciplines (e.g., epidemiology, health behavior, and medicine) also take these courses. This coursework provides the student with the skills necessary to learn about and develop a good understanding of an interdisciplinary framework for service delivery and research. Students learn about interdisciplinary roles and collaboration necessary to improve the health and safety of the worker and work environment. Students from all core disciplines, participate in field experiences, conduct joint walk-throughs, collaboratively work together to address problems in occupational health, and make joint presentations related to the problem. For example, in the safety/ergonomics course (ENVR 432) five groups of students worked in interdisciplinary teams and selected safety and also ergonomic work-related health issues, visited the work-site, conducted a job safety/task hazard analysis, and analyzed methods for prevention and control. For each project, students made a power point class presentation presenting all findings. The safety project was on a specific topic, such as Accident Investigation and Job Safety Analysis. The ergonomic project was selected by the team to identify and describe a musculoskeletal disorder (MSD) hazard at a specific worksite, describe possible hazard prevention and control methods, and explain the health care management protocol and education and training program. Project examples completed were at Martin Marietta Surface Mine (heavy lifting, static loading,

repetitive tasks, and equipment vibration), UNC Recreation Center (workstation area evaluations), South Orange Rescue Squad (ambulance operations), and a dentist's office (dental hygienist work tasks). Each group also participated in and reported on an ergonomic case study problem solving exercise. The topic of one of the case studies was back injuries occurring in a hospital laundry department. Students also jointly toured the Triangle Pharmaceutical Company in NC which was safety focused and was followed by an in-depth classroom discussion of safety problems identified and control and prevention measures. In the online version students have power point presentations and audio, work on joint projects, and write joint papers using a case study approach.

In the toxicology course taught jointly by Dr. Woodhall Stopford (Duke Occupational Medicine) and Susan Randolph (Occupational Health Nursing) and in the industrial hygiene course taught by Dr. Nelson Couch with guest lecturers, students attend interdisciplinary classes on-campus or online (with chat rooms). The courses are designed for occupational medicine residents, occupational health nurses, and environmental science / industrial hygiene students and stress the development of problem solving skills using a multidisciplinary approach that involves the integration of specialists in all of the core disciplines. Students develop a project, paper, and presentation (e.g., chromium, lead, latex allergy) on a selected chemical providing an in-depth analysis of the risk, exposure assessment approaches, and prevention and control measures. Examples of student papers and presentations in industrial toxicology are Danger in Dry-Cleaning, Oxycodone Hydrochloride in Manufacturing Pharmaceuticals, Lead in the Workplace, Arsenic, Cyanide in Gold Processing, Asphalt Fumes, Methylene Chloride, Radon Exposures, and Effect of Chronic Lead Exposure in a Painter.

Trainees from all disciplines are encouraged to attend CE courses sponsored by the NC OSHERC and registration fees are waived. Trainees attend courses such as, workers' compensation, basic industrial hygiene, advanced safety, toxicology, legal concerns, ergonomics, biohazard science, case management, hearing conservation, and respiratory protection. At both the Summer and Winter Institutes, the Fundamentals of Industrial Hygiene course uses an interdisciplinary approach with several disciplines attending. The class of about 30 students is made up of industrial hygienists, safety specialists, occupational health nurses, and periodically, physicians and virtual walk-throughs are done. A large number of nurses and safety professionals attend the industrial hygiene courses and a large number of industrial hygienists and nurses attend the safety courses, etc. This is due to the demands of employers requiring expertise in more than one area; i.e., industrial health, safety, environmental and occupational health nursing. The Duke Occupational Medicine program is unusual in that it incorporates several disciplines including occupational health nursing, industrial hygiene, occupational epidemiology, biohazards, occupational mental health, and occupational and environmental medicine within one division. It is expected that OM residents will have continued opportunities for interdisciplinary team interactions with other core program trainees as opportunities to participate in the division's hazard assessment and clinical toxicology activities expand with the addition of the proposed occupational medicine program back into the NC OSHERC.

Faculty members from each program routinely lecture in courses and seminars in the other disciplines and serve on dissertation/thesis committees. For example, Dr. Bonnie Rogers and Susan Randolph (OHN) provide a lecture on health care worker hazards in the occupational epidemiology course; Pat Curran (IH), Tom Sluchak (Ergonomics), Carol Epling (OM), and Jon Wallace (Safety) provide interdisciplinary lectures in the OHN I course; and Judith Holder (OP) provides a lecture on employee assistance programs in the OHN II class. The Duke Occupational Medicine (TPG) continues to be interactive and supportive. For example, two Duke OM faculty/residents teach in the Interdisciplinary Approaches in Occupational Health course and Dr. Bonnie Rogers sits on the Duke OM Resident Advisory Committee.

Faculty and trainees from the disciplines interact on several research projects. Students have worked with other students and faculty from occupational medicine, epidemiology, and occupational nursing on research projects ranging from commercial fishing, construction, healthcare, to traditional manufacturing industry. These opportunities have helped to broaden the trainees' perspectives on occupational safety and health issues. Examples of recent projects that include both faculty and trainees:

1. Low Back Injury Prevention in the Homebuilding Industry

Participants: Dr. Gary Mirka (Safety and Ergonomics, NCSU), Dr. Hester Lipscomb, Dr. John Dement, Dr. Samuel Moon (Occupational Medicine, Duke University), Dr. Leonard Bernard (Construction Engineering, NCSU)

2. Ergonomic Interventions for the Furniture Manufacturing Industry

Participants: Dr. Gary Mirka (Safety and Ergonomics, NCSU), Dr. Hester Lipscomb (Epidemiology, Duke University)

3. Learning Curve Analysis of a Patient Lift Assist Device

Participants: Stephanie Reid, Dr. Gary Mirka (Safety and Ergonomics, NCSU), Dr. Hester Lipscomb (Epidemiology, Duke University)

4. Occupational Injuries Among Commercial Fishers

Participants: Dr. Dana Loomis, Kristen Kucera (Epidemiology, UNC-CH), Dr. Gary Mirka (Safety and Ergonomics, NCSU), Mary Anne MacDonald (Ethnographer, Duke University)

5. Musculoskeletal Injuries to Nurses in Hospitals

Participants: Dr. Bonnie Rogers, Judy Ostendorf, Kathleen Buckheit, Courtney Stanion (HSROSH, UNC) A large number of nurses and safety professionals attend the industrial health courses, a large number of industrial health and nurses attend the safety courses, etc. This is due to the demands of employers requiring expertise in more than one area; i.e., industrial health, safety, environmental and occupational health nursing., Katie Slavin (OHN, UNC); Dr. Gary Mirka (Safety and Ergonomics, NCSU), plus safety graduate students.

These projects are ongoing and will continue into the next project period along with others.

Future Plans:

- Continue annual orientation/update
- Continue NORA Interdisciplinary Seminar Series
- Continue cognate interdisciplinary course (toxicology, IH, safety/ergonomics) with joint trainee projects

- Expand and continue to offer new interdisciplinary courses at the CE institutes based on needs assessment data and other courses i.e., OSHA Update and online as appropriate
- Involve trainees in interdisciplinary faculty research, publications, and presentations

III. PROGRAM PROGRESS REPORTS

D. Program Title: NORA Research

E. Program Director: Bonnie Rogers

F. Program Description, Activities, and Accomplishments

The goal of the NORA Research Support Program is to provide a focused effort to support NORA related research training, interdisciplinary research discussion and collaboration, when feasible, and dissemination and applications of research through continuing education. Research training received by trainees is based on the curriculum of study in each department (e.g. industrial hygiene, occupational health nursing, epidemiology).

Interdisciplinary research interaction is accomplished in several ways: collaborative research projects among faculty and students where like interests exist, which is already being done; participation of students and faculty in the interdisciplinary seminar series and continuing education/outreach events which has a focus on NORA research; and discussion at OSHERC executive Committee (Program Directors) meetings to identify opportunities for students to engage in research projects. The interdisciplinary seminar series has been described previously in this document in the interdisciplinary coordination section. The dates, presenters, coordinating discipline, and number of attendees for each NORA Seminar held during the annual reporting period are listed below:

- August 25, 2005: Lisa Pompeii, PhD, RN (Graduate, OHN & EPID) presented "Research Approaches to Studying Back Pain Among Nursing Personnel at a Tertiary Care Medical Center." 44 attendees.
- November 2, 2005: David Kim, Doctoral Student (ENVR) presented "Experimental and Computational Methods of Quantifying the Absorption and Penetration of Chemical Mixtures Through the Skin." 46 attendees.
- February 15, 2006: David Richardson, PhD (EPID) presented "Critical Windows: How Time Patterns of Exposure Influence Disease Risk." 56 attendees.
- May 17, 2006: Gary Mirka, PhD, Yu Shu, & Zongliang Juang (graduate students at NCSU-- Ergo/Safety) presented "Applied Ergonomics Research": (1) A Controlled Study of the Effects of Wrist Splint Orthoses; (2) Lifting Tasks Performed on Laterally Slanted Ground Surfaces. 55 attendees.

NORA related research projects include the following: a completed Train the Trainer Health Care Provider Initiative on Pesticide Exposure which resulted in the presentation at National Environmental Educational Training Foundation (NEETF) "Pesticide Competency Guidelines"; a Robert Wood Johnson project, Ergonomics and Nursing in the hospital environments involved three OHN faculty, Gary Mirka, NCSU faculty, and one OHN student; this particular project resulted in submission of an R2P NORA proposal and several articles are in process; one of the OHN faculty and one of the students are working on a project titled

Effectiveness of Guidelines for Hazardous Substances. Four separate projects related to musculoskeletal disorders and special populations at risk were conducted by students and faculty and resulted in four publications by the same titles: Evaluation of a Redesigned Self-Checkout Station for Wheelchair Users, College Students and Computers, Differences in Trunk Kinematics and Ground Reaction Forces Between Older and Younger Adults During Lifting, and Effects of Age on Muscle Activity and Upper Body Kinematics during a Repetitive Forearm Supination Task; two projects pertaining to musculoskeletal disorders and intervention effectiveness research were Assessing the Effects of Positive Feedback and Reinforcement in the Introduction Phase of an Ergonomic Intervention and Learning Curve Analysis of a Patient Lift Assist Device and they too, resulted in publications by the same name. Two projects pertaining to low back disorders that also resulted in publications were The Effect of a Repetitive, Fatiguing Lifting Task on Horizontal Ground Reaction Forces and A Study of Lifting Tasks Performed on Laterally Slanted Ground Surfaces and two projects and publications pertaining to musculoskeletal disorders were Ergonomic Interventions for the Reduction of Back and Shoulder Biomechanical Loading when Weighing Calves and A Biomechanical Analysis of Anterior Load Carriage.

NORA funds are also used for tuition in the industrial hygiene, occupational health nursing, safety and ergonomics, and epidemiology programs.

**Industrial Hygiene Program
Progress Report
July 1, 2005 – June 30, 2006**

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III. PROGRAM PROGRESS REPORTS (July 1, 2005 - June 30, 2006)

A. Industrial Hygiene

B. Program Director: Leena A. Nylander-French, Ph.D., CIH

C. Program Description

The mission of the UNC-CH Industrial Hygiene Training Program is to educate and train highly qualified scientists in both the principles of research and the practice of occupational hygiene for mitigating exposure and disease. The Program encompasses a full range of applications in occupational hygiene, including sample collection, analysis, statistical and toxicokinetic modeling, and interpretation of exposure data in order to investigate the relationships between exposure and development of disease. The location of the program within the Department of Environmental Sciences and Engineering in the School of Public Health provides unique resources and interdisciplinary opportunities for education of the individuals able to develop cost-effective, reliable exposure assessment methods and control solutions, which are needed by today's rapidly changing industry. The industrial hygiene program at the UNC-CH is well positioned to provide research training at Master's and doctoral level in the areas of exposure assessment and control technology for human exposures to both airborne and dermal hazards.

The industrial hygiene faculty identifies itself as the Exposure Assessment and Control (EAC) focus group, which includes industrial hygiene, exposure assessment, and air pollution control. There are 7 full-time faculty members in the industrial hygiene program and 9 adjunct faculty members. The program has an extremely strong and broad exposure assessment group, which provides unique and innovative methods and state of the art statistical knowledge and tools to evaluate exposures. We continue to provide trainees with research experience in conducting field studies to develop exposure assessment methods, to investigate exposure-dose-response relationships, and to calibrate models for the optimal control of exposure. Furthermore, the EAC group has an important link to the Epidemiology and Biostatistics departments, which provide the knowledge base needed to investigate the level of risk associated with a given exposure and how the control of such risk can be achieved.

The students in the EAC can select to obtain one of the following degrees: Master of Science (MS), Master of Science in Public Health (MSPH), Master of Science in Environmental Engineering (MSEE), or Doctor of Philosophy (Ph.D.). All three MS-degree programs require 2 years of course work and submission of a master's technical report or thesis, which describes a relevant research project, and an oral defense/presentation of the work before a faculty committee. Appropriate projects involve laboratory research, development of theory, and/or fieldwork. The offered core courses (Appendix A Table 1) and advanced courses (Appendix A Table 2) for Master's students are given below. The Department of Environmental Sciences and Engineering requires a seminar (ENVR400) and a Unifying Concepts course (ENVR401) designed to expose all ENVR students to the fundamental principles common to the field. Students in the EAC focus also take industrial hygiene core courses specified in Table 1. In addition, students take enough elective courses selected from the advanced courses listed in Table 2 to bring the total number of credits earned to a minimum of thirty semester hours.

Students in the MSEE program must take ENVR750 Principles of Industrial Ventilation, ENVR751 Ventilation Design Problem, and ENVR754 Air Pollution Control. Students in the MSPH program must take two general public health courses, one from the Department of Health Behavior and Health Education (HBHE600 or alternative) and one from the Department of Health Policy and Administration (HPAA600 or alternative). In addition to the core courses listed below, most students take several advanced courses (listed in Table 2). Students are encouraged to take courses taught by faculty outside the EAC focus area faculty after consultation with their faculty advisor.

EAC students are encouraged to enroll in continuing education courses offered through the ERC that cover materials related to professional practice not presented through our regular academic courses. Students can also take courses at Duke University (e.g., occupational diseases, biohazards) or at North Carolina State University (e.g., noise, ergonomics and safety) through a reciprocity agreement we have with those schools.

All NIOSH funded students are required to take PUBH785: Interdisciplinary Approaches in Occupational Health (3 credits), attend a minimum number of interdisciplinary seminars, and attend a NC OSHERC orientation meeting. Other interdisciplinary activities noted in industrial hygiene include students taking courses with occupational health nursing students, safety students, and physicians in toxicology, industrial hygiene, and safety/ergonomics courses and working on projects together. Students also engage in joint collaborative research.

There are few formal course requirements for the Ph.D. degree; the actual courses required are determined by the doctoral committee. Students in this program typically spend between one and two years in course-work prior to taking their qualifying examinations. The examinations include both written and oral components and cover basic knowledge of the principles of industrial hygiene as well as a proposal for a research project. The student is then responsible for conducting an independent research project, which contains sufficient new information for a minimum of three peer-reviewed publications. The doctoral program is usually completed within four to five years.

Every master's, doctoral, and postdoctoral trainee receives instruction in the responsible conduct of research either through course work (e.g., ENVR411) or through special training. All students working in the laboratory are required to attend courses, which cover laboratory safety procedures; specific training is also required before engaging in experiments involving biological materials. All students engaged in procedures with human biological material are immunized for Hepatitis B and are instructed in safe procedures for handling and disposing these materials in accordance with requirements of the UNC Health and Safety Office. All students involved with research projects involving use of human and animal subjects are required to complete the CITI course in the Protection Human Research Subjects (<http://www.citiprogram.org>), which is sponsored by the Human Research Ethics UNC-CH.

D. Program Activities and Accomplishments

During the academic year 2005-2006, the EAC focus area graduated 5 Ph.D. students and 2 Master's students (1 MSPH and 1 MSEE). Four Master's students (3 MSPH and 1 MSEE) and one doctoral student were supported by the UNC-ERC training grant during 2005-2006. Our students have made numerous oral and poster presentations in both national and international meetings. The demand for occupational health professionals remains unabated and placement of our graduates continues to remain strong as indicated by the direct employment of our graduates. The ERC funded MSEE graduate was immediately employed as a health and safety professional. One doctoral student accepted a faculty position at the Arizona State University while three accepted post-doctoral fellowships. During 2006-2007, we are supporting three Master's students and two doctoral students. One of the doctoral students is a minority student. Below, the accomplishments of each trainee supported by NIOSH ERC during 2005-2006 is summarized.

Katie Bland (MSEE; research advisor David Leith) Thesis title: LORI-10 Personal Cascade Impactor: a Performance Evaluation. Ms. Bland presented her Master's thesis research at the AIHCE 2006 in Chicago, IL. A manuscript describing this research has been submitted for publication. Ms. Bland is employed as an Assistant Engineer to design and review industrial control systems for dust by engineering consulting firm Burns and McDonnell, Kansas City, MO.

Tausha Buchanan (MSPH, research advisor David Leith): Thesis title: Investigation of Aerosol Penetration Through Walls. Ms. Buchanan investigates the relationship between pressure differential across the wall of a building and aerosol infiltration through cracks and gaps in the building structure. The aerosols of concern range from 10 nm to 5 µm in diameter. Experimental data are developed and matched against relevant theory. Her research project is carried out as collaboration with Drs. R. Mosely and J. Rosati at US EPA, RTP, NC.

Sheila Flack (MSPH/Ph.D.; research advisor Leena A. Nylander-French) Thesis title: Dermal and Inhalation Exposure to Propiconazole among Farm Workers in North Carolina. The purpose of this study is to assess dermal and inhalation exposure to propiconazole among farmer workers during pesticide handling, to determine frequency and types of personal protective equipment used, and to understand which factors (e.g. environment, behavior) may contribute to propiconazole exposure. This research is carried out as collaboration with Dr. Goktepe at NC A&T University, which is a minority institution. Ms. Flack presented her research findings at the annual Society of Toxicology meeting in San Diego, CA and in AIHCE 2006, Chicago, IL.

Linda Gaines (Ph.D.; research advisor Leena A. Nylander-French). Thesis topic: Biomarkers to quantify exposure to 1,6-hexamethylene diisocyanate. Ms. Gaines is currently conducting field studies to measure

spray painters' exposure to HDI in both North Carolina and Washington State (collaboration with Dr. Steve Whittaker, Washington State Department of Labor & Industries SHARP program, Olympia, WA). This research is funded by NIOSH (R01 OH 007598-03: Dermal Exposure to 1,6-Hexamethylene Disocyanate).

Ghassan Hamra (MSPH; research advisor David Richardson, Epidemiology and Leena A. Nylander-French) Thesis topic: Nuclear plant workers' exposure to tritium and development of an exposure model.

NIOSH support has been invaluable for the EAC focus area to be able to support first rate Master's and doctoral students. NIOSH support has also allowed the students and faculty to design more individually appropriate study and research program as well as more possibilities for collaboration between the different disciplines in the Department, the School of Public Health, and with other research institutions in North Carolina and the US.

Faculty Honors, Awards, and Appointments

Marc Serre received Newton Underwood Award for Excellence in Teaching from the Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina at Chapel Hill, 2005. David Leith was nominated by the University of North Carolina for APHA/Pfizer award as National Professor of the year in Public Health. Stephen M. Rappaport has been appointed as an adjunct professor at the School of Public Health, University of California, Berkeley, CA.

Student Theses and Dissertations

1. Kristen Hampton, MSPH thesis: *Adjusting For Sampling Variability In Sparse Data: A Bayesian Maximum Entropy Approach To Disease Mapping*, December 2005 (Advisor Marc Serre).
2. Katie Bland, MSEE thesis: *LORI-10 Personal Cascade Impactor: A Performance Evaluation*, March 2006.
3. T. Renee Anthony, Ph.D. thesis: *Investigation of Particle Inhalability*, August 2005. (Advisor Michael Flynn).
4. Yi-Chun E. Chao, Ph.D. thesis: *Determination of Dermal Exposure to JP-8 Jet Fuel Using the Tape-Strip Method*, August 2005 (Advisor Leena A. Nylander-French).
5. Seung-Jae Lee, PhD thesis: *Models of Soft Data in Geostatistics and Their Application in Environmental and Health Mapping*, December 2005 (Advisor Marc Serre).
6. David Kim, Ph.D. thesis: *Toxicokinetic Models of Dermal Exposure to Jet Fuel*, Department of Environmental Sciences and Engineering, May 2006 (Advisor Leena A. Nylander-French).
7. Sitthichok Puangthongtub, PhD thesis: *Bayesian Maximum Entropy Space/Time Analysis of Ambient Particulate Matter and Mortality in Thailand*. May 2006 (Advisor Marc Serre).

E. Program Products

During the program period of 2005-2006, the EAC core faculty and students published 39 scientific articles and gave 41 presentations in national or international scientific meetings (see Appendix D). The EAC core faculty published 14 scientific articles jointly with the Master's and doctoral students (see Appendix C). David Leith presented a course entitled "Dustiness of Pharmaceutical Aerosols" at Pfizer Inc., New York, July 2005.

We have completed one research project entitled "Dermal and Inhalation Exposure to Propiconazole among Farm Workers in North Carolina" in which Ms. Flack, one of our NIOSH ERC supported trainee, had a significant involvement in carrying out the development and the use of the analytical chemistry methods to assess dermal and inhalation exposure to propiconazole among farmer workers during pesticide handling and to determine frequency and types of personal protective equipment used and factors (e.g. environment, behavior) contributing to propiconazole exposure. Ms. Flack presented her research findings at the annual Society of Toxicology meeting in San Diego, CA and in AIHCE 2006, Chicago, IL. This research was carried out as collaboration with Dr. Goktepe at NC A&T University, which is a minority institution.

F. Future Plans (Include in summary form plans for the next budget period.)

The goal of the Industrial Hygiene Training program is twofold. The training objectives for the Master's program remain the education of highly qualified professional industrial hygienists and scientists with strength in the discipline of industrial hygiene, i.e., the fundamental principles involved in the anticipation, recognition, evaluation, and control of factors arising in the workplace that adversely impact human health and well-being. At the doctoral level, industrial hygiene training and research provide the foundation for the development of

new methods for exposure assessment and control and prepare scientists for research and teaching careers in occupational health and safety. We will continue to provide trainees with research experience in conducting field studies to develop exposure assessment methods, to investigate exposure-dose-response relationships, and to calibrate models for the optimal control of exposure.

**Occupational Health Nursing Program
Progress Report
July 1, 2005 – June 30, 2006**

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III. PROGRAM PROGRESS REPORTS

A. Program Title: Occupational Health Nursing Program

B. Program Director: Bonnie Rogers

C. Program Description: The Master of Public Health (MPH) and Master of Science (MS) degrees with specialization in Occupational Health Nursing are offered in the Public Health Leadership Program. The MPH program requires a minimum of 42 credits of which 20% may be transfer-in credits as is permitted for all students by the Graduate School. The program is taken on-campus and through distance education. The MPH program in Occupational Health Nursing prepares occupational health nurse specialists for positions in leadership, program planning and evaluation, or management of occupational health nursing programs. The program leading to the MS degree prepares graduates in program planning and evaluation; however, emphasis is on the development of research skills as beginning researchers. The on-campus MPH student can complete the degree in 1 ½ years, the distance learning MPH student in 2 ½ years, and the MS degree can be completed in 2 years; however, students have up to five years to complete the program.

- i. **Goals and Objectives:** The goal of the Occupational Health Nursing (OHN) Program is to provide education, training, and research experiences as appropriate to occupational health nursing professionals, so as to transfer learned knowledge to protect and promote the health of the workforce. Program objectives include:
- Provide OHN education both on-campus and via distance education (for the MPH degree).
 - Provide MS degree education (thesis required) on-campus.
 - Provide interdisciplinary learning opportunities and experiences with a public health foundation (5 core) and occupational health cognate courses.
 - Provide integrated/applied learning through practicum experiences.
 - Provide trainees with opportunities for scholarly demonstration of knowledge learned (e.g., master's paper, publications, presentations).
 - Admit 4-6 trainees/year, encouraging diversity in enrollment.
 - Offer continuing education/outreach to the occupational safety and health community.
- ii. **Responsible Conduct of Science Training:** This training is achieved through both Informal and formal instruction in responsible conduct of research. It is discussed in PHNU 781: Occupational Health Nursing I, PHNU 782: Occupational Health Nursing II, and PUBH 785: Interdisciplinary Approaches to Occupation Health, PUBH 992: Master's Paper, and OHN Program students are required to complete The Collaborative Institutional Training Initiative (CITI Program) titled Instruction in The Protection of Human Research Subjects. Instruction on the scientific integrity and ethical principles in research is provided at five separate times during the curriculum. All trainees and faculty participate.
- iii. **Program Leadership and Faculty:** There are no changes in the program leadership and faculty. The Program Director, Bonnie Rogers, and OHN faculty, Judy Ostendorf and Susan Randolph, continue to provide primary faculty support to the program. Publications in the reporting period (n-14) are shown in Appendix C. In addition to teaching and other faculty responsibilities, Ms. Ostendorf coordinates the Distance Education OHN option and will co-direct the Occupational Health Nursing Certificate Program. Ms. Randolph helps coordinate the Health Services Research PhD program. All faculty continue to advise, mentor, serve as readers on master's papers, and collaborate with students to arrange meaningful practicum experiences and prepare publications. A table showing core, contributing, and adjunct faculty follows.

Core Faculty	Competence Area
Bonnie Rogers, DrPH, COHN-S, LNCC, FAAN	OHNsg, Epidemiology, Ethics, Health Care Worker Hazards, Legal
Judy Ostendorf, MPH, COHN-S, CCM	OHNsg, Ergonomics & Case Management
Susan Randolph, MSN, COHN-S	Occupational Health Nursing, Agriculture
CONTRIBUTING FACULTY	
Kathleen Buckheit, MPH, COHN-S/CM/SM	Occupational Health Nursing, Ergonomics, Safety

ADJUNCT FACULTY	AFFILIATION	Competence Area
Elise Handleman, MEd, COHN-S	Director, Office of Occupational Health Nursing, Federal OSHA	OHNsg, Ergonomics
Judith Holder, PhD	Director, Occupational Mental Health Program, Duke University	Occupational Mental Health
Karen Mastroianni, MPH, COHN-S	President, Dimensions in Occupational Safety and Health	OHNsg, Health Education
Kay Campbell, EdD, COHN-S	Director, Health Promotion, GSK	OHNsg, Health Promotion
Elizabeth Lawhorn, MSN, COHN-S, CCM	Manager, Occupational Health Services, EXXon Mobil	OHNsg, Health Promotion, Surveillance
Grace Rome Schnackenberg, MS, COHN-S, CCM	OHN, Texas Instruments	OHNsg, Counseling
Ruth Barlow, MS, COHN-S, CCM	President, Optimal Outcomes	OHNsg, Case Management
Sheila Higgins, MPH, COHN-S	OHN Consultant, State of NC	OHNsg, Military
Patricia Travers, MS, COHN-S	Integrated Benefits, Compaq Corp.	OHNsg, Disability Management
Jon Wallace, MBA, CSP	President, Workplace Safety	Occupational Safety
Gary Greenberg, MD, MPH	Duke University, OEHM	Occupational Medicine

iv. **Curricula:** The OHN specialty is broad and dynamic and the curriculum requires a sound foundation in the sciences of public health, occupational health, and nursing within an interdisciplinary framework which is an essential integrated building block. The master's curriculum content in OHN contains three components: the public health sciences; the occupational health nursing core studies and OHN functional role courses, and practica; and the occupational health sciences interdisciplinary cognates. All students in the MPH or the MS degree program take the same core courses in the public health sciences, excepting coursework in health services administration and behavioral sciences, which is only for the MPH students. All OHN students take the occupational health nursing core studies, functional role, and occupational health cognates. MS students are required to take research methods/statistics coursework for research skills development.

Specialization in occupational health nursing requires foundational courses from the public health sciences, specifically epidemiology (EPID 600), biostatistics (BIOS 600), health administration (HPAA 600), environmental sciences (ENVR 600), and behavioral sciences (HBHE 600). Coursework in epidemiology provides a foundation for epidemiological inquiry; biostatistics provides for application of statistics in the planning, coordination and analysis of projects, research, and data; environmental sciences coursework introduces the student to basic concepts in environmental health, e.g., air and water pollution, food safety, hazardous substance exposure, and environmental policy and management; behavioral sciences addresses social and behavioral theories applied to health motivating; and coursework in health policy/administration focuses on organizational and human resources management.

Through a theoretical and conceptual framework, the OHN Program prepares the student as a specialist in occupational health nursing. OHN course content uses an occupational health nursing model based on system's theory developed by Dr. Bonnie Rogers to emphasize OHN roles, worksite assessment, interdisciplinary functioning, health promotion and prevention, management, program planning and

administration including cost-benefit/effectiveness in occupational settings. The OHN courses (PHNU 781, PHNU 782) and practica (PHNU 783, PHNU 784, and PHNU 886) are sequenced so that students begin by learning theories, concepts and principles in occupational health nursing and then applying these at the worksite, i.e., assess work-related health problems, and plan, implement, and evaluate occupational health programs/projects. Students have a variety of applied learning experiences e.g. walkthroughs, health promotion projects, and seminar leadership and teaching opportunities including a presentation and discussion of each student's individual philosophy of occupational health nursing and a jointly prepared and presented topic of occupational health nursing interest. For example, students this year presented the topic heat stress. Students also conduct joint walk-throughs in the context of a system's analysis approach making joint presentations and providing an individually written paper.

D. Program Activities and Accomplishments:

i. Progress Toward Goals and Objectives:

- Provide OHN education both on-campus and via distance education (for the MPH degree).
Both the on-campus and distance education formats are offered for the MPH degree. We currently have 4 on-campus students and 13 distance education students.
- Provide MS degree education (thesis required) on-campus.
We currently have one student pursuing the MS degree.
- Provide interdisciplinary learning opportunities and experiences with a public health foundation (5 core) and occupational health cognate courses.

Occupational health nursing students are highly engaged in numerous interdisciplinary activities. Selected required coursework in safety/ergonomics (ENVR 432), toxicology (ENVR 423), industrial hygiene (PHNU 787), and the new Interdisciplinary Approaches in Occupational Health (PUBH 785) provides the student with the skills necessary for the further development of the role of the OHN within an interdisciplinary framework. Students learn about interdisciplinary roles and collaboration necessary to improve the health and safety of the worker and work environment. Students from all core disciplines, participate in field experiences, conduct joint walk-throughs, collaboratively work together to address problems in occupational health, and make joint presentations related to the problem. For example, in the safety/ergonomics course (ENVR 432) five groups of students worked in interdisciplinary teams and selected a work-related health issue, visited the work-site, conducted a job safety/task hazard analysis, and analyzed methods for prevention and control. For each project, students made a power point class presentation presenting all findings, methods, and explanations of the health care management protocol and education and training program. Project examples completed were at Martin Marietta Surface Mine (heavy lifting, static loading, repetitive tasks, and equipment vibration), UNC Recreation Center (workstation area evaluations), South Orange Rescue Squad (ambulance operations), and a dentist's office (dental hygienist work tasks).

In the toxicology course (ENVR 423) students attend interdisciplinary classes on-campus or online and online chat rooms, and develop a project, paper, and presentation (e.g., chromium, lead, latex allergy) on a selected chemical providing an in-depth analysis of the risk, exposure assessment approaches, and prevention and control measures. Examples of student papers and presentations in industrial toxicology are Danger in Dry-Cleaning, Oxycodone Hydrochloride in Manufacturing Pharmaceuticals, Lead in the Workplace, Arsenic, Cyanide in Gold Processing, Asphalt Fumes, Methylene Chloride, Radon Exposures, and Effect of Chronic Lead Exposure in a Painter.

In the interdisciplinary approaches course (PUBH 785), interdisciplinary students attend interdisciplinary-based lectures, conduct a joint walk-through of the animal facility labs at UNC medical school, and select an industry and specific hazard based on their interest, and to research and formally present their findings in class discussing interdisciplinary roles. For example, Katie Bland (IH), Jill Connell (OHN), Jonathan Drum (Safety and Ergonomics), and Stephanie Reid (Safety and Ergonomics) selected The Industry of Quarry Mining. Zewditu Demissie (Epidemiology), Jaci Freeman (Safety and Ergonomics), Andrew Imler (Industrial Hygienist), and Shelly Johnson (Occupational Health

Nurse) selected Hair Salons. Both papers and presentations were excellent. During this course, occupational medicine was well represented with three physicians providing different lectures and discussions and a good interactive opportunity. In addition, industrial hygiene, safety/ergonomics, and nursing presented information. Injury prevention and labor issues were of significant interest to the students and a lively debate on ethical issues in occupational health was superb!

NORA Interdisciplinary Seminars also provide interdisciplinary learning opportunities and experiences through web casts. The topics and discipline responsible for the seminars are listed below:

August 25, 2005--"Research Approaches to Studying Back Pain Among Nursing Personnel at a Tertiary Care Medical Center" by Lisa Pompeii (Nursing/Medicine)

November 2, 2005--"Experimental and Computational Methods of Quantifying the Absorption and Penetration of Chemical Mixtures Through the Skin" by David Kim (Industrial Hygiene)

February 15, 2006--"Critical Windows: How Time Patterns of Exposure Influence Disease Risk" by David Richardson (Epidemiology)

May 17, 2006--"Applied Ergonomics Research" by Gary Mirka, Yu Shu, & Zongliang Jiang (Safety/Ergonomics)

- Provide integrated/applied learning through practicum experiences.

PHNU 783/784 practica are concurrent during the academic semesters and are required for students without OHN experience. The concentrated field practicum, PHNU 886 (5-8 weeks), is required of all students, and enables them to develop and implement advanced OHN practice projects and synthesize the practice within their functional roles. Field practica or training is a planned and supervised experiential component of the academic program which provides learning opportunities not available in the classroom. The purpose and potential benefits of the field practicum are to relate theoretical classroom learning to practice situations; gain experience, skills and confidence in dealing with administrative, and/or service problems; explore and increase understanding of the structure and dynamics (e.g., agency objectives, goals, values, resources, constraints, etc.) of the setting in which he/she is working and the influence of occupational health/safety; and identify work-related health problems for intervention, prevention, and control. This is perhaps one of the best learning experiences offered and is not only completed in traditional industry settings but also in government, professional associations, agricultural, and hospital employee health settings.

- Provide trainees with opportunities for scholarly demonstration of knowledge learned.

During this reporting period 6 students graduated; 5 of them wrote master's papers and 1 wrote a thesis. Two of them have commented that they are preparing to edit their paper/thesis for publication.

- Admit 4-6 trainees/year, encouraging diversity in enrollment.

Eight trainees were admitted during this reporting period. One of these trainees was a minority, a male. An African American female applied but GRE scores (V=290 & Q=230) and overall GPA (2.8) were too low for admittance.

- Offer continuing education/outreach to the occupational safety and health community.

The OHN Program continues to actively participate in the NC OSHERC continuing education/outreach efforts. We offer the "OHN Certification Review and the Occupational Health Nursing: Introduction to Principles and Practice" courses every year. A new course was developed and offered in 2005, "Case Management Certification Review". Three OHN faculty are on the Education and Standards Committee of NCAOHN, which plans the continuing education programs offered semi-annually, for occupational health nurses throughout the state. The NORA Interdisciplinary Seminars are offered to the occupational safety and health community throughout the United States and has been well received.

Four OHN faculty presented sessions at the International Conference on Occupation Health (ICOH) in Milan, Italy related to occupational safety and health training, education, and evaluation of training programs.

- ii. **Trainee Honors and Awards:** Two trainees received Public Health Leadership Awards; the Klingenfus and Blee Hay. One trainee received the Delta Omega Book Award and one trainee was inducted into Sigma Theta Tau Nursing Honor Society.
 - iii. **Trainee Theses:** One MS student completed her thesis, titled, "The Study of Registered Nurses' Perceptions of Occupational Risks and Hazards in the Hospital Setting".
 - iv. **Trainee Recruitment Including Diversity Efforts:** Recruitment and marketing efforts have been extensive for the past year. During the reporting period there were 36 inquiries, with contacts returned or initiated by OHN faculty, with 5 of those making application. We have advertised extensively in the AAOHN News during the months of May and November; NCAOHN Connection, four times per year; AOEC News, annually; NC OSHERC Institute advertising semi annually; discussed program and provided application materials at the NC OSHERC Institutes, OHN Certification Review Courses 3-4 times per year, and Basic OHN Principles, annually; and provided information on the PHLP website and FAQs. A specific brochure targeting OHN distance education was developed and has been used in meetings with nurses in the Black Nurses Association. The brochure states that "Minorities are encouraged to apply". A banner announcement was developed and is currently being displayed on the minoritynurse.com recruitment website. We currently have two minority students enrolled. When inquiries are made by prospective applicants, an application packet is emailed or mailed and telephone or email contact follow-ups are made with every inquirer. A running list of inquiries is kept and, for those who are serious applicants, continued follow-up is done throughout the application process.
- E. Program Products:** Publications (n=14) and presentations (n=47) of program faculty and trainees are listed in Appendix C and D respectively. The NCAOHN Spring and Fall Conferences were co-sponsored by the OHN Program. CE courses presented were the Occupational Health Nursing Certification Review Course, the Occupational Health Nursing: Introduction to Principles and Practice Course, and the Case Management Certification Review Course. Research projects that were completed and had significant trainee involvement included a Robert Wood Johnson grant titled "Ergonomics and Nursing in Hospital Environments" and a NIOSH and University of Maryland funded grant titled "Antineoplastic Drug Exposure".
- F. Future Plans:**
- Implement the on-line certificate in Occupational Health Nursing Program. This will provide a recruitment groundfield for potential applicants to master's level degree program and/or for those needing additional knowledge related to the specialty field.
 - Continue to provide graduate level education and training for master's students in occupational health nursing in both residential and distance learning formats.
 - Continue the aggressive recruitment plan for the master's programs, emphasizing minority recruitment. This will include advertising, both traditional and web-based, recruitment through our alumni and recruitment ambassadors, and development of brochures for distribution.
 - Continue to provide continuing education/outreach course offerings in Occupational Health Nursing Certification Review, Case Management Certification Review, Occupational Health Nursing: An Introduction to Principles and Practice, and offsite courses as requested.
 - Continue interdisciplinary interaction through overview course, seminars, orientation session, and research experiences as appropriate.

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III. PROGRAM PROGRESS REPORTS

A. Program Title: OCCUPATIONAL SAFETY AND ERGONOMICS PROGRAM

B. Program Director: Dr. Gary Allen Mirka

C. Program Description

1. Goals and Objectives

The goals and objectives for the Occupational Safety and Ergonomics (OS&E) Program Area are to provide education, training, and support to master's level graduate students seeking an advanced engineering degree with an emphasis in OS&E. The regional need for practitioner engineers trained in safety and ergonomics can be seen by examining the injury and illness statistics of the furniture, home construction, and agriculture industries – industries of significant importance to the economy of North Carolina and the region. These industries all have injury/illness rates higher than those for private industry as a whole and the prevention of occupational injuries and illnesses can have a significant impact on these industries and their workers. The rationale for housing a training grant within a department of engineering relies on the fact that it is generally recognized that engineering controls are the most effective methods for reducing the incidence and severity of occupational injuries. The main thrust of our program is teaching students how to recognize, evaluate and control occupational safety hazards. The training provided through this program has been and will continue to be a combination of traditional classroom instruction, applied occupational safety fieldwork, and basic and applied research training.

2. Responsible Conduct of Science Training

The focus of our training in the responsible conduct of science is in three areas: 1) the ethical treatment of human subjects, 2) responsible data collection/analysis and 3) responsible authorship. The training in each of these areas is provided through a structured presentation by Dr. Mirka as he works with the students on research projects. Dr. Mirka has developed a very structured approach towards the gradual exposure of the NIOSH trainees to the research environment. In their first semester, the students participate in a laboratory-based research project. In their second semester they participate in a field research study. Finally, in the summer between the first and second years the students begin the development of their thesis topic and conduct their thesis research in the second year of the program. With this particular structure in place, there are logical points in time when various research ethics related topics are addressed in the context of the research project. Also, through his role as the Director of Graduate Programs for the Department of Industrial and Systems Engineering at North Carolina State University (NCSU), Dr. Mirka has also developed a sequence of three seminars that focus on research ethics. Dr. Mirka presents a seminar on the use of human subjects in research, Dr. James Wilson (ISE department head) presents a seminar on the ethics of publication and peer review and Mr. Matthew Ronning (NCSU Associate Vice Chancellor For Research Administration) presents a seminar on data integrity and research recordkeeping. These seminars are offered each fall semester. In addition to these sources, PUBH 285 (a required course for all OS&E students) also provides a formal presentation of the issues in the ethical conduct of research. Students are evaluated on their retention of these critically important issues as part of this course.

3. Faculty Participation

i. Program Director

The Program Area Director, Dr. Gary Allen Mirka, Professor of Industrial and Systems Engineering, has been a member of the faculty of the department since 1992 and has provided substantial leadership and expertise to the existing Safety and Ergonomics Training Program. Dr. Mirka was the co-director of the NCSU Safety TPG from 2001-2003 and has been the Program Director of the Safety and Ergonomics Program Area of the NC OSHERC for the last three years. Dr. Mirka is the sole administrator of the Safety and Ergonomics Program Area. He is responsible for coordinating the course offerings, recruiting students to the program, assigning students to program area advisors, and

assuring that the program area students follow the required curriculum and gain the necessary research training.

Dr. Mirka's area of specialization is occupational ergonomics and safety with a special emphasis in lifting/spine biomechanics. He was the 1993 recipient of the Volvo Award on Low Back Pain Research and has 46 refereed, archival journal publications. Dr. Mirka's research efforts have focused on the development of ergonomic interventions for specific industries (construction, agriculture, furniture manufacturing, commercial fishing). In terms of curriculum development, Dr. Mirka has developed four new courses in the area of safety and ergonomics and has developed a web-based course: IE 544 "Occupational Biomechanics". Dr. Mirka has a strong record of research funding from both NIOSH as well as industry sources. In addition to his academic work experience, Dr. Mirka has consulted with a wide variety of North Carolina industries including the furniture manufacturing industry, light and heavy manufacturing, research and development firms. He has been a member of American Industrial Hygiene Association, American Society of Biomechanics, Ergonomics Society (United Kingdom), Human Factors and Ergonomics Society, Institute of Industrial Engineers, American Society for Engineering Education and American Society of Safety Engineers. Dr. Mirka devotes 20% FTE to the direction of the program.

ii. Program Faculty

Dr. David Kaber is an Associate Professor in the Department of Industrial and Systems Engineering and is a core faculty member of the program area. He participates fully in the program in terms of interacting with students through teaching courses, advising students, chairing student committees, and involving students in his active research program. Dr. Kaber's expertise and research efforts are focused on occupational safety and health, situation awareness in complex systems automated systems (level of control and adaptive automation), human factors in teleoperation and telerobotics (telepresence), and human-machine system/interface. Dr. Kaber and Dr. Mirka have a history of collaboration with several coauthored journal articles in the last three years and serving on graduate student committees together. Dr. Kaber has taught three of our safety and ergonomics courses during his tenure at NC State and has developed a web-based version of IE 541 "Occupational Safety".

Dr. Simon Hsiang is the newest faculty member of our program area, beginning his employment as an Associate Professor of Industrial and Systems Engineering at NCSU in August 2005. He is a core member of the group and participates fully in the program in terms of interacting with students through teaching courses, advising students, chairing student committees, and involving students in his active research program. Dr. Hsiang's expertise and research efforts cover broad areas of concern in occupational safety and health. Much of his work is in the area of the interaction between the cognitive and the physical aspects of health and safety issues. Dr. Hsiang came to us from Texas Tech University where he was an Associate Professor of Industrial Engineering. Previously he worked for Liberty Mutual Insurance, where he participated in a variety of safety and ergonomics research projects. Dr. Hsiang has previously taught a breadth of courses in safety, ergonomics, statistics and more general industrial engineering courses.

Dr. Nelson Couch is an Adjunct Assistant Professor of Industrial Engineering and is a core faculty member in this program due to the important classroom teaching contribution that he makes. While Dr. Couch has a broad expertise in occupational safety applications (was named a Fellow of the American Industrial Hygiene Association in 2004) his particular area of emphasis is the area of radiation safety. Dr. Couch has been active in teaching our Occupational Safety (IE 541) and Systems Safety (IE 741) courses. Dr. Couch is an adjunct member of the faculty of the Department of Industrial and Systems Engineering. Dr. Couch has also contributed through his participation on NIOSH trainee thesis committees, as his adjunct status allows for this contribution.

From other near-by universities Dr. Samuel Moon and Dr. Hester Lipscomb Associate Professors in the Department of Community and Family Medicine at Duke University have participated on inter-institutional graduate committees of our trainees (and both have been adjunct faculty to our department) and interdisciplinary research projects. Both Drs. Lipscomb and Moon have served on two graduate committees. Over the reporting period Dr. Mirka served on an epidemiology PhD student

graduate committee chaired by Dr. Dana Loomis (Director of the Occupational Epidemiology Program at UNC-CH).

4. Curriculum

Over this reporting period the Safety and Ergonomics Program Area was focused exclusively on the training at the master's level (this changes in the coming year with the approval of the PhD training). In addition to the traditional coursework training, our program places a heavy emphasis on research training for our master's students. All students who participate in the NIOSH trainee program participate in our on-going funded research efforts as a fundamental part of their training. This has been our approach throughout the existence of our program (note the publications of our current and recently-graduated trainees in Appendix C) and will continue to be our approach for future trainees. Our approach has been to engage all students in a basic laboratory research project in their first semester of training. This familiarizes the students with the basic tools of laboratory research. In their second semester of training they participate in a field research project. In the summer between the first and second year of the training program the students begin the process of developing their thesis topic, which is then conducted in their second year of training. Using this structured approach the trainees received exposure to basic laboratory experiment techniques, field research techniques as well as the process of conducting independent research. This approach also formalizes the research ethics training received by the students. In terms of the more traditional coursework training, the training of the master's-level students is focused on producing high-quality practitioners with a good understanding of research methods. There are two groups of students that this master's-level program supports. The first group (Group A) are full time graduate students (thesis-option) who will enter the program having already completed a baccalaureate degree. The second group of students (Group B) are students that are pursuing a five-year combined BS-MIE degree that is offered by the Department of Industrial and Systems Engineering. This is a relatively new program in our department and is available only to our very best students (GPA>3.5). All master's-level trainees (both Group A and Group B) take a specific set of required courses to satisfy the safety and ergonomics requirements, participate in on-going, sponsored research in the laboratory and are required to take a total of 30 credit hours for graduation (17 of these credit hours have a safety or ergonomics focus). All trainees engage in an Applied Practicum in OS&E, to demonstrate skill competence and participate in funded research activities to develop their research skills. All trainees will graduate with the skills necessary to recognize, assess, and develop and implement engineering and administrative controls for general occupational safety and ergonomics hazards. The safety and ergonomics training provided in this program comes from both required and elective courses. To satisfy the Safety concentration requirements, students can select from the courses (or equivalents) listed in Appendix A. Courses in italic type face are required for the trainees. In total there are 17 credit hours of required safety and ergonomics coursework and an additional 2-3 credit hours of safety and ergonomics electives. A listing of these courses can be found in Appendix A.

Required Applied Practicum in Occupational Safety & Ergonomics: Either during the final semester of course work for the master's students or after all course work is completed (final decision to be made by advisor and program director) all trainees engage in an applied practicum (IE 796A). This applied practicum is part of the programs for the express purpose of giving trainees an introductory work experience specific to occupational safety and ergonomics. Trainees perform a specific, defined work project through an assigned employer. Each trainee keeps a project notebook that tracks project milestones, problems, solutions, etc. The trainee's advisor reviews the notebook weekly, to monitor the trainee's progress. Each trainee (or team, if a group project) prepares a technical report summarizing the work experience and prepares and presents a seminar at the work site. The evaluation of the end product of the project is evaluated by the sponsor and the course instructor. The students also noted in their evaluation that the breadth of hazards identified in these facilities represented the scope of the courses required as part of the curriculum. In particular the industrial toxicology course (ENV 135 "Industrial Toxicology") was found to be invaluable to them and, as such, this particular course has been highly recommended for all trainees since.

D. Program Activities and Accomplishments

Over this reporting period the Safety and Ergonomics Program Area 22 students have been enrolled in the safety and ergonomics area within the department. Of these, five have received some financial support through the NIOSH-supported NCOSH ERC. The majority of the trainees that were not supported by NIOSH funding were PhD students, a group that, at the time, was not eligible for support as our program was limited to master's level training only. This will change in the coming year as our PhD training was approved in the most recent review. Of the seven students that were recruited in this time period, there were five women (a minority group in engineering) and one was an African-American woman. This African-American woman was awarded a prestigious Dean's Fellowship. Of the six graduates that we had in this time period, there was one African-American woman. Also in this time period Dr. Simon Hsiang joined our faculty, with research interests in safety, systems safety, biomechanics and human modeling. Finally, Dr. David Kaber received the 2006 Clifton A. Anderson Outstanding Faculty Award for the Department of Industrial and Systems Engineering.

Dissertations completed in the period

1. Ma, Ruiqi "The Effect of In-vehicle Automation and Reliability on Driver Situation Awareness and Trust"
2. Shin, Gwanseob "Viscoelastic Responses of the Lumbar Spine during Prolonged Stooping"

Theses completed in the period

1. Drum, Jonathan "An Investigation of the Effects of Fatigue and Stance Width on Horizontal Ground Reaction Forces and Trunk Kinematics"
2. Reid, Stephanie "Learning Curve Analysis of a Patient Lift Assist Device"
3. Xu, Xu "The Effect of Obesity on Trunk Kinematics and Ground Reaction Forces during Lifting"

E. Program Products

Over this reporting period the Safety and Ergonomics Program Area faculty and students have published (in-print) nine archival journal articles, have ten more accepted and "in press" and submitted fifteen more for review (see Appendix C for the full listing of manuscripts generated, in whole or part, from ERC training grant support). Faculty and students have also been active in presenting their work at professional conferences including American Nuclear Society International Meeting, 49th Annual Meeting of the Human Factors and Ergonomics Society, International Ergonomics Association, 2006 ACM Conference on Human-robot Interaction, 11th International Conference on Human-computer Interaction.

Also during this period the trainees conducted an independent research project related to the ongoing work that Dr. Mirka has been conducting in the agriculture industry (NIOSH U50 OH07551-01). The focus of this work was to better understand the biomechanics of carrying. This project was generated from our observations of farmworkers carrying buckets of produce in the field, and our interest in developing recommendations for carrying technique. The students developed an EMG and motion analysis-based study that had human subjects carrying buckets of sweet potatoes while walking on a treadmill. The subjects carried the bucket at three different heights and the students assessed the impact of height on the muscle activity and stability of the task. This work is currently under review in the journal *Ergonomics*.

F. Future Plans

The most significant plan is for the expansion of our training to include PhD-level research training. As all of our current funding is used to support the master's students in the program, this will take some time. But as these master's students begin to graduate (most are on track to complete their programs of study in May 2007) this will open opportunities to support more PhD students with the ERC support. This will have a significant impact on the recruiting that we will conduct for the Fall of 2007. Dr. Mirka plans to continue his efforts at recruiting under-represented minorities (both gender and race).

**Occupational Epidemiology Program
Progress Report
July 1, 2005 – June 30, 2006**

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III. PROGRAM PROGRESS REPORTS

A. Program Title

Occupational Epidemiology

B. Program Director

Dana Loomis, PhD

C. Program Description

Goals and Objectives

Occupational Epidemiology is an allied research program that has been part of the UNC ERC since 2001. The mission of the occupational epidemiology program is to train highly-qualified scientists who will develop and apply the theory, methods and substance of epidemiology to protect workers' safety and health. With the program now in its fifth year, we are emphasizing engaging trainees in high-quality research on occupational health and safety, supporting trainees in contributing scholarly publications, and ensuring that they successfully complete the program.

Program Leadership and Faculty

Core and adjunct faculty members for the program are shown in a table on page 46. There have not been any changes in program leadership in the past year. Dr. Loomis served as Interim Chair of the Department from January through August, but his term is now completed. One of the program's most prominent faculty members, Dr. David Savitz, has left UNC, but will continue as an adjunct faculty member. Dr. David Peden, Professor of Medicine and Director of the Center for Environmental Medicine, Asthma and Lung Biology at UNC has also joined the program as an adjunct member.

Curriculum

The course of study leads to the PhD and is designed for students with a Master's degree in epidemiology or a related field. Training activities include required and elective courses, mentored research practica, interdisciplinary seminars, preliminary written and oral examinations, participation in research, and the development and execution of the doctoral dissertation project. There were no significant changes in the program or curriculum in the past year. Support from NIOSH provides valuable enhancements to the occupational epidemiology program through courses, seminars and opportunities to be exposed to other occupational health disciplines. Some of the most valuable training takes place as students work with professors to conduct research and publish the findings.

Responsible Conduct of Research

All occupational epidemiology trainees are required to complete both formal coursework on research ethics and training in the responsible conduct of research with human subjects required by the Public Health Institutional Review Board. This training is documented and assessed at the Intra-Departmental Review required of all doctoral students, and again before undertaking the dissertation research. All current trainees have completed the required training.

D. Program Activities and Accomplishments

Progress Toward Goals & Objectives

Three criteria have been established for evaluation of the program's success: 1) timely completion of degrees by trainees; 2) number and quality of publications contributed by trainees to the peer-reviewed literature; 3) placement of graduates in appropriate positions.

Because the occupational epidemiology program is small, typically supporting only two trainees at any one time, and still relatively young, with the first trainees appointed in August, 2001, there were no new program graduates in the past year.

All of the trainees who were in the program one year ago continue in training and are in good academic standing. Myduc Ta has not yet graduated, but is working actively on her dissertation on community-level structural determinants of workplace violence under the supervision of Dr. Loomis and is expected to graduate in 2007. Zewditu Demissie is in the early stages of developing a dissertation proposal with input from several of the program faculty. She is expected to graduate in 2008. In addition, trainees and faculty members are engaged in research that has generated papers that are in preparation, undergoing review, or accepted for publication, as described in Section E.

Trainee Recruitment

With the two trainees appointed previously continuing in the program, funds were not available for recruitment of new trainees this year.

Other Accomplishments

Faculty Honors and Awards

Dana Loomis, Elected Chair, Scientific Committee on Epidemiology, International Commission on Occupational Health (ICOH), June 2006.

David Richardson, Research Fellowship, Alfred Krupp Kolleg Greifswald Foundation and Alfred Krupp von Bohlen und Halbach Foundation, 2006.

Faculty Appointments

Dana Loomis, Appointed Interim Chair, Department of Epidemiology, January-August, 2006.

Stephen Marshall, Promoted to Associate Professor of Epidemiology and Orthopaedics, 2005; Appointed Adjunct Associate Professor of Exercise and Sports Science, 2006; Member of National Academy of Science's Committee on Medical, Physical, and Mental Standards for Military Recruitment.

New Courses

"Analyses of case-control data," David Richardson, Instructor, 17th International Summer School of Epidemiology, University of Ulm, Germany. 2006.

Trainee Honors and Awards

None

E. Program Products

Program trainees were the lead authors of three original scientific papers that were published or submitted during the past year and which resulted directly from research done during their training. Two of these papers have been published and one is being revised for resubmission. Trainees participated with program faculty members as co-authors of five additional peer-reviewed papers and one book chapter. Peer-reviewed publications involving trainees have appeared in leading specialty journals, including the American Journal of Public Health, Occupational and Environmental Medicine, Injury Prevention, Pediatrics, and the Journal of Allergy and Clinical Immunology. In addition, trainees made or contributed to research presentations at conferences of the American Public Health Association and the International Commission on Occupational Health. A complete list of trainee publications appears in the Appendix.

Other students benefited indirectly from the presence of the training program, although they were not appointed as trainees. Student publications that were enhanced by program support are also listed in Appendix C.

F. Future Plans

Recruiting promising individuals to the program and working with trainees to guide them through the development of appropriate doctoral research projects, encourage them to generate scholarly publications and to mentor them to successful completion of the PhD will continue to be key objectives for the program and its faculty. In addition, the faculty will continue to seek extramural funds that will provide a strong research base for the program.

Specific plans for the requested budget period include:

1. Recruiting highly qualified individuals as trainees;
2. Working with current trainees to emphasize scholarly publication;
3. Ensuring that individuals who have received program support continue to progress toward graduation;
4. Continuing research collaborations with faculty from the Safety/Ergonomics program and the Occupational Medicine program;
5. Enhancing interdisciplinary interaction through trainee participate in research;
6. Contributing to Dr. Rogers's interdisciplinary occupational health course and the NORA Interdisciplinary Seminars.

Beyond addressing the preceding programmatic goals, we hope to recruit a new faculty member in occupational epidemiology to replace Dr. Savitz, perhaps at the assistant or associate professor level. A long-term goal is to expand the size of the program from two trainees to five, as recommended in the review of our most recent application for competing renewal. With programs and departments competing for the best applicants—particularly outstanding minorities—training grant support is often a critical factor in applicants' decisions about which institution to attend. In the past year, however, we did not have the resources to recruit any new trainees. In addition, although ERC support is of great value to the trainees, a training program that is too small is ultimately difficult to sustain with new courses, continuing education, outreach and other activities that require a significant amount of faculty time.

Table of Occupational Epidemiology Program Faculty

Core Faculty	Research and Competency Areas
Dana Loomis (Program Director)	Injuries, musculoskeletal disorders, exposure assessment, methods
Jiu-Chiuan Chen	Respiratory diseases; musculoskeletal disorders; exposure assessment
Marilie Gammon	Breast cancer, gastric cancer, esophageal cancer
Stephen Marshall	Injuries; quantitative methods
Andrew Olshan	Parental occupation, pregnancy outcome and childhood cancer; exposure assessment methods
Charles Poole	Quantitative methods
David Richardson	Cancer; radiation workers; quantitative methods
Jane Schroeder	non-Hodgkin's lymphoma, renal cell cancer, uterine fibroids, pesticides and other agricultural exposures.
Steve Wing	Ionizing radiation, social justice and health; philosophy of epidemiology
Adjunct Faculty	
John Dement	Exposure assessment, construction
Hester Lipscomb	Musculoskeletal disorders, injuries, construction
Kenneth Mundt	Surveillance, methods, injury and disability, historical exposure reconstruction, science policy
David Peden	Respiratory diseases, asthma, allergy, biomarkers
Bonnie Rogers	Occupational health nursing, hazards to health workers, ethics
Carol Runyan	Injuries, violence, young workers, agriculture
Vilma Santana	Mental health; women; work organization
David Savitz	Pregnancy outcome; electromagnetic fields; pesticides & cancer
Timothy Wilcosky	Exposure assessment, methods, cancer

**Health Services Research in Occupational Safety and Health
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Health Services Research in Occupational Safety and Health (HSROSH) Progress Report

July 1, 2005 – June 30, 2006

III. PROGRAM PROGRESS REPORTS

A. Program Title: Health Services Research in Occupational Safety and Health

B. Program Director/s: Dr. Bonnie Rogers and Dr. Morris Weinberger

C. Program Description: The Collaborative PhD Program in Health Services Research in Occupational Safety and Health (HSROSH) is located within the Department of Health Policy and Administration. Students are full-time and on-campus. A minimum of 44 credit hours of graduate coursework, excluding dissertation hours, is required for the degree. Students take required courses in HPAA core seminars, methods, a minor area, occupational safety and health area, and health services. Students select a minor area of expertise which may be disciplinary (i.e., economics, epidemiology, financial management, sociology/organizational studies, political science, public policy development) or interdisciplinary (i.e., decision sciences, quality and access). They must pass a written comprehensive examination upon completion of coursework, then present and defend a dissertation proposal and a final dissertation defense based on original research.

The objectives of the training program are to provide education, experiences, and a professional environment for trainees to:

- 1) Develop knowledge and skills in order to conduct independent research in health services research in the field of occupational safety and health.
- 2) Develop knowledge of the literature, important findings, methodological problems, data availability, and research issues related to the organization, financing, and management of occupational health services and delivery options including an examination of quality, cost-benefit, and cost-effectiveness analyses and evaluation.
- 3) Learn how to apply currently acceptable statistical analysis techniques to research issues in health services research in occupational safety and health.
- 4) Develop teaching skills by designing and teaching a course in the area of specialization.
- 5) Develop a minor or collateral area to bring additional perspectives to problems in health services research.

The program normally takes four years to complete and requires a minimum of two years in residence. All requirements for the degree must be completed within eight years from the date of first registration in the Graduate School. At least two semesters of full-time residency equivalency (nine or more hours) must be taken in continuous registration on this campus with a minimum of four semesters of residency required overall.

1. Goals and Objectives. The goal of the HSROSH program is to provide both intensive and extensive training in research methods, subject matter, and theory appropriate to health services research with occupational safety and health integrated through coursework, seminars, research experiences, and a dissertation specific to HSROSH. Interdisciplinary interaction is emphasized in PUBH 785 (formerly PUBH 285), Interdisciplinary Approaches to Occupational Safety and Health; the NORA Interdisciplinary Seminars which are held quarterly; and group activities. The objectives are to:

- Continue recruitment efforts.
- Enroll two trainees.
- Graduate one of three trainees.
- Provide increased interdisciplinary interaction.

2. Responsible Conduct of Science Training.

The responsible conduct of research, one of the core competencies of the HPAA Doctoral Program, is addressed in several courses, including HPAA 885 (formerly HPAA 301), HPAA 886 (formerly HPAA 302), HPAA 872 (formerly HPAA 305), HPAA 873 (formerly HPAA 360), HPAA 874 (formerly HPAA 361), and some of the minor courses. For example, EPID 780 (formerly EPID 276), Occupational Epidemiology, includes a required module on ethics in occupational health research. In addition, PUBH 785 (formerly PUBH 285) has two lectures on ethics which address conflict of interest, informed consent, protection of human subjects, data collection and confidential storage of data, and responsible authorship. All students and faculty are required to complete CITI Program, Instruction in the Protection of Human Research Subjects. This web-based course should be completed during the first 2 semesters of the student's program. The required modules address ethical principles, use of human subjects, assessing risk, informed consent, privacy and confidentiality, use of records in research, protected populations, conflicts of interest, HIPPA and research, etc.

3. Faculty Participation. The faculty of the HSROSH Program remains unchanged. Dr. Bonnie Rogers continues as NC OSHERC PI/Program Director and Director for the HSROSH Program. Dr. Morris Weinberger continues as Co-Director for the HSROSH Program grant. Susan Randolph continues as Program Coordinator and supporting faculty. The faculty for the program represent researchers and practitioners from a wide variety of disciplines including professionals in health services research, occupational health and safety, economics, epidemiology, injury prevention and control, management systems, and statistics. Exposure to these faculty and disciplines, as well as linkages with external agencies including the NC State Public Health Department, various industry segments, and labor groups, will enhance the students' experiences. The table below shows core, supporting, and adjunct faculty along with their area of interest and/or competence.

Core Faculty	Interest/Competence Area/s
Tom Ricketts	Rural health care, primary care, regionalization of services, political philosophy, policy implementation and development, and global and comparative national health policies
Bonnie Rogers (PI; Director)	Occupational hazards to health care workers (antineoplastic agent exposure), ergonomic and work practice interventions, and ethical problems in occupational health
Carol Runyan	Injury prevention and control, adolescent workers, and workplace violence
Morris Weinberger (co-Director)	Health services research, primary care, patient-centered outcomes research, pharmaceutical care, and quality care
Supporting Faculty	Interest/Competence Area/s
Marisa Domino	Economics of mental health, agency relationships among physicians, patients, and insurers; diffusion of new technologies, and public provision of health care and health insurance to low income populations
Shoou-Yih Daniel (Daniel) Lee	Health care organizations
Edward Norton	Health economics, long-term care and aging, mental health, managed care, and econometrics
Susan Randolph	Occupational health and hazard surveillance
William Sollecito	Management systems
Sally Stearns	Health economics, applied statistical methods, health services reimbursement systems, cost-effectiveness analysis, and use of health services at end of life
Bryan Weiner	Organizational change, adoption, and implementation of innovations, patient safety, and inter-organizational relationships

Adjunct Faculty	Interest/Competence Area/s
Kay Campbell	Occupational health promotion, disability management
David Coble	Safety in occupational health
Carol Epling	Occupational medicine education
Arnold Kaluzny	Assessment, program evaluation, development and operations of strategic alliances in health services
Kerry Kilpatrick	Operations research
Dana Loomis	Occupational epidemiology, health risks to vulnerable groups
Judith Ostendorf	Ergonomics in occupational health

4. Curricula. The curriculum is divided into categories reflecting health services research/research methods (9 credit hours); analytical methods (9 credit hours); minor area/health policy elective (18 credit hours); occupational safety & health requirements (11 credit hours); professional development (8 credit hours); and dissertation (minimum of 6 credit hours). Relevant coursework in occupational safety and health is taken but may be interchanged to some degree with minor area coursework to the extent that minor coursework requirements are met. HPAA 873 and HPAA 874 are integrative seminars with occupational safety and health content. For example, Dr. Brian Caveney from Duke University, Occupational and Environmental Medicine presented Duke Employee Hypertension Initiative on October 25, 2005. Dr. Bob Konrad and Dr. Jennifer Craft Morgan from the Cecil G. Sheps Center for Health Services Research presented “Occupational Safety and Health Issues in Work in the Long-Term Care Sector” on November 29, 2005. Comprehensive examinations and dissertation requirements in the specialty must be met. Courtney Stanion presented “Racial Differences in Traumatic Occupational Injuries in NC: Cause, Severity, and Financing of Medical Care” on April 25, 2006.

An example of a typical curricula schedule is presented below using Epidemiology as the minor area of study.

Course Type	Fall Year 1	Spring, Year 1	Fall, Year 2	Spring, Year 2
HSR/Research Methods	HPAA 870 (300) HPAA 881 (273) HPAA 496 (140)	HPAA 885 (301) HPAA 882 (371)	HPAA 886 (302) HPAA 883 (274)	HPAA 872 (305) Elective
Analytical Methods	(math module) HPAA 496 (140) (Stata software)			
Seminars	HPAA 873 (360) HPAA 874 (361) HPAA 871 (304)	HPAA 873 (360) HPAA 874 (361)	HPAA 873 (360) HPAA 874 (361)	HPAA 873 (360) HPAA 874 (361)
Minor (Epidemiology/OSH)	EPID 710 (168)	PUBH 785 (285) EPID 715 (268)	EPID 695 (125)	EPID 780 (276)

Students are expected to attend the NORA Interdisciplinary Seminars held quarterly each year. The seminars are also webcast to accommodate distance education students and varying class schedules, and to promote outreach to the larger occupational safety and health community. Each training area within the NC OSHERC is responsible for securing a speaker to address a topic in the respective area on a rotating basis. HSROSH is responsible for the upcoming seminar in November 2006 and John Staley, a doctoral student in the HSROSH Program will present an aspect of his doctoral research. Bob Konrad previously presented “Occupational Hazards of Health Care Workers—from Neurosurgeons to Nurse Aides” on May 19, 2005.

D. Program Activities and Accomplishments

1. Progress Toward Goals and Objectives

- Continue recruitment efforts. Recruitment efforts continue to be a major emphasis. An aggressive recruitment effort is in place which included emphasis on electronic distribution for timely promotion of the program over more traditional hard copy. Program notices were placed on the following web pages: HPAA doctoral program, the Cecil B. Sheps Center for Health Services Research, the UNC Injury Prevention and Research Center, and the NC OSHERC Public Health Leadership. Program information has been placed at the NC OSHERC Institute exhibits, AIHA meeting exhibit, AOHC meeting exhibit, and APHA meeting exhibit. Advertisements have been placed in the Occupational Safety and Health Newsletter and Public Health Nursing Newsletter of the American Public Health Association. Information is posted 1-2 times per year on the OEM ListServ. Efforts were concentrated on local and regional chapters of the American Industrial Hygiene Association, American Conference of Governmental Industrial Hygienists, and American Society of Safety Engineers. Local universities with occupational and/or environmental health graduate curriculum were contacted about the HSROSH Program including East Carolina University (environmental health; occupational safety); North Carolina A&T University (agricultural and environmental sciences; industrial system engineering; industrial system engineering); and St. Augustine's College (Industrial Hygiene). Information was also posted on chapter newsletters (electronic) which generated inquiries about the program. Current students stated they heard about the program through word-of-mouth, advertisements in newsletters from local professional associations, and searches on the web. This was useful information to focus recruitment efforts; they were encouraged to help promote the program to their colleagues. In addition, members of the HSROSH Advisory Panel promote the program in the activities and travel in North Carolina and across the country. All inquiries were contacted immediately about the program by email and/or telephone with periodic follow-ups. In addition, people who had expressed interest in the program but had not yet applied were contacted.
 - Enroll two trainees. One trainee was admitted to the HSROSH Program who was already in the HPAA doctoral program.
 - Graduate one of three trainees. There have been no graduates of the program. Two trainees plan to graduate in 2007.
 - Provide increased interdisciplinary interaction. Occupational health content has been integrated into the HPAA research seminars (HPAA 873 and HPAA 874). This accomplished two things; it reduced the number of credit requirements for OSH, and it increased interdisciplinary interaction among HPAA doctoral students. All trainees must attend and participate in quarterly NORA Interdisciplinary Seminars which are also webcast; they were already described. In addition, all trainees must take PUBH 785, Interdisciplinary Approaches to Occupational Health. Interdisciplinary students attend interdisciplinary-based lectures and work in groups for some assignments. Other interdisciplinary interaction occurs when students take 8 credits in OSH to fulfill the training requirement. Typically students engage in group work or have field experiences which promote learning about the fundamental aspects of occupational safety and health.
- 2. Trainee Honors, Awards, & Scholarships:** One trainee was inducted into Alpha Epsilon Lambda, the National Academic Honor Society for Graduate and Professional Students in 2006. One trainee received the Harry T. Phillips Award for Outstanding Teaching by a doctoral student in 2005.
- 3. Faculty Honors, Awards, Appointments:**
- Morris Weinberger was inducted into Delta Omega.

4. Trainee Theses and Dissertations

- Julie Seibert is also finishing up her dissertation research on Employment and Disability: A Three Dimensional Perspective. She is currently working part-time as a Research Coordinator at the University of Florida where she runs and writes reports for a Texas Medicaid managed care program.
- John Staley is examining responder fitness and health including EMS, firefighters, and law enforcement, which builds upon his proposed dissertation with firefighter fitness.
- Courtney Stanion is working on her proposal related to using NC Trauma database for surveillance of traumatic occupational injuries, and would like to examine possible racial differences in jury rates and likelihood of a workers' compensation claim.

5. New Faculty Positions: None.

6. New Courses: The number of credits for PUBH 785 was increased from 2 credits to 3 credits. Course numbers changed throughout the School of Public Health.

7. Trainee Recruitment Including Diversity Efforts: Recruitment efforts were explained previously. HPAA has a committee that meets monthly to address minority recruitment and retention. Applications from racial and ethnic minorities have been received. Over the past 3 years, five minorities applied to the program but non were accepted due to very low GRE scores, low GPA, or research interests did not match with faculty. Contacts were made with historically black universities that have an occupational safety and health program, such as North Carolina A&T (Agricultural and Environmental Sciences) and St. Augustine's College (Industrial Hygiene) to advertise our interest in obtaining applicants to the HSROSH Program. All inquiries are follow-up and discuss the application process to ensure all aspects are addressed.

E. Program Products

1. Publications and Presentations of Program Faculty and Trainees: Faculty and students published or have in press over 80 books, book chapters, and refereed articles. They also gave over 40 presentations. See Appendix C for publications and Appendix D for presentation listings.

2. Conferences/Symposia Sponsored: Not applicable.

3. CE Courses Presented: Not applicable.

4. Successful R2P Projects: Not applicable.

5. Research Projects Completed Having Significant Trainee Involvement

- Julie Seibert was a research assistant for Marisa Domino, PhD working on a state-level database on Medicaid managed care program information during June and July 2006.
- John Staley is coordinator for the Firefighter Biometrics Project to develop proof of concept bio-monitoring system for firefighters which involves multi-disciplinary research team including health policy, exercise physiology, and technology faculty from the University of North Carolina, as well as the Medical Director for the North Carolina State Highway Patrol. He is also working with the Departments of Health Policy and Administration and Health Behavior and Health Education on a Firefighter Nutrition Study. Based on his dissertation study design, he is examining worksite nutritional habits and culture in North Carolina firefighters.
- Jessica Meed is working with Jim Porto, PhD on a project to access how the readiness of hospitals and medical workers is measured.

6. Unique Training Courses Presented: Not applicable.

F. Future Plans:

- Graduate two trainees.
- Continue interdisciplinary interaction.
- Phase out the program by June 30, 2007.

**Continuing Education Program
Progress Report
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II. PROGRAM PROGRESS REPORT for 7-1-05 to 6-30-06

A. **Program Title:** Continuing Education Program (CE)

B. **Program Director:** Kathleen Buckheit, MPH

C. **Program Description:** Since 1976, the Center has been committed to the presentation of quality CE programs for occupational safety and health professionals. Based on needs assessments, course evaluations, outreach, and recruitment activities, there continues to be a substantial need for this service, due in part to the ever-changing needs of practitioners and an increased need for an interdisciplinary approach to Continuing Education (CE). The CE Program is responsible for developing, coordinating, and implementing courses that provide information to the various disciplines to enhance their work productivity, and provide professional development. The CE Program includes education and hands-on training required to earn and maintain professional certifications, licensure, and regulatory requirements. This is accomplished by identifying these requirements through various forms of needs assessments, collaborating with qualified faculty and academic advisors, and developing and delivering appropriate courses to meet these needs. Evaluations from various sources serve as quality assurance that courses are effectively and efficiently delivering the NC OSHERC programs and services.

i. **Goals and Objectives:** The **goals** of the CE Program remains to provide top quality education and training to health and safety practitioners in the southeast region through Institutes, contract courses, and onsite short offerings. As in the past, the CE Program will focus on collaborating with other institutions and agencies to provide the highest quality programs and faculty available. Therefore, seeking opportunities to increase outreach is a high priority and included in the following **major objectives**:

- Analyze data annually from all needs assessments to develop two online courses within the next five years and develop one new short courses every two years as needs assessments dictate;
- Train at least 800 people per year – twice the NIOSH ERC grant requirement;
- Increase diversity enrollment by 5% based on data from CE registration forms through outreach to identified to historically black colleges, Native American tribes, and Black and Hispanic nurses' groups;
- Provide educational collaborations with two additional chapters of professional associations;
- Increase union attendees in CE courses by 5% over next two years through outreach to the local unions with the assistance of Mr. Tom O'Connor, Advisory Board member and NCOSH;
- Increase outreach to local health departments through offers of free tuition for at least two staff; and
- Increase physician attendance by 10% through collaboration with Duke OM, COEMA, and new partnerships with VA COEMA and American Academy of Family Physicians.

ii. **Program Leadership and Faculty** commitment comes from both the academic and non-academic faculty. Academic faculty has a university affiliation; non-academic faculty are practitioners and consultants. Both continue to engage in outreach with professional associations on behalf of the NC OSHERC and participate there and with us as course directors, planners, technical advisors, presenters, evaluators, and advisors for the various disciplines who offer a unique blend of theoretical and practical experience.

- **CE Program Director**, Kathleen Buckheit, has been Director for three years and is responsible for overseeing the administration of all program development and activities, including: selecting courses and faculty; facilitating development of online courses, ensuring quality for courses, faculty, presentations, and customer satisfaction; providing sound fiscal management; marketing programs and services; developing and conducting outreach and diversity activities. She works closely with the Advisory Boards on these responsibilities. Ms. Buckheit has over 20 years experience in Occupational Health in a variety of settings that include: OHS Program Manager in industry; Research Collaborator; State OHN Consultant; Supervisor of exposure surveillance grants as Hazardous Substances Emergency Events Surveillance (HSEES) Program and Adult Blood Lead Exposure Surveillance (ABLES) Program; and PI on the NC Occupational Surveillance Grant on which she remains an advisor. She is also an advisor for the Pesticide-Related Illness and Injury Surveillance grant headed by the current State Consultant. She has taught several courses on Bioterrorism and worked for NC DHHS on SARS and Anthrax teams. She previously demonstrated her leadership in organizing training in the handling, managing, and evaluation of environmental exposure to toxic algae for NC. She developed the *Medical Management Guidelines* for the NC Department of Environment and Natural Resources (DENR), Division of Water Quality, and NCSU Aquatic Botany Lab workers, which were later adopted by the NC Public Health Preparedness Teams for bioterrorism. As the NC State OHN Consultant, she worked with industry and health and safety

professionals to develop disaster preparedness systems at the worksite. She was part of the NC DHHS task force developing *Safe Re-entry Guidelines* for local health departments faced with new public health concerns of unknown hazardous materials. She worked with the State Emergency Response Team as a 4-county coordinator after the NC Flooding of Hurricane Floyd and has been appointed facilitator for the NC DHHS, Occupational and Environmental Epidemiology Branch, for a series of community meetings and panel discussions for an ATSDR grant addressing Toluene Diisocyanate (TDI) exposures in NC.

Ms. Buckheit has been UNC adjunct faculty for over 11 years in the Public Health Leadership Program. She has networked to identify new faculty and courses recommended from needs assessment data. She participates on several state and national organizations and university boards, demonstrating leadership expertise. She devotes 75% of her time to CE and Outreach.

- **CE Program Assistant Director**, Vicki Smith, serves as Assistant Director (AD) of CE, she devotes 80% time to CE and is responsible for the day-to-day administrative activities of the Center. With over 25 years with the CE Program, she , supervises the administrative staff, manages off-site classroom contracts and travel, conducts marketing through 5 listservs, schedules courses, and submits CE course contract proposals. She coordinates faculty and course locations, and oversees data management systems.
- **CE Program Specialists (2)** have worked for over 16 and 20 years with the NC OSHERC CE Program and have administrative responsibilities for individual CE courses assigned to them; maintaining student tracking, daily office administrative duties, registrations, daily receipts, and website contacts. They work with the instructors on preparing course materials and equipment, applying for contact hours, and producing certificates of attendance. Both are responsible for customer service, course evaluation data collection and analysis. They devote 80% commitment to CE.
- **Business Manager**, Judy Beaver, Business Manager for the NC Institute for Public Health provides all financial management for the CE Program. She also has personnel to assist with invoicing, deposits, and other financial transactions required for budget management. She has 30 years experience with UNC.
- **CE Program Faculty**. Faculty are both academic faculty, who are occupational health and safety professionals with either fulltime or adjunct university appointments, and non-academic faculty, such as consultants and practitioners. Both groups serve as course directors, instructors, technical advisors, curriculum and evaluation reviewers, and planning committee and advisory board members for CE Program offerings. The CE faculty have many years of experience and technical expertise to develop interdisciplinary curriculum and provide quality training. Some of the CE faculty include:
 - **Industrial Hygiene (IH)**: More than 20 faculty teach over 20 classes and serve as course directors, instructors, technical advisors, and advisory and planning committee members. As a consultant with a wide variety of health and safety experiences in the public and private sector, Nelson Couch, PhD, CIH, CSP, Chair of the Technician Certificate Program Advisory Board and lead academic faculty member for CE Programs, represents academic faculty from UNC IH and NCSU Safety Programs. His expertise in both the IH and Safety disciplines supports his interdisciplinary understanding of the needs of the CE Program. He is course director for CIH and CSP Review Courses. Other faculty includes: Salvatore DiNardi, PhD, CIH, U of MA at Amherst and editor of the AIHA text: *The Industrial Environment, Its Evaluation, Control, and Management*, Dennis George, PhD, Western Kentucky University (WKU), Craig Scholl, CSP, Firecon, Inc., Rod Handy, PhD, CIH, Purdue University, Michael May, PhD, WKU, and Scott Harris, PhD, US EPA. Rich Cravener, CIH, CSP, CIIT, teaches interdisciplinary course on Lab Safety.
 - **Occupational Health Nursing (OHN)**: Academic faculty serve as course directors, instructors, and advisory and planning committee members for the CE Program, presenting: *OHN: Introduction to Principles and Practice*; and *OHN, OHN Safety Management*, and *Case Management Certification Review Courses*. CE collaborates with the NC Association of Occupational Health Nurses (NCAOHN) and NC Tarheel Association of Occupational Health Nurses (NCTAOHN) with four OHN academic faculty, Bonnie Rogers, DrPH, Judy Ostendorf, MPH, Susan Randolph, MS, and Kathleen Buckheit, MPH, planning, developing, and presenting at semi-annual NCAOHN State Conferences, and local chapter meetings and provide all AV equipment and on-site technical support. The OHN Program Director is a certified legal nurse consultant in occupational health and safety and President of the local chapter, Eastern NC Association of Legal Nurse Consultants (ENC-AALNC). Ms. Ostendorf is Treasurer, and Ms. Buckheit is Secretary. All work on three educational offerings per year.

- **Occupational Medicine (OM):** Faculty at UNC-CH, Duke University Medical Center, and private practitioners serve as course directors and faculty in CE OM courses. Dennis Darcey, MD, MSPH and Brian Caveney, JD, MD, MPH from Duke, participate on the CE Advisory Board and develop and present Workplace Ergonomics at the Institutes. Brian Boehlecke, MD, UNC, teaches the Pulmonary Function Testing Technician course. With OM as a new component of NC OSHERC, the collaboration and opportunities to involve physicians and provide more OM courses will to expand to the hospital setting.
 - **Occupational Safety and Ergonomics (OS):** Academic faculty from NCSU School of Engineering and consultants from their Ergonomics Center plan, develop, and conduct Ergonomics courses with Tamara James, MS, Ergonomics Director for Duke, Tim McGlothlin, MS, Director of NCSU's Ergonomics Center. Dr. Nelson Couch, a NCSU faculty member, Chairs the Technician Certificate Programs Advisory Board and teaches for CE. Ray Boylston, (first head of NC OSHA and a wealth of experience and knowledge), David Coble, Bill Taylor, and Jim Jones provide a unique team of safety instructors blending their years of varied experiences from OSHA, industry, military and city government. Jon Wallace, co-instructor for the academic Safety and Ergonomics course with Judy Ostendorf (OHN), is course director for the Safety and Health Systems Auditing CE course and is also developing the Fundamentals of Safety online course.
 - **Occupational Epidemiology (OE):** Occupational Epidemiology course was first conducted August 2002. Although CE is not a requirement of this allied Program, courses in Epidemiology will continue to be offered and Dana Loomis, PhD, will oversee and advise on planning and presentation.
- iii. **Curriculum – Needs Assessments** are vital to supplying appropriate education and training for the health and safety professionals. A variety of methods were used to identify these needs and were used to determine courses to be offered and developed. We listened to the students and followed the needs assessments that asked for more environmental courses. We have contacted environmental health and food service organizations through outreach to offer assistance and collaborate with their educational programs to involve them in the Environmental Technician Certificate Program. Several new courses are offered every year through the various programs presented in collaboration with the professional associations, such as the Carolinas Occupational and Environmental Medicine Association (COEMA) Annual Symposium and the NC Association of Occupational Health Nurses (NCAOHN) Semi-annual Conferences. Recent needs assessments conducted during 2003-2005 through the following include:
1. **Survey of students attending current NC OSHERC CE programs:** A random survey of 75 student evaluations attending 11 CE courses during 2004-2005 requested 34 courses in “other”. Data indicate that students’ top courses are: Ergonomics; Safety; Confined Space; Industrial Hygiene Sampling; Lab/Biosafety; and Indoor Air/Mold.
 2. **Information gathered at NC OSHERC exhibit booth at professional conferences and via the NC OSHERC website for 39 participants:** Data collected indicate the top five courses requested are: Certification Review Courses (OHN, IH, OM, SAFETY-100%); Complying with OSHA (62%); Workplace Health Promotion (62%); Industrial Hygiene (56%); Occupational Safety (51%).
 3. **Information gathered by NIOSH ERC exhibit booth at professional conferences in 2005:** The ERC data from 52 participants indicate the top five courses requested are: Risk Assessment (81%); Respiratory Protection (63%); Occupational Safety (60%); Hearing Loss/Conservation Programs (54%); and Ventilation (50%).
 4. **Results of Needs Assessments conducted by professional Associations:** AAOHN 2005 needs assessment data indicate the top five topics are: Worksite Health Promotion/Wellness (71%); Legal Liability/Scope of Practice Issues’ (67%); Case Management (67%); Safety/Injury Prevention (65%); and Stress Management (64%).
 5. **Centerwide needs assessment** of March 2005 was sent to 2,834 people on the Center’s Email list. Occupational Medicine (OM) had limited audience in this assessment since it was not part of the NC OSHERC. As a Training Program Grant (TPG), Duke OM has conducted its own needs assessment and CE courses that we will use to develop and present OM courses. The Centerwide needs assessment survey listed **56** topics from which survey respondents could choose. The top five CE topics are identified by discipline listed in the proposal under Proposed Training section.

Tracking of the effectiveness and impact of professional Certification Review Courses is conducted for CIH, CSP, CHMM, COHN, and COHN/CM. Questionnaire results and Pass/Fail Rates from course attendees are being tracked and indicate highly successful offerings.

D. Program Activities and Accomplishments

▪ Courses Offered During Project Period 7-1-05 To 6-30-06

The NC OSHERC is recognized for the quality and variety of continuing education courses offered that continue to meet local, regional and national needs and all courses have contact hours for CEUs or professional certification units. **Table 12A** illustrates the breakdown of students and courses by core and documents the interdisciplinary attendance at what used to be traditionally distinct core courses, demonstrating that the roles and responsibilities of the health and safety professionals is crossing into other disciplines. Many courses are interdisciplinary in nature and are attended by nurses, occupational physicians, industrial hygienists and safety professionals even though it is not listed in that particular discipline. Therefore, although a course is offered in a specific discipline, attendance by other professionals very frequently crosses over disciplines. This year the CE Program trained **1,745** of students in **97** courses. This is over **four times** the NIOSH grant requirement to train 400 students per year in CE. All courses have CEUs through UNC and/or professional organizations (AAOHN, ABIH, BCSP).

NC OSHERC continues to meet the training needs of the region. The **geographic** statistics indicated that **85%** of the trainees were from the southeast region. For the past year, this was an increase from the previous five years of **64%** reported from the region. For 2005-2006, the breakdown of attendees reporting their ethnic background was: White – 70%; Black – 20%; Hispanic – 6%; Asian – 2%; American Indian – 1%; Other – 1%. With diversity plans, we seek to enroll more Hispanic and American Indian populations.

• **Technician Certificate Programs** were initiated with IH in 1996 after careful analysis of many methods of surveying students to identify job responsibilities and in what ways they felt the knowledge and skills were deficient. Safety followed in 1999 with Environmental offered in 2002. From the input of the health and safety professionals in the workforce and the many methods of conducting needs assessments, it was apparent that the scope of practice of the specialty profession has changed and enlarged to cover non-standardized responsibilities that cross over into other disciplines. Now all Certificate Programs all require two week-long courses (4 units or non-academic credits) in the base discipline and two remaining units chosen from a list of about **25** electives every year, applicable to all of the Technician Certificate Programs to best fit the role of the technician. Exams are outcome measurements of acquired skill and knowledge. Since 1996, there have been **678** Certificate Program students, **334** graduated.

Individual interdisciplinary and departmental components have provided for the interdisciplinary focus of the CE and HST Programs. Although offered as elective courses, they are not exclusive to the Technician Certificate Programs and, therefore, all trainees are encouraged to participate. Frequently, students enroll in the Certificate Programs after taking one of the interdisciplinary electives. These interdisciplinary courses have been very successful and, because of student requests and various forms of Needs Assessments, the Technician Certificate Program Advisory Board approved all electives for use in any of the Certificate Programs allowing the student to choose as the courses best applied to their own scope of practice. Sample courses are: Respiratory Protection; Industrial Ventilation for Practitioners; Applied Industrial Toxicology; Ergonomics in the Workplace; Indoor Air Quality; Non-Ionizing Fields Radiation; Industrial Noise Management; Safety and Health Audit Management; and many more.

• **Professional Certification Review Courses** prepare professionals to pass their relative certification exams, required by many employers for advancement and higher compensation. These courses are interdisciplinary using faculty from all program areas. Comprehensive Industrial Hygiene (CIH); Certified Safety Professional (CSP and ASP); Certified Hazardous Materials Manager (CHMM); Certified Occupational Health Nurse (COHN and COHN-S), Certified Occupational Health Nurse/Case Manager (COHN /CM and COHN-S/CM) are offered. Developed by Safety and OHN faculty for a new OHN certification offered this year, Certified Occupational Health Nurse Safety Manager (COHN/SM and COHN-S/SM) Review Course was offered this Fall.

• **Distance Education** was initiated three years ago to incorporate distance-learning opportunities into the total CE Program based on needs assessments and student requests, beginning with **Fundamentals of Industrial Hygiene (FIH)**. Although most who inquired have taken the course in person, three are currently enrolled. **FIH** was the first course developed in a web-based format, modeled after the FIH

course produced by the UNC OHN and IH Programs for distance learning students. This 4.5-day course, earning 36 contact hours for CEUs, is also offered in the traditional CE format at both semi-annual Institutes. The online format awards the same 4.5 ABIH or 2.9 BCSP points or CEU contact hours and the student has up to 15 weeks to complete the course and earn two units for the Technician Certificate Program. There have been many inquiries from individuals and industries to use this format since January 2005; however, five have registered and three have begun the course Fall 2006. We have had meetings with AIHA to collaborate on a marketing effort to promote the online course together.

Fundamentals of Occupational Safety (FOS) is the second online course mirrored after FIH and has been delayed until the first students complete the FIH online. The target is for 2007 after evaluating the success of the FIH course and develop the best approach for the FOS course. **Other Online Courses** are being discussed. **Toxicology** is being evaluated to see if there is a market for this course online. This decision will be made in Fall 2007 after the FIH online course can be adequately marketed in collaboration with AIHA and the success of the online offerings evaluated.

- **North Carolina State Ventilation Conference Certificate Program** began over 49 years ago as a joint Conference with NCSU College of Engineering and NC OSHERC, drawing faculty from nationally-recognized universities and industries. Needs Assessments and requests have demonstrated the value and usefulness of this Certificate that started at the NC OSHERC in May 2005 with 22 students taking and passing the first of two levels of required courses and exams and nine completing the Certificate this year. This Certificate offers higher level courses geared more for engineers in design, installation and maintenance of building-appropriate ventilation systems. The CE Director participates on the Advisory Board. Several other states have shown interest in collaborating with this new Certificate Program.
- **NORA Interdisciplinary Series** coordinated through the NC OSHERC Director's office with all core and allied programs participating, presented web casts on a quarterly basis. All disciplines are responsible for developing a seminar on a rotational basis to ensure the interdisciplinary content and is available from their computers to all participants for CE credit through UNC.
- **Offsite CE Programs** are available as contract courses for private and government agencies. The courses are held at the chosen locations to satisfy the organizational needs of the customer. All types of courses are included from asbestos training to certification review courses.

iii. **Program Evaluations** are conducted for each course to identify deficiencies and weaknesses to modify and improve CE courses. Methods used are:

1. **Outcomes Measurements** conducted for all certification review courses request exam results six months after course. Passing rates are significantly higher than national passing rates for all courses.
2. **Student evaluations** indicate high satisfaction. Of the random survey of 2004-2005 CE courses (n=75), a composite summary evaluation showed a 4.73 Likert scale satisfaction rating (5 is the highest).
3. **Evaluations of course materials** are frequently done by UNC faculty members to assist course directors and faculty in the development of course curriculum and materials.
4. **Exam results** for courses requiring testing, uses the passing rate of 85% of students to indicate that the material was adequately covered. All Certificate Program students take exams earning non-academic credit or units. First time passing rate is 90% for the three Certificate Program courses. After re-test, passing rates are 100%. Exams are also used for revisions in question design and content.
5. **Workplace effects** are requested by follow-up contact to determine what effects can be attributed to the CE Programs by asking students to share their success stories.

E. **Future Plans For Project Year:** July 1, 2006 to June 30, 2007

- i. **Proposed Activity** is expected to increase with many collaborations being formed, such as: 7 Public Health Response Surveillance teams (PHRST), NC DHHS and UNC's Center for Public Health Preparedness and Emergency Management as opportunities exist to develop courses throughout the region as the problem of emerging "clan meth labs" increases. Opportunities for the upcoming year are:
 - Developing new training modules on domestic preparedness with an increase in courses and students on a variety of chemical, biological, radiological, and nuclear (CBRN) topics;
 - Soliciting more contract courses, providing off-site group education and training; and
 - Increasing the scope of the CE program with a more regional focus by increasing the collaboration with the Sunshine and Deep South ERCs through the development of a 5-year Partnership Plan for annual conferences and providing select courses for each other's ERCs.

- ii. Marketing, Outreach, and Diversity:** The emphasis on providing the highest quality CE education has been the draw for those familiar with the NC OSHERC, especially from EPA Region IV. Networking remains important in marketing to the health and safety professional organizations, members, employers, and employees. Attendance by the CE Director at interdisciplinary meetings allows for recognition of the CE Program and provides opportunities to promote the NC OSHERC. Professional association meetings are and will be set as targets for marketing and outreach. Outreach includes participating on advisory boards, presenting courses, providing equipment and free tuition, and promotion of the other CE and academic programs in return for the possibility of providing future education and training options for these groups and strengthen the skills and knowledge of the workers and those responsible for the health and safety of the workforce. Future plans include: expanding marketing and outreach, visiting historically black colleges, American Indian Education Centers, and union and Hispanic workers' outreach; and targeting professional associations throughout the southeast region to continue working with their educational planning committees for their educational programs.

**Continuing Education for Hazardous Substance Training Program
Progress Report
July 1, 2005 – June 30, 2006**

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III. PROGRAM PROGRESS REPORT for 7-1-05 to 6-30-06

F. **Program Title:** Continuing Education for Hazardous Substance Training (HST) Program

G. **Program Director:** Kathleen Buckheit, MPH

H. **Program Description:** Since 1976, the Center has been committed to the presentation of quality continuing education programs for occupational safety and health professionals. Based on needs assessments, course evaluations, outreach, and recruitment activities, there continues to be a substantial need for HST, due in part to the ever-changing needs of practitioners and an increased need for an interdisciplinary approach to HST. The HST Program targets local and state government employees in the Southeast region.

i. **Goals and Objectives: The HST Program goals are:** Provide quality HST training required: for job performance, to meet regulations, and to protect the health and safety of workers in the hazardous substance response and site remediation activities in the Southeast Region IV. **The HST Program objectives** were met this year in the following ways:

1. Train at least 100 people per year: **15 courses** trained **350 workers. 268 or 76%** were **state and local employees**, which are the target worker groups for the HST Program.
2. Increase marketing by 50% through outreach, advertising, and assisting other agencies involved with clean-up and remediation: Advertising through mailings from purchased mailing lists, Email blasts; conference exhibits; and outreach and recruiting to the various agencies increased 150%;
3. Increase minority enrollment by 5% - 2005-2006 realized an increase of 50% that are identified as minorities, bringing the total to 154 in this year's offerings;
4. Provide contact hours for all HST courses: Every course was approved for contact hours by the continuing education office of UNC or through professional associations;
5. Analyze needs assessments data annually to evaluate HST Program curriculum: Aggressive recruiting with needs assessment surveys continues through the NC AHMR and State Fire Rescue and state (NC DENR) and local health departments environmental health departments (Wake and Durham). Using this and other data collected in previous years determined that an Environmental Risk Assessment course be offered and was implemented in 2006.
6. Develop one online HST course, based on needs assessment data, within the next five years. Through outreach to HST organizations, data is being gathered to identify courses to develop that are cost-effective and requested and are also identified by needs assessments.

ii. **Program Leadership and Faculty:** Kathleen Buckheit has been Director of the NC OSHERC CE and HST Programs for 3 years. In her position as HST Director, Ms. Buckheit is responsible for overseeing the administration of all HST Program development and activities, including: selecting courses and faculty; facilitating development of online courses, ensuring quality for courses, faculty, presentations, and customer satisfaction; providing sound fiscal management; marketing programs and services; developing and conducting outreach and diversity activities. She works closely with the HST Technical Coordinator on these responsibilities. Ms. Buckheit has over 20 years experience in Occupational Health in a variety of settings that include: program manager in industry; research collaborator; State OHN Consultant; Supervisor of exposure surveillance grants as Hazardous Substances Emergency Events Surveillance (HSEES) Program and Adult Blood Lead Exposure Surveillance (ABLES) Program; and PI on the NC Occupational Surveillance Grant on which she remains an advisor. She is also an advisor for the Pesticide-Related Illness and Injury Surveillance grant headed by the current State Consultant.

She has taught several courses on Bioterrorism, worked for NC DHHS on SARS and Anthrax teams, participated for 10 years as medical representative for Hazmat Response Team in Research Triangle Park, NC and county-wide disaster exercises with Emergency Management, HazMat and Fire Response Services held at large manufacturing facilities. She previously demonstrated her leadership in organizing training in the handling, managing, and evaluation of environmental exposure to toxic algae for NC. She developed the *Medical Management Guidelines* for the NC Department of Environment and Natural Resources (DENR), Division of Water Quality, and NCSU Aquatic Botany Lab workers, which were later adopted by the NC Public Health Preparedness Teams for bioterrorism.

As the NC State OHN Consultant, she worked with industry and health and safety professionals to develop disaster preparedness systems at the worksite. When clandestine methamphetamine labs multiplied, she was part of the NC DHHS task force developing *Safe Re-entry Guidelines* for the local health departments who were faced with new public health concerns of unknown hazardous materials. At this time, she repeated her HAZWOPER training with the state disaster preparedness responders. She worked with the State Emergency Response Team as a 4-county coordinator after the NC Flooding of Hurricane Floyd, reducing exposures of contaminated water from Underground Storage Tanks and pesticides. She has been appointed facilitator for the NC DHHS, Occupational and Environmental Epidemiology Branch, for a series of community meetings and panel discussions on a communications plans for an ATSDR grant addressing Toluene Diisocyanate (TDI) exposures in NC communities.

Ms. Buckheit has been UNC adjunct faculty for over 11 years in the Public Health Leadership Program. She has participated in many HST Outreach activities, on advisory boards, boards of directors, health and safety professional organizations. She has networked to identify new faculty and courses recommended from needs assessment data. She participates on several state and national organizations and university boards, demonstrating leadership expertise. She devotes 25% of her time to HST.

- **Program Technical Coordinator**, Dr. Nelson Couch, PhD, CIH, CSP, is responsible for identifying the regional and national needs from assessment data, developing the HST Program curriculum, and identifying qualified faculty. He is academic faculty in both IH and Safety Programs at UNC and NCSU, respectively. His qualifications are listed under **Program Faculty**.
- **Program Assistant Director**, Vicki Smith, serves as Assistant Director (AD) of all HST activities, and is responsible for the day-to-day administrative activities of the Center. Ms. Smith has over 25 years experience with the NC OSHERC CE Program and 20 years in the HST Program. She has responsibilities for direct supervision of administrative staff dealing with HST courses, conducting off-site visits and managing off-site classroom contracts and travel, conducting course promotion through 5 listservs, scheduling courses, recruiting HST course students, and submitting HST course contract proposals to local and state governmental agencies and private employers. She coordinates HST faculty assignments and course locations, and oversees proper functioning of data collection management systems and other administrative duties. The AD has 20% commitment to the HST Program.
- **Program Specialists (2)** have worked for over 16 and 20 years with the NC OSHERC CE and HST Programs and have administrative responsibilities for individual HST courses assigned to them; maintaining student tracking, daily office administrative duties, registrations, daily receipts, and website contacts. They work with the instructors on preparing course materials and equipment, applying for contact hours, and producing certificates of attendance. Both are responsible for customer service, course evaluation data collection and analysis. They devote 20% commitment to the HST Program.
- **Business Manager**, Judy Beaver, Business Manager for the NC Institute for Public Health provides all financial management for HST Program. She also has personnel to assist with invoicing, deposits, and other financial transactions required for budget management. She has 30 years experience with UNC.
- **Program Faculty**. In Table 11, faculty members, primary affiliations, and roles in the proposed HST Program are listed. Faculty are both academic faculty, who are occupational health and safety professionals with either fulltime or adjunct university appointments, and non-academic faculty, such as consultants and practitioners. Both groups serve as course directors, instructors, technical advisors, curriculum and evaluation reviewers, and planning committee and advisory board members for HST Program offerings. The HST faculty have many years of experience and technical expertise to develop HST curriculum and provide quality training. Some of the HST faculty include:
 - **Nelson Couch, PhD, CIH, CSP**, is the HST Program Technical Coordinator and lead academic faculty member for both CE and HST Programs, representing the academic faculty from both UNC IH and NCSU Safety. As a consultant with a wide variety of health and safety experiences in the public and private sector, Dr. Couch is the Chair of the Technician Certificate Program Advisory Board and a member of the HST Advisory Board. His expertise in both the Industrial Hygiene and Safety disciplines supports his interdisciplinary understanding of the needs of the HST. He is also course director for both the Comprehensive Industrial Hygiene (CIH) and Certified Safety Professional (CSP) Review Courses, which contain a good amount of HST content. Col. Couch's 34 years as radiological expert with the Air Force/Reserves provides the expertise on Nuclear, Biological, and Chemical (NBC) Disaster

Preparedness course. As Bioenvironmental Engineer for Air Force Reserves, he supported the Air Combat Command Office of the Command Surgeon at the NBC/CBRNE for the entire Air Force until his retirement this year. Within the UNC Health Policy and Administration Department, Dr. Couch participated in developing Chemical Hazards and the Radiological/Nuclear modules and increasing hazards of clandestine methamphetamine labs, for an online course for first responders and community emergency planners.

- **Don Linville**, Safety and Health Director for Hepaco, Inc., a company that provides nationwide emergency clean-up services of hazardous materials is a long-standing HST trainer. Mr. Linville provides HAZMAT and other HST such as Incident Commander and Personal Protective Equipment. He provides contract HST courses for agencies and organizations responsible for cleanup, enforcement, and training of personnel under CERCLA/SARA.
- **Salvatore DiNardi, PhD, CIH**, is Professor Emeritus at U of MA at Amherst and advisor and course director for the Occupational Hygiene Sampling course where an interdisciplinary approach is used to teach HST students methods of collecting and analyzing hazardous substances. He is the editor of the AIHA text: *The Industrial Environment, Its Evaluation, Control, and Management*.
- **Rod Handy, PhD, CIH**, Environmental Science professor at Purdue University is course director for Environmental Regulations and guest lecturer for the interdisciplinary "Current Issues" course.
- **Scott Harris, PhD**, is the Federal On-Scene Coordinator for the Emergency Readiness Team, US Environmental Protection Agency, Region 6, Dallas, TX and provides advice on EPA issues and regulations and teaches in the Environmental Regulations course.
- **Sherry Rigouard, MPH**, is an advisor, epidemiologist, PI for ATSDR's Hazardous Substances Emergency Events Surveillance (HSEES) grant, and instructor for the clandestine methamphetamine lab courses offered for public and private employees with the State Bureau of Investigations.

iii. **Curriculum - Needs Assessments** have been used to identify the types, numbers, and frequency of courses offered, curriculum and course design, and faculty who teach the HST programs. The programs are driven by the results of the analysis of the several forms of determining the need for training and education. Data collected from a variety of sources was used in planning the activities of the HST program and includes recent needs assessments conducted during 2003-2006 through the following sources:

- Surveys are being collected this year (2006) from members of the NC Association of Hazardous Materials Responders of fire, HazMat, and medical responders (In process).
- Several county environmental health groups have collaborated with NC OSHERC and provided their assessment data this year (2006) (In process).
- NC OSHERC is developing a needs assessment survey for NC DENR to be conducted in 2007.
- Needs assessment survey for HST of 112 attendees at the National Environmental Health Association Conference in San Antonio (June 2006) identified the top five courses requested: Biosafety (56%), Disaster Preparedness (56%), Methamphetamine Labs (54%), Environmental Risk Assessment (48%), HAZMAT (48%), Respiratory Protection and Personal Protective Equipment (46%), Sampling of Environmental Exposures (44%). This group represented 32 Southeast Region residents.
- 50 student evaluations from a random survey of 11 HST courses during 2004-2005 indicated that the top HST courses requested were: Confined Space (58%); Occupational Hygiene Sampling (56%); Biosafety (46%); Indoor Air/Mold Remediation (44%); and Ventilation (40%).
- Information gathered at the NC OSHERC exhibit booth at professional conferences and via the NC OSHERC website from 39 participants in 2003: Data collected indicate the top five HST related courses requested are: Respiratory Protection (53%); Lead (43%); HazMat Training (41%); Indoor Air Quality (41%); and Confined Space (41%).
- Information gathered by NIOSH ERC (all ERCs) exhibit booth at professional conferences: The ERC data from 52 participants indicate the top five courses requested are: Regulatory Update (42%); Environmental Risk Assessment (33%); HazCom (33%); and Occupational Hygiene Sampling (30%); and Applied Toxicology (21%).
- AAOHN 2005 needs assessment data indicate the top three HST topics are: Regulatory Compliance (60%); Environmental Health Issues (60%); All-hazard Preparedness (44%).

- Information from the established HST and Technician Certificate Advisory Committees: The Advisory Board reviewed the courses and recommending developing an Environmental Risk Assessment course.
- Centerwide needs assessment of March 2005 was sent to 2,834 people on the Center's email list. The Centerwide needs assessment survey listed 19 HST topics from which survey respondents could choose. The top HST courses are identified by discipline are listed and starred as follows:

Topics identified relative to HST	OHN	IH	Safety	Occ Med
Regulatory Update – OSHA / Workers' Compensation	48% *	29%	41% *	50% *
Environmental Health Issues	38% *	43% *	40% *	50% *
Risk Assessment	30% *	61% *	55% *	0%
Toxicology	18%	36% *	14%	0%
Mold Exposure/ Indoor Air Quality	20% *	39% *	35% *	0%
Respiratory Protection	15%	36%	21%	50% *
Air Sampling	10%	54% *	28% *	0%
Ventilation	3%	39% *	21%	0%
HAZMAT	15%	25%	35% *	50% *
Bioterrorism	33% *	25%	28% *	50% *
Infectious Diseases	23% *	14%	10%	0%
Occupational Reproductive Hazards	15%	61% *	17%	50% *
Occupational Pulmonary Diseases / Asthma	15%	21%	24%	50% *
Agricultural Health and Safety / Pesticides	16%	21%	24%	100% *
Confined Space and Compliance	8%	29%	31% *	0%
Occupational Surveillance / Epidemiology	56% *	50% *	34% *	50% *

During the next project period, HST Program data will be used to prioritize and actively promote HST courses. This demonstrates that the HST Program is vigilant in responding to the workforce needs on regional and national level and remains on track with its offerings. We rely on mailed surveys and use Internet responses, Emailed surveys, and in-person needs assessment from professional conferences where personal networking and outreach contacts occur.

F. Program Activities and Accomplishments

- **Outreach and Coordination with Agencies** is accomplished through new and continued partnerships that are being developed and enhanced, especially with local and state government agencies, such as NC DENR. Needs assessments provide data to determine where to focus marketing activities. The area of clandestine methamphetamine labs and the health risks has been gaining attention and importance in the southeast region over the last year. Focus on collaborating and partnering with State Emergency Response Team (SERT), State Bureau of Investigation (SBI), and local and state health agencies responsible for determining the safety of re-entry into these lab areas. These complicated issues require an interdisciplinary approach to content and presentation, and use of resources of the NC OSHERC. These outreach activities will be used to market the NC OSHERC Programs and provide for name recognition for future student enrollment. Partnerships have been established with the NC DHHS, NC Center for Public Preparedness, the seven Public Health Preparedness Teams and coordinating regional HazMat teams, and the NC Association of Hazardous Materials Responders. There are several opportunities to work with these groups in training of chemical, biological, radiological, and nuclear (CBRN) terrorism. A course is being developed for occupational response to these types of disasters for workplace events and funding is being sought to develop this as an online course, which may be offered in the future.
- **Courses Offered During Project Period 7-1-05 To 6-30-06**
HST courses were offered in the semi-annual Institutes and contract courses at the employers' locations. Many students report on the benefit in their workplaces of the HST Program, for example professional certification courses as CHMM. Increased emphasis has been placed on targeting state and local government agencies for contract HST courses. During 7-1-05 to 6-30-06, **Table 12a** shows **350**

students participated in **15** HST courses. Although asbestos is a hazardous substance for which we provide a significant amount of training, those courses are **not** included in the HST data. Of HST students **218 (62%)** listed that their main responsibility involves hazardous substances, which may indicate the interdisciplinary aspects of their jobs that require HST roles as just one of many job responsibilities. Of the total attendees, **268 (76%)** were from local, state and federal government. NC OSHERC developed an agreement with the IHMM and administered the CHMM exam on three dates, one date followed the successful presentation of the CHMM Review course. Passing rates (98%), are consistently higher than national rates (81%)

▪ **Program Evaluations** are conducted in several ways for HST programs and include:

1. Post-course tracking and student evaluations upon completion of HST courses: 96% were satisfied;
2. Evaluation by Advisory Board members attending courses when possible: 6 courses rated high;
3. Pass rates on post course exams: 100% passed short courses and the pass rates were much higher than national rates for Certification Review Courses;
4. Impact evaluation of CHMM course by questionnaires of attendees and Pass/Fail Rate of attendees taking certification exam: all stated various positive impacts in their work practices, such as promotions and better job opportunities; and
5. Results of faculty audits –some suggestions were presented for course improvements but rated high.

Post-course evaluations consistently receive high satisfaction ratings, yet some suggestions are implemented as needed. A random sample of 50 HST students indicates a (4.7) high satisfaction rating of 4 or 5 on the Likert scale. The Director and Technical Coordinator review the information gathered through this evaluation process and faculty evaluations. Results are discussed with the course directors for any changes needed in program content prior to the next offering. The evaluation process is key in the overall quality control plan.

G. Future Plans For Project Year: July 1, 2007 to June 30, 2008

- **Proposed Activity is** expected to increase with many collaborations that are being formed, such as: seven regional PHRSTs, partnering with NC DHHS, and UNC's Center for Public Health Preparedness, take training opportunities to a wider disaster preparedness audience throughout the US. For traditional hazardous substances workers, collaboration with Emergency Management and Poison Control operations provide availability for training in the regional communities. The HST Director worked with NC DHHS and developed *Guidelines for Re-entry of Clandestine Methamphetamine Labs* for the SBI and the local health departments. Follow-up opportunities exist to develop HST throughout the region as the problem of emerging "clan meth labs" increases. Courses are being developed with the NC Public Health Preparedness Teams (PHPT) and NC DHHS. Information from the PHRST shows a need for occupational response to workplace disasters and may be offered online. Six opportunities for the upcoming year are:
- Developing new training modules on domestic preparedness with an increase in courses and students on a variety of chemical, biological, radiological, and nuclear (CBRN) topics.
 - Extending the scope of the program beyond NC, thus giving it a more regional focus, including a continued collaboration with the Sunshine and Deep South ERCs with the development of a 5-year Partnership Plan for annual conferences and providing select courses for each others' ERCs.
 - Increasing HST instructors from partnerships with the NC Association of HazMat Responders.
 - Expanding needs assessments to address the growing needs of hazardous substance training and the growing health and safety issues with clandestine methamphetamine labs.
 - Soliciting more contract courses, providing off-site group education and training. This will provide a better financial base from which to operate this program and will provide additional program income that can be directed to providing services for state and local government agencies.
 - Continuing special emphasis on the development and implementation of courses dealing with domestic preparedness related to terrorist activities. Target audiences will be local health departments and first responders. A partnership with the NC PHPT already exists as the HST Director developed the *Guidelines for Medical Monitoring* for the Public Health Regional Response Teams.

- **Marketing, Outreach, and Diversity:** The emphasis on providing the highest quality HST education has been the draw for those familiar with the NC OSHERC, especially from Region IV. Networking remains important in marketing to the health and safety professional organizations, members, employers, and employees with the HST programs and services. Attendance at interdisciplinary meetings allows for recognition of the HST Program Director and HST Technical Coordinator and provides opportunities to promote the NC OSHERC. For example, local section meetings for AAOHN, ACOEM, AIHA, CHMM, and ASSE are and will be set as targets for marketing and outreach. Outreach includes presentations, use of equipment, free tuition, and promotion of the other CE and academic programs in return for the opportunity to provide future education and training options for these groups and strengthen the skills and knowledge of the workers and those responsible for the health and safety of the workforce. Future plans include:
 - Expanding marketing and outreach within the southeast, visiting historically black colleges, American Indian Education Centers; and Hispanic workers' outreach groups to offer education, equipment, and consultations and promote the programs;
 - Targeting professional groups through associations including: OHNs; Occupational and Family Medicine; Safety; IH; HazMat Managers; Bioterrorism Responders; Public Health; and Environmental professionals to continue working with their educational planning committees for their educational programs.

IV. Specific Improvements in OS&H Resulting from ERC Programs

The major impact of any academic institution is obviously in the success and contributions of its students. UNC-OSHERC alumni continue to be major contributors to the occupational safety and health field at all levels, in all programs, as the individual program area trainee lists indicate.

One example of specific improvements in occupational safety and health resulting from ERC programs is that one of the Safety and Ergonomics trainees, as part of the IE796 course, Applied Practicum in Occupational Safety and Health, conducted a thorough safety evaluation of all of the Parks and Recreation facilities of Wake County, NC. As has been the case with the previous times that this course has been offered, these results were used by county employees to address important safety concerns identified through his audit of these facilities.

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APPENDIX A

PROGRAM CURRICULA, COURSE REQUIREMENTS & SAMPLE CURRICULA

Industrial Hygiene Program

Curriculum

Table 1. Core Courses:

Number	Title	Credit	Semester	Faculty
ENVR 400	Seminar Series	1	Both	ENVR Faculty
ENVR 401	Unifying Concepts	3	Both	Faculty
BIOS 545	Principles of Experimental Analysis	3	Both	Biostatistics faculty
EPID 600	Principles of Epidemiology	4	Both	Epidemiology faculty
ENVR 411	Laboratory Techniques and Field Measurements	3	Fall	Nylander-French, Weinberg, Whalen
ENVR 416	Introduction to Aerosol Science	4	Fall	Leith
ENVR 516	Aerosol Science Laboratory (alternate years)	2	Fall	Leith
ENVR 430	Health Effects of Environmental Agents, OR	3	Fall	Ball, Nylander-French
ENVR 423	Industrial Toxicology, OR	2	Spring	Stopford
ENVR 470	Environmental Risk Assessment, OR	3	Spring	Crawford-Brown
ENVR 732	Health Effects of Outdoor and Indoor Air Pollution	3	Fall	Hazucha
ENVR 422	Air and Industrial Hygiene	3	Fall	Fox
ENVR 263	Radiation Hazards Evaluation I	3	Spring	Couch
ENVR 432	Occupational Safety and Ergonomics (PHN286)	3	Fall	Faculty
ENVR 433	Health Hazards of Industrial Operations	3	Spring	Flynn
ENVR 750	Principles of Industrial Ventilation	3	Fall	Flynn
ENVR 992	Master's Technical Report, OR	3	Both	Core Faculty
ENVR 993	Master's Thesis			

Table 2. Advanced Courses:

Number	Title	Credit	Semester	Faculty
ENVR 770	Biological Monitoring	2	Spring	Nylander-French
ENVR 751	Ventilation Design Problems	1	Fall	Flynn
ENVR 754	Air Pollution Control	3	Spring	Leith
ENVR 768	Micro-Environmental Air Flow Modeling (odd years)	3	Fall	Flynn
ENVR 769	Advanced Methods of Exposure Assessment (even years)	3	Spring	Rappaport
ENVR 784	Environmental Law	3	Fall	Heath
ENVR 468	Advanced Functions of Temporal GIS	3	Fall	Serre
ENVR 765	Model-Based Exposure Mapping and Risk Assessment	3	Spring	Serre
MAE 510	Effects of Noise and Vibration on Man (NCSU)	2	Fall	Faculty
MAE 514	Noise and Vibration Control (NCSU)	3	Spring	Faculty

Course Requirements IH Program

- The Department of Environmental Sciences and Engineering requires a seminar (ENVR400) and a Unifying Concepts course (ENVR401).
- MSEE requires Principles of Industrial Ventilation (ENVR750), Ventilation Design Problem (ENVR751), and Air Pollution Control (ENVR754).
- MSPH requires, one course in Health Behavior and Health Education (HBHE600 or alternative) and one in Health Policy and Administration (HPAA600 or alternative).
- EAC focus industrial hygiene core courses are specified in Table 1 and the advanced courses in Table 2. Depending of students' interests and educational goals the course curriculum is tailored for each student individually.

**Possible Coursework for a Student Interested in:
Exposure Assessment Emphasizing Biomarkers
IH Program**

Year I (MS/Ph.D.)

Fall

BIOS 600 (3) Principles of statistical inference
EPID 600 (4) Fundamentals of epidemiology
ENVR 430 (3) Health effects of environmental agents
Seminar (1)

Spring

BIOS 545 (3) Principles of experimental analysis
ENVR 442 (3) Biochemical and molecular toxicology
ENVR 770 (2) Biological monitoring
Seminar (1)

Year II (MS/Ph.D.)

Fall

EPID 785 (3) Environmental epidemiology
EPID 745 (2) Molecular techniques for public health
research
ENVR 707 (3) Advanced toxicology
Seminar (1)

Spring

ENVR 740 (2) Principles of chemical carcinogenesis
ENVR 769 (3) Advanced methods of exposure
assessment
ENVR 471 (3) Quantitative risk assessment in
environmental health
Seminar (1)

Year III (Ph.D.)

Fall

BIOS 665 (3) Analysis of categorical data
ENVR 991 (5) Research in environmental health
sciences
Seminar (1)

Spring

ENVR 728 (3) Analysis of trace organics
ENVR 991 (6) Research in environmental health
sciences
Seminar (1)

Year IV (Ph.D.)

Fall

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Spring

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Participation in Ph.D. Research:

Each Ph.D. student in EAC conducts a research project, which will be reported in the form of a dissertation. Some EAC students perform laboratory research related to the development or application of methods of environmental or biological monitoring. Others perform field studies to characterize environmental exposures and to investigate the effects of covariates upon these exposures. Regardless of the topic, each project must contain sufficient original work to allow a minimum of three refereed publications for which the student is first author. The EAC student and his/her advisor make primary decisions regarding curricula, dissertation topics, and related issues. The advisor is looked upon as the principal source of guidance, helping to provide opportunities for the student to write and review grant applications and manuscripts and offering assistance in other ways to enrich the student's academic experience.

**Possible Coursework for a Student Interested in:
Exposure Assessment Emphasizing Airborne Exposures
IH Program**

Year I (MS/Ph.D.)

Fall

BIOS 600 (3) Principles of statistical inference
ENVR 416 (4) Introduction to aerosol science
EPID 600 (4) Fundamentals of epidemiology
Seminar (1)

Spring

BIOS 545 (4) Principles of experimental analysis
ENVR 433 (4) Health hazards of industrial
operations
Seminar (1)

Year II (MS/Ph.D.)

Fall

EPID 780 (3) Occupational epidemiology
ENVR 767 (3) Modeling for environmental risk
analysis
ENVR 430 (3) Health effects of environmental agents
Seminar (1)

Spring

ENVR 750 (3) Principles of industrial ventilation
ENVR 470 (3) Environmental risk assessment
ENVR 769 (3) Advanced methods of exposure
assessment
Seminar (1)

Year III (Ph.D.)

Fall

ENVR 766 (3) Stochastic environmental health
Modeling
ENVR 991 (5) Research in environmental health
sciences
Seminar (1)

Spring

ENVR 770 (2) Biological Monitoring
ENVR 991 (6) Research in environmental health
sciences
Seminar (1)

Year IV (Ph.D.)

Fall

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Spring

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Participation in Ph.D. Research:

Each Ph.D. student in EAC conducts a research project, which will be reported in the form of a dissertation. Some EAC students perform laboratory research related to the development or application of methods of environmental or biological monitoring. Others perform field studies to characterize environmental exposures and to investigate the effects of covariates upon these exposures. Regardless of the topic, each project must contain sufficient original work to allow a minimum of three refereed publications for which the student is first author. The EAC student and his/her advisor make primary decisions regarding curricula, dissertation topics, and related issues. The advisor is looked upon as the principal source of guidance, helping to provide opportunities for the student to write and review grant applications and manuscripts and offering assistance in other ways to enrich the student's academic experience.

**Possible Coursework for a Student Interested in:
Spatiotemporal Exposure Assessment
IH Program**

Year I (MS/Ph.D.)

Fall

BIOS 600 (3) Principles of statistical inference
ENVR 468 (3) Advanced functions of temporal GIS
ENVR 768 (3) Micro environmental air flow modeling
Seminar (1)

Spring

BIOS 545 (4) Principles of experimental analysis
ENVR 463 (3) Random field modeling of physical
processes
ENVR 765 (3) Model-based exposure mapping and
risk assessment
Seminar (1)

Year II (MS/Ph.D.)

Fall

BIOS 550 (3) Basic Elements of probability and
statistical inference I
STAT 154 (3) Measure and integration theory
STAT 322 (3) Environmental statistics OR
STAT 664 (3) Applied statistics
Seminar (1)

Spring

BIOS 551 (3) Basic elements of probability and
statistical inference II
ENVR 766 (3) Stochastic environmental health
modeling
ENVR 769 (3) Advanced methods of exposure
assessment
Seminar (1)

Year III (Ph.D.)

Fall

BIOS 660 (3) Probability and statistical inference I
ENVR 991 (6) Research in environmental health
sciences
Seminar (1)

Spring

BIOS 662 (4) Intermediate statistical methods
ENVR 991 (5) Research in environmental health
sciences
Seminar (1)

Year IV (Ph.D.)

Fall

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Spring

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Participation in Ph.D. Research:

Each Ph.D. student in EAC conducts a research project, which will be reported in the form of a dissertation. Some EAC students perform laboratory research related to the development or application of methods of environmental or biological monitoring. Others perform field studies to characterize environmental exposures and to investigate the effects of covariates upon these exposures. Regardless of the topic, each project must contain sufficient original work to allow a minimum of three refereed publications for which the student is first author. The EAC student and his/her advisor make primary decisions regarding curricula, dissertation topics, and related issues. The advisor is looked upon as the principal source of guidance, helping to provide opportunities for the student to write and review grant applications and manuscripts and offering assistance in other ways to enrich the student's academic experience.

**Possible Coursework for a Student Interested in:
Exposure Modeling and Control
IH Program**

Year I (MS/Ph.D.)

Fall

BIOS 600 (3) Principles of statistical inference
ENVR 763 (3) Mathematical modeling
ENVR 750 (3) Principles of industrial ventilation
Seminar (1)

Spring

BIOS 545 (4) Principles of experimental analysis
ENVR 433 (3) Health hazards of industrial operations
EPID 600 (3) Fundamentals of epidemiology
Seminar (1)

Year II (MS/Ph.D.)

Fall

ENVR 768 (3) Micro-environmental air flow modeling
ENVR 416 (4) Introduction to aerosol science
ENVR 516 (2) Aerosol science laboratory
Seminar (1)

Spring

ENVR 754 (3) Air pollution control
ENVR 769 (3) Advanced methods of exposure
assessment
ENVR 463 (3) Random field modeling
Seminar (1)

Year III (Ph.D.)

Fall

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Spring

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Year IV (Ph.D.)

Fall

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Spring

ENVR 991 (8) Research in environmental health
sciences
Seminar (1)

Participation in Ph.D. Research:

Each Ph.D. student in EAC conducts a research project, which will be reported in the form of a dissertation. Some EAC students perform laboratory research related to the development or application of methods of environmental or biological monitoring. Others perform field studies to characterize environmental exposures and to investigate the effects of covariates upon these exposures. Regardless of the topic, each project must contain sufficient original work to allow a minimum of three refereed publications for which the student is first author. The EAC student and his/her advisor make primary decisions regarding curricula, dissertation topics, and related issues. The advisor is looked upon as the principal source of guidance, helping to provide opportunities for the student to write and review grant applications and manuscripts and offering assistance in other ways to enrich the student's academic experience.

**MPH Occupational Health Nursing Program
Sample Guide for Distance Learning Education Format****

Year 1 (See Note:)

Summer (Fall Registration)	Fall	Spring
PHNU 781 (3) ²	EPID 600 (3) ¹ HPAA 600 (3) ¹ PHNU 783 (2)*	ENVR 600 (3) ¹ ENVR 423 (3) ¹ PUBH 785 (3) ¹ PHNU 784 (2)*

Year 2

Summer (Fall Registration)	Fall	Spring
PHNU 782 (3) ²	BIOS 600 (3) ¹ PHNU 787 (2) ¹ PUBH 748 (2) ¹	PUBH 746 (3) ¹ HBHE 600 (3) ¹

Year 3

Summer (Fall Registration)	Fall	Spring
PHNU 886 (3) PUBH 992 (3)	ENVR 432 (3) ¹	

1 = internet-based

2 = on campus course (1 week)

* PHNU 783/784 required for students without occupational health nursing experience.

** With the continued development of the online format, changes in curriculum may occur.

Certifications

- CITI Course in Protection of Human Research Subjects (**first year**)
- CPR, AED, & First Aid (anytime)
- Spirometry (anytime)
- Hearing Conservation (anytime)

Note:

- This format is fluid and is constructed as a guide to which course offerings may vary in the semester in which they are offered.
- This program of study can be completed in approximately 2-2½ years as outlined above. However, you have five years from admission within which the program must be completed.
- Independent study/transfer in credit (20% of total program credits may be transferred in with approval).

Number	Hours	Title
BIOS 600	3hr.	Principles of Statistical Inference
ENVR 600	3hr.	Environmental Health
ENVR 423	3hr.	Industrial Toxicology
ENVR 432	3hr.	Occupational Safety and Ergonomics
EPID 600	3hr.	Principles of Epidemiology
HBHE 600	3hr.	Social and Behavioral Sciences in Public Health
HPAA 600	3hr.	Introduction to Health Policy and Administration
PHNU 744	3hr.	Roles and Functions of Public Health Nursing
PHNU 781	3hr.	Occupational Health Nursing I
PHNU 782	3hr.	Occupational Health Nursing II
PHNU 783*	2hr.	Occupational Health Nursing Field Practicum I
PHNU 784*	2hr.	Occupational Health Nursing Field Practicum II
PHNU 787	2hr.	Fundamentals of Industrial Hygiene
PHNU 886	3hr.	Field Practice in Public Health
PUBH 740	1-3hr.	Special Issues in Public Health Practice
PUBH 746	3hr.	Program Planning and Evaluation
PUBH 748	2hr.	Policy Development
PUBH 785	3hr.	Interdisciplinary Approaches to Occupational Health
PUBH 992	3hr.	Master's Paper

MPH Occupational Health Nursing Program Sample Guide for On Campus Education Format

Year 1

Summer (Fall Registration)	Fall	Spring
PHNU 781 (3) ²	EPID 600 (3) ¹ HPAA 600 (3) PHNU 783 (2)*	ENVR 600 (3) ¹ ENVR 423 (3) ¹ PUBH 785 (3) ¹ PHNU 784 (2)*

Year 2

Summer (Fall Registration)	Fall	Spring
PHNU 782 (3) ²	BIOS 600 (3) ¹ PHNU 787 (2) ¹ PUBH 748 (2) ¹	PUBH 746 (3) ¹ HBHE 600 (3) ¹

Year 3

Summer (Fall Registration)	Fall	Spring
PHNU 866 (3) PUBH 992 (3)	ENVR 432 (3) ¹	

1 = Internet based

2 = On-campus course (1 week; however course completion extends throughout semester)

* PHNU 783/784 required for students without occupational health nursing experience
Note:

- This format is fluid and is constructed as a guide to which course offerings may vary in the semester in which they are offered.
- The program of study can be completed in 2-2½ years as outlined above. However, you have 5 years from admission within which the program must be completed.
- Independent study/transfer in credit (20% of total program credits may be transferred in with approval)

Certifications

- CITI Course in Protection of Human Research Subjects (**first year**)
- CPR, AED, & First Aid (anytime)
- Spirometry (anytime)
- Hearing Conservation (anytime)

Minimum credits required for graduation = 42

Number	Hours	Title
BIOS 600	3hr.	Fundamentals of Biostatistics/Principles of Statistical Inference
ENVR 600	3hr.	Environmental Health
ENVR 422	3hr.	Air and Industrial Hygiene
ENVR 423	3hr.	Industrial Toxicology
ENVR 432	3hr.	Occupational Safety and Ergonomics
EPID 600	3hr.	Principles of Epidemiology
HBHE 600	3hr.	Social and Behavioral Sciences in Public Health
HPAA 600	3hr.	Introduction to Health Policy and Administration
PHNU 744	3hr.	Roles and Functions of Public Health Nursing
PHNU 781	3hr.	Occupational Health Nursing I
PHNU 782	3hr.	Occupational Health Nursing II
PHNU 783*	2hr.	Occupational Health Nursing Field Practicum I
PHNU 784*	2hr.	Occupational Health Nursing Field Practicum II
PHNU 787	2hr.	Fundamentals of Industrial Hygiene
PHNU 886	3hr.	Field Practice in Public Health
PUBH 740	1-3hr.	Special Issues in Public Health Practice
PUBH 746	3hr.	Program Planning and Evaluation
PUBH 748	2hr.	Policy Development
PUBH 785	3hr.	Interdisciplinary Approaches to Occupational Health
PUBH 992	3hr.	Master's Paper

**MS Occupational Health Nursing Program
Sample Guide for On Campus Education Format**

Year 1

Summer (Fall Registration)	Fall	Spring
PHNU 781 (3)	EPID 600 (3) BIOS 600 (3) PHNU 783 (2)* HBHE 750 (4)	ENVR 600 (3) ENVR 423 (3) PHNU 784 (2)* PUBH 785 (3)

Year 2

Summer (Fall Registration)	Fall	Spring
PHNU 782 (3) PHNU 886 (3)	PUBH 748 (2) ENVR 422 or PHNU 787 (2) ENVR 432 (3) Elective (3)	BIOS 545 (3) PUBH 993 (3) Elective 1

Certifications

CITI Course in The Protection of Human Research Subjects (**first year**)
Spirometry
Hearing Conservation
CPR, AED, & First Aid

Minimum credits required for graduation = 45

Number	Hours	Title
BIOS 600	3hr.	Fundamentals of Biostatistics/Principles of Statistical Inference
BIOS 545	3hr.	Principles of Experimental Analysis
ENVR 600	3hr.	Environmental Health
ENVR 422	3hr.	Air and Industrial Hygiene
ENVR 423	3hr.	Industrial Toxicology
ENVR 432	3hr.	Occupational Safety and Ergonomics
EPID 600	3hr.	Principles of Epidemiology
HBHE 750	4hr.	Applied Research Methods in Health Behavior and Health Education
PHNU 744	3hr.	Roles and Functions of Public Health Nursing
PHNU 781	3hr.	Occupational Health Nursing I
PHNU 782	3hr.	Occupational Health Nursing II
PHNU 783*	2hr.	Occupational Health Nursing Field Practicum I
PHNU 784*	2hr.	Occupational Health Nursing Field Practicum II
PHNU 787	2hr.	Fundamentals of Industrial Hygiene
PHNU 886	3hr.	Field Practice in Public Health
PUBH 740	1-3hr.	Special Issues in Public Health Practice
PUBH 746	3hr.	Program Planning and Evaluation
PUBH 748	2hr.	Policy Development
PUBH 785	2hr.	Interdisciplinary Approaches to Occupational Health
PUBH 993	3hr.	Master's Thesis

* PHNU 783/784 required for students without occupational health nursing experience.

Note: Students are required to complete the 45 credit minimum through elective courses. While PHNU 744 (Roles and Functions of Public Health Nursing) and PUBH 746 (Program Planning and Evaluation) are recommended as electives, students are encouraged to select courses that meet specific learning needs.

Occupational Safety and Ergonomics Program

Program curricula, course requirements, and sample curricula by academic program

Master's-Level Training. The training of the MS-level students is focused on producing high-quality practitioners with a good understanding of research methods. There are two groups of students that this master's-level program will support. The first group (Group A) will be full time graduate students (thesis-option) who will enter the program having already completed a baccalaureate degree. This is typically a two-year degree program. The second group of students (Group B) will be students that are pursuing a five-year combined BS-MIE degree that is offered by the Department of Industrial and Systems Engineering. This is a relatively new program in our department and is available only to our very best students (GPA>3.5). This program allows the students to replace up to three undergraduate courses with their graduate equivalent and "double count" the credit hours. It typically takes these students an additional year to finish the course requirements for the master's degree, but after five years they leave with both the BSIE and MIE degrees. Based on full-time enrollment, Group A students would be expected to graduate in two years and Group B students would be supported for the fifth year of their combined program. All master's-level trainees (both Group A and Group B) will take a specific set of required courses to satisfy the safety and ergonomics requirements, participate in on-going, sponsored research in the laboratory and are required to take a total of 30 credit hours for graduation (17 of these credit hours have a safety or ergonomics focus). All master's-level trainees will engage in an Applied Practicum in OS&E, to demonstrate skill competence and participate in funded research activities to develop their research skills. All trainees will graduate with the skills necessary to recognize, assess, and develop and implement engineering and administrative controls for general occupational safety and ergonomics hazards.

The safety and ergonomics training provided in this program comes from both required and elective courses. A short description of each of the required courses and the most often selected electives is provided here to describe the breadth of the program coursework. The syllabi for these courses are provided in the Appendix for a more complete description of the topics covered in each course.

IE 540: Human Factors in Systems Design

Basic concepts of ergonomics and their application to design of human-machine systems and products. Consideration of human behavioral and biological capabilities and limitations in design for human efficiency, safety and comfort. Systems development cycle; human-machine function allocation; task and skill analysis; systems evaluation; anthropometry. Design of control and display systems, instrument panels, workplaces, seating and tools.

IE 541: Occupational Safety Engineering

Occupational accident-injury study; morbidity, mortality; investigation and analysis. Hazard control; energy countermeasure strategies; control technology. Impact biomechanics, trauma and survivability. Risk assessment; systems safety analysis. Product design, manufacturing defects, system failures and human error as causative factors. Safety program development. Near-accident reporting. OSHA compliance; standards. Accident, trauma and forensic case studies from manufacturing, motor carrier and construction industries.

IE 544: Occupational Biomechanics

Anatomical, physiological, and biomechanical bases of physical ergonomics. Strength of biomaterials, human motor capabilities, body mechanics, kinematics and anthropometry. Use of bioinstrumentation, active and passive industrial surveillance techniques and the NIOSH lifting guide. Acute injury and cumulative trauma disorders. Static and dynamic biomechanical modeling. Emphasis on low back, shoulder and hand/wrist biomechanics.

IE 741: Systems Safety

The process of system safety combines management decision-making, engineering analyses and risk assessment into a comprehensive, systematic approach for managing safety issues. This course will familiarize the student with techniques for identifying and recognizing potential safety hazards and the concept of risk assessment. Various system safety techniques (listed below) will be explored together with their application to hazard analysis and control. Use of situations in the industrial environment and case studies will help to illustrate the usefulness of various system safety techniques.

IE 796A: Applied Practicum in Occupational Safety & Ergonomics

Capstone course for those students participating in the Occupational Safety and Ergonomics Training Program. Application of the skills and techniques learned in program to the recognition, evaluation, and control of occupational safety hazards. Students will work in a local company and provide “consultative services” in occupational safety.

PUBH 285: Occupational Health: Interdisciplinary Approaches

Overview course on occupational health focusing on interdisciplinary approaches to address complexities of workplace exposures, impact of work-related hazards, and interactions on health. Here students attend lectures conducted by an interdisciplinary team of faculty, participate in joint interdisciplinary workplace walk-throughs, and develop and present joint research-based projects (described further in the Interdisciplinary section of the Administrative Core proposal section of this application).

ENV 135: Industrial Toxicology

Toxicological assessment of and a case presentation of related exposure is given. A conceptual approach is utilized to design appropriate programs to prevent worker ill health due to industrial toxicant exposure. In this course students attend interdisciplinary classes either on-campus or on-line, participate in “live” chat sessions, and jointly prepare and present a paper on a chemically-related issue e.g. radon exposures, danger in dry cleaning, or cyanide in gold processing – all student projects.

In terms of the sequence/curriculum, sample curricula for each degree are shown below. Required safety/ergonomics courses are shown in **bold**. All courses are three credit hours unless otherwise specified. Note that while the ENV 135 course was not a specified “required” course in the curriculum of the recently graduated students, their overwhelmingly positive response to this course has changed its status from an elective to a required course in these curricula.

Sample MSIE curriculum:

- Semester 1: IE 514 Manufacturing Product Engineering
IE 544 Occupational Biomechanics
IE 723 Production Planning, Scheduling and Inventory Control
IE 601 Industrial Engineering Seminar (1 credit hour)
- Semester 2 IE 601 Industrial Engineering Seminar (1 credit hour)
IE 540 Human Factors in Systems Design
IE 541 Occupational Safety Engineering
ST 516 Experimental Statistics For Engineers II
- Semester 3 ENV 135 Industrial Toxicology (2 credit hours)
IE 741 Systems Safety Engineering
IE 695 Master's Thesis Research
- Semester 4 **IE 796A Applied Practicum In Occupational Safety**
PSY 745 Human Performance
PUB 285 Occupational Health: Interdisciplinary Approaches (2 credit hours)
IE 695 Master's Thesis Research

Safety Concentration: The above sample curriculum shows one set of course options available to the students. To satisfy the Safety concentration requirements, students can select from the courses (or equivalents) listed below. Courses in italic type face are required for the trainees. In total there are 17 credit hours of required safety and ergonomics coursework and an additional 2 credit hours of safety and ergonomics electives.

IE 540: Human Factors in Systems Design

IE 541: Occupational Safety Engineering

IE 544: Occupational Biomechanics

IE 741: Systems Safety

IE 796A: Applied Practicum in Occupational Safety & Ergonomics

PUBH 285: Occupational Health: Interdisciplinary Approaches – offered at UNC-CH

ENVR 135: Industrial Toxicology – offered at UNC-CH

IE 796B: Research Practicum in Occupational Safety & Ergonomics

ENVR 134: Air and Industrial Hygiene – offered at UNC-CH

ENVR 137: Occupational Safety and Ergonomics – offered at UNC-CH

ENVR 138: Health Hazards of Industrial Operations – offered at UNC-CH

MAE 510: Effects of Noise and Vibration

MAE 514: Industrial Noise Control

EPID 125: Injury and Violence as Public Health Problems – offered at UNC-CH

EPID 160: Principles of Epidemiology – offered at UNC-CH

EPID 168: Fundamentals of Epidemiology – offered at UNC-CH

EPID 268: Theory and Quantitative Methods in Epidemiology – offered at UNC-CH

EPID 276: Occupational Epidemiology – offered at UNC-CH

Required Applied Practicum in Occupational Safety & Ergonomics: The applied practicum is part of the programs for the express purpose of giving trainees an introductory work experience specific to occupational safety and ergonomics. Trainees perform a specific, defined work project through an assigned employer. Each trainee (or team, if a group project) prepares a technical report summarizing the work experience and prepares and presents a seminar at the work site. The evaluation of the end product of the project is evaluated by the sponsor and the course instructor. The projects completed over the past three offerings of this course illustrate the technical content of the course. In the Spring of 2003 three students worked on a safety project at Burt's Bees, a local cosmetics company. The students performed a complete safety audit of the entire facility, developed a written safety program for the facility and developed solutions for a set of five of the greatest hazards identified in the audit. In the Spring 2005 offering of the course, four students worked on a project for the Wake County Health Department. These students performed a structured health and safety audit of nine different clinics throughout Wake County. The sponsor had a

specific spreadsheet format for the students to complete for each of these clinics. The clinics were diverse in the kinds of safety and health hazards and the students did a full audit of one clinic per week throughout the semester. In the Spring 2006, one student performed a formal safety audit of the Parks and Recreation facilities in Wake County. In these projects the formal evaluation of the sponsor towards the work product was A-level work. A formal evaluation of the projects by the students indicated that the projects were challenging and, for those who have since graduated and found employment, were representative of the kinds of tasks they experience in their current positions. They also noted in this evaluation that the breadth of hazards identified in these facilities represented the scope of the courses required as part of the curriculum. In particular the industrial toxicology course (ENV 135 "Industrial Toxicology") was found to invaluable to them and, as such, this particular course has been highly recommended for all trainees since.

EPIDEMIOLOGY PROGRAM SCHEDULE

Epidemiology

PI: Rogers, Bonnie

EPID 271 Class Schedule Spring 2005

Date	Week	Day	Lecture	Topic	Speaker	Required Readings	Homeworks
January							
13	1	Thursday	1	Rates Analysis and Survival Analysis	Marshall		
18	2	Tuesday	2	Hazard and Survival	Marshall	Bull 1997 pages 1041-58	
20	2	Thursday	3	Kaplan-Meier, Log-Rank, Effect Measures	Marshall	Bull 1997 pp 1041-58 and 1062-63	
25	3	Tuesday	4	Lab: Stratified Analysis Tools	TA		
27	3	Thursday	5	Proportional Hazards Regression	Marshall	Tibshirani 1982	
February							
1	4	Tuesday	6	Risk Sets, Partial Likelihoods, Logistic & PHReg, Ties	Marshall	Alison 1995 pp 111-37	HMWK 1 due
3	4	Thursday	7	Assessing the PH Assumption (Goodness of Fit)	Marshall	Alison 1995 pp 173-181	
8	5	Tuesday	8	Relaxing the PHA; Extended Model; Time Interactions	Marshall	Alison 1995 pp 154-157	
10	5	Thursday	9	Lab: Assessing PHA and Time Interactions (Survivor)	Marshall		
15	6	Tuesday	10	Stratified Proportional Hazards Model	Marshall	Alison 1995 pp 158-161	HMWK 2 due
17	6	Thursday	11	Lab: Stratified Model; Relaxing the PHA (Dust)	Marshall		
22	7	Tuesday	12	Left Truncation, Interval Censoring	Marshall	Alison 1995 pp 161-165; Falk 94	
24	7	Thursday	13	Time-Dependent Variables: Counting Process	Marshall		
March							
1	8	Tuesday	14	Recurrent Events	Marshall		
3	8	Thursday	15	Sensitivity Analysis	Marshall	R&G Chap 19; Taubes 1995	
8	9	Tuesday	16	Sensitivity Analysis	Marshall	R&G Chap 19; Taubes 1995	HMWK 3 due
10	9	Thursday	17	Computer-Intensive Methods: Exact and Bootstrap	Marshall	Zhu 1997	
15	--	Tuesday	--	Break	--		
17	--	Thursday	--	Break	--		
22	10	Tuesday	18	Analysis of person-time incidence rates	Loomis	R&G Chap 3	HMWK 4 due
24	10	Thursday	19	Stratified Analysis of Rates and Standardization	Loomis	R&G Chap 3	
29	11	Tuesday	20	Categorizing Exposures	Richardson	Wing 1991; Greenland 1995	
31	11	Thursday	21	Poisson Regression I	Loomis	Kleinbaum 1998; Alison 1999	
April							
5	12	Tuesday	22	Poisson Regression II	Loomis	Kleinbaum 1998; Alison 1999	
7	12	Thursday	23	Lab: Poisson Regression	Marshall	Kleinbaum 1998; Alison 1999	
12	13	Tuesday	24	Poisson Regression III	Loomis	Richardson 2004; Loomis in press	HMWK 5 due
14	13	Thursday	25	Exposure Response Models	Loomis	Steenland 2004	
19	14	Tuesday	26	Multiple Imputation	Marshall	Yuan 2001; Heitjan 1997	
21	14	Thursday	27	Binomial Regression	Miller	McNutt 2003; Zou 2004	
26	15	Tuesday	28	Multiple Imputation	Marshall	Yuan 2001; Heitjan 1997	HMWK 6 due
28	15	Thursday	29	Final Exam	None		

This version: Jan 13

**PhD Program Curriculum
Health Services Research in Occupational Safety and Health**

Course Title	Credits
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Health Services Research/Research Methods (9 credit hours)

*HPAA 870 Seminar on Health Services and Policy Research	3
*HPAA 885 Methods in Health Services Research	3
*HPAA 886 Qualitative Research Methods	3

Analytical Methods (9 credit hours)

*HPAA 881 Linear Regression Models	3
*HPAA 882 Analysis of Panel Data	3
*HPAA 883 Analysis of Categorical Data	3

Minor Area/Health Policy Elective (18 credit hours)†

Specific courses are determined by minor area of study:
*Epidemiology, Economics, Political Science, Sociology,
Financial Management, Decision Science, & Quality and Access*

Occupational Safety & Health Requirements (11 credit hours)†

*PUBH 785 Interdisciplinary Approaches to Occupational Health	3
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Select 8 other credits of electives in Occupational Safety and Health from an approved list or approval from the Program Director.

Professional Development (8 credit hours)

*HPAA 871 Seminar in Teaching Health Policy & Administration	1
*HPAA 872 Developing Proposals for Health Services and Policy Research	3
*#HPAA 873 Policy Seminar in HPAA	1
*#HPAA 874 Advanced Research Seminar in HPAA	1

Other

*HPAA 994 Doctoral Dissertation	6 (minimum)
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* Required course

HPAA 873—1 credit per semester for 1st year students

HPAA 874—1 credit per semester for 2nd year students

(Both HPAA 873 and 874 are core department seminars. While credit is given for 1st and 2nd year students, all students are expected to attend.)

† While a student must complete 11 credits to fulfill the Occupational Safety and Health (OS&H) requirement, courses taken to fulfill the Health Services Research and Minor Area of Study requirements may also count toward the OS&H credits if they are relevant.

APPENDIX B
PUBLICATIONS

**INDUSTRIAL HYGIENE PROGRAM
PUBLICATIONS (program trainees underlined)**

1. Anthony, T.R., Flynn, M.R., and Eisner, A. Evaluation of Facial Features on Particle Inhalation Ann. Occup. Hyg. 49(2):179-193, 2005.
2. Anthony, T.R. and Flynn, M.R.: CFD Model for a 3-D Inhaling Mannequin: Verification and Validation. Ann. Occup. Hyg. 50:149-156, 2006.
3. Anthony, T.R. and Flynn, M.R.: CFD Investigation of Particle Inhalation. J. Aerosol Sci. 37:750-765, 2006.
4. Boundy, M.; Leith, D. and Polton, T.: Method to Evaluate the Dustiness of Pharmaceutical Powders. Annals of Occupational Hygiene 50, 253-258, 2006.
5. Chao, Y-C.E.; Gibson, R.L. and Nylander-French, L.A.: Dermal exposure to jet fuel (JP-8) in US Air Force personnel. The Annals of Occupational Hygiene 49(7):639-645, 2005.
6. Chao, Y-C.E.; Kupper, L.L.; Serdar, B.; Egeghy, P.P.; Rappaport, S.M. and Nylander-French, L.A.: Dermal exposure to JP-8 significantly contributes to production of urinary naphthols in fuel-cell maintenance workers. Environmental Health Perspectives 114(2):182-185, 2006.
7. Fent, K.W.; Jayaraj, K.; Gold, A.; Ball, L.M. and Nylander-French, L.A.: A tape-strip sampling to measure dermal exposure to 1,6-hexamethylene diisocyanate. Scandinavian Journal of Work, Environment and Health 32(3):225-240, 2006.
8. Flynn, M.R.: On the moments of the 4-parameter lognormal distribution. Commun. Stats. Theory & Mthds. 34(4):745-751, 2005.
9. Flynn, M.R.; Koto, Y.; Fent, K. and Nylander-French, L.A.: Modeling dermal exposure – an illustration for spray painting applications. Journal of Occupational and Environmental Hygiene 3:475–480, 2006.
10. Flynn, M.: Fitting Human Exposure Data with the Johnson Sb Distribution. J. Exposure. Science. Env. Epid. 16:56-62, 2006.
11. Gurka, M.J.; Edwards, L.J. and Nylander-French, L.: Testing transformations for the linear mixed model. Journal of Computational Statistics and Data Analysis (available on line June 27, 2006).
12. Henderson, A.P.; Barnes, M.L.; Bleasdale, C.; Cameron, R.; Clegg, W.; Heath, S.L.; Lindstrom, A.B., Rappaport, S.M.; Waidyanatha, S.; Watson, W.P. and Golding, B.T.: Stability of Benzene Oxide and its Reactions with Thiols. Chem Res Toxicol 18:265-270, 2005.
13. Henderson, A.P.; Waidyanatha, S.; Delany, K.; Lindstrom, A.B.; Bleasdale, C.; Watson, W.P.; Rappaport, S.M. and Golding, B.T.: Evidence for the Formation of Michael Adducts from (E,E)-Muconaldehyde with Thiols Including Glutathione. Biorganic Chem 33(5):363-373, 2005.
14. Johnson, A.; Kupper, L.L.; Taylor, D.J. and Rappaport, S.M.: Modeling Exposure-Biomarker Relationships: Applications of Linear and Nonlinear Toxicokinetics for Understanding Genotoxic Metabolism and Carcinogenesis. J Ag Bio Environ Stat 10(4):440-459, 2005.
15. Kim, D.; Andersen, M.E. and Nylander-French, L.A.: A dermatotoxicokinetic model of human exposures to jet fuel. Toxicological Sciences 93(1):22-33, 2006.
16. Kim, D.; Andersen, M.E. and Nylander-French, L.A.: Dermal absorption and penetration of jet fuel components in humans. Toxicology Letters 165(1):11-21, 2006.
17. Kim, S.; Vermeulen, R.; Waidyanatha, S.; Johnson, B.; Lan, Q.; Rothman, N.; Smith, M.T.; Li, G.; Zhang, L.; Shen, M.; Yin, S. and Rappaport, S.M.: Using Urinary Biomarkers to Elucidate Dose-Related Patterns of Human Benzene Metabolism. Carcinogenesis 27(4):772-781, 2006.
18. Kim, S.; Vermeulen, R.; Waidyanatha, S.; Johnson, B.A.; Lan, Q.; Smith, M.T.; Li, G.; Zhang, L.; Shen, M.; Yin, S.; Rothman, N. and Rappaport, S.M.: Modeling Human Metabolism of Benzene Following Occupational and Environmental Exposures. Cancer Epidemiol Biomarkers Prev, in press.
19. Kirrane, E.; Loomis, D., Egeghy, P. and Nylander-French, L.: Personal exposure to benzene from fuel emissions among commercial fishers: comparison of 2-stroke, 4-stroke and diesel engines. Journal of Exposure Analysis and Environmental Epidemiology (available on line May 31, 2006).
20. Lan, Q.; Zhang, L.; Hakim, F.; Shen, M.; Memon, S.; Li, G.; Vermeulen, R.; Smith, M.T.; Rappaport, S.M.; Hayes, R.; Linet, M.; Yin, S. Rothman, N. and Rabkin, C.S.: Lymphocyte Toxicity and T-Cell Receptor Excision Circles in Workers Exposed to Benzene. Chem-Biol Interact 153-154:111-115, 2005.

21. Lan, Q.; Zhang, L.; Shen, M.; Smith, M.T.; Li, G.; Vermeulen, R.; Rappaport, S.M.; Forrest, M.S.; Hayes, R.B.; Linet, M.; Dosemeci, M.; Alter, B.P.; Weinberg, R.S.; Yin, S.; Yeager, M.; Welch, R.; Waidyanatha, S.; Kim, S.; Chanock, S. and Rothman, N.: Polymorphisms in Cytokine and Cellular Adhesion Molecule Genes and Susceptibility to Hematotoxicity Among Workers Exposed to Benzene. *Cancer Res* 65(20):9574-9581, 2005.
22. Lin, Y.S.; Kupper, L.L. and Rappaport, S.M.: Air Samples Versus Biomarkers for Epidemiology. *Occ Env Med* 62:750-760, 2005.
23. Lin, Y.S.; McKelvey, W.; Waidyanatha, S. and Rappaport, S.M.: Variability of Albumin Adducts of 1,4-Benzoquinone, a Toxic Benzene Metabolite, in Volunteer Subjects. *Biomarkers* 11(1):14-27, 2006.
24. Lin, Y.S.; Vermeulen, R.; Tsai, C.; Waidyanatha, S.; Lan, Q.; Rothman, N.; Smith, M.T.; Zhang, L.; Shen, M.; Li, G.; Yin, S.; Kim, S. and Rappaport, S.M.: Albumin Adducts of Electrophilic Benzene Metabolites in Benzene-exposed and Control Workers, *Env Health Perspect*, in press.
25. Meeker, J.D.; Barr, D.B.; Serdar, B.; Rappaport, S.M. and Hauser, R.: Utility of 1-Naphthol and 2-Naphthol Levels to Assess Environmental Carbaryl and Naphthalene Exposure in an Epidemiology Study. *J Expo Sci Environ Epidemiol*, in press.
26. Parkin, R.; Savelieva E. and Serre, M.L.: Soft Geostatistical Analysis of Radioactive Soil Contamination. In: P. Renard, H. Demougeot-Renard and R. Froidevaux (Eds), *geoENV V - Geostatistics for Environmental Applications*, Springer, pp. 331-342, 2005.
27. Pleil, J.D.; Funk, W.F. and Rappaport, S.M.: Residual Indoor Contamination from World Trade Center Rubble Fires as Indicated by Polycyclic Aromatic Hydrocarbon (PAH) Profiles. *Environ Sci Technol* 40:1172-1177, 2006.
28. Pleil, J.D.; Kim, D.; Prah, J.D. and Rappaport, S.M.: Exposure Reconstruction for Reducing Uncertainty in Risk Assessment: Example Using MTBE Biomarkers and a Simple Pharmacokinetic Model. *Biomarkers*, accepted pending revisions.
29. Rappaport, S.M.; Kupper, L.L. and Lin, Y.S.: On the Importance of Exposure Variability to the Doses of Volatile Organic Compounds. *Toxicol Sci* 83:224-236, 2005.
30. Rappaport, S.M.; Waidyanatha, S.; Yeowell-O'Connell, K.; Rothman, N.; Smith, M.T.; Zhang, L.; Qu, Q.; Shore, R.; Li, G. and Yin, S.: Protein Adducts as Biomarkers of Human Benzene Metabolism. *Chem-Biol Interact* 153-145:103-109, 2005.
31. Richmond-Bryant, J.; Eisner, A.D. and Flynn, M.R.: Considerations for modeling particle entrainment into the wake of a circular cylinder, *Aerosol Sci Tech.* 40:17-26, 2006.
32. Savelieva, E.; Demyanov, V.; Kanevski, M.; Serre, M.L. and Christakos, G.: BME-Based Uncertainty Assessment of the Chernobyl Fallout, *Geoderma* 128:312-324, 2005.
33. Serdar, B.; Tornero-Velez, R.; Echeverria, E.; Nylander-French, L.A.; Kupper, L.L. and Rappaport, S.M.: Predictors of occupational exposure to styrene and styrene-7,8-oxide in the reinforced plastics industry. *Occupational and Environmental Medicine* (available online June 27, 2006).
34. Shen, M.; Lan, Q.; Zhang, L.; Chanock, S.; Li, G.; Vermeulen, R.; Rappaport, S.M.; Guo, W.; Hayes, R.B.; Linet, M.; Yin, S.; Yeager, M.; Welch, R.; Forrest, M.S.; Rothman, N. and Smith, M.T.: Polymorphisms in Genes Involved in Genome Maintenance Confer Susceptibility to Benzene-Induced Hematotoxicity. *Carcinogenesis*, in press.
35. Smith, M.T.; Vermeulen, R.; Li, G.; Zhang, L.; Lan, Q.; Hubbard, A.E.; Forrest, M.S.; McHale, C.; Zhao, X.; Gunn, L.; Shen, M.; McCarthy, D.; McGuire, M.; Rappaport, S.M.; Yin, S.; Chanock, S. and Rothman, N.: Use of "Omic" Technologies to Study Humans Exposed to Benzene. *Chem-Biol Interact* 153-154:123-127. 2005.
36. Waidyanatha, S.; Sangaiah, R. and Rappaport, S.M.: Characterization and Quantification of Cysteinyl Adducts of Benzene Di-epoxide. *Chem Res Toxicol* 18:1178-1185, 2005.
37. Wu, R.; Waidyanatha, S.; Henderson, A.P.; Serdar, B.; Zheng, Y. and Rappaport, S.M.: Determination of dihydroxynaphthalenes in human urine by gas chromatography-mass spectrometry. *J Chromatog (B)* 826:206-213, 2005.
38. Zhang, L.; Lan, Q.; Guo, W.; Li, G.; Yang, W.; Hubbard, A.E.; Vermeulen, R.; Rappaport, S.M.; Yin, S.; Rothman, N. and Smith, M.T.: Use of OctoChrome Fluorescence in situ Hybridization to Detect Specific Aneuploidy Among all 24 Chromosomes in Benzene-exposed Workers. *Chem-Biol Interact* 153-154:117-122, 2005.

39. Yokley, K.; Tran, H.T.; Pekari, K.; Rappaport, S.M.; Riihimäki, V.; Rothman, N.; Waidyanatha, S. and Schlosser, P.M.: Physiologically Based Pharmacokinetic Modeling of Benzene in Humans: A Bayesian Approach. *Risk Anal* 26(4):925-943, 2006.

OCCUPATIONAL HEALTH NURSING PROGRAM PUBLICATIONS

BOOK CHAPTERS

Occupational Health. Rogers, B. and Travers, P. Chapter in Nies, M. and McEwen, M. Community Health Nursing. Elsevier, 2007.

Community Health Nursing in Occupational Health. Chapter in Stanhope, B. and Lancaster, J. Community and Public Health Nursing. Elsevier, 2006.

Rogers, B. (2005). Research. AAOHN Core Curriculum, M. Salazar, ed. St. Louis: Elsevier, 2005.

PUBLICATIONS

Rogers, B., Randolph, S., Ostendorf, J. Aging and environmental health. Environmental Health Nursing Initiative, www.atsdr.gov, 2006.

Rogers, B., Randolph, S., Ostendorf, J. Environmental exposure history for fishermen and women. Environmental Health Nursing Initiative, www.atsdr.gov, 2006.

Rogers, B., Randolph, S., Ostendorf, J. Environmental and human health impact from flooding. Environmental Health Nursing Initiative, www.atsdr.gov, 2006.

Rogers, B., Lawhorn, E. The role of the occupational and environmental health professional in response to hurricanes Katrina and Rita, AAOHN Journal, In press.

Rogers, B. Ergonomics and nursing in hospital environments: Translating research to practice, AAOHN Journal, In press.

Rogers, B. Ergonomics and nursing in hospital environments, Ergonomics, submitted.

Rogers, B. Integrating occupational health and health promotion, American Journal of Health Promotion, In press.

Rogers, B. Workplace violence. Nursing eCE, 2006.

Rogers, B. The National occupational research agenda – The second decade of NORA, AAOHN Journal, 54; 153, 2006.

Pompeii, L., Savitz, D., Evenson, K., Rogers, B., McMahon, M. Physical exertion at work and the risk of preterm delivery and small- for gestational-age birth, Obstetrics & Gynecology, 106(6), 2005.

Randolph, S.A. (Accepted for publication). Case study: Workplace violence: Policy initiatives. In D. Mason, J. Leavitt, & M. Chaffee, Policy and Politics in Nursing and Health Care (5th ed). Philadelphia: Saunders. (Submitted June 29, 2005; accepted Dec 9, 2005; publication date is early Oct 2006)

OCCUPATIONAL SAFETY AND ERGONOMICS PROGRAM PUBLICATIONS

Musculoskeletal Disorders and Special Populations at Risk

1. Evaluation of a Redesigned Self-Checkout Station for Wheelchair Users
Publication: Bajaj, K, GA Mirka, CM Sommerich, and H Khachatoorian (2006) "Evaluation of a Redesigned Self-Checkout Station for Wheelchair Users", *Assistive Technology*, 18(1): 15-24.
2. College students and computers
Publication: Noack, K, CM Sommerich and GA Mirka (Accepted) "College students and computers: Profile of use and musculoskeletal discomfort and their comparison with those of professional computer users", To Appear in *International Journal of Industrial Ergonomics*.
3. Differences in Trunk Kinematics and Ground Reaction Forces Between Older and Younger Adults During Lifting
Publication: Shin, G, M Nance and GA Mirka (2006) "Differences in Trunk Kinematics and Ground Reaction Forces Between Older and Younger Adults During Lifting", *International Journal of Industrial Ergonomics*, 36: 767-772.
4. Effects of Age on Muscle Activity and Upper Body Kinematics during a Repetitive Forearm Supination Task
Publication: Jiang, Z, Y Shu, J Drum, S Reid, and GA Mirka (In Review) "Effects of Age on Muscle Activity and Upper Body Kinematics during a Repetitive Forearm Supination Task", Submitted to *International Journal of Industrial Ergonomics*.

Musculoskeletal Disorders and Intervention Effectiveness Research

5. Assessing the Effects of Positive Feedback and Reinforcement in the Introduction Phase of an Ergonomic Intervention
Publication: Brandenburg, DL and GA Mirka (2005) "Assessing the Effects of Positive Feedback and Reinforcement in the Introduction Phase of an Ergonomic Intervention", *Human Factors*, 47(3): 526-535.
6. Learning Curve Analysis of a Patient Lift Assist Device
Publication: Reid, S, and GA Mirka (In Review) "Learning Curve Analysis of a Patient Lift Assist Device", Submitted to *Applied Ergonomics*.

Low Back Disorders

7. The Effect of a Repetitive, Fatiguing Lifting Task on Horizontal Ground Reaction Forces
Publication: Shu, Y, J Drum, S Southard, G Shin and GA Mirka (2005) "The Effect of a Repetitive, Fatiguing Lifting Task on Horizontal Ground Reaction Forces", *Journal of Applied Biomechanics*, 21(3): 260-270.
8. A Study of Lifting Tasks Performed on Laterally Slanted Ground Surfaces
Publication: Jiang, Z, G Shin, JH Freeman, S Reid and GA Mirka (2005) "A Study of Lifting Tasks Performed on Laterally Slanted Ground Surfaces", *Ergonomics*, 48(7): 782-795.

Musculoskeletal Disorders

9. Ergonomic Interventions for the Reduction of Back and Shoulder Biomechanical Loading when Weighing Calves
Publication: Southard, SA, JH Freeman, JE Drum and GA Mirka (Accepted) "Ergonomic Interventions for the Reduction of Back and Shoulder Biomechanical Loading when Weighing Calves", To Appear in *International Journal of Industrial Ergonomics*.

10. A Biomechanical Analysis of Anterior Load Carriage

Publication: Anderson, AP, KA Meador, LR McClure, D Mkrozhapoulos, DJ Brooks and GA Mirka (In Review) "A Biomechanical Analysis of Anterior Load Carriage", submitted to *Ergonomics*.

OCCUPATIONAL EPIDEMIOLOGY PROGRAM PUBLICATIONS

Sanford C, Marshall SW, Martin SL, Coyne-Beasley T, Waller A, Cook PJ, Norwood T, Demissie Z. Deaths from violence in North Carolina, 2004. How deaths differ in males and females. *Inj Prev* (in press).

Charles L, Loomis D, Demissie Z. Occupational hazards experienced by building cleaners, housekeepers, and janitors: a review of the epidemiologic literature. *Occup Environ Med* (submitted).

Elliott L, Heederik D, Marshall SW, Peden D, Loomis D. Incidence of allergy and allergy symptoms among workers exposed to laboratory animals. *Occup Environ Med* 2005; 62(11):766-771.

Elliott L, Heederik D, Marshall SW, Peden D, Loomis D. Progression of symptoms in laboratory animal allergy. *J Allerg Clin Immunol*, 2005;116:127-132.

Loomis DP, Marshall SW, Ta M. Employer policy towards guns in the workplace and risk of homicide on the job. *Am J Public Health*, 2005;95:830-832.

Loomis D, Richardson DB, Elliott L. Poisson regression analysis of ungrouped data. *Occup Environ Med* 2005;62:325-329.

Runyan CW, Schulman M, Ta M. Adolescent Employment: Relationships to Injury and Violence. In: Liller KD, editor. *Injury Prevention for Children and Adolescents: Research, Practice, and Advocacy*. Washington, D.C.: American Public Health Association; 2006.

Runyan CW, Schulman M, Dal Santo J, Bowling JM, Agans R, Ta M. Work-related Hazards and Workplace Safety of U.S. Adolescents Employed in the Retail and Service Sectors. *Pediatrics* (in press).

Ta M, Loomis D. Frequency and Determinants of Recommended Workplace Violence Safety Measures. *Journal of Safety Research* (in revision).

Publications Enhanced by Program Support

Rentz ED, Martin SL, Gibbs DA, Clinton-Sherrod M, Hardison J, Marshall SW. Family violence in the military: a review of the literature. *Trauma, Violence, and Abuse* 2006;7(2):93-108.

Knowles S, Marshall SW, Guskiewicz KM. Estimating rates and risks in sports injury research. *Journal of Athletic Training*. 2006; 41(2):201-215.

Knowles S, Marshall SW, Loomis DP, Weaver N, Yang J, Bowling JM, Kalsbeek W, Mueller FO. Risk factors for high school sports injury. *American Journal of Epidemiology*. In press.

HEALTH SERVICES RESEARCH IN OCCUPATIONAL SAFETY AND HEALTH PUBLICATIONS

Books/Book Chapters

- Grabowski, D.C., & **Norton, E.** (2006). Nursing Home Quality of Care. In A. Jones (Ed.), *Elgar Companion to Health Economics* (pp. 296-305). Northampton, MA: Edward Elgar.
- Norton, E.C., & Stearns, S.** (2006). Logistic Regression. In E. Chumney, and Simpson, K. (Ed.), *Methods and Designs for Outcomes Research* (pp. 105-113). American Society for Health-Systems Pharmacists.
- Ricketts, T.** (2005). Healthcare Workforce Planning. In M. Fottler, and Fried, B. (Ed.), *Human Resources and Healthcare: Managing for Success* (2nd Ed.). Chicago: AUPHA/Health Administration Press.
- Rogers, B.** (2006). Community Health Nursing in Occupational Health. In B. Stanhope and Lancaster, J., *Community and Public Health Nursing*. Philadelphia, PA: Elsevier.
- Rogers, B. & Travers, P.** (2006). Occupational Health. In M. Nies and M. McEwen, *Community Health Nursing*. Philadelphia, PA: Elsevier.
- Rogers, B.** Research. (2005). In M. Salazar (Ed.), *AAOHN Core Curriculum for Occupational and Environmental Health Nursing*. St. Louis, MO: Saunders.
- Greenberg, G. & **Rogers, B.** (2005). Clinical Occupational and Environmental Health Practice. In B. Levy, D. Wegman, S. Baron, and R. Sokas, *Occupational and Environmental Health*. Philadelphia, PA: Lippincott Williams & Wilkins.
- Bosworth, H., Oddone, E., & **Weinberger, M.** (2006). Conclusion. In E. Oddone, and Weinberger, M. (Ed.). *Patient Treatment Adherence: Concepts, Intervention and Measurement*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Van Houtven, C., **Weinberger, M.**, & Carey, T. (2006). Implications of Non-Adherence for Economic Evaluations and Health Policy. In H. Bosworth, Oddone, E., & Weinberger, M. (Eds.), *Patient Treatment Adherence: Concepts, Intervention and Measurement*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Weinberger, M.**, & Salz, T. (2006). Physician Adherence to Clinical Practice Guidelines. In H. Bosworth, Oddone, E., and Weinberger, M. (Eds.), *Patient Treatment Adherence: Concepts, Intervention and Measurement*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Weiner, B.**, Helfrich, C., & Hernandez, S. (2006). *Learning, Innovation, and Change*. Albany, NY: Delmar Publishing.

Refereed Papers/Articles

- Alexander, J., **Lee, S.**, & **Weiner, B.** (In Press). The Effects of Governing Board Configuration on Identify Change in Hospitals. *Journal of Health and Social Behavior*.
- Alexander, J., **Weiner, B.**, Shortell, S., Baker, L, Becker, M. & Geppert, J. (2006). Care Management Implementation and Patient Safety. *Journal of Patient Safety*.

- Alexander, J., **Lee, S.**, & **Weiner, B.** (2006). Governing Board Configuration and Profound Organizational Change in Community Hospitals. *Journal of Health & Social Behavior*.
- Alexander, J., Griffith, J., & **Weiner, B.** (2006). Quality Improvement Strategies and Hospital Profitability and Cost Performance. *Journal of Organizational Behavior*.
- Arozullah, A., **Lee, S.**, Khan, T., Kurup, S., Ryan, J., Bonner, M., Soltysik, R., & Yarnold, P. (2006). Predicting Preventable Hospital Admissions: The Role of Social Support and Low Literacy. *Journal of General Internal Medicine*, 21, 140-145.
- Beskow, L., Sandler, R., & **Weinberger, M.** (In Press). Policies for Research Recruitment Through U.S. Cancer Registries: Balancing Privacy and Scientific Issues. *American Journal of Public Health*.
- Beskow, L., Millikan, R., Sandler, R., Godley, P., Weiner, B., & **Weinberger, M.** (2006). The Effect of Physician Permission Versus Notification in Research Recruitment Through Cancer Registries. *Cancer Causes and Control*, 17, 315-323.
- Beskow, L., Sandler, R., Millikan, R., & **Weinberger, M.** (2005). Patient Perspectives on Research Recruitment Through Cancer Registries. *Cancer Causes and Control*, 16, 1171-1175.
- Bradford, D., Gaynes, B., Kim, M., Kaufman, J., & **Weinberger, M.** (2005). Can Shelter-based Interventions Improve Treatment Engagement in Homeless Individuals with Psychiatric and/or Substance Misuse Disorders? A Randomized Controlled Trial. *Medical Care*, 43, 763-768.
- Brown, A., Gregg, E., Stevens, M., Karter, A., **Weinberger, M.**, Safford, M., Gary, T., Caputo, D., Waitzfelder, B., Kim, C., & Beckles, G. (2005). Race, Ethnicity, Socioeconomic Position, and Quality of Care for Adults with Diabetes Enrolled in Managed Care: The Translating Research into Action for Diabetes (TRIAD) Study. *Diabetes Care*, 28, 2864-2870.
- Campione, J., Sleath, B., Biddle, A., & **Weinberger, M.** (2005). The Influence of Physician Guideline Compliance on Patient Statin Adherence: A Retrospective Cohort Study. *The American Journal of Geriatric Pharmacotherapy*, 3(4), 229-239.
- Carpenter, W., **Weiner, B.**, Kaluzny, A., **Domino, M.**, & **Lee, S.** (2006). The Impact of Managed Care on the National Cancer Institute's Community Clinical Oncology Program. *Medical Care*.
- Carter, W., **Lee, S.**, Thomas, K., & Morrissey, J. (2006). Managed Care, Inter-agency Linkages, and Outpatient Substance Abuse Treatment. *Administration and Policy in Mental Health*, 33(1), 122-131.
- Domino, M.**, Morrissey, J., Chung, S., & Nadlicki, T. (Forthcoming). Changes in Service Use During a Trauma-informed Intervention for Women. *Women & Health*.
- Domino, M.**, & Huskamp, H. (2005). Behavioral Health Carve-out Networks as Risky Assets. *Journal of Health Economics*, 24, 795-813.
- Domino, M.**, Morrissey, J., Chung, S., Huntington, N., Larson, M., & Russell, L. (2005). Twelve-Month Service Use and Costs for Women with Co-occurring Mental and Substance Use Disorders and a History of Violence. *Psychiatric Services*, 56(10), 1223-1232.
- Fried, B., Shadle, J., & **Domino, M.** (2005). The Effect of Natural Disaster on Mental Health Utilization: Flooding in North Carolina after Hurricane Floyd. *Psychiatric Services*, 56(11), 1367-1373.

- Hall, S., Kaufman, J., & **Ricketts, T.** (2006). Defining Urban and Rural Areas in U.S. Epidemiological Studies. *Journal of Urban Health*, 83(2).
- Hall, S., Kaufman, J., Millikan, R., **Ricketts, T.**, Herman, D., & Savitz, D. (2005). Urbanization and Breast Cancer Incidence in North Carolina. *Annals of Epidemiology*, 15(10), 796-803.
- Helfrich, C., Savitz, L., Swiger, K., & **Weiner, B.** (2006). Adoption and Implementation of Diabetes Registries by Community Health Centers. *American Journal of Preventive Medicine*.
- Jackson, G., Edelman, D., & **Weinberger, M.** (In Press). Simultaneous Control of Intermediate Diabetes Outcomes Among VA Patients. *Journal of General Internal Medicine*.
- Konetzka, R.T., **Stearns, S.**, & **Norton, E.C.** (2007). Medicare Payment Changes and Nursing Home Quality: Spillover Effects on Long-stay Residents. *International Journal of Health Care Finance and Economics*.
- Konetzka, R.T., **Norton, E.C.**, Sloane, P.D. Kilpatrick, K., & **Stearns, S.** (2006). Medicare Prospective Payment and Quality of Care for Long-stay Nursing Facility Residents. *Medical Care Research and Review*, 44(3), 270-276.
- Krebs, E., Carey, T., & **Weinberger, M.** (2006). What Does the "Fifth Vital Sign" Mean? A Prospective Study of Pain Screening in Primary Care. *Journal of General Internal Medicine*, 163.
- Krishnaraj, A., Yankaskas, B. & **Stearns, S.** (2006). Screening Mammography After Breast Cancer Treatment: Patterns in Community Practice. *Breast Cancer Research and Treatment*.
- Lakon, C.M., Ennett, S.T., & **Norton, E.C.** (2006). Mechanisms Through Which Drug, Sex Partner, and Friendship Network Characteristics Relate to Risky Needle Use Among High Risk Youth and Young Adults. *Social Science and Medicine*.
- Lee, J.Y., Rozier, R., **Norton, E.C.**, & Vann, Jr., W.F. (2005). Addressing Selection Bias in Dental Health Services Research. *Journal of Dental Research*, 84(10), 942-946.
- Lee, S.**, Gazmararian, J., & Arozullah, A. (In Press). Health Literacy and Social Support Among Elderly Medicare Beneficiaries Enrolled in a Managed Care Plan. *Journal of Applied Gerontology*.
- Lee, S.**, Morrissey, J., Thomas, K., Carter, W., & Ellis, A. (2006). Assessing Linkages Between Substance Abuse, Mental Health, and Primary Care Agencies. *American Journal of Drug and Alcohol Abuse*, 32, 69-86.
- Lee, S.**, Bender, D., Ruiz, R., & Cho, Y. (2006). Development of an Easy-to-Use Spanish Health Literacy Assessment Tool. *Health Services Research*, 41(3), 1392-1412.
- McKinney, M., **Weiner, B.**, & Wang, V. (2006). Recruiting Participants to Cancer Prevention Clinical Trials: Lessons from Successful Community Oncology Programs. *Nursing Oncology Forum*, 33(5), 951-959.
- Norton, E.C.**, Yoon, J., Domino, M., & Morrissey, J. (2006). Transitions Between the Public Mental Health System and Jail for Persons with Severe Mental Illness: A Markov Analysis. *Health Economics*, 15(7), 719-733.
- Norton, E.C.**, Wang, H., & **Stearns, S.** (2006). Behavioral Implications of Out-of-Pocket Health Care Expenditures. *Swiss Journal of Economics and Statistics*.
- Norton, E.C.**, & Van Houtven, C.H. (2006). Inter-vivos Transfers and Exchange. *Southern Economic Journal*.

- Pathman, D.E., **Ricketts, T.**, & Konrad, T.R. (2006). How Adults' Access to Outpatient Physician Services Relates to the Local Supply of Primary Care Physicians in the Rural Southeast. *Health Services Research*, 41(1), 79-102.
- Purser, J., **Weinberger, M.**, Cohen, H., Pieper, C., Morey, M., & Williams, G. (2005). Walking Speed Predicts Health Status and Hospital Costs for Frail Elderly Veterans. *Journal of Rehabilitation Research and Development*, 42, 535-546.
- Quinonez, R., **Stearns, S.**, Talekar, B., Rozier, R., & Downs, S. (2006). Simulating the Cost-Effectiveness of Fluoride Varnish in a Medical Setting. *Archives of Pediatric and Adolescent Medicine*, 160, 164-170.
- Randolph, S.A.** (In Press). Case study: Workplace violence: Policy initiatives. In D. Mason, J. Leavitt, & M. Chaffee, *Policy and Politics in Nursing and Health Care* (5th ed). Philadelphia: Saunders.
- Ricketts, T.** (2006). State and Local Partnerships for Meeting the Healthcare Needs of Small and Often Remote Rural Communities. *North Carolina Medical Journal*, 67(1), 43-50.
- Rogers, B., Randolph, S.A.,** & Ostendorf, J. Aging and Environmental Health. *Environmental Health Nursing Initiative*, 2006, www.atsdr.gov
- Rogers, B., Randolph, S.A.** & Ostendorf, J. Environmental Exposure History for Fisherman and Women. *Environmental Health Nursing Initiative*, 2006, www.atsdr.gov
- Rogers, B., Randolph, S.A.** & Ostendorf, J. Environmental and Human Health Impact from Flooding. *Environmental Health Nursing Initiative*, 2006, www.atsdr.gov
- Rogers, B.** & Lawhorn, E. (In press). The Role of the Occupational and Environmental Health Professional in Response to Hurricanes Katrina and Rita. *AAOHN Journal*.
- Rogers, B.** (In press). Competencies in Occupational and Environmental Health Nursing. *AAOHN Journal*.
- Rogers, B.** (In press). Ergonomics and Nursing in Hospital Environments: Translating Research to Practice. *AAOHN Journal*.
- Rogers, B.** (Submitted for publication). Ergonomics and Nursing in Hospital Environments. *Ergonomics*.
- Rogers, B.** (In press). Integrating Occupational Health and Health Promotion. *American Journal of Health Promotion*.
- Rogers, B.** (2006). The National Occupational Research Agenda—The Second Decade of NORA. *AAOHN Journal*, 54(4), 153.
- Pompeii, L., Savitz, D., Evenson, K., **Rogers, B.**, & McMahon, M. (2005). Physical Exertion at Work and the Risk of Preterm Delivery and Small-for-Gestational-Age Birth, *Obstetrics & Gynecology*, 106(6), 1279-1288.
- Rogers, B.** (2006). Workplace Violence. *Nursing eCE*.
- Woebkenberg, M., **Rogers, B.** et al. (In press). NORA at Nine: Exposure Assessment Methods. Cincinnati, OH: NIOSH.
- DeBord, G., Boraiko, C., & **Rogers, B.** (In press). Biomarkers in Exposure Assessment. *AIHA Journal*.

- Rothman, R., Malone, R., Bryant, B., Wolfe, C., Padgett, P., DeWalt, D., **Weinberger, M.**, & Pignone, M. (In Press). The Spoken Knowledge in Low Literacy in Diabetes (SKILLD) Scale: A Diabetes Knowledge Test for Vulnerable Patients. *Diabetes Educator*.
- Shenkman, E., & Seibert, J. (In Press). The Texas STAR Managed Care Organization (MCO) Program and Primary Care Case Management Program (PCCM) Adult Enrollee CAHPS Survey Report SFY 2005. Report Submitted to the Texas Health and Human Services Commission, November 2005.
- Shenkman, E., & Seibert, J. (In Press). The Texas STAR Managed Care Organization (MCO) Program and Primary Care Case Management Program (PCCM) Caregiver CAHPS Survey Report SFY 2005. Report Submitted to the Texas Health and Human Services Commission, November 2005.
- Shenkman, E., & Seibert, J. (In Press). The Texas STAR+PLUS Non-Elderly Adult Enrollee Unmet Needs Report Fiscal Year 2005. Report Submitted to the Texas Health and Human Services Commission, March 2006.
- Shenkman, E., & Seibert, J. (In Press). The Texas STAR Managed Care Organization (MCO) Program and Child Health Insurance Program (CHIP) in Texas Renewal/Non-Renewal Survey Report Fiscal Year 2006. Report Submitted to the Texas Health and Human Services Commission, May 2006.
- Shenkman, E., & Seibert, J. (In Press). Child Health Insurance Program in Texas: The New Enrollee Survey Report for Fiscal Year 2006. Report Submitted to the Texas Health and Human Services Commission, May 2006.
- Shenkman, E., & Seibert, J. (In Press). An Analysis of Disenrollment Patterns in the Child Health Insurance Program in Texas Fiscal Year 2006. Report Submitted to the Texas Health and Human Services Commission, May 2006.
- Shenkman, E., & Seibert, J. (In Press). Children's Health Insurance Program in Texas: The Established Enrollee CAHPS Survey Report Fiscal Year 2006. Report Submitted to the Texas Health and Human Services Commission, June 2006.
- Stearns, S.**, Dalton, K., Holmes, G., & Seagrave, S. (2006). Using Propensity Stratification to Compare Patient Outcomes in Hospital-Based versus Freestanding Skilled Nursing Facilities. *Medical Care Research and Review*.
- Van Houtven, C.H., & **Norton, E.C.** (2006). Economic Effects of Informal Care. *Swiss Journal of Economics and Statistics*.
- Wasserman, M., Bender, D., & **Lee, S.** (In Press). Strategies for Increasing Utilization of Preventive Services by Latina Women: A Review of Published Intervention Studies. *Medical Care Research and Review*.
- Wasserman, M., Bender, D., & **Lee, S.** (In Press). Utilization of Preventive Reproductive Health Services by Latina Women: A Review of Published Intervention Studies. *Medical Care Research and Review*.
- Wasserman, M., Bender, D., **Lee, S.**, Morrissey, J., Mouw, T., & Norton, E.C. (2006). Social Support Among Latina Immigrant Women: Bridge Persons as Mediators of Cervical Cancer Screening. *Journal of Immigrant and Minority Health*, 8(1), 67-84.
- Weiner, B.**, McKinney, M., & Carpenter, W. (2006). Adapting Clinical Trials Networks to Promote Cancer Prevention and Control Research. *Cancer*, 106(1), 180-187.

Weiner, B., Helfrich, C., Savitz, L., & Swiger, K. (In Press). How Primary-Care Practices Adopt and Implement Biomedical and Patient-Oriented Strategies for Care of Diabetes Mellitus: Six Exploratory Case Studies. *American Journal of Preventive Medicine*.

Weiner, B., Alexander, J., Shortell, S., Baker, L., Becker, M., & Geppert, J. (2006). Quality Improvement Implementation and Hospital Performance on Hospital Patient Safety Indicators. *Medical Care Research and Review*, 63(1), 29-57.

Weiner, B., Alexander, J., Shortell, S., Baker, L., Becker, M., & Geppert, J. (2006). Quality Improvement Structures and Practices as Determinants of Hospital Quality Indicators. *Health Services Research*, 41(2), 307-334.

Yang, Z., & **Norton, E.C.** (2006). How Much Would a Medicare Prescription Drug Benefit Cost? Offsets in Medicare Part A Cost by Increased Drug Use. *Journal of Pharmaceutical Finance, Economics, and Policy*.

APPENDIX C
PRESENTATIONS

INDUSTRIAL HYGIENE PROGRAM PRESENTATIONS

1. Akita, Y.; Serre, M.L. and Carter, G.: Research Translation in Spatiotemporal Exposure Assessment for Contaminated River Superfund Site, EPA Science Forum 2006, poster presentation, 3rd place prize, Washington DC, USA, May 16-18, 2006.
2. Anthony, T.R. and Flynn, M.R., CFD Investigation of Particle Inhalability Studies, AAAR, Austin, TX Oct. 2005.
3. Bernstein, K.; Law, D.C.G.; Serre, M.L.; Schumacher, C.M.; Leone, P.A.; Rompalo, A.M.; Miller, W.C. and Zenilman, J.M.: Space-time modeling of an early syphilis outbreak. , ISSTD 2005, poster presentation, Amsterdam, July 10-15, 2005.
4. Bland, K.; Boundy, M and Leith, D.: Lori-10 Personal Cascade Impactor: A Performance Evaluation, AIHCE, Chicago, May 2006.
5. Casuccio, G.; Leith, D.; Wagner, J.; Casuccio, G.; Cowley, C.; Lersch, T.; Willis, B.; Conner, T.; Peters, T. and Merrifield, T.: Passive Aerosol Sampler for PM10-2.5. USEPA Symposium, Durham NC, May 2006.
6. Chao, Y-C.E.; Kupper, L.L.; Serdar, B.; Egeghy, P.P.; Rappaport, S.M. and Nylander-French, L.A.: Dermal exposure to jet fuel JP-8 significantly contributes to the production of urinary naphthols in fuel-cell maintenance workers. VII International Scientific Conference "Current and Future Challenges in Environmental Health, Toxicology, and Food Safety in Eastern and Central Europe", Kyiv, Ukraine, 2-5 May, 2006.
7. Coulliette, A.D.; Money, E.; Serre, M.L.; Noble, R.T.: An Application of Space/Time Estimation of Microbial Indicators and Markers with Respect to Rainfall in the Newport River Estuary, NC, The 106th General Meeting of the American Society of Microbiology, Poster presentation, Orlando, Florida, USA, May 21-25, 2006.
8. Flack, S.; Goktepe, I.; Ball, L.M. and Nylander-French, L.A.: Dermal exposure to propiconazole among farm workers. Society of Toxicology Annual Meeting, San Diego, CA, March 5-9, 2006.
9. Johnson, D.N.; Serre, M.L.; Miller, C.T.; Carter, G.: Using Spatially Offset Data for the Estimation of Groundwater Arsenic Exposure in New Jersey, The Fifth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Poster presentation, Monterey, California, USA, May 22-25, 2006.
10. Kim, D.; Dong, B.; Poulos, C.; Whittington, D.; Serre, M. and Nyamete, A.: GIS-based Spatial Estimation and Mapping of Private Demands for Vaccination Programs: Evidence from Lingchuan County, China. the annual conference for the Association of Collegiate Schools Planning, Poster presentation, Kansas City, Missouri, USA, October 27-30, 2005.
11. Kim, D.; Andersen, M.E. and Nylander-French, L.A.: Estimation of Human Skin Permeability Coefficients of Jet Fuel Components In Vivo. Society of Toxicology Annual Meeting, San Diego, CA, March 5-9, 2006.
12. Lee, S.J. and Serre, M.L.: Modeling the uncertainty associated with the observation scale of space/time natural processes, American Geophysical Fall Meeting, Oral presentation, San Francisco, California, USA, December 05-09, 2005.
13. Leith, D; Wagner, J.; Peters, T.; Casuccio, G. and Merrifield, T.: Collection and Characterization of PM2.5, PM10, and PMC Particles Using a Passive Air Sampler. AAAR Annual Meeting, Austin TX, October 2005.
14. Leith, D; Wagner, J.; Peters, T.; Casuccio, G. and Merrifield, T.: Passive Sampler for Aerosol Particles. EPA CASAC Committee, October 2005.
15. Liljelind, I.; Nylander-French, L.A. and Eriksson, K.: Tape-strip method can be used to measure exposure of ethyleneglycol dimethacrylate (EGDMA) among dental technicians. Swedish Occupational and Environmental Medicine Spring Meeting, Umeå, Sweden, April 26-28, 2006.
16. LoBuglio, J.N.; Characklis, G.W. and Serre, M.L.: Utilizing Spatiotemporal Random Field Theory and Uncertain Information to Assess and Reduce Monitoring Cost for Surface Waters Subject to TMDLs, World Environmental and Water Resources Congress 2006, Oral presentation, Omaha, Nebraska, USA, May 21-25, 2006.
17. Money, E.; Akita, Y.; Carter, G. and Serre, M.L.: Space/Time Assessment Of Water Quality Along The River Network In New Jersey, American Geophysical Fall Meeting, Poster presentation, San Francisco, California, USA, December 05-09, 2005.

18. Money, E.; Serre, M.L. and Carter, G.: Incorporation of a River Distance Metric to Account for the Spatial Correlation of Monitoring Data in the Geostatistical Estimation of Water Quality Along Rivers. American Geophysical Union Joint Assembly, Oral Presentation, Baltimore, Maryland, USA, May 23-26, 2006.
19. Nylander-French, L.A.: Xenobiotic Bioavailability: The Importance of Dermal Exposure, Bioavailability Workshop, Superfund Basic Research Program, Elizabeth, NJ, 9-11 November, 2005.
20. Nylander-French, L.A.: Dermal Exposure: Moving Beyond Qualitative Assessment, Yale School of Medicine, Occupational and Environmental Medicine, New Haven, CT, 26 January, 2006.
21. Nylander-French, L.A.: Dermal Exposure: Moving Beyond Qualitative Assessment, Swedish Occupational and Environmental Medicine Spring Meeting, Umeå, Sweden, April 26-28, 2006.
22. Nylander-French, L.A.: Dermal Exposure: Moving Beyond Qualitative Assessment, VII International Scientific Conference "Current and Future Challenges in Environmental Health, Toxicology, and Food Safety in Eastern and Central Europe", Kyiv, Ukraine, May 2-5, 2006.
23. Rappaport, S.M: Variability of Exposures of Construction Workers, Center to Protect Workers' Rights, Silver Spring, MD, 27 July, 2005.
24. Rappaport, S.M: An Overview of Statistical Approaches to Assessing Chemical Exposures, American Statistical Association Annual Meeting, Minneapolis, MN, 10 August, 2005.
25. Rappaport, S.M: Using Biomarkers to Define the Human Metabolism of Benzene, School of Public Health, University of California, Berkeley, CA, 12 September, 2005.
26. Rappaport, S.M: Air Samples versus Biomarkers for Epidemiology, Epidemiology Branch, National Institute for Environmental Health Sciences, Research Triangle Park, NC, 21 November, 2005.
27. Rappaport, S.M: Using Biomarkers to Define Human Benzene Metabolism, Annual Science Retreat, Division of Extramural Research and Training, National Institute for Occupational Health, Wilmington, CC, 1 December, 2005.
28. Rappaport, S.M: Are biomarkers better measures of exposure than air samples for epidemiology studies?, Symposium of the U.K. Molecular Epidemiology Group, Imperial College London, U.K., 8 December, 2005.
29. Rappaport, S.M: Are biomarkers better measures of exposure than air samples for epidemiology studies?, Bilateral French-American Workshop on Biomarkers, Office of Science and Technology, Embassy of France in the United States, Charleston, SC, 17 January, 2006.
30. Rappaport, S.M: Dose-related Metabolism of Benzene As Determined with Human Biomarkers, Laboratory of Pharmacology & Chemistry, National Institute of Environmental Health Sciences Research Triangle Park, NC, 26 January, 2006.
31. Rappaport, S.M: Air Samples versus Biomarkers for Epidemiology, U.S. Environmental Protection Agency, HEASD, Research Triangle Park, NC, 1 March, 2006.
32. Serre, M.L.; Lee, S.J.; Money, E. and Akita, Y.: Integrating Multiple Source Data Uncertainty for Spatiotemporally Distributed Hydrological Systems, American Geophysical Fall Meeting, Poster presentation, San Francisco, California, USA, December 05-09, 2005.
33. Serre, M.L. and Hampton, K.: A Spatial Analysis Framework Adjusting For Sampling Variability And Observation Scale Effects In Disease And Health Disparity Mapping, The Seminar Series On Methods In Health Disparities Research, The Cecil Sheps Center For Health Services Research, Invited talk, Chapel Hill, North Carolina, USA, January 13, 2006.
34. Serre, M.L.: Integrating Multiple Source Data for the Water Quality Assessment of River Networks using a Geostatistical Bayesian Maximum Entropy Framework with River Metric, IHR seminar series, Invited talk, IIRH- Hydroscience & Engineering, the University of Iowa, Iowa City, IA, USA, April 14, 2006.
35. Serre, M.L.; Akita, Y. and Carter, G.: Assessing Surface Water Quality in New Jersey: Using GIS, spatio-temporal Geostatistics, and BME. A One-day Application Development Session at the New Jersey Department of Environmental Protection, Trenton, NJ, USA, May 15, 2006.
36. Sommerlatt, D.; Leith, D. and Boundy, M.: Passive Sampler for Coarse Mode Aerosol. AAAR Annual Meeting, Austin TX, October 2005.
37. Thomasen, J. *; Fent, K. *; Leith, D. and Nylander-French, L.A.: Characterizing the errors associated with two-stage filter cassettes designed to separate isocyanate vapor and aerosols. American Industrial Hygiene Conference and Exposition, Chicago, IL, May 13-18, 2006.

38. Wagner, J.; Leith, D.; Casuccio, G.; Merrifield, T.; Peters, T. and Willis, B.: Passive Aerosol Sampler for Characterization, Ambient Concentration, and Particle Size Measurement. USEPA Symposium, Durham NC, May 2006.
39. Wang, Z.-M. and Leith, D.: Comparison of Active and Passive Samplers for Monitoring Ambient Air. AAAR Annual Meeting, Austin TX, October 2005.
40. Willis, R.; Leith, D.; Merrifield, T.; Wagner, J.; Casuccio, G.; Cowley, C.; Conner, T. and Peters, T.: Evaluation of PM10, PM2.5 and PM10-2.5 Measurements using a Passive Particulate Sampler. USEPA Symposium, Durham NC, May 2006
41. Yeatts, K.B.; Lee, S.-J. and Serre, M.L.: Spatial Distribution of Wheezing Prevalence and Airborne Lead Levels Across Rural and Urban Areas of North Carolina, Seventeenth Conference of the International Society for Environmental Epidemiology, Poster presentation, Johannesburg, South Africa, September 13-16, 2005.

OCCUPATIONAL HEALTH NURSING PROGRAM PRESENTATIONS

- 07/05 "Back to the Future: Case Management with a Fresh Look"
25rd Annual National Workers' Compensation and Occupational Medicine Seminar, Seak, Inc. Cape Cod, Hyannis, MA
- 08/05 "OSHA", "Case Management", "Hearing Conservation", "Recordkeeping" & "Health Education & Wellness Counseling"
28th Annual Occupational Safety and Health Summer Institute; 19th Annual Review Course for Occupational Health Nurses
Marco Island, FL
- 10/05 "The Occupational Setting for Delivery of Public Health Nursing" and "Hurricane Katrina, Public and Occupational Health Concerns"
Community Health Nursing Class
University of North Carolina @ Chapel Hill School of Nursing
Chapel Hill, NC
- 10/05 "Bloodborne Pathogens" ENVR 137—Occupational Safety and Ergonomics
- 10/05 "Professional Issues in Nursing"
Florida Occupational Health Conference 2005
St. Pete's Beach, FL
- 11/05 "OSHA and Other Key Regulatory Issues"
19th Annual OHN: An Introduction to Principles and Practice
North Carolina Occupational Safety and Health Education and Research Center
Chapel Hill, NC
- 11/05 "Roles of the OHN/OHN Resources"
18th Annual Occupational Health Nursing: Introduction to Basic Principles.
- 01/06 "The OHN as an Interdisciplinary Team Member"
Occupational Safety Engineering Class, IE 741
North Carolina State University
Raleigh, NC
- 01/06 "Health Services Delivery Systems", "Finance and Funding", & "Return to Work"
Case Management Review
Amelia Island, FL
- 01/06 "OSHA", "Recordkeeping" "Case Management", "Hearing Conservation" & "Health Education & Wellness Counseling"
14th Annual Review Course for Occupational Health Nurses
Amelia Island, FL
- 02/06 "What is the Role of the Occupational and Environmental Health Nurse in the Public Health Arena?"
Community Health Nursing Class
University of North Carolina @ Chapel Hill School of Nursing
Chapel Hill, NC

- 04/06 "Importance of Organizations"
Maryland Area Association of Occupational Health Nurses
Timonium, MD
- 06/06 "Development of a Distance Education Program in Occupational Health Nursing: Meeting the Educational Needs of Practitioners"
28th International Congress on Occupational Health (ICOH)
Milan, Italy
- 06/06 "Healthy People in Healthy Places"
Scientific Committee on Occupational Health Nursing (SCOHN)
Milan, Italy
- 06/06 "Evaluation of an Occupational Health Nursing Program through Competency Achievement: On Campus and Distance Education"
28th International Congress on Occupational Health
Milan, Italy
- 06/06 "AAOHN Adopts Policy Governance: Keys to Success"
28th International Congress on Occupational Health
Milan, Italy
- 08/06 "OSHA", "Case Management", "Hearing Conservation", "Recordkeeping" & "Health Education & Wellness Counseling"
29th Annual Occupational Safety and Health Summer Institute; 20th Annual Review Course for Occupational Health Nurses
Marco Island, FL
- 08/06 "Ergonomics and Nursing in Hospital Environments"
10th Anniversary of the UNC Employee Occupational Health Clinic
University of North Carolina at Chapel Hill
Chapel Hill, NC
- 2006 "Legal Nurse Consultant and Professional Organizations"
Legal Nurse Institute, UNC School of Nursing
Chapel Hill, NC
- 2006 "Compliance with Personal Protective"
Equipment Institute of Medicine, National Personal Protective Technology Laboratory Pittsburg, PA
- 2006 "Occupational Health Nursing Certification Review"
University of North Carolina
Marco Island, Florida
- 2006 Keynote Address: NASA 2006 Occupational Health Conference: "Environmental Health Threats: How Ready Are We?"
National Air and Space Administration
Charleston, South Carolina
- 2006 "Pesticide Competency Guidelines"
National Environmental Educational Training Foundation
Washington, D.C., 2006.

- 2006 "Distance Education in Occupational Health Nursing"
International Commission on Occupational Health
Milan, Italy
- 2006 "Occupational Health Disaster in Expert Network"
American Association of Occupational Health Nursing, Expo and Symposium Albuquerque, New Mexico
- 2006 "Keynote Address: Catherine Dempsey Lecture: Environmental Health Threats: How Ready Are We?"
American Association of Occupational Health Nursing, Expo and Symposium Albuquerque, New Mexico
- 2006 "NORA Partnership and Innovative Research Awards."
NIOSH
Washington, D.C.
- 2006 "Ethical Issues in Genetics in Occupational Health"
National Institute for Occupational Safety and Health,
Georgetown University, Washington, D.C.
- 2005 "Occupational Health Nursing Certification Review"
University of North Carolina
Marco Island, Florida
- 2005 "Occupational Health Nursing Basic Principles: Conceptual Framework"
University of North Carolina
Chapel Hill, NC
- 2005 "Women in the Workplace and Health Promotion"
Scientific Committee on Education and Training in Occupational Health, ICOH Strasbourg, France
- 2005 "Distance Learning in Educational and Training in Occupational Health"
Scientific Committee on Education and Training in Occupational Health, ICOH Strasbourg, France
- 2005 "Occupational Health Nursing Certification Review,"
University of North Carolina
Marco Island, Florida
- 2005 "The Importance of Pediatric Environmental Health"
PEHSU Annual Meeting
Washington, D.C.
- 2005 "Case Management with a Fresh Look"
SEAK
Cape Cod, MA, 2005

OCCUPATIONAL SAFETY AND ERGONOMICS PROGRAM PRESENTATIONS

Shin, Nance and Mirka (2005) "Differences in Trunk Kinematics and Ground Reaction Forces Between Older and Younger Adults During Lifting", Proceedings of the Human Factors and Ergonomics Society 49th Annual Meeting, pp.177-181.

Jiang, Shin, Freeman, Reid and Mirka (2005) "Lifting Performed on Laterally Slanted Ground Surfaces", Proceedings of the Human Factors and Ergonomics Society 49th Annual Meeting, 1325-1329.

Kelagher, Mirka and Sommerich (2005) "The Effects of Fatigue from Repeated Trunk Extensions on Trunk Muscle Activity", Proceedings of the Human Factors and Ergonomics Society 49th Annual Meeting, pp. 1315-1319

Shin, Mirka and Loba (2005) "Viscoelastic Responses of Lumbar Spine During and After Prolonged Stooping", Proceedings of the Human Factors and Ergonomics Society 49th Annual Meeting, pp.1269-1273.

Segall, N., Green, R. S. and Kaber, D. B. (2006). User, robot and automation evaluations in high throughput biological screening processes. In Proceedings of the 2006 ACM Conference on Human-robot Interaction (HRI 06) (pp. 274-281). New York: ACM.

Steinfeld, A., Fong, T., Kaber, D. B., Lewis, M., Scholtz, J., Schultz, A. and Goodrich, M. (2006). Common metrics for human-robot interaction. In Proceedings of the 2006 ACM Conference on Human-robot Interaction (HRI 06) (pp. 33-40). New York: ACM.

Ma, R., Kaber, D. B. and Sheik-Nainar, M. A. (2005). Situation awareness in driving while using adaptive cruise control and a cell phone. In Proceedings of the 49th Annual Meeting of the Human Factors and Ergonomics Society (pp. 381-385). Santa Monica, CA: Human Factors and Ergonomics Society.

Sheik Nainar, M. A. and D. B. Kaber (2005). Virtual reality locomotion interface for the study of gait kinematics. In Proceedings of the 11th International Conference on Human-computer Interaction (Vol. 9, "Advances in Virtual Environments Technology: Musings on Design, Evaluation, & Applications").

Riley, J. M. and D. B. Kaber (2005). Assessing the relationship of situation awareness and subjective telepresence in virtual landmine disposal simulation. In Proceedings of the 11th International Conference on Human-computer Interaction (Vol. 9, "Advances in Virtual Environments Technology: Musings on Design, Evaluation, & Applications").

Kaber, D. B., Riley, J. M., Lampton, D. & Endsley, M. R. (2005). Measuring situation awareness in a virtual urban environment for dismounted infantry training. In Proceedings of the 11th International Conference on Human-computer Interaction (Vol. 9, "Advances in Virtual Environments Technology: Musings on Design, Evaluation, & Applications").

OCCUPATIONAL EPIDEMIOLOGY PROGRAM PRESENTATIONS

Martin SL, Sanford C, Marshall SW, Coyne-Beasley T, Waller A, Cook PJ, Norwood T, Demissie Z. Violent deaths in North Carolina. Comparison of female and male suicides and homicides. To be presented at the annual meeting of the American Public Health Association on November 8, 2006 in Boston, MA.

Trent CB, Loomis D. Indirect adjustment for smoking: issues in a retrospective occupational cohort study on lung cancer. Presented at Epicoh 2005, Bergen, Norway, September 2005. Occup Environ Med 2005;62:e34:4.

HEALTH SERVICES RESEARCH IN OCCUPATIONAL SAFETY AND HEALTH PROGRAM PRESENTATIONS

- Arozullah, A., **Lee, S.**, Kim, J., & Lee, T. Is Health Literacy Level Predictive of Prescription Filling Behavior or Medication Adherence? Presented at the Society of General Internal Medicine, April 2006, Los Angeles, CA
- Butterfield, M., Stechuchak, K., Olsen, M., Strauss, J., Zervakis, J., O'Loughlin, S., Roland, J., Swartz, M., Oddone, E., & **Weinberger, M.** Adverse Impact of Involuntary Hospitalization on Perceptions of Psychiatric Care in Veterans. Presented at the VA HSR&D Annual Meeting, 2006, Washington, DC
- Cho, Y., **Lee, S.**, Arozullah, A., & Crittenden, K. Examining the Mechanisms of How Health Literacy Relates to Health Status and Health Service Utilization Among Medicare Enrollees, Presented at the American Public Health Association, November 2005, New Orleans, LA
- Crittenden, K., **Lee, S.**, Cho, Y., & Arozullah, A. Explaining the Gender Gap in Depressive Symptoms Among the Elderly. Presented at the North Carolina Conference on Aging, October 2005, New Bern, NC
- Lee, S.**, & Alexander, J. "Does Governance Matter? Board Configuration and Hospital Performance. Presented at the Academy of Management meeting, August 2006, Atlanta, GA
- Lee, S.**, Arozullah, A., Cho, Y., & Crittenden, K. The Interactive Effect of Health Literacy and Social Support on Health Status Among Medicare Enrollees. Presented at the AcademyHealth Annual Research Meeting, June 2006, Seattle, WA
- Lee, S.**, Arozullah, A., Cho, Y., & Crittenden, K. Health Literacy, Social Support, and Health Status Among Medicare Enrollees in an Inter-City Neighborhood. Presented at the American Public Health Association meeting, November 2005, New Orleans, LA
- Masselink, L.E., K.T.R., **Lee S.** Workplace Integration Among International and U.S. Medical Graduates. Presented (poster) at the AcademyHealth Annual Research Meeting, June 2006, Seattle, WA
- Randolph, S.A.** Bloodborne Pathogens. Presented at the ENVR 137—Occupational Safety and Ergonomics, UNC-Chapel Hill, October 10, 2005.
- Randolph, S.A.** Professional Issues in Nursing. Presented at the Florida Occupational Health Conference 2005, October 15, 2005, St. Pete's Beach, FL
- Randolph, S.A.** Roles of the OHN/OHN Resources. Presented at the 18th Annual Occupational Health Nursing: Introduction to Basic Principles., November 8, 2005, Chapel Hill, NC
- Randolph, S.A.** Importance of Organizations. Presented at the Maryland Area Association of Occupational Health Nurses, April 5, 2006, Timonium, MD
- Randolph, S.A.** Healthy People in Healthy Places. Presented at the Scientific Committee on Occupational Health Nursing (SCOHN), June 10, 2006, Milan, Italy
- Randolph, S.A.** Evaluation of an Occupational Health Nursing Program through Competency Achievement: On Campus and Distance Education. Presented at the 28th International Congress on Occupational Health, June 13, 2006, Milan, Italy
- Randolph, S.A.** AAOHN Adopts Policy Governance: Keys to Success. Presented at the 28th International Congress on Occupational Health, June 14, 2006, Milan, Italy

- Ricketts, T.** Supply of Physicians: Methodology and Policy Issues. Presented at the Association of Academic Medical Centers Physician Research Conference, Washington, DC
- Ricketts, T.** Recruitment and Retention of Physicians in Rural Areas. Presented at the Association of American Medical Colleges Council of Academia Societies Meeting, March 2006, Miami, FL
- Ricketts, T.** Conceptualizing and Measuring Access to Care (inaugural lecture). Presented at the Program in Quality and Patient Outcomes, October 2005, Chapel Hill, NC
- Ricketts, T.** Trends in North Carolina Physician Supply. Presented at the 5th Annual Small & Rural Hospital Conference, November 2005, Charlotte, NC
- Rogers, B.** Legal Nurse Consultant and Professional Organizations. Presented at the Legal Nurse Institute, 2006, UNC-Chapel Hill, NC
- Rogers, B.** Compliance with Personal Protective Equipment. Presented at the Institute of Medicine, National Personal Protective Technology Laboratory, 2006, Pittsburgh, PA
- Rogers, B.** Occupational Health Nursing Certification Review, UNC-Chapel Hill, 2006, Marco Island, FL
- Rogers, B.** Keynote Address: Environmental Health Threats: How Ready Are We? Presented at the NASA 2006 Occupational Health Conference, NASA, 2006, Charleston, SC
- Rogers, B.** Pesticide Competency Guidelines. Presented at the National Environmental Educational Training Foundation, 2006, Washington, DC
- Rogers, B.** Distance Education in Occupational Health Nursing. Presented at the International Commission on Occupational Health, June 2006, Milan, It
- Rogers, B.** Occupational Health Disaster Expert Network. Presented at the AAOHN Symposium and Expo, May 2006, Albuquerque, NM
- Rogers, B.** Catherine Dempsey Keynote Address: Environmental Health Threats: How Ready Are We? Presented at the AAOHN Symposium and Expo, May 2006, Albuquerque, NM
- Rogers, B.** NORA Partnership and Innovative Research Awards. Presented at the NIOSH NORA Symposium, April 2006, Washington, DC
- Rogers, B.** Ethical Issues in Genetics in Occupational Health. Presented at NIOSH, 2006, Georgetown University, Washington, DC
- Rogers, B.** Conceptual Framework. Presented at the Basic OHN Course, UNC-Chapel Hill, 2006, Chapel Hill, NC
- Rogers, B.** Women in the Workplace and Health Promotion. Presented at the Scientific Committee on Education and Training in Occupational Health, ICOH, 2005, Strasbourg, Fr
- Rogers, B.** Distance Learning in Educational and Training in Occupational Health. Presented at the Scientific Committee on Education and Training in Occupational Health, ICOH, 2005, Strasbourg, Fr
- Ruiz, R., Bender, D., **Lee, S.**, & Mayer, M. Metabolic Syndrome and Mexican American Adolescents: Deciphering the Role of Acculturation (Poster). Presented at the National Research Service Award (NRSA) Trainees Research, June 2006, Seattle, WA

Ruiz, R., Bender D., **Lee, S., Norton, E.C.**, Mayer, M., & Ammermann. Cultural and Lifestyle Determinants of Mexican American Adolescents Risk for Metabolic Syndrome. Presented at the AcademyHealth Annual Research Meeting, June 2006, Seattle, WA

Sheiderich, S., **Lee, S.**, Cho, Y., Crittenden, K., Vicencio, D., & Arozullah, A. Low Health Literacy and Social Support Are Associated with Lower Mammogram Use. Presented at the Society of General Internal Medicine, April 2006, Los Angeles, CA

Staley, J. Crisis and Risk Communication and Management. Developed and taped to be part of PUBH 785, Interdisciplinary Approaches to Occupational Health.

Stanion, C. Occupational Animal Exposure as a Predictor of Allergy and Asthma – Prescription Drug Claims, NORA Symposium, April 19, 2006, Washington, DC

Stearns, S., Park, J., Rozier, G., Talekar, B., & Quinonez, R. Evaluating Cost Effectiveness of Preventive Medicaid Dental Treatments by Physicians with Selective Participation. Presented at the American Society of Health Economists meeting, June 2006, Madison, WI

Stearns, S., Konetzka, T., & Park, J. The Staffing-Outcomes Relationship in Nursing Homes. Presented at the American Society of Health Economists Inaugural Conference, June 2006, Madison, WI

Talekar, B., Rozier, R. & **Stearns, S.** Use of Patient Records to Supplement Medicaid Claims Data. Presented at the IAADR/CADR 84th General Session, Orlando, FL

Wang, H., **Norton, E.C.**, & Rozier, R. The Effects of SCHIP on Dental Care Access and Use. Presented at the IAADR/CADR 84th General Session, Orlando, FL

APPENDIX D
UPDATED DATA TABLES

ERC Applicant Institution: University of North Carolina at Chapel Hill
 Program Director: Nylander-French, L.A.
 Discipline: Industrial Hygiene

Table 4a
Academic Training Report
Previous Budget Period: July 1, 2005 to June 30, 2006

Degree Awarded	How Does Degree Read?	# Full-Time Trainees Enrolled ¹	# Full-Time NIOSH-Supported Trainees	# Part-Time Trainees Enrolled	# Part-Time NIOSH-Supported Trainees	# Other Trainees Taking OS&H Courses ²	# Trainees Graduated
Baccalaureate/associate degree							
Master's degree							
MS	Master of Science	0	0	2	0	0	0
MSPH	Master of Science in Public Health	5	4	2	0	0	1
MSEE	Master of Science in Environmental Engineering	1	1	0	0	0	1
Doctorate degree							
Ph.D.	Doctor of Philosophy	16	1	0	0	0	5
Post-doctoral (Include formally registered Occupational Medicine residents in all years of the residency.) ³							
		1	0	0	0	0	
Other (specify, e.g., undergraduate Certificate program trainees)							

Refer to: Supplemental Instructions, page 10.

¹ Trainee counts include all students in the approved programs.

² Does not include trainees counted in any of the full-time or part-time categories

³ In this case, there may be double counting between Doctorate degree and Post-doctoral categories.

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Bonnie Rogers
Discipline: Occupational Health Nursing

Table 4a
Academic Training Report
Previous Budget Period: July 1, 2005 to June 30, 2006

Degree Awarded	How Does Degree Read?	# Full-Time Trainees Enrolled¹	# Full-Time NIOSH-Supported Trainees	# Part-Time Trainees Enrolled	# Part-Time NIOSH-Supported Trainees	# Other Trainees Taking OS&H Courses²	# Trainees Graduated
Baccalaureate/associate degree							
Master's degree							
MPH	Master of Public Health w/OHN Concentration	0	0	16	16	0	5
MS	Master of Science in PH Nursing	2	2	0	0	0	1
Doctorate degree							
Post-doctoral (Include formally registered Occupational Medicine residents in all years of the residency.) ³							
Other (specify, e.g., undergraduate Certificate program trainees)							

Refer to: Supplemental Instructions, page 10.

¹ Trainee counts include all students in the approved programs.

² Does not include trainees counted in any of the full-time or part-time categories

³ In this case, there may be double counting between Doctorate degree and Post-doctoral categories.

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Gary Mirka
Discipline: Safety and Ergonomics

Table 4a
Academic Training Report
Previous Budget Period: July 1, 2005 to June 30, 2006

Degree Awarded	How Does Degree Read?	# Full-Time Trainees Enrolled¹	# Full-Time NIOSH-Supported Trainees	# Part-Time Trainees Enrolled	# Part-Time NIOSH-Supported Trainees	# Other Trainees Taking OS&H Courses²	# Trainees Graduated
Baccalaureate/associate degree							
Master's degree							
MS	Master of Science in Industrial Engineering	7	5	0	0	9	3
MIE	Master of Industrial Engineering	3	1	0	0	6	1
Doctorate degree							
PhD	Doctor of Philosophy	12	0	0	0	7	2
Post-doctoral (Include formally registered Occupational Medicine residents in all years of the residency.) ³							
Post-Doc		1	0	0	0	0	N/A
Other (specify, e.g., undergraduate Certificate program trainees)							

Refer to: Supplemental Instructions, page 10.

¹ Trainee counts include all students in the approved programs.

² Does not include trainees counted in any of the full-time or part-time categories

³ In this case, there may be double counting between Doctorate degree and Post-doctoral categories.

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Dana Loomis
Discipline: Occupational Epidemiology

Table 4a
Academic Training Report
Previous Budget Period: July 1, 2005 to June 30, 2006

Degree Awarded	How Does Degree Read?	# Full-Time Trainees Enrolled¹	# Full-Time NIOSH-Supported Trainees	# Part-Time Trainees Enrolled	# Part-Time NIOSH-Supported Trainees	# Other Trainees Taking OS&H Courses²	# Trainees Graduated
Baccalaureate/associate degree		0	0	0	0	0	0
Master's degree		0	0	0	0	0	0
Doctorate degree							
PhD	Doctor of Philosophy	10	2	0	0	0	0
Post-doctoral (Include formally registered Occupational Medicine residents in all years of the residency.) ³							
Other (specify, e.g., undergraduate Certificate program trainees)							

Refer to: Supplemental Instructions, page 10.

¹ Trainee counts include all students in the approved programs.

² Does not include trainees counted in any of the full-time or part-time categories

³ In this case, there may be double counting between Doctorate degree and Post-doctoral categories.

ERC Applicant Institution: University of North Carolina-Chapel Hill
Program Director: Bonnie Rogers
Discipline: HSROSH

Table 4a
Academic Training Report
Previous Budget Period: July 1, 2005 to June 30, 2006

Degree Awarded	How Does Degree Read?	# Full-Time Trainees Enrolled¹	# Full-Time NIOSH-Supported Trainees	# Part-Time Trainees Enrolled	# Part-Time NIOSH-Supported Trainees	# Other Trainees Taking OS&H Courses²	# Trainees Graduated
6Baccalaureate/associate degree							
Master's degree							
Doctorate degree							
PhD	Doctor of Philosophy	4	4	0	0	0	0
Post-doctoral (Include formally registered Occupational Medicine residents in all years of the residency.) ³							
Other (specify, e.g., undergraduate Certificate program trainees)							

Refer to: Supplemental Instructions, page 10.

¹ Trainee counts include all students in the approved programs.

² Does not include trainees counted in any of the full-time or part-time categories

³ In this case, there may be double counting between Doctorate degree and Post-doctoral categories.

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12a
CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Program Area: Continuing Education

Course/Seminar Title ¹	Program Area	Total Trainees	Length of Course	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
Respiratory Fit Test	IH	3	0.5	1.5			3			3						
Respiratory Fit Test	IH	3	0.5	1.5			3			2		1				
CIH Review	IH	12	4.5	54			8	4		7	1	1	1		2	
CIH Review	IH	14	4.5	63			14			8	4				2	
Respiratory Protection	IH	10	4.5	45			6	2	2	4	4				2	
Occupational Hygiene Sampling	IH	6	4.5	27			1	5		6						
Fundamentals of Industrial Hygiene	IH	8	4.5	36	2	2	1	3		6	1		1			
Indoor Air Quality	IH	5	2.5	12.5	1		2	2		4	1					
Radiation Protection	IH	5	2.5	12.5	1		3	1		4			1			
Indust. Ventilation - Practitioners	IH	8	2.5	20	1		6	1		6	2					
Respiratory Protection	IH	8	4.5	36	1	1		3	3	3	3	2				
Risk Assessment	IH	5	2.5	12.5		0	2	2	1	3	1	1				
Fundamentals of Industrial Hygiene	IH	10	4.5	45			6	2	2	3	2	2	2		1	
Occupational Hygiene Sampling	IH	5	4.5	22.5			3	2		2	3					
Indoor Air Quality	IH	12	2.5	30		1	4	7		5	4	2	1			
Subtotal IH	15 courses	114	50	419	6	4	62	34	8	66	26	9	6	0	7	0

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12a
CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Program Area: Continuing Education

Course/Seminar Title ¹	Program Area	Total Trainees	Length of Course	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
Respiratory Protection for Nurses	OHN	7	0.5	3.5		7					5	1		1		
OHN: Intro to Principles & Practice	OHN	18	2.5	45		18					13	1	3	1		
NCAOHN Conference (Spring 2006)	OHN	112	3	336		111		1			85	6	7	9		5
NCAOHN Conference (Fall 2005)	OHN	108	2	216		107			1		91	2	5	5		4
OHN Certification Review	OHN	10	2.5	25	2	8					5	3				2
OHN Certification Review	OHN	55	2.5	137.5		55					40	5	5			5
Pulmonary Function	OHN	4	2.5	10		4					3					1
Pulmonary Function	OHN	3	2.5	7.5	1	1			1		2			1		
Subtotal OHN	8 courses	317	18	781	3	311	0	1	2	244	18	20	17	0	17	1
COEMA Conference	OM	28	1.5	42	26	2					18		7			2
VA COEM Conference	OM	50	1	50	40	3	3	3	1		30	5	5	5		5
Subtotal OM	2 courses	78	3	92	66	5	3	3	1	48	5	12	5	0	7	1

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12a
CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Program Area: Continuing Education

Course/Seminar Title ¹	Program Area	Total Trainees	Length of Course	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
CSP Review	OS	5	4.5	22.5			1	4		4			1			
CSP Review	OS	7	4.5	31.5			2	5		4		2			1	
Lock Out/Tag Out	OS	19	0.5	9.5				19		19						
Lab Safety	OS	6	2.5	15		1	2	2	1	5					1	
Ergo for Prod. Fac.	OS	9	2.5	22.5	1			7	1	7	2					
Fund. Of Occ Safety	OS	11	4.5	49.5		1	1	9		8	2	1				
Ergo in Workplace	OS	9	2.5	22.5				3	6	7	2					
OSHA Elect. Safety	OS	13	2.5	32.5				3	10	10	2	1				
Comply with OSHA	OS	9	4.5	40.5	1			7	1	5	4					
Safety & Health Systems Audit	OS	10	2.5	25				1	8	7	2				1	
Safety Inspect & Auditing	OS	11	2.5	27.5				1	7	6	4				1	
Managing Contractors 10 hrs	OS	12	2.5	30		1		10	1	6	5				1	
Lab Safety	OS	11	2.5	27.5	1		1	8	1	8	1	1			1	
Ergo for Prod. Fac.	OS	9	2.5	22.5		1	2	4	2	5	4					
Ergo in Workplace	OS	8	2.5	20				1	7	7	1					
Comply with OSHA	OS	17	4.5	76.5	1	1	1	13	1	14	1	2				
Fund. Of Occ Safety	OS	5	4.5	22.5				4	1	5						
Subtotal OS	18 courses	171	53	498	4	5	19	130	13	127	30	7	1	0	6	0

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12a
CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Program Area: Continuing Education

Course/Seminar Title ¹	Program Area	Total Trainees	Length of Course	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
HAZWOP Incident Command	HST	10	1	10					10	10						
Hazard. Waste	HST	8	1	8					8	1		7				
HAZWOP Incident Command	HST	8	2	16					8				8			
40-Hr HAZWOP	HST	7	4	28			1		6	6			1			
8 Hr HAZWOP Ref.	HST	5	1	5					5			5				
HAZWOP Incident Command	HST	16	2	32					16				16			
Environmental Regs	HST	14	4.5	63		1	4	7	2	10	3				1	
Environmental Health	HST	7	4.5	31.5			1	6		4		2	1			
Confined Space	HST	9	2.5	22.5			1	7	1	5	4					
Mold Assess/Remed.	HST	8	2.5	20		3	2	2	1	3	3		2			
CHMM Certific. Rev.	HST	14	3.5	49			5	3	6	8	3	1	2			
Clandestine Meth Labs - NC PHRST	HST	96	1	96	8	10	28	29	21	24	5	28	39			
Biosafety for OSH	HST	10	2.5	25	1	0	1	6	2	5	3				2	
Biosafety for OSH	HST	6	2.5	15			4	2		3	3					
Haz. of Meth Labs - Durham Cnty SWM	HST	132	.5	61					132				132			
Subtotal HST	15 Courses	350	35	482	9	14	47	62	218	79	24	43	201	0	3	0

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12a
CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Program Area: Continuing Education

Course/Seminar Title ¹	Program Area	Total Trainees	Length of Course	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
NIOSH 582 (Savannah River)	OTHER	3	4.5	13.5			3				3					
Asb Comp (NC DOL)	OTHER	22	2	44		1	8	7	6			22				
O & M	OTHER	7	2	14			1	2	4	3	1				3	
Asb O & M Ref (UNC Fac)	OTHER	3	1	3					3			3				
Asb Aware (Cummins)	OTHER	10	2.5	2.5			1		9	10						
AHERA Sup. Ref.	OTHER	27	1	27		1	8	4	14	16	1	1	2		7	
Asb Sup. Ref.	OTHER	24	1	24		1	8	4	11	19			5			
Sup. Ref. (Ft. Bragg)	OTHER	3	1	3					3	2	1					
Asb Sup. Ref. (Southport)	OTHER	5	1	5					5	5						
AHERA Sup. Ref.	OTHER	22	1	22			13	3	6	11	3	4	2		2	
AHERA Sup. Ref.	OTHER	46	1	46			15	2	29	27	3	4	4		8	
AHERA MP Ref.	OTHER	18	0.5	9	2		5	4	7	8	1	1	6		2	
AHERA MP Ref.	OTHER	25	0.5	12.5		3	5	2	15	12	2		9		2	
AHERA MP Ref.	OTHER	20	0.5	10	2		5	2	11	7	1	3	8		1	
AHERA MP Ref.	OTHER	35	0.5	17.5			12	7	16	18	2	5	9		1	
AHERA BI Ref.	OTHER	71	0.5	35.5			15	9	47	37	3	3	22		6	
AHERA BI Ref.	OTHER	53	0.5	26.5			14	10	29	31	4		16		2	
AHERA BI Ref. (Ft. Bragg)	OTHER	3	0.5	1.5					3	2	1					
AHERA BI Ref. (Southport)	OTHER	3	0.5	1.5					3	3						
AHERA BI Ref.	OTHER	42	0.5	21			10	7	25	20	3	4	13		2	
AHERA BI Ref.	OTHER	75	0.5	37.5			25	13	37	43	5	6	18		3	

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12a
CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Program Area: Continuing Education

Course/Seminar Title ¹	Program Area	Total Trainees	Length of Course	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
AHERA Init. BI	OTHER	6	3	18			2	2	2	3	0	1	1		1	
AHERA Init. BI	OTHER	13	3	39			4	1	8	6	1		5		1	
AHERA Init. MP	OTHER	3	2	6			1		2	1	1	1				
AHERA Init. MP	OTHER	5	2	10			1	1	3		1		4			
AHERA Design. Ref.	OTHER	24	1	24			12	3	9	21		1	2			
AHERA Design. Ref.	OTHER	14	1	14			9	1	4	11	1	1	1			
AHERA Design. Ref.	OTHER	20	1	20			10	1	9	11	2	3	1		3	
Lead Sup. Refresher	OTHER	10	1	10					10	8		1	1			
Math Review	OTHER	8	0.5	4		1	3	4		6	1	1				
Hear Cons Recertific	OTHER	2	1	2		1		1		1	1					
Biosafety	OTHER	7	2.5	17.5			1	4	2	2	1		1		3	
Hear Conserv Certific	OTHER	4	2.5	10		3	1			3					1	
Toxicology	OTHER	6	2.5	15			3	1	2	4	2					
Hear Conserv Recert.	OTHER	1	1	1		1				1						
Biosafety	OTHER	10	2.5	25	1		1	6	2	5	3				2	
Math Review	OTHER	6	0.5	3			2	3	1	3	2	1				
Disaster - Safety & Security	OTHER	8	2.5	20				8		6	1				1	
Hear Conserv Certific	OTHER	9	2.5	22.5	2	3	1	2	1	7			1		1	
Subtotal OTHER	39 courses	673	55	638	7	15	199	114	338	373	51	66	131	0	52	0

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12b
Summary of CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Course/Seminar Title	Program Area	Total Trainees	Total # of Courses	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
Subtotal IH	IH	114	15	419	6	4	62	34	8	66	26	9	6	0	7	0
Subtotal OHN	OHN	317	8	870.5	3	311	0	1	2	244	18	20	17	0	17	1
Subtotal OMR	OMR	78	2	109.5	66	5	3	3	1	48	5	12	5	0	7	1
Subtotal OS	OS	213	18	561	7	9	24	158	15	146	33	12	7	0	13	2
Subtotal HST	HST	350	15	482	9	14	47	62	218	79	24	43	201	0	3	0
Subtotal Ag S&H	Ag S&H	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal Other Category	OT	673	39	635	7	15	199	114	338	373	51	66	131	0	52	0
GRAND TOTALS (All Program Areas)		1,745	97	3,076	98	358	335	372	582	956	157	162	367	0	99	4

Refer to: Supplemental Instructions, page 12.

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 11
Continuing Education Faculty

Faculty Name	Primary Affiliation ¹ [If Academic, include Department]		Role in Proposed CE Program ²
	Discipline	Institution/Employer	
Kathleen Buckheit, MPH, COHN-S/CM	Continuing Education, Occupational Health Nursing	University of North Carolina	HST Director, Faculty
Nelson Couch, PhD, CIH, CSP	Industrial Hygiene Occupational Safety	University of North Carolina NC State University	HST Technical Coordinator, Course Dir., Faculty
Sherry Rigouard, MPH	Epidemiology, Occupational Health Nursing	University of North Carolina, NC Dept. of Health and Human Services	Advisory Board, Course Dir. Faculty
Reginald Jordan, PhD, CIH	Industrial Hygiene Environmental Science	University of North Carolina, NC Dept. of Environment and Natural Resources	Advisory Board, Course Dir. / Faculty
Ray Hackney, PhD, CIH	Industrial Hygiene, Environmental Science	University of North Carolina	Advisory Board, Course Dir. / Faculty
Dennis George, PhD	Environmental Science	Western Kentucky State University	Advisory Board, Faculty
Rod Handy, PhD	Environmental Science	Purdue University	Advisory Board, Course Dir. / Faculty
Scott Harris, PhD	Industrial Hygiene, Environmental Science	USEPA Region 6, Federal On-Scene Coord., Emergency Readiness Team (6SF-RE)	Advisor, Faculty
Gary Greenberg, MD, MPH	Occupational Medicine, Occupational Health Nursing	University of North Carolina	Advisory Board, Course Dir. / Faculty
Wayne Thomann, PhD	Occupational Medicine, Environmental Science	Duke University	Advisory Board, Course Dir. / Faculty
Dennis Darcey, MD, MSPH	Occupational Medicine	Duke University	Advisor
Salvatore DiNardi, PhD	Industrial Hygiene, Environmental Science	University of Massachusetts at Amhearst	Advisory Board, Course Dir. / Faculty
Mary Giguere, MSPH	Industrial Hygiene, Environmental Science	University of North Carolina, NC Dept. of Health and Human Services	Advisory Board
David Lilley, MPH	Industrial Hygiene, Environmental Science	University of North Carolina, NC Dept. of Environment and Natural Resources	Advisory Board
Keith Earnshaw, CIH	Environmental Science	Earnshaw Environmental Consultants	Advisory Board
Jim Husted, CHMM	HAZMAT	Husted and Associates	Course Dir., Faculty
Craig Colton, CSP	Fire Safety, Environmental Science	Firecon, Inc.	Advisory Board, Course Dir. / Faculty
Don Linville, CIH	Industrial Hygiene, Environmental Science	Hepaco, Inc.	Course Dir., Faculty
Robin B. DeHate, MPH, PhD(c), CHMM	Environmental Science, HAZMAT	University of South Florida, GEI Consultants, Inc.	Course Dir., Faculty

Refer to: Supplemental Instructions, page 10.

¹ Industrial Hygiene, Occupational Health Nursing, Agricultural Safety and Health, etc.

² Instructor, speaker, course director, etc.

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12a
CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Program Area: Hazardous Substance Training

Course/Seminar Title ¹	Program Area	Total Trainees	Length of Course	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
HAZWOP Incident Command	HST	10	1	10					10	10						
Hazard. Waste	HST	8	1	8					8	1		7				
HAZWOP Incident Command	HST	8	2	16					8				8			
40-Hr HAZWOP	HST	7	4	28			1		6	6			1			
8 Hr HAZWOP Ref.	HST	5	1	5					5			5				
HAZWOP Incident Command	HST	16	2	32					16				16			
Environmental Regs	HST	14	4.5	63		1	4	7	2	10	3				1	
Environmental Health	HST	7	4.5	31.5			1	6		4		2	1			
Confined Space	HST	9	2.5	22.5			1	7	1	5	4					
Mold Assess/Remed.	HST	8	2.5	20		3	2	2	1	3	3		2			
CHMM Certific. Rev.	HST	14	3.5	49			5	3	6	8	3	1	2			
Clandestine Meth Labs - NC PHRST	HST	96	1	96	8	10	28	29	21	24	5	28	39			
Biosafety for OSH	HST	10	2.5	25	1	0	1	6	2	5	3				2	
Biosafety for OSH	HST	6	2.5	15			4	2		3	3					
Haz. of Meth Labs - Durham Cnty SWM	HST	132	.5	61					132				132			
Subtotal HST	15 Courses	350	35	482	9	14	47	62	218	79	24	43	201	0	3	0

Refer to: Supplemental Instructions, page 10.

¹ Group together by Program Area and provide sub-totals for each Program Area in Table 12b. Add or delete rows as necessary.

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12b
Summary of CE Course Offerings by Program Area
Previous Budget Period: July 1, 2005 to June 30, 2006

Course/ Seminar Title ¹	Program Area	Total Trainees	Total # of Courses	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
					MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
Subtotal IH	IH															
Subtotal OHN	OHN															
Subtotal OMR	OMR															
Subtotal OS	OS															
Subtotal HST	HST	350	15	482	9	14	47	62	218	79	24	43	201	0	3	0
Subtotal Ag S&H	Ag S&H															
Subtotal Other Category	OT															
GRAND TOTALS (All Program Areas)		350	15	482	9	14	47	62	218	79	24	43	201	0	3	0

Refer to: Supplemental Instructions, page 10.
¹ Group together by Program Area and provide sub-totals for each Program Area.

ERC Applicant Institution: University of North Carolina at Chapel Hill
Program Director: Kathleen Buckheit, MPH

Table 12c
CE Course Offerings - Summary by Program Area
Since Beginning of Current Project Period - 7/01/02 - 6/30/06

Program Area	Total # of Trainees	Number of Courses	Total Pers Days	# Trainees by Profession					# Trainees by Employer						
				MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
Industrial Hygiene (IH)															
Occupational Health Nursing (OHN)															
Occupational Medicine (OM)															
Occupational Safety (OS)															
Hazardous Substance Training (HST)	1070	63	2442	22	21	138	187	702	274	105	208	451	6	26	0
Agricultural Safety and Health (Ag S&H)															
Other OS&H, e.g. Tox, Epi, Ergo, Biostat (OT)															
TOTAL	1070	63	2,442	22	21	138	187	702	274	105	208	451	6	26	0