HARVARD EDUCATION AND RESEARCH CENTER FOR OCCUPATIONAL SAFETY AND HEALTH

ANNUAL REPORT
July 1, 2005 – June 30, 2006

SUBMITTED BY:
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II. Introduction and Executive Summary

A. Major Accomplishments

In 2005-6, ERC researchers made significant research progress, reporting findings in high impact peer-reviewed journals. Highlights and abstracts of these discoveries include:

Exhaled breath pH in welders:
OBJECTIVES: We sought to investigate changes in exhaled breath condensate (EBC) pH in healthy workers exposed to welding fumes. METHODS: Fourteen exposed participants (median age 39 years, 5 smokers) and 8 nonexposed controls (median age 44 years, 1 smoker) were monitored at an apprentice welding school. Exposure to fine particulate matter less than 2.5 microm (PM2.5) was assessed using cyclone samplers. EBC samples were collected at baseline and at the end of the work shift. EBC samples were deaerated using argon and pH values were measured using standard pH microelectrodes. RESULTS: Mean +/- SEM PM2.5 levels were 1.17 +/- 0.18 mg/m for exposed subjects and 0.03 +/- 0.01 mg/m for controls. Baseline median (range) EBC pH values for the control and exposed group were similar (P = 0.86), 7.21 (4.91 to 8.26), and 7.39 (4.85 to 7.79), respectively. The exposed subjects had a small-but-marginally significant (P = 0.07) pre- to post-work shift increase in pH of 0.28, whereas the control group showed a minimal increase of only 0.03 (P = 0.56). Compared with the control group, the exposed group had a median cross-shift pH increase of 0.25 (P = 0.49). CONCLUSIONS: The aerosolized fine particulate matter contained in metal fumes may be associated with an acute increase in EBC pH values. Further study is necessary to investigate the acute rise in EBC pH after acute exposure to welding fume. This study was a collaboration with investigators at NIOSH DRDS.

Evidence-based management of acute back pain:
The objective of this study was to explore concurrence with evidence-based management of acute back pain by primary care specialty and years in practice groups. METHODS: Participants randomly selected from five American Medical Association physician groups were surveyed asking their initial care recommendations for case scenarios with and without sciatica. Response differences were compared among groups and with the Agency for Health Research Quality's guideline. RESULTS: Response rate was 25%. Emergency physicians were least likely to order diagnostic studies for both cases but more often made recommendations likely to promote inactivity. Occupational physicians were less likely to order diagnostic studies and more likely choose treatments conducive to increasing activity. The longer physicians were in practice, the less likely they were to follow recommendations. All specialty groups selected more non-evidence-based interventions for the patient with sciatica. General practitioners were least likely to follow the guidelines in either case. CONCLUSIONS: Despite widespread dissemination of acute low back pain guidelines, the study suggests a lack of adherence by certain primary care groups, physicians with more practice experience, and in specific areas of management.

Adverse Effects of Asbestos Exposure and Smoking on Lung Function:
BACKGROUND: Exposure to asbestos is a well-recognized cause of both malignant and nonmalignant diseases of lung parenchyma and pleura. This study was conducted to determine the adverse effects of exposure to asbestos and smoking on pulmonary function. METHODS: Four hundred and sixty-eight workers who were occupationally exposed to asbestos for an average of 13 years were selected from an asbestos-product factory in China. Of them, 85 workers were diagnosed with asbestosis. Additionally, 282 workers who had no experience of exposure to industrial dust were included as a control group. A questionnaire was administered during a face-to-face interview and spirometric maneuvers and single-breath CO diffusing capacity (DL(CO)) were performed. RESULTS: Multivariate regression analysis

showed that exposure to asbestos was more strongly associated with decreased forced vital capacity (FVC) and DL(CO), and asbestosis more strongly associated with decreased FVC, while smoking was a major contributing factor to reduced FEV1/FVC. The results were confirmed by a further analysis where the subjects were grouped exclusively by smoking, asbestos exposure, and chest radiographic changes. No interaction or joint effect was observed between asbestos exposure and smoking. CONCLUSIONS: This analysis suggested that asbestos and smoking might play independent roles, in which asbestos caused mainly a restrictive impairment, and smoking was a major causal factor for airway obstruction in the workers who were intensively exposed to asbestos.

Proteomic Profiling of workers exposed to metals:

Arsenic (As) and lead (Pb) are important inorganic toxicants in the environment. Frequently, humans are exposed to the mixtures of As and Pb, but little is known about the expression of biomarkers resulting from such mixed exposures. In this study, we analyzed serum proteomic profiles in a group of smelter workers with the aim of identifying protein biomarkers of mixed As and Pb exposure. Forty-six male workers co-exposed to As and Pb were studied. Forty-five age-matched male office workers were chosen as controls. Urine As and blood Pb concentrations were determined. Serum proteomic profiles were analyzed by Surface-Enhanced Laser Desorption/Ionization Time-Of-Flight (SELDI-TOF) mass spectrometer on the WCX2 ProteinChip. Using Recursive support vector machine (RSVM) algorithm, a panel of five peptides/proteins (2097 Da, 2953 Da, 3941 Da, 5338 Da, and 5639 Da) was selected based on their collective contribution to the optional separation between higher metal mixture exposure and non-exposure controls. Among these five selected markers, the 3941 Da was down-regulated and the four other proteins were up-regulated. Descriptive statistics confirmed that these five proteins differed significantly between metal exposure and non-exposure. Interestingly, the combined use of the five selected biomarkers could achieve higher discriminative power than single marker. These results demonstrated that proteomic technology, in conjunction with bioinformatics tools, could facilitate the discovery of new and better biomarkers of mixed metal exposure.

Child Labor and Musculoskeletal Disorders in Brazil:

OJECTIVES: This article describes the prevalence of musculoskeletal pain in several anatomic sites in children and teens, and investigates, while adjusting for potential confounders, the association between musculoskeletal pain and back pain and the following: age, gender, sports practice, use of computer/video games/television, school attendance, intensity of involvement in household domestic activities, care of other children, care of sick/elderly family members, work activities, and workloads. METHODS: We conducted a cross-sectional study interviewing 3,269 children aged 10-17 years in the low-income areas of Pelotas, Brazil. RESULTS: The prevalence of pain in the neck, knee, wrist or hands, and upper back exceeded 15%. Workers in manufacturing had a significantly increased risk for musculoskeletal pain (prevalence ratio [PR]=1.31) and for back pain (PR=1.69), while workers in domestic service had 17% more musculoskeletal pain and 23% more back pain than nonworkers. Awkward posture (PR=1.15) and heavy physical work (PR=1.07) were associated with musculoskeletal pain, while monotonous work (PR=1.34), awkward posture (PR=1.31), and noise (PR=1.25) were associated with back pain. CONCLUSIONS: Musculoskeletal pain is common among working children and teens. Knowledge of occupational risk factors can support actions to restructure work conditions to reduce or eliminate childhood exposure to hazardous conditions. Our results suggest that strategies to prevent musculoskeletal disorders in child workers should be developed.

A 20-Year Cohort Study of Respiratory Disease among Cotton Textile Workers in Shanghai:

In order to evaluate chronic effects of long-term exposure to cotton dust on respiratory health, and the role of dust and endotoxin, longitudinal changes in lung function and respiratory symptoms were observed prospectively from 1981 to 2001 in 447 cotton textile workers, along with 472 silk textile controls. The results from five surveys conducted over the 20-yr period are reported, including standardized questionnaires, pre- and post-shift spirometric measurements, work-area inhalable dust sample

collections and airborne Gram-bacterial endotoxin analysis. Cotton workers had more persistent respiratory symptoms and greater annual declines in forced expiratory volume in one second (FEV1) and forced vital capacity as compared with silk workers. After exposure cessation, in the final 5-yr period, the rate of FEV1 decline tended to slow in nonsmoking males, but not in nonsmoking females. Workers who reported byssinotic symptoms more persistently suffered greater declines in FEV1. Chronic loss in lung function was more strongly associated with exposure to endotoxin than to dust. In conclusion, the current study suggests that long-term exposure to cotton dust, in which airborne endotoxin appears to play an important role, results in substantial adverse chronic respiratory effects.

Obesity and Cardiovascular Disease in Firefighters:
OBJECTIVE: Obesity, despite being a significant determinant of fitness for duty, is reaching epidemic levels in the workplace. Firefighters' fitness is important to their health and to public safety. RESEARCH METHODS AND PROCEDURES: We examined the distribution of BMI and its association with major cardiovascular disease (CVD) risk factors in Massachusetts firefighters who underwent baseline (1996) and annual medical examinations through a statewide medical surveillance program over 5 years of follow-up. We also evaluated firefighters' weight change over time. RESULTS: The mean BMI among 332 firefighters increased from 29 at baseline to 30 at the follow-up examination (2001), and the prevalence of obesity increased from 35% to 40%, respectively ($p < 0.0001$). In addition, the proportion of firefighters with extreme obesity increased 4-fold at follow-up (from 0.6% to 2.4%, $p < 0.0001$). Obese firefighters were more likely to have hypertension ($p = 0.03$) and low high-density lipoprotein-cholesterol ($p = 0.01$) at follow-up. Firefighters with extreme obesity had an average of 2.1 CVD risk factors (excluding obesity) in contrast to 1.5 CVD risk factors for normal-weight firefighters ($p = 0.02$). Finally, on average, normal-weight firefighters gained 1.1 pounds, whereas firefighters with BMI > or = 35 gained 1.9 pounds per year of active duty over 5 years of follow-up. DISCUSSION: Obesity is a major concern among firefighters and shows worsening trends over time. Periodic medical evaluations coupled with exercise and dietary guidelines are needed to address this problem, which threatens firefighters' health and may jeopardize public safety.

Occupational Risk Factors Associated with Low Back Pain:
BACKGROUND: Urban taxi drivers differ from other professional drivers in their exposures to physical and psychosocial hazards in the work environment. Epidemiological data on low back pain (LBP) of this occupational group are very scarce. AIMS: To examine LBP in taxi drivers and its association with prolonged driving and other occupational factors. METHODS: We analyzed the cross-sectional data from the Taxi Drivers' Health Study. Standardized instruments were used to collect information on personal factors, work-related physical and psychosocial factors and driving time profiles. LBP prevalence was assessed using the modified Nordic Musculoskeletal Questionnaire. Multiple logistic regression models were employed for statistical analyses. RESULTS: Of 1242 drivers, 51% reported LBP in the past 12 months, significantly ($P < 0.001$) higher than other professional drivers (33%) in Taiwan. After adjusting for the effects of demographic characteristics, lifestyle factors, anthropometric measures and socioeconomic positions, we found that driving time >4 h/day [prevalence odds ratio (POR) 1.78; 95% CI 1.02-3.10], frequent bending/twisting activities while driving (adjusted OR 1.86; 95% CI 1.15-2.99), self-perceived job stress (POR 1.75; 95% CI 1.20-2.55), job dissatisfaction (POR 1.44; 95% CI 1.05-1.98) and registration type were the major occupational factors significantly associated with higher LBP prevalence in taxi drivers. CONCLUSIONS: We have identified that long driving time and several physical and psychosocial factors are associated with high prevalence of LBP in taxi drivers. This should be further investigated in prospective studies. Future studies are needed to examine the potential adverse effects of prolonged exposure to low levels of whole-body vibration.

Exposures to welding fumes and fuel oil ash in workers in boiler overhaul:
The health effects of exposure to vanadium in fuel-oil ash are not well described at levels ranging from 10 to 500 microg/m(3). As part of a larger occupational epidemiologic study that assessed these effects during the overhaul of a large oil-fired boiler, this study was designed to quantify boilermakers' exposures to fuel-oil ash particles, metals, and welding gases, and to identify determinants of these exposures. Personal exposure measurements were conducted on 18 boilermakers and 11 utility workers (referents) before and during a 3-week overhaul. Ash particles < 10 microm in diameter (PM(10), mg/m(3)) were sampled over full work shifts using a one-stage personal size selective sampler containing a polytetrafluoroethylene filter. Filters were digested using the Parr bomb method and analyzed for the metals vanadium (V), nickel (Ni), iron (Fe), chromium (Cr), cadmium (Cd), lead (Pb), manganese (Mn), and arsenic (As) by inductively coupled plasma mass spectrometry. Nitrogen dioxide (NO(2)) was measured with an Ogawa passive badge-type sampler and ozone (O(3)) with a personal active pump sampler.Time-weighted average (TWA) exposures were significantly higher ($p < 0.05$) for boilermakers than for utility workers for PM(10) (geometric mean: 0.47 vs. 0.13 mg/m(3)), V (8.9 vs. 1.4 microg/m(3)), Ni (7.4 vs. 1.8 microg/m(3)) and Fe (56.2 vs. 11.2 microg/m(3)). Exposures were affected by overhaul time periods, tasks, and work locations. No significant increases were found for O(3) or NO(2) for boilermakers or utility workers regardless of overhaul period or task group. Fuel-oil ash was a major contributor to boilermakers' exposure to PM(10) and metals. Vanadium concentrations sometimes exceeded the 2003 American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value.

Exposure to nonpersistent insecticides and male reproductive hormones:
BACKGROUND: Urinary metabolites of several nonpersistent insecticides have been measured in a high percentage of men in the general population, suggesting widespread environmental exposures to these compounds. The present study explored the association of urinary concentrations of 3,5,6-trichloro-2-pyridinol (TCPY), a metabolite of chlorpyrifos and chlorpyrifos-methyl, and 1-naphthol (1N), a metabolite of carbaryl and naphthalene, with serum reproductive hormone levels in adult men. METHODS: Subjects (n = 268) were the male partners in couples presenting to a Massachusetts infertility clinic in years 2000 through 2003. TCPY and 1N were measured in a spot urine sample from each subject and adjusted for dilution using specific gravity. Reproductive hormones (follicle-stimulating hormone, leuteinizing hormone, inhibin B, testosterone, and sex hormone-binding globulin) were measured in serum collected from subjects during the same clinic visit. RESULTS: Multiple linear regression models showed an inverse association between TCPY and testosterone concentration. An interquartile range (IQR) increase in TCPY was associated with a decline of 25 ng/dL (95% confidence interval = -40 to -10) in testosterone concentration. The association appeared to be dose-dependent when exposure was divided into quintiles. The highest TCPY quintile was associated with a testosterone decline of 83 ng/dL (-128 to -39) compared with the lowest TCPY quintile. We also found inverse associations between TCPY and free androgen index and between 1N and testosterone, and suggestive inverse associations between TCPY and leuteinizing hormone and between 1N and free androgen index. CONCLUSION: In adult men, TCPY and 1N were associated with reduced testosterone levels. On a population level, these reductions are of potential public health importance because of widespread exposure to these nonpersistent insecticides

Body mass index and serum 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane in nulliparous Chinese women:
BACKGROUND: Basic health indicators, such as body mass index (BMI), have been associated with serum 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane/1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene (DDT/DDE) levels; however, both positive and inverse associations of BMI with serum DDT/DDE have been reported. Given the association of BMI with a number of outcomes, it may confound studies of DDT/DDE-associated health effects. We investigated the relationship of BMI with serum DDT/DDE accounting for other determinants of exposure among women with relatively recent environmental exposures to DDT. METHODS: Serum DDT/DDE was analyzed in 466 nonsmoking, nulliparous women recruited from Anhui province in China between 1996 and

1998 as part of a reproductive health study of textile workers. The women in the sample were born between 1963 and 1977, 8 to 21 years before China's 1984 DDT ban. We used multivariate linear regression to investigate associations of BMI, age, and birth year with serum DDT/DDE. RESULTS: Mean (SD) serum total DDT concentration was 32 ng/g (17.8 ng/g). Birth year showed an inverse relationship with serum DDT independent of age. Despite limited variability in BMI, there was a consistent inverse relationship between BMI and serum DDT. Specifically, each kg/m(2) increase in BMI was associated with a -1.34 ng/g (95% confidence interval, -2.12 to -0.56 ng/g) decrease in serum total DDT. CONCLUSIONS: There were high total DDT levels in this sample of nulliparous Chinese women relative to Western populations, birth year was more strongly associated with serum DDT than age, and BMI was inversely related to serum DDT in this study.

Smoking imputation and lung cancer in railroad workers exposed to diesel exhaust:
BACKGROUND: An association between diesel exhaust exposure and lung cancer mortality in a large retrospective cohort study of US railroad workers has previously been reported. However, specific information regarding cigarette smoking was unavailable. METHODS: Birth cohort, age, job, and cause of death specific smoking histories from a companion case-control study were used to impute smoking behavior for 39,388 railroad workers who died 1959-1996. Mortality analyses incorporated the effect of smoking on lung cancer risk. RESULTS: The smoking adjusted relative risk of lung cancer in railroad workers exposed to diesel exhaust compared to unexposed workers was 1.22 (95% CI = 1.12-1.32), and unadjusted for smoking the relative risk was 1.35 (95% CI = 1.24-1.46). CONCLUSIONS: These analyses illustrate the use of imputation in record-based occupational health studies to assess potential confounding due to smoking. In this cohort, small differences in smoking behavior between diesel exposed and unexposed workers did not explain the elevated lung cancer risk.

An FTIR investigation of isocyanate skin absorption using in vitro guinea pig skin:
Isocyanates may cause contact dermatitis, sensitization and asthma. Dermal exposure to aliphatic and aromatic isocyanates can occur in various exposure settings. The fate of isocyanates on skin is an important unanswered question. Do they react and bind to the outer layer of skin or do they penetrate through the epidermis as unreacted compounds? Knowing the kinetics of these processes is important in developing dermal exposure sampling or decontamination strategies, as well as understanding potential health implications such exposure may have. In this paper the residence time of model isocyanates on hairless guinea pig skin was investigated in vitro using attenuated total reflectance-Fourier transform infrared (ATR-FTIR) spectrometry. Model isocyanates tested were octyl isocyanate, polymeric hexamethylene diisocyanate isocyanurate (pHDI), polymeric isophorone diisocyanate isocyanurate (pIPDI) and methylenediphenyl diisocyanate (MDI). Isocyanates in ethyl acetate (30 microL) were spiked directly on the skin to give 0.2-1.8 micromol NCO cm(-2) (NCO = -N=C=O), and absorbance of the isocyanate group and other chemical groups of the molecule were monitored over time. The ATR-FTIR findings showed that polymeric isocyanates pHDI and pIPDI may remain on the skin as unreacted species for many hours, with only 15-20% of the total isocyanate group disappearing in one hour, while smaller compounds octyl isocyanate and MDI rapidly disappear from the skin surface (80+% in 30 min). Isocyanates most likely leave the skin surface by diffusion predominantly, with minimal reaction with surface proteins. The significance of these findings and their implications for dermal exposure sampling and isocyanate skin decontamination are discussed.

Exposure of trucking company workers to particulate matter during the winter:
This study analyzed the workplace area concentrations and the personal exposure concentrations to fine particulate (PM2.5), elemental carbon (EC), and organic carbon (OC) measured during the winter period in trucking companies. The averaged personal exposure concentrations at breathing zones of workers are much greater than those of the microenvironment concentrations. The highest difference between the area (microenvironment) and personal exposure concentrations was in the PM2.5 concentrations followed

by the OC concentrations. The area concentrations of PM2.5, EC, and OC at a large terminal were higher than those at a small one. The highest area concentrations of PM2.5, EC, and OC were observed in the shop areas followed by pick-up and delivery (P&D) areas. The area concentrations and personal exposure to PM2.5, EC,

and OC in the shop and P&D areas which are highly affected by diesel engine exhaust emissions were much higher than those in the docks which are significantly affected by liquefied petroleum gas (LPG) engine exhaust emissions. The highest EC fraction to the total carbon (EC + OC) concentrations was observed in the shops, while the lowest one was identified in the offices. The personal exposure of the smoking workers to PM2.5 and OC was much higher than that of the non-smoking workers. However, the smoking might not significantly contribute to the personal exposure to EC. There were significant correlations between the PM2.5 and OC concentrations in both the area and personal exposure concentrations. However, significant correlations between the PM2.5 and EC concentrations and between the OC and EC concentrations were not identified.

In addition to these numerous outstanding research accomplishments, ERC faculty also received the following recognition:

Best Paper Award from *Indoor Air* journal for 2002-2004 presented at Beijing conference of the International Academy of Indoor Air Sciences on September 4, 2005 for authorship of the paper "Risk of indoor airborne infection transmission estimated from carbon dioxide concentration" by S.N. Rudnick and D.K. Milton.

Best Paper, Resident's Section of ACOEM for a paper presented by Dr Amy Neurnberg, Dr. David Christiani and others in the Occupational and Environmental Medicine group on biomarkers of inflammation after acute metal fume exposure at Annual Meeting in May, 2006.

Finally, highlights from our outreach Core involved the following activities. Ann Backus, Director of Outreach, attended the NIOSH Town Hall Meeting on the NORA agenda in Seattle, Washington, January 19, 2006. She provided testimony on the need for regional research centers, and on research agenda topics for the Agriculture, Forestry, and Fishing Sector for the second decade of NORA. She also moderated a session and served on the planning committee with Craig Slatin and David Wegman, UMASS Lowell; Max Lum and Sidney Soderholm of NIOSH; and David Christiani of HSPH for the NIOSH Town Hall Meeting held in Lowell, MA on March 20, 2006.

B. Significant Changes since July 1, 2004 – June 30, 2005

There are no significant changes from the prior reporting period.

C. ERC Website

WWW.hsph.harvard.edu/erc

APPENDIX A
BUDGET SUMMARY

1. NIOSH SUPPORT

The Harvard ERC budget for the 05-06 year was $1,531,354.

2. OTHER EXTERNAL SUPPORT

Liberty Mutual Research Institute for Safety

3. INSTITUTIONAL SUPPPORT

The Harvard School of Public Health supports the program in the following ways:

- For the 05-06 budget year, the School committed $118,041 in resources to the Harvard ERC.
- The School pays malpractice insurance for all the MD's, faculty and medical residents, $5,000 each.
- The School covers library privileges for the Simmons College nurses, $500 each per year.
- The Occupational Health Program, where the Harvard ERC is administered, receives approximately $70,000 per year from the Harvard School of Public Health Center for Continuing and Professional Education. For the 04-05 budget year $80,499, and for the 05-06 budget year, $70,289.
- The Occupational Health Program receives $19,000 in endowment interest from the Alic Hamilton Fund.

A. Program Title

Center Administration

B. Program Director

David C. Christiani, MD, MPH

C. Program Description

The Harvard Education and Research Center has seven academic components: cores in Industrial Hygiene, Occupational Health Nursing, Occupational Medicine, and four special component cores: Occupational Epidemiology, Occupational Injury Prevention and Control, Hazardous Substances Academic Training and Pilot Project Research Training. Each of the three core programs offer curricula leading to masters and doctoral degrees except the nursing core, which does not offer a doctoral program. The Occupational Epidemiology and Injury Prevention components offer doctoral education, and HSAT a master's degree.

During the current academic year, a fifth special component, the Occupational Health Services Research and Training Special Component has been phased out because of a low priority score received on the last competitive renewal.

The Center Administration is responsible for financial management as well as overall educational and scientific direction of the Center. The Center Administration personnel are made up by the Director (Dr. David Christiani), the Deputy Director (Dr. Thomas Smith) and Center Administrator (Ms. Jean Economos).

D. Program Activities and Accomplishments

In addition to providing general direction for the Center, the Administrative Core manages all appointments and reappointments of faculty, staff and students; organizes biweekly meetings with Core/Component directors as part of Center Governance; organizes External Advisory Committee meetings and meetings with the Dean of the faculty to respond to Advisory Committee recommendations; and holds an annual retreat for ERC faculty to facilitate planning and academic coordination for the next year. In addition, the Administrative core, with ERC faculty, organizes ERC seminars, as well as research seminars and Occupational Medicine Grand Rounds.

The ERC is located at the Harvard School of Public Health; Simmons College is an adjacent collaborative academic institution. Both schools are situated in the Fenway-Longwood area of Boston. In addition to courses taken at the two institutions, electives may be taken at other Harvard graduate schools or at the Massachusetts Institute of Technology (MIT) in Cambridge.

Extramural training is offered in a number of locations. All ERC students as part of a required academic course take field trips to local industries. Hospital and industrial sites throughout metropolitan Boston provide practica for occupational health nurses and occupational medicine residents. Industrial hygiene students spend a six-month internship at industrial locations throughout the United States. Occupational medicine residents may rotate through OSHA (Washington, D.C.) and NIOSH (Cincinnati or Morgantown).

A number of formal and informal arrangements with other institutions are integral to the conduct of ERC activities and achievement of the Center's goals. Through activities of the academic programs, the

continuing education program, and the outreach program, the Center has developed close working relationships with a number of regional institutions and organizations. A contractual agreement with Simmons College is in place for the collaborative occupational health nursing program.

All ERC medical faculty interact with colleagues within Harvard or at other institutions. Drs. Christiani, Hu, Kales, Goldman and Monson have joint faculty appointments at the Harvard School of Public Health and at Harvard Medical School. Within the School of Public Health, Drs. Monson, Christiani and Hauser have joint appointments in Epidemiology. Clinical occupational medicine is conducted at Cambridge Hospital, Fallon Clinic, Massachusetts General Hospital, Northeast Specialty Hospital, and Occupational Health and Rehabilitation, Inc. Since the Center does not have a safety training core, a long-standing relationship with safety professionals from the Liberty Mutual Insurance Company has existed. Drs. Albert Mangone, Vincent Ciriello, Ted Courtney, David Lombardi and Thomas Leamon have appointments as visiting lecturers. Each is involved in teaching occupational safety and ergonomics in the academic and continuing education programs.

The continuing education program is both intramural and extramural. The intramural component is offered through the Center for Continuing Professional Education and presents long-standing courses in industrial hygiene and radiological health. It has a stable audience of industrial and governmental professionals. The extramural component is administered by the Center and takes place in Massachusetts and throughout the New England region.

With respect to interdisciplinary interaction, The Harvard ERC has continued to promote program interaction among the ERC components. Such interactions arise from the demonstrated educational needs of individual programs that are complimentary in strength to utilize unique resources of ERC programs of other disciplines. In addition, the long history of the Harvard ERC has given rise to a multi-layered integration of educational, research, and service activities. Interdisciplinary interaction is enhanced by close geographic proximity: all of our component programs except one are found at the Harvard School of Public Health and the one collaborative program with Simmons is close by (1 block) from HSPH.

Collaboration among the ERC is achieved specifically through a variety of methods. Firstly, didactic educational resources are shared for the purpose of providing instruction to NIOSH trainees in the variety of disciplines represented by the ERC component programs. Secondly, ERC component faculty and students are engaged in collaborative research projects. Thirdly, ERC components are involved in interdisciplinary practicum experiences. Fourthly, the ERC component programs work together to promote continuing education and educational development for professionals and non-professionals in occupational health and safety. Lastly, ERC component programs collaborate in outreach activities to constituent communities: professionals, labor, industry, and government.

E. Program Products

Meeting Regional Needs and Evaluation of Impact of Programs Innovative Outreach Initiatives and Response to Regional Needs

Recognizing the diversity, high-level technology, and industrialization in the New England Region, the potential for occupationally related illnesses and injuries is obvious. The role of the advanced practice occupational health nurse in health promotion, disease prevention and control of occupationally related injuries is well documented. In the New England area, there are insufficient numbers of advanced practice occupational health professionals (Physicians, Nurses, IH's, Epidemiologists) being prepared to meet the current and future health care demands of workers in these highly complex work environments, which are now very diverse and include construction, healthcare, manufacturing, biotechnology, offices/services, universities and laboratories, agriculture, transportation, retail, forestry and fisheries.

Measures of Effectiveness

The following table illustrates the overall ERC performance in the areas of NORA research and professional training and outreach in Occupational Safety and Health.

Performance Measure	Target	Actual Performance
Compete successfully for NORA-relevant extramural research funds	3 project grants funded	Exceeded (5 new grants funded).
Maintain trainee number	35 per year	35 this year
Graduate professionals in the multi-disciplinary fields of Occupational Safety and Health	At least 10 masters and doctoral graduates per year	Achieved
Expand Injury Prevention Program	Renew Special Component	Met
Increase publications in NORA-related research in peer-review journals	Minimum of 10	Exceeded target
Electronic data-base and recruitment for Harvard ERC	Develop website	Met
Maintain diversified outreach to key stakeholders	Workers, Management, Unions	Met
Increase Collaboration between Health Promotion and OH Programs	Apply for Center of Excellence (Healthier Workforce)with Faculty of Society, Health and Development	Met
Fund new round of pilot projects	At least 5 new pilots	Exceeded (8 funded).
Track ERC graduates for career progress	1) Track and document masters students who later pursue doctoral training; 2) Institute post-graduation free e-mail access.	1) Met for those who remain at ERC. Created student database. 2) Met. Post-Harvard e-mail not available to all graduates.
Continuing Education course	Develop and complete a new course on chemical terrorism/emergencies.	Met (see CE)

A. Program Title

Industrial Hygiene Core

B. Program Director 2005-2006

Thomas J. Smith, PhD, CIH

C. Program Description

i. Goals and Objectives

The School recognizes the importance of a symbiotic relationship between the research and professional branches of industrial hygiene. The research scientist makes available new evaluation methods, information on hazards, and hazard control applications for the professional. The practitioner anticipates, identifies, evaluates, and effects control of hazards in particular situations. The ERC supports both branches by offering a professional Master of Science in Environmental Health (concentration in Industrial Hygiene) in addition to the Doctor of Science in Environmental Health (concentration in Industrial Hygiene) degree. The principal educational objectives of the industrial hygiene training are:

1. At the master's level our goal is to prepare broadly educated graduates who will practice as creative and competent professional industrial hygienists, and who can develop into leaders in this profession and environmental health in general.
2. To develop graduates who have learned to work effectively with other professional in Occupational Health, and to provide interdisciplinary training for physicians, nurses, and safety specialists.
3. To train researchers in four areas of interest: the assessment of occupational exposures, estimation of dose for epidemiologic studies, evaluation of the effectiveness of intervention strategies and engineering controls.

The workplace is constantly changing and IH researchers must anticipate the needs of the practitioner, who must recognize new hazards and have state-of-the-art hazard evaluation and control strategies.

ii. Responsible Conduct of Science

The Harvard School of Public Health is committed to the conduct of research in an ethical manner. Accordingly, an academic course has been developed that is directed at all students and fellows in doctoral or postdoctoral programs. All students supported by the training grant are required to enroll in HPM 292, Research Ethics. The course reviews a series of ethical issues that arise in the conduct of research. Topics include informed consent, disclosure of conflicts of interest, multiple authorship issues, issues in mentoring, privacy, genetics, gender- and race-based discrimination, and the Federal oversight program. All investigators and researchers who are involved directly with human subjects, or with data or tissue which they can link back to individual subjects, must fulfill the following: Harvard University's on-line training module; attend the 90-minute "IRB Basics" workshop; and attend one special issues workshop offered by the Human Subjects Committee each academic year.

iii. Faculty Participation

Dr. Thomas Smith, Professor of Industrial Hygiene and director of the industrial hygiene program, has worked with Dr. Herrick to establish the international reputation of the Harvard Industrial Hygiene Program. His research continues to work on exposure-response relationships in occupational epidemiology, exploring exposures in the trucking industry that may be associated with lung cancer. He also is now working on exposure assessment for the validation of new biomarkers, such as hemoglobin adducts, and hopes to place them on the same firm scientific footing as traditional biologic monitoring tools, such as blood lead.

His reputation for leadership in industrial hygiene research has resulted in regular requests for post-doctoral positions and inquiries about opportunities for visiting scientists.

Dr. Robert Herrick, Senior Lecturer on Industrial Hygiene, and associate director of the industrial hygiene program is an internationally known senior industrial hygienist, who has been Chair of the American Conference of Governmental Industrial Hygienists and President of the International Occupational Hygiene Association. He came to Harvard from NIOSH where he was acting Deputy Director of the Division of Surveillance, Health Evaluation, and Field Studies. He brings decades of experience in field industrial hygiene and research oversight. He has also developed a strong research program in hazard assessment and exposure controls for several construction settings, including road pavers, roofers, and stone masons.

Under the leadership of Dr. Stephen Rudnick, Lecturer on Environmental and Occupational Health Engineering, our Hazardous Wastes Training subprogram has grown to be a very important component of our industrial hygiene program. Dr. Rudnick is deeply involved in the advising and mentoring of our students, and he makes important contributions to the student internship program. Dr. Rudnick has also developed, and teaches the course EH292cd, Properties and Behavior of Airborne Particles. His research addresses control of airborne infectious agents.

Dr. Jack Dennerlein, Assistant Professor of Ergonomics and Safety, has substantially extended our capabilities in ergonomics and biomechanics. Occupational biomechanics, control of human movement, and design and control of human-mechanical interfaces are his primary research interests. He has the goal of developing a distinct training program in ergonomics and biomechanics. He has also been teaching a course in biomechanics in the Applied Physics Program on the main campus. Dr. Dennerlein is also co-director of the Occupation Injury Prevention Program.

iv. Program Curriculum

Our normal curriculum was offered with few modifications. However, a broad review and revision of the curriculum is in process, which is being led by Dr. Herrick. This will integrate our program more effectively with the environmental epidemiology, exposure and risk assessment aspects of our departmental location.

D. Program Activities and Accomplishments

i. Progress toward goals and objectives

To accomplish our goals, we have three sets of activities:

1. A broad academic program of core courses has been developed for our professional SM students. The School required basic courses in biostatistics, epidemiology, and physiology, all Occupational Health students begin with two core courses taught by the IH and program faculty (1) introduction to industrial hygiene concepts of exposure and its evaluation and control, and (2) introduction occupational hazards and their recognition in the field. These are followed by a series of specialty courses: ventilation, physical stress in the workplace, safety and ergonomics, occupational health policy and law, radiological health, risk assessment, and administration. Courses are structured to provide practical training in engineering design and testing of control systems and in advanced analytical procedures. Students' learning is monitored by assignments, reports and examinations. An internship is strongly recommended for all students between their first and second years, and some do a full six months with a company. During the internship, students will do a major project under the supervision of a CIH. In certain cases, for example, experienced students already possessing a MS or Ph.D. in a related field, or students who will enter doctoral studies, program lengths of 1 or 1.5 years are permitted. Dr. Herrick currently advises three SM students.
2. In addition to our interdisciplinary core courses, which include students from all of the programs, we

also regularly serve on doctoral committees of students in environmental and occupational epidemiology, and risk assessment. This past year, Dr. Smith has served on 4 committees (three students graduated) and Dr. Herrick is serving on 2 committees.

3. Our doctoral program follows the School requirements for a set of coursework on a major (industrial hygiene) and two minors (frequently epidemiology and biostatistics). Often our doctoral students have completed an SM in IH, so they have little additional coursework to take. Drs. Smith is supervising two doctoral students and Dr. Herrick is supervising the research training of one doctoral student. In addition, Dr. Jonathan Levy is supervising one doctoral student.
4. Dr. Smith's two post-doctoral fellows have completed their work with him and moved on to new positions, Dr. Dhimiter Bellow has taken an Assistant Professor position at the University of Massachusetts/Lowell, and Dr. Chin-Hsiang Tsai has returned to Taiwan with her family and will be seeking a university position when her twins (born January, 2006) are old enough to be in child care. Dr. Smith has taken a new post-doctoral fellow, Dr. David Kim, a recent graduate from the University of North Carolina.

Our work to meet these goals has been characterized by attention to detail and flexibility to meet perceived needs of present and future professionals. Thus at the present time, emphasis is placed on the role of industrial hygienists in an overall environmental program and in occupational risk evaluation and hazard control in collaboration with other Occupational Health professionals.

ii. Trainee honors, awards, and scholarships

At the recent American Industrial Hygiene Conference and Exposition, one of our students, Jee Young Kim, won and award for the best student poster.

iii. New faculty positions

We have developed a request for a new position in industrial hygiene, which will emphasize the development of new biomarkers of exposure. This will be authorized for the 2006-07 academic year.

iv. Trainee recruitment including diversity efforts

The Harvard School of Public Health recognizes the need for increased participation of persons from underrepresented groups as students, fellows, and faculty. In 1985, the School established the Office of Professional Development to take the lead in developing a program for minority development and retention. Mr. Stan Hudson, Associate Dean for Students has responsibility for this program. Dean Hudson has targeted recruitment activities toward the Departments of Biostatistics, Environmental Health, Epidemiology, and Nutrition. Focus is on increasing the numbers of inquiries about our training programs, enhancing the number and quality of applications, and facilitating the admission and matriculation of high quality students.

Also, HSPH is a member of the National Consortium for Educational Access (NCEA). This consortium is comprised of 35 graduate degree-granting institutions and 47 historically Black colleges and universities. NCEA's goal is to increase the number of doctoral-trained minorities. Literature is distributed regularly to NCEA member institutions, and seven institutions have identified candidates as potential HSPH students.

In the ERC training programs, we have targeted the minority pool of candidates, including mailings to the traditionally Black Colleges and Universities, and to Schools of Medicine with large minority enrollments. The HSPH-wide minority recruiting activities use flyers describing the Program as well.

The Departments of Epidemiology and Environmental Health have been active in recruiting minority health professionals to the field. Over the past five years, the ERC and the School have implemented minority recruitment by targeted recruiting, by obtaining scholarship funds dedicated to underrepresented minorities, and by participating in summer minority internship and apprenticeship programs at the school.

E. Program Products

Please refer to appendix D for a list of publications and a list of presentations by faculty and students.

F. Future Plans

Our plan is to continue as previously, with the addition of curriculum revisions being developed by Dr. Herrick and other faculty in the Exposure, Epidemiology and Risk Program. Drs. Smith, Dennerlein, and Herrick are pursuing new research opportunities to support their own interests and their students.

APPENDIX B
INDUSTRIAL HYGIENE CURRICULUM

INDUSTRIAL HYGIENE TWO-YEAR MS DEGREE PROGRAM (80 credits)

FALL SEMESTER, FIRST YEAR

BIO 201 (Fall)
Introduction to Statistical Methods - 5.0
EH 205 (Fall)
Human Physiology - 5.0
EH 243 (Fall)
Ergonomics/Human Factors - 2.5
EH 510 (Fall)
Fundamentals of Environmental Exposures Assessment - 2.5
EH 262 (Fall)
Introduction to the Work Environment - 2.5
EPI 201 (Fall1)
Introduction to Epidemiology - 2.5

WINTER SESSION, FIRST YEAR

EH 280
Field Methods in Occupational & Environmental Health - 2.5

SPRING SEMESTER, FIRST YEAR

EH 231 (Spring)
Occupational Health Policy & Administration - 2.5
EH 241 (Spring)
Occupational Safety and Injury Prevention - 2.5
EH 253* (Spring)
Ventilation - 2.5
ID 263 (Spring)
Practice of Occupational Health - 5.0
RDS 500 (Spring2)
Risk Assessment - 2.5

SUMMER SEMESTER

Summer Internship

FALL SEMESTER, SECOND YEAR

Full time Internship EH 303 or combination of practicum and other coursework including:
EH 256 (Fall2)
Introduction to Aerobiology - 2.5
EH 279
Radiation Environment: Its Identification, Evaluation and Control - 2.5
EH 504
Principles of Toxicology (01) - 5.0
SHH 201
Society and Health- 2.5
Other electives as arranged with your advisor - 7.5

WINTER SESSION, SECOND YEAR

Other electives as arranged with your advisor

SPRING SEMESTER, SECOND YEAR

EH 250
Protecting Workers & Communities from Hazardous Substances - 2.5
EH 253*
Ventilation - 2.5
EH 263
Analytical Methods and Exposure Assessment - 2.5
(Not offered 2006-2007)
EH 267
IH/ERGO Internship and Environmental Sciences Research Seminar - 2.5
ID 215 (Spring)
Environmental and Occupational Epidemiology - 2.5

IH STUDENTS WHO DO THE "HAZARDOUS SUBSTANCE" SUBSPECIALTY ARE ALSO REQUIRED TO TAKE ONE OF THE FOLLOWING SPRING COURSES
ID287
Bioterrorism: Public Health Preparedness and Response- 2.5
MIT 1.812J
Regulation of Chemicals, Radiation, and Biotechnolgy- 5.0
MIT 11.370
Brownsfields Policy and Practice - 5.0
Other hazardous substance related course approved by your advisor
***Note:** in years when EH 253 (Ventilation) is not given, EH 292 (Properties and Behavior of Airborne Particles) and EH 254 (Evaluation and Control of Noise and Vibration) are substituted.

STUDENTS WHO CONCENTRATE IN ERGONOMICS ARE ALSO REQUIRED TO TAKE THE FOLLOWING, IN PLACE OF SOME IH ELECTIVES
EH 296
Occupational Biomechanics - 5.0
EH 282
Injury Epidemiology - 2.5
ID 240
Principles of Injury Prevention - 2.5
Additional electives other than the coureses listed may be chosen. Other potential electives may be found in the curriculum listings for the Risk Assessment, Environmental Epidemiology, and Industrial Hygiene/Ergonomics/Hazardous Substance Tracks. In addition, there are many courses available at Harvard and MIT that may be suitable electives. Consult your advisor for course recommendations that may be suitable to your specific area(s) of interest.

ERGONOMICS TWO-YEAR MS DEGREE PROGRAM (80 credits)
FALL SEMESTER
BIO 201 (Fall)
Introduction to Statistical Methods - 5.0
EH 205 (Fall)
Human Physiology - 5.0
EH 243 (Fall)
Ergonomics/Human Factors - 2.5
EH 262 (Fall)
Introduction to the Work Environment - 2.5
EH 510 (Fall)
Fundamentals of Environmental Exposure Assessment - 2.5

EPI 201 (Fall1)
Introduction of Epidemiology - 2.5

SPRING SEMESTER

EH 231 (Spring)
Occupational Health Policy & Administration 2.5
EH 241 (Spring)
Occupational Safety and Injury Prevention 2.5
EH 253 (Spring)
Ventilation - 2.5
ID 263 (Spring)
Practice of Occupational Health - 5.0
RDS 500 (Spring2)
Risk Assessment - 2.5

REQUIRED (ERGO) COURSES OFFERED ALTERNATE YEARS

EH 296(Spring)
Occupational Biomechanics - 5.0
(Offered 2006-2007)
EH 250 (Spring)
Protecting Workers from Hazardous Substances - 2.5 (Offered 2006-2007)
EH 253 (Spring)
Ventilation - 2.5
(Offered 2006-2007)
EH 254 (Spring)
Control of Noise & Vibration - 2.5
(Not offered 2006-2007)
EH 263 (Spring)
Analytical Chemistry and Exposure Assessment - 5.0
(Not offered 2006-2007)

OTHER RECOMMENDED COURSES (ERGO)

Additional 5 Credits of Biostatistics—or—2.5 Biostatistics & HPE299d
EH 273 (Fall)
IH/ ERGO Internship (second year) - 20.0
(Not offered 2006-2007)
EH 267 (Spring)
IH/ ERGO Internship Seminar (second year) - 2.5
ENG SCI 145
Intro. to Sys. Anal. with Physiological Applications 5.0

APPENDIX D
INDUSTRIAL HYGIENE PUBLICATIONS

Davis, ME, Smith, TJ, Laden, F, Hart, JE, Ryan, L and Garshick, E. Modeling particle exposure in US trucking terminals. Environmental Science and Technology: (in press), 2006.

Kile, ML, Houseman, EA, Rodrigues, E, Smith, TJ, Quamruzzaman, Q, Rahman, M, Mahiuddin, G, Su, L and Christiani, DC. Toenail Arsenic Concentrations, GSTT1 Gene Polymorphisms, and Arsenic Exposure from Drinking Water. Cancer Epidemiol Biomarkers Prev 14(10): 2419-26, 2005.

Lee, BK, Smith, TJ, Garshick, E, Natkin, J, Reaser, P, Lane, K and Lee, HK. Exposure of trucking company workers to particulate matter during the winter. Chemosphere (in press), 2005.

Quinn, MM, Smith, TJ, Schneider, T, Eisen, EA and Wegman, DH. Determinants of airborne fiber size in the glass fiber production industry. Journal of Occupational and Environmental Hygiene 2: 1-10, 2005.

Yu, CL, Wang, SF, Pan, PC, Wu, MT, Ho, CK, Smith, TJ, Li, Y, Pothier, LJ and Christiani, DC. No association between residential exposure to petrochemicals and brain tumor risk. Cancer Epidemiology, Biomarkers & Prevention 14(12): 3007-3009, 2005

Yu CL, Wang SF, Pan PC, Wu MT, Ho CK, Smith TJ, Li Y, Pothier L, Christiani DC; Kaohsiung Leukemia Research Group. Residential exposure to petrochemicals and the risk of leukemia: using geographic information system tools to estimate individual-level residential exposure. Am J Epidemiol. 2006 Aug 1;164(3):200-7. Epub 2006 Jun 5.

Beall C, Bender TJ, Cheng H, Herrick R, Kahn A, Matthews R, Sathiakumar N, Schymura M, Stewart J, Delzell E. Mortality among semiconductor- and storage device-manufacturing workers. J Occup Environ Med. 2005 Oct; 47(10):996-1014.

Bender TJ, Beall C, Cheng H, Herrick RF, Kahn AR, Matthews R, Sathiakumar N, Schymura MJ, Stewart JH, Delzell E. Methodologic Issues in Follow-Up Studies of Cancer Incidence Among Occupational Groups in the United States. Ann Epidemiol. 2005 Sep 19.

Herrick RF, Stewart JH, Blicharz D, Beall C, Bender T, Cheng H, Matthews R, Sathiakumar N, Delzell E. Exposure assessment for retrospective follow-up studies of semiconductor- and storage device-manufacturing workers. J Occup Environ Med. 2005 Oct; 47(10):983-95. Erratum in: J Occup Environ Med. 2005 Dec; 47(12):1319.

Liu Y, Woodin, MA, Smith TJ, Herrick RF, Williams PL, Hauser R, Christiani, DC. Exposure to fuel-oil ash and welding emissions during the overhaul of an oil-fired boiler. J Occup Environ Hyg. 2005 Sep; 2(9):435-43.

Liu, Y, Woodin, MA, Hauser R, Williams PL, Herrick RF, Christiani DC, Smith TJ. Estimation of personal exposures to particulate matter and metals in boiler overhaul work. J Occup Environ Med. 2005 Jan; 47(1):68-78.

Meeker, JD, Barr DB, Ryan L, Herrick RF, Bennett DH, Bravo R, Hauser R. Temporal variability of urinary levels of nonpersistent insecticides in adult men. J Expo Anal Environ Epidemiol. 2005 May; 15 (3):271-81.

Bender TJ, Beall C, Cheng H, Herrick RF, Kahn AR, Matthews R, Sathiakumar N, Schymura MJ, Stewart JH, Delzell E. Cancer incidence among semiconductor and electronic storage device workers. Occup Environ Med. 2006 Jul 17; [Epub ahead of print]

Rudnick SN, MW First. Fundamental factors affecting upper-room ultraviolet germicidal irradiationPart II. Predicting effectiveness. Journal of Occupational and Environmental Hygiene In Press (2006).

First MW, SN Rudnick, KF Banahan, RL Vincent, PW Brickner. Fundamental factors affecting upper room ultraviolet germicidal irradiationPart I. Experimental. Journal of Occupational and Environmental Hygiene. In Press (2006).

Lander LL, SN Rudnick, MJ Perry. Assessing noise exposure in farm youths. Accepted conditionally by Journal of Agromedicine (2006).

McDevitt JJ, KM Lai, SN Rudnick, EA Houseman, MW First, and DK Milton. Characterization of UVC light sensitivity of vaccinia virus, Submitted to Applied Environmental Microbiology (2006).

Herrick RF, JD Meeker, MD McClean, LM Zwack, and K Hanley. Physical and chemical characterization of asphalt (bitumen) paving exposures. Submitted to Journal of Occupational and Environmental Hygiene (2006).

Levy JI, AM Wilson, and LM Zwack. Quantifying the efficiency and equity implications of power plant air pollution control strategies in the United States. Submitted to Environmental Health Perspectives (2006)

Tuchmann J, JI Levy, and LM Zwack. Perceptions of inequality among environmental justice and risk assessment professionals. Submitted to Risk Analysis (2006).

Presentations by Faculty and Students

Laboratory and Field Studies of 1,3-Butadiene Metabolism. TJ Smith, HY Chang, YL Guo, S Park, F Bois, CH Tsai, HC Huang, S Osterman-Golkar, J Swenberg. IISRP Meeting in Charleston, SC, September, 2006.

Particle Exposure Assessment for the US Trucking Industry. TJ Smith, P Reaser, J Hart, J Schauer, F Laden, E Garshick. EPICOH Meeting in Norway, April, 2005.

Principles of Industrial Hygiene, Feb 7 2006, lecture in 95th Session of the Harvard Trade Union Program, Cambridge MA

PCB in Schools, Westchester County Commission, May 22 2006, White Plains NY

Physical and Chemical Properties of Asphalt Fume Exposures, Health Effects Symposium on Occupational Exposures to Emissions from Asphalt/Bitumen, June 7 2006 Dresden, Germany

Student Posters at the AIHC&E, 2005

Dilution Ventilation to Control Welding Fumes in a Crude Oil Tank at a Shipyard in Singapore
R.C. Lewis, R.F. Herrick, Harvard School of Public Health; K.T. Tan, M.R. Yep Abu, Ministry of Manpower, Occupational Safety and Health Division, Occupational Hygiene and Risk Management Branch, Republic of Singapore.

Comprehensive Baseline Workers' Exposure Assessment in a Cogeneration Plan
H. Palacios, R. Herrick, Harvard School of Public Health; W. Trabilcy, T. Beaulieu, P. Greenley, Massachusetts Institute of Technology.

Occupational Health and Safety Practice in Taiwan: a Comparative Approach
J. Smith-Davis, R.F. Herrick, Harvard School of Public Health.

Correlation of Inhalation and Dermal Exposures to PAHs in Highway Construction Workers
L. Zwack, M.D. McClean, R.F. Herrick, Harvard School of Public Health.

Pilot Study for Truck Drivers' Exposure to Diesel Engine Exhausts
Y. Zhu, D. Blicharz, R.F. Herrick, Harvard School of Public Health.

A. Program Title

Occupational Health Nursing Core

B. Program Directors 2005-2006

Carol Love RN, PhD and Susan Duty MSN, Sc.D

C. Program Description

i. Goals and Objectives

The occupational health nursing core prepares nurses in the role of occupational health nurse practitioner (OHNP) and occupational health nurse clinician (OHNPDD). The objectives of the occupational health nursing program include: 1.) to plan, develop, implement and evaluate a rigorous academic program for nurses seeking the advanced practice role in occupational health, 2.) to recruit and retain qualified graduate students including minorities and individuals from underserved areas into the OHN program and 3.) to provide research training in the area of occupational and environmental health. The Harvard School of Public Health ERC and Simmons College cooperative nursing program is designed to prepare registered nurses as occupational safety and health nurse practitioners with expertise in research methodology, and/or advanced practice nursing.

The nursing program offers two areas of concentration, a 49 credit program preparing nurse practitioners with expertise in occupational health nursing (OHNP) and a 74 credit dual degree program preparing nurses with expertise in both occupational health nursing and research methodologies (OHNPDD). With the addition of the occupational health epidemiology core these graduates become eligible to apply to the doctoral program at Harvard School of Public Health.

ii. Responsible Conduct of Science

The Harvard School of Public Health is committed to the conduct of research in an ethical manner. Accordingly, an academic course has been developed that is directed at all students and fellows in doctoral or postdoctoral programs. All students supported by the training grant are required to enroll in this course. The required course is HPM 292, Research Ethics. The course reviews a series of ethical issues that arise in the conduct of research. Topics include informed consent, disclosure of conflicts of interest, multiple authorship issues, issues in mentoring, privacy, genetics, gender- and race-based discrimination, and the Federal oversight program. All investigators and researchers who are involved directly with human subjects, or with data or tissue which they can link back to individual subjects, must fulfill the following: Harvard University's on-line training module; attend the 90-minute "IRB Basics" workshop; and attend one special issues workshop offered by the Human Subjects Committee each academic year.

iii. Faculty Participation

The success of the OHN program is the result of the expertise and commitment of the occupational health faculty at both the Harvard School of Public Health and The School for Health Studies at Simmons College. The knowledge and expertise of the faculty provide the student with a rigorous interdisciplinary academic and clinical OHNP program. The following faculties are essential to the implementation of the OHN program.

Dr. Carol Love, RN, Ph.D., is Professor of Nursing and Director of Occupational Health Nursing at Simmons College and has a joint appointment in the Department of Occupational and Environmental Medicine at the Harvard School of Public Health and at Simmons College School for Health Studies is an

experienced administrator, teacher and researcher in the field of occupational health nursing. As Director of the OHN Program she is responsible for the development, implementation and evaluation of the OHN program, participating in instructing academic courses, and the identification and evaluation of expert faculty. Dr. Susan Duty was hired in 2003 as an Assistant Professor and serves as co-director of the ERC Nursing Core Program. The program is fortunate in having nursing faculty who are certified nurse practitioners with skills in occupational health nursing science and research methodology. Core faculty include: Dr Susan Neary, Patricia White, RNC, MSN, Janet Rico MSN, MBA, Dr. Rebecca Donohue, and Dr. Judy Beal. Dr. Beal teaches the research and theory sequence. Dr. Duty and Ms. Rico are responsible for the clinical practicum and supervision of Occupational Health Nursing students. Dr. Duty is a certified nurse practitioner and maintains a clinical practice in an occupational health setting. There is also a committed group of occupational health nurses and nurse practitioners that serve as preceptors, lecturers and mentors to the graduate nursing students.

Susan Duty, RN, MSN, MS, Sc.D is a 2002 graduate of the Harvard ERC Occupational Epidemiology program and a 1999 graduate of Simmons College and Harvard School of Public Health dual degree program. In January of 2003 she was appointed Assistant Professor of Nursing at Simmons College. Her responsibilities include program development, curriculum design, research supervision, recruitment and teaching. Dr Duty is committed to a collaborative occupational health nursing practice and field based research. Dr. Duty is a member of the Massachusetts Coalition of Nurse Practitioners, the American Association of Occupational Health Nurses and Sigma Theta Tau. Her research agenda is in the area of reproductive hazards of men exposed to environmental levels of phthalates and characterizing occupational phthalate exposures among manicurists. She was an invited speaker at the Epidemiology Section of the Human Health Effects of Phthalate Exposure Workshop sponsored by the National Institute for Environmental Health and Safety and at an international symposium on Low Dose Endocrine Disruptors.

Janet Sweeney Rico is a certified nurse practitioner and serves as a community advocate for children and adults. She is on the Board of Directors of VINFEN, an agency that provides programs for the physically and mentally at risk population. One of the goals of this program is to develop and implement work placements for these residents.

Dr. Judy Beal was appointed the Associate Dean for Nursing in July of 2001. She is active in scholarly presentations and publications. Dr. Beal has published extensively in her area of expertise and has been recognized by the MNA and Sigma Theta Tau as an outstanding leader and researcher in nursing. The Massachusetts Nursing Association awarded her the Outstanding Nurse Research Award. She was the guest editor for a special edition of the APN on instrumentation and the development of research tools and was recently appointed to the editorial board of the Maternal Child Health Journal.

Dr. Rebecca Donohue has presented several lectures to professional colleagues, and has appeared on ABC's Good Morning America. She is an abstractor for Women's Health Scan and has had several abstracts published. Dr. Susan Neary serves on the Ethics Advisory Board for the East Boston Health Center's Elder Service Health Plan. Patricia White is on the Ethics Advisory Board at the South Shore Visiting Nurses Association. She has entered doctoral study at the University of Rhode Island.

iv. Program Curriculum

The theory and research courses are a series of three courses, two in scholarly inquiry and one research practicum. The courses in scholarly inquiry explore the historical and philosophical basis of nursing and related theories and the applicability of theory to practice and research. Appropriate research methodologies are explored for each theoretical model including both qualitative and quantitative models. All students are required to complete and present a formal research project and prepare a manuscript to be submitted to an appropriate professional journal. Faculty collaborate with occupational health practitioners in both the academic and clinical community to develop and implement research project

applicable to occupational health.

The primary care core curriculum consists of a sequence of four primary care courses and four clinical practicum courses. The first primary health care course is NUR 570 Health Promotion: A Global Perspective. This interdisciplinary course is offered for graduate students in nursing, nutrition, health care administration and physical therapy. Emphasis is place on prevention of illness and injury. Health issues of special populations including workers, migrants, the homeless and people of diversity are explored. Health promotion practices, issues and programs are analyzed. Principles of epidemiology are addressed. All students identify a health issue for a particular target population, conduct a needs assessment on that population of workers and present their findings. Examples of these need assessments include a worksite ergonomic assessment of a college, a job task analysis of hotels' service staff, an evaluation of back injuries in a population of health care providers, and a worksite wellness program.

The primary health care clinical practicum (NUR 580, 580A, 581,582, 582A, 584, 584B) consists of 410 classroom hours and 680 clinical hours. The classroom content focuses on the essential content necessary to provide primary health care to clients from diverse populations. A holistic approach is stressed, with attention to health promotion, disease prevention and the diagnoses and management of common health problems encountered in primary care. Interventions for health problems are addressed within the scope of the practice of the advanced practice nurse. Interventions for nursing and medical diagnoses are based on current research and accepted practice. The core practicum begins with a six-week volunteer patient experience where students perform a complete physical exam and learn to document an appropriate history and management plan. Upon successful completion of this experience, students have a six-week clinical experience with nurse practitioner preceptors in an occupational health and/or primary health care site. Here they develop knowledge skills necessary to assess and manage clients with acute and chronic health problems. Once the students have achieved the objectives they are assigned to a preceptor in the occupational health setting. Here students integrate their knowledge of primary health care into the care of employees at the worksite. The students are able to participate in the daily management and program planning of the occupational health unit including record keeping, disability management, health promotion and injury prevention activities, risk assessment, first aid, safety and worksite walkthroughs. Students have a minimum of eight hours per week for the first clinical practicum. The fall and spring semester of the second year, students are placed in occupational health clinical settings for 12-16 hours per week respectively. All students participate in interdisciplinary evaluations of worksite risks and hazards and complete worksite needs assessment in the ID263cd, Practice of Occupational Health Course. Students from industrial hygiene and occupational medicine as well as nursing students are enrolled in this course and participate in the interdisciplinary analysis of worksite issues.

All OHNP students, both the OHNP and the OHNPDD students, will take five required courses in Occupational Health at the HSPH. These include EH 243ab Ergonomics/Human Factors, ID 263cd, Practice of Occupational Health EH 231cd, Occupational Health Policy and Administration, EH 300, Tutorial in Toxicology; and EH 232cd, Introduction to Occupational and Environmental Medicine. These revisions have added scope and depth to the OHN concentration and provide students with the essential content needed to sit for the adult nurse practitioner and the occupational health nurse certification exams. A sample curriculum for both the OHNP concentration and the OHNPDD concentration is attached.

D. Program Activities and Accomplishments

We have been more successful with recruitment efforts and now have 3 fulltime students in the OHNP program. A trainee, Rachel Kwapniewski was awarded the Excellence in Research Award for her work on a collaborative research project entitled A Pilot Study: Characterizing Phthalate Exposure among Nail Salon Workers and Identifying Barriers for Manicurists to Participate in Research Studies which was presented at Simmons College Research Day, May 2006-09-25.

The Simmons College Department of Nursing received full accreditation by the Commission on Collegiate Nursing Education. The department is also developing a Doctorate in Nursing Practice program, a clinical doctorate program which is still in the planning phase.

Simmons College has also begun a Health Professions Education doctoral program which is open to master's degree prepared OHNs.

E. Program Products

Program alumnae and faculty have been published in peer reviewed journals as well as in professional organization publications and clinical journals. Faculty and students have collaborated on research projects with significant trainee involvement and have been instrumental in involving non-occupational health practitioners in Occupational and Environmental research projects. All students present their research studies in a formal research symposium to which faculty members, preceptors and nurses from the community are invited. There is evidence of cross-fertilization of ideas when non-occupational health students become exposed to issues of workplace health and ultimately identify research projects that focus on occupational health issues. Students also present their research during an interdisciplinary bi-monthly Research Seminar at the Harvard School of Public Health. OHNP students have presented research projects at the Simmons College Research Day, May 2006 and other students not in the OHNP program have collaborated with faculty on an environmental health study entitled A Pilot Study to identify the distribution and determinants of indicator and pathogenic target bacteria in homes with healthcare workers, young children and pets. The results of this pilot study will be presented November 2006 at the American Association of Public Health Annual Meeting in Boston, MA

F. Future Plans

The ERC offers a RN to MS program, a Masters completion program for certified nurse practitioners and certifications of advanced graduate studies for nurses who are Masters prepared and wish to become occupational health nurse practitioners. As part of the recent curriculum changes at Simmons, a direct entry program for baccalaureate graduates is offered to individuals who plan to change careers and enter nursing. This program is a three-year full time program with the possibility of enrolling in the OHN program after the pre-licensure phase of the program is completed successfully. Upon completion, students will earn an MSN. Opportunities also exist for Masters prepared nurses to enter a doctoral program in Environmental Health.

Simmons College is beginning a new certificate of advanced graduate study (CAGS) in Occupational Health Nursing for those Adult or Family Nurse Practitioners who want to change career focus and work in occupational health settings. This will begin September 2007.

The Nursing Faculty of the ERC will continue to provide consultation to international nursing programs as they develop the curricula for occupational health nursing. Consultation has been provided to nursing faculty in Slovakia, Taiwan, Japan and Korea. Additional plans include the development of on line certificate programs for occupational health nurses in the areas occupational diseases, case management, and a certification review course. A graduate program offered either as graduate credit or for CEU's in administration and management is planned in cooperation with the Health Care Administration Program.

After many years, Dr. Carol Love has stepped down as Director of the OHN Core Program and Dr. Susan Duty has become the director. Dr. Love is remaining on as a consultant to the ERC Nursing Core Programs.

APPENDIX B
OCCUPATIONAL HEALTH NURSE PRACTITIONER PROGRAM
Master of Science in Nursing with a Concentration in Occupational Health

YEAR 1			
FALL SEMESTER			
NUR 404	Normal and Abnormal Physiology		4
SHS 570	Health Promotion: a Global Perspective		2
SHS 410	Research Methods		3
EH 243 (NUR 575)	**Ergonomic/Human Factors**		**2**
		Semester Credits	11
SPRING SEMESTER			
NUR 507	Scholarly Inquiry I		2
NUR 580	Theory and Practice: Primary Health Care Nursing of the Adult I		2
NUR 580A	Clinical Decision Making of the Adult I		1
EH 231 (NUR 572)	**Occupational Health Policy and Administration**		**2**
ID 263 (NUR 571)	**Practice of Occupational Health**		**4**
		Semester Credits	11
SUMMER SEMESTER			
NUR 581	Clinical Practicum in Primary Care		3
		Semester Credits	3
YEAR 2			
FALL SEMESTER			
NUR 422	Clinical Pharmacology		3
NUR 508	Scholarly Inquiry II		2
NUR 582	Theory and Practice: Primary Health Care Nursing of the Adult II		3
NUR 582A	Clinical		
EH 300 (NUR 573)	**Tutorial in Toxicology**		**2**
		Semester Credits	13
SPRING SEMESTER			
NUR 509	Research Practicum		2
	NUR 584 Theory and Practice: Primary Health Care Nursing of the Adult III		3
NUR 584B	Clinical Decision Making in the Workplace		4
EH 232 (NUR 574)	**Occupational and Environmental Medicine**		**2**
		Semester Credits	11
		Total Credits	49

Courses listed in bold are all interdisciplinary courses. All clinical and practicum courses are interdisciplinary.

OCCUPATIONAL HEALTH NURSE PRACTITIONER DUAL DEGREE PROGRAM (OHNPDD)

Master of Science in Nursing with a Concentration in Occupational Health
Master of Science in Occupational/Environmental Health

YEAR 1

FALL SEMESTER

NUR 404	Normal and Abnormal Physiology	4
SHS 570	Health Promotion: a Global Perspective	2
EH 243	**Ergonomic/Human Factors**	**2.5**
EH 262	**Introduction to the Workplace Environment**	**2.5**
EPI 200	**Principles of Epidemiology**	**2.5**
BIO 200	**Biostatistics**	**5**
	Semester Credits	18.5

WINTER SEMESTER

EH 281 (NUR 576)	**Occupational Health Care Delivery**	**2.5**
	Semester Credits	2.5

SPRING SEMESTER

NUR 507	Scholarly Inquiry I	2
NUR 580	Theory and Practice: Primary Health Care Nursing of the Adult I	2
NUR 580A	Clinical Decision Making of the Adult I	1
EH 231	**Occupational Health Policy and Administration**	**2.5**
ID 263	**Practice of Occupational Health**	**5**
ID 215	**Environmental and Occupational Epidemiology**	**2.5**
	Semester Credits	15

SUMMER SEMESTER

NUR 581	Clinical Practicum in Primary Health Care	3
	Semester Credits	3

YEAR 2

FALL SEMESTER

NUR 422	Clinical Pharmacology	3
NUR 508	Scholarly Inquiry II	2
NUR 582	Theory and Practice: Primary Health Care Nursing of the Adult II	3
NUR 582A	Clinical Decision Making II (Occ Health Settings) 3	
EH 236	**Epidemiology of Occupational Standards**	**5**
ID 204	**Toxicology**	**5**
	Semester Credits	21

SPRING SEMESTER

NUR 509	Research Practicum	2
NUR 584	Theory and Practice: Primary Health Care Nursing of the Adult III	3
NUR 584B	Clinical Decision Making in the Workplace	4
EH 232	**Occupational and Environmental Medicine**	**2.5**
EH 241	**Occupational Safety**	**2.5**
	Semester Credits	14

Simmons credits 34, HSPH credits 40 — Total Credits 74

Courses listed in bold are all interdisciplinary courses. All practicum and clinical courses are interdisciplinary.

OCCUPATIONAL HEALTH NURSE PRACTITIONER PROGRAM (for Direct Entry Candidates)

Master of Science in Nursing with a Concentration in Occupational Health

YEAR 1 (After completion of the 18 month generalist curriculum)

SPRING SEMESTER		
NUR 458	RN internship I (24 hr/wk)	1
NUR572 (EH 231)	**Occupational Health Policy and Administration**	**2**
NUR 507	Scholarly Inquiry I	2
NUR 571 (EH263)	**Practice of Occupational Health**	**4**
	Semester Credits	9
SUMMER SEMESTER		
NUR 508	Scholarly Inquiry II *(or in fall)*	2
NUR 459	RN internship II (32 hr/wk)	1
	Semester Credits	3
FALL SEMESTER		
SHS 570	Health Promotion: a Global Perspective	2
NUR 404	Normal and Abnormal Physiology	4
SHS 410	Research Methods	3
NUR 575 (EH 243)	**Ergonomic/Human Factors**	
	(could switch with SHS570 if we had to	**2**
	Semester Credits	11

YEAR 2

SPRING SEMESTER		
NUR 580	Theory and Practice: Primary Health Care Nursing of the Adult I	2
NUR 509	Research Practicum	2
NUR 580A	Clinical Decision Making of the Adult I	1
	Semester Credits	5
SUMMER SEMESTER		
NUR 581	Clinical Practicum in Primary Care	3
	Semester Credits	3
FALL SEMESTER		
NUR 422	Clinical Pharmacology	3
NUR 582	Theory and Practice: Primary Health Care Nursing of the Adult II	3
NUR 582A	Clinical Decision Making II (Occ Health Settings)	3
NUR 573 (EH 300)	**Tutorial in Toxicology**	**2**
	Semester Credits	11

YEAR 3

SPRING SEMESTER		
NUR 584	Theory and Practice: Primary Health Care Nursing of the Adult III	3
NUR 584B	Clinical Decision Making in the Workplace	4
NUR 574 (EH 232)	**Occupational and Environmental Medicine**	**2**
	Semester Credits	9
	Total Credits	51

Courses listed in bold are all interdisciplinary courses. All clinical and practicum courses are interdisciplinary.

APPENDIX D
OCCUPATIONAL NURSING PUBLICATIONS

Publications and Presentations

Duty SM, Ackerman RM, Calafat AM and Hauser R (2005) Personal care product use predicts urinary phthalate monoester concentrations. *Environmental Health Perspective* 113(11):1530-1535

Duty SM, Calafat AM, Ryan L, Silva MJ, Hauser R. Phthalate exposure and reproductive hormones in adult men. Hum Reprod. 2005;20:604-610.

Collins, J. & Menzel, N. (In press). Introduction and problem statement. In A. Nelson (Ed.), *Handle with care: A practice guide for safe patient handling and movement.* New York, NY: Springer Publishing Company.

Hauser R, Duty SM and Calafat AM. (2005). Evidence of altered semen quality in relation to urinary levels of phthalate metabolites. (Epidemiology: submitted)

Hauser R, Meeker JD, Duty S, Silva M, Calafat A. Altered semen quality in relation to urinary levels of phthalate monoester and oxidative metabolites. Epidemiology (In Press)

Legendre S. (2005). The VAOHN - Focus on Workplace Health and Safety. *Vermont Nurse Connection*, (Officail Publication of the Vermont State Nurse's Association) page 18

Legendre S (2005) *Ongoing Focus on Safety.* Annual Report to Our Community.Northwestern Medical Center

Menzel, N. (In press). Manager of information systems. In K. Polifko-Harris (Ed.). *Professional nursing concepts.* Albany, NY: Delmar

Menzel, N. (In press). *Workers' comp management from a to z: A "how-to" guide with forms*, 3rd. Beverly, MA: OEM Press

Menzel, N., & Robinson, M. (In press). Back pain in direct patient care providers: Early intervention with cognitive behavioral therapy. *Pain Management Nursing.*

Menzel, N., Lilley, S., & Robinson, M. (In press.) Interventions to reduce back pain in rehabilitation hospital nursing staff. *Rehabilitation Nursing.*

Menzel, N. Back pain prevalence in nursing personnel: Measurement issues. (2004). *AAOHN Journal, 52* (2), 54-65. Golden Pen Award winner.

Menzel, N., Brooks, S., Bernard, T., & Nelson. A. (2004). The physical workload of nursing personnel: Association with musculoskeletal discomfort. *International Journal of Nursing Studies, 41(8), 859-867*

Shaw, W. S., Zaia, A., Pransky, G., Winters, T., & Patterson, W. B. (2005). Perceptions of provider communication and patient satisfaction for treatment of acute low back pain. *Journal of Occupational and Environmental Medicine, 47*, 1036-1043.

Winters, T. H., & Zaia, A. M. (2006). Disease transmission and outbreak investigation. In R. Nordness (Ed.), *Epidemiology and biostatistics secrets* (pp. 71-82). Philadelphia: Elsevier.

Presentations

Duty, SM, Hauser RB, Calafat A. A pilot study: characterizing phthalate exposure among nail salon workers. Abstract ID 114231, American Public Health Association 133rd Annual Meeting and Exposition. December, 2005

Legendre, S. Strategies For Prevention of Repetitive Trauma Disorders in a Manufacturing Setting. Presented to the Vermont Nurses Association at Mack Molding Company, Cavendish, Vermont onApril 13, 2005

Menzel, N. (2005, December). Nursing students behind bars. American Association of Public Health, Philadelphia, PA.

Menzel, N. (2005, September). Safe patient handling and movement. Florida Nurses Association Conference, Bonita Beach, FL.

Menzel, N. (2005, February). Psychosocial factors producing back pain and disability. Safe Patient Handling & Movement Conference, St. Pete Beach, FL.

Zaia, A (2005, July). Environmental Health Conference for Nurses: Placement of Environmental Health Concepts in Nursing Curricula and in Public Health Practice Nursing. Harvard School of Public Health, Boston, MA

A. Program Title

Occupational Medicine Core

B. Program Director 2005-2006

Howard Hu, MD, MPH
For 2006, Stefanos N. Kales, MD, MPH

C. Program Description

i. Goals and Objectives

The goals of the occupational medicine program at the Harvard ERC remain as follows: (1) to develop a critical number of physician- preventive medicine specialists who are well-prepared both clinically and in research, making them effective practitioners in the field of occupational medicine; (2) to provide sufficient flexibility in the curriculum after attaining basic competency in order that physicians might be trained in a variety of orientations suitable for careers in industry, government, academia, and other positions of leadership; (3) to develop the next generation of teachers in occupational medicine; (4) to give all residents a comprehensive research experience that will enhance their ability to plan and conduct research in the future and prepare them to critically appraise the literature and conduct evidence-based occupational medicine; and finally (5) to identify a limited number of physicians with potential to become active researchers in the field.

Our specific objectives are (1) to provide an outstanding curriculum in occupational medicine and health during the first year of the program resulting in the awarding of the Masters of Public Health or Masters of Occupational Health degree; (2) to provide intensive exposure to practical clinical and research issues in occupational medicine through participation in our Grand Rounds and Research Seminars throughout both years of the program; (3) to provide a broad grounding in current occupational medicine literature; (4) to mentor trainees through a full original research experience culminating in their first-authoring a final research report that is either submitted for publication in a peer-reviewed journal or that is equivalent in its rigor; (5) to provide extensive clinical occupational medicine experiences in academic, industry, and community practice rotations; (6) to provide broad public health experiences in occupational health through a required rotation at the Massachusetts Department of Public Health; (7) to provide other rotation electives that address each trainee's career trajectory; and (8) to integrate and adjust all of these objectives as part of an individualized educational plan tailored to each trainee.

ii. Responsible Conduct of Science

The Harvard School of Public Health is committed to the conduct of research in an ethical manner. Residents take ID 251, "The Ethical Basis of the Practice of Public Health", and must complete the basic training module and four electives required by the Harvard Human Subjects Committee. Topics include informed consent, disclosure of conflicts of interest, multiple authorship issues, privacy, gender, age, and race-based issues. Institutional Review Board (IRB) applications must be completed for all non-exempt research. Where research covers multiple organizations, usually hospitals, each organization's IRB must approve the research proposal. Finally, all residents complete HIPPA training upon entering the practicum year.

iii. Faculty Participation

Supervision comes from an outstanding nationally- and internationally-renowned faculty with a history of producing specialists who have become occupational health leaders in academia, government, industry, health care, and in non-governmental organizations. The faculty interact with trainees through a variety of roles and forums. First, each trainee has an academic advisor, who is assigned prior to matriculation. Second, OM core faculty are prominent among those directing and teaching required and elective MPH/MOH coursework. Third, each resident selects a core faculty research advisor who supervises and mentors the resident's research project. Fourth, OM faculty serve as case discussants for our grand rounds, which are held every other week during the academic year. Fifth, as Practicum rotation preceptors, OM faculty closely supervise and teach residents clinical and other practical competencies on a one-to-one basis.

iv. Program Curriculum

The Harvard Occupational & Environmental Medicine Residency is a fully ACGME-accredited 2-year training program for physicians leading to board-eligibility in Occupational Medicine (one of the three specialties of the American Board of Preventive Medicine (ABPM). Our curriculum emphasizes rigorous academic training; excellence in clinical occupational medicine; and cutting-edge research. With regard to our MPH curriculum, it is built around the requirements and competencies specified by CEPH, ACGME and ABPM. With regard to the practicum year, it is designed to provide mastery of all ACGME general, PM & OM competencies and to meet/exceed ABPM requirements.

The first year consists of full-time didactic coursework resulting in a MPH or MOH with a concentration in Occupational/Environmental Health. The curriculum includes epidemiology, biostatistics, health and social behavior, the work environment, occupational and environmental medicine, toxicology, industrial hygiene, safety, ergonomics, occupational health policy and administration, health promotion, and ethics. (For more details see: http://www.hsph.harvard.edu/mph/index.html#oeh.) Also during this first year, OM Residents attend Seminars in Occupational/ Environmental Health, Research Seminars, Grand Rounds in Occupational Medicine, and Board Review. In addition, they receive a research orientation and start to develop a research project with the guidance of OM faculty.

The second year ("practicum year") consists of (1) clinical rotations at our affiliated academic and corporate occupational/environmental medicine clinics; (2) experiences at the Massachusetts Department of Public Health; (3) elective rotations and experiences at the Pediatric Environmental Health Center of Boston Children's Hospital; the Travel Clinic at New England Medical Center; the national office of OSHA; NIOSH; and ATSDR; (4) continued attendance at Research Seminars, Grand Rounds, and Board Review; (5) attendance at a course on the epidemiologic basis of occupational & environmental health standards; and (6) continuation of research leading to a final research presentation and paper of publication quality.

The curriculum of the second year, practicum experience provides a firm grounding in the prevention, diagnosis, treatment, and rehabilitation of OEM disorders; the assessment of impairment and disability and fitness for duty; counseling, education, and risk communication to workers and community members with regards to OEM topics; the planning, administration, and supervision of occupational health programs; and methods for the successful conduct of occupational/environmental health investigations.

The occupational medicine program encourages residents to take board review courses and may help subsidize them. As a practice check, each year, all residents are required to take the annual

in-service practice exam offered in the summer by the American College of Preventive Medicine. Thus, during their training, the residents take the in-service exam twice. The results are reviewed and discussed with each resident in the context of his/her ACGME-required individualized educational plan (IEP) review. Individual recommendations are made based on results; the option of private tutoring on test-taking skills may be offered.

D. Program Activities and Accomplishments

i. Progress toward goals and objectives

At the end of the 2005-2006 academic year, four full-time residents completed their practicum year and received residency completion certificates. They all have plans to take the ABPM boards in November. Two of these four are now in other training programs: one is finishing his last year of internal medicine training at the Cambridge Health Alliance/Harvard Medical School; the other has entered a pulmonary fellowship at the Massachusetts General Hospital/Harvard Medical School. The third graduate has returned to the US Navy to serve as an occupational medicine physician there. The fourth graduate is examining several occupational medicine opportunities in California. One part-time resident has completed the practicum year including his research project and is finalizing one last course requirement. He has attained a full-time staff position in Occupational Medicine at the Cambridge Health Alliance/Harvard Medical School.

Three residents entered the practicum year in July 2006. Two of them received their MPH degree in June 2006. The third resident had a prior MPH [in non OEH concentrations] and took additional courses at Harvard as a special student last year. Beginning July 1st with the 2006-2007 academic year, we recruited three new residents for the didactic year: one in the MPH program, and two who already had MPHs [in a non-OEH concentration] - now taking courses towards the MOH degree.

With regards to achievement of ABPM Board Certification in Occupational Medicine, we have documented that between 1997 and 2005, 31 Residents graduated and were eligible to take the Boards. Of these, 26 took the boards, and 24 passed (3 on second try), for an overall pass rate of 92.36% among those taking the exam. Two have not retaken the exam.

ii. Trainee honors, awards, and scholarships

In the last seven years, we have had eight residents receive ACOEM (AOHC) Resident Research Presentation Awards with topics including lead exposure, firefighting, traumatic injuries and ergonomic hazards.

Two of our first year residents are OPSF (Occupational Physicians Scholarship Fund) awardees as is one of our second year residents. Another second year resident is a US Naval Scholar. Last year's graduates included three OPSF scholars and another US Naval Scholar.

iii. Faculty honors, awards, appointments

Dr. Howard Hu will be receiving the 2006 Harriet Hardy Award from the New England College of Occupational & Environmental Medicine for his leadership in the field. Dr. Hu just stepped down as Director of the OM Core and Occupational/Environmental Medicine Residency after 10 years of service in this capacity. He has also been named the new Chair of Environmental Health at the University of Michigan.

Dr. Stefanos Kales, the current Director of the OM core and the OEMR, was again named as one of "America's Top Physicians 2006" by the Consumer Research Council of America.

iv. Trainee theses and dissertations

Ibeawuchi Mbanu, MD, MPH (Stefanos Kales, MD, MPH advisor)
Seasonal and Weather Influences on US Firefighter Coronary Heart Disease Deaths:1994-2000.

Michael D. Lappi, MPH, MS, DO, PhD (David Christiani, MD, MPH advisor)
Ambient Occupational Exposure Assessment During Military Breaching Exercises: Technical Report

Jonathan D. Holder, DO, MPH (Stefanos Kales, MD, MPH advisor)
Profile of Massachusetts Firefighters Retiring under Heart Presumption Legislation: 1997-2003.

Marcelo Targino, MD, MPH, (Howard Hu MD, MPH, ScD advisor)
Lead Exposure and Postural Changes in Blood Pressure: The Normative Aging Study

Amy Nuernberg, MD, MPH (David Christiani, MD, MPH advisor)
Urinary 8-isoprostane and 8-OHdG Concentrations in Boilermakers with Welding Exposure

Brooke Maylie, MD, MPH (Rose Goldman, MD, MPH advisor)
A comparison of the 10-point Numeric Rating Scale to the Short-Form McGill Pain Questionnaire for Measuring the Impact of the Psychosocial and Occupational Factors on Pain

v. New faculty positions

In November of 2005, Dr. Hu announced his intention to step down as Director of the OM Core and Occupational/Environmental Medicine Residency. Dr. Kales, a program alumnus and faculty member was chosen by the ERC Director, Dr. Christiani, as Dr. Hu's successor. The transition process has proceeded smoothly as expected.

vi. New courses

We have made no significant changes to the MPH curriculum since our last report. The tailoring of our toxicology course more specifically to the needs of our resident physicians (stronger emphasis on clinical toxicology) has been very successful and will be continued.

vii. Trainee recruitment including diversity efforts

As discussed in last year's report, the Harvard School of Public Health recognizes the need for increased diversity among its students, fellows, and faculty. Our focus is on increasing the numbers of inquiries among underrepresented groups about our training programs, enhancing the number and quality of their applications, and facilitating the admission and matriculation of high quality students from diverse backgrounds.

With respect to the OM Core, we have been successful in recruiting minority trainees. In the past reporting period (2005-2006), among our residents, we had 33% women, and 33% ethnic minorities. During the same period, 25% of the residents had been born outside the US. Among the current cohort of trainees, 33% are women and 33% are ethnic minorities. All have been superbly qualified, and we are proud of our record of success with respect to recruiting minority trainees given the very small total (minority and non-minority) pool of qualified OEMR candidates.

E. Program Products

The bimonthly Grand Rounds sponsored by the Occupational Medicine Core are designed to bring the clinical experience of our resident physicians to a wider audience and to provide the residents with an opportunity to hone their case presentation skills. These Grand Rounds are accredited by the ACCME to offer 1 CME/grand round for physicians who attend. We recently submitted documentation of our process and were awarded four more years of accreditation by ACCME. Our research seminars and ERC seminars are similarly accredited and provide continuing education for physicians in the Harvard Medical area.

Research to practice is underscored primarily during the annual conference of the New England College of Occupational and Environmental Medicine (NECOEM, the regional professional organization of ACOEM) when Harvard faculty present for a half-day of a two-day congress on their research projects and the implications for practice. Ann Backus, OEMR administrator, presents a vendor table featuring a recent research project by ERC residents and/or faculty. Last year's presentation featured the phthalate research of Russ Hauser, Susan Duty and resident Ron Green.

The topics of research projects completed during this reporting period are listed above under "Theses and Dissertations."

F. Future Plans

The curriculum and practicum are stable and will not undergo any major changes. To the collection of Grand Rounds, Research Seminars, and ERC Seminars we will add a seminar series for resident physicians oriented to practical career preparation in occupational health.
This series will include the Board preparation sessions currently underway.

A new course in noise-induced hearing loss is underdevelopment and will be offered March 29, 30, 2007. This course will feature state-of-the-art research findings in audiology, pathophysicology, exposure assessment, the potential for synergistic effects of noise and chemical exposure, childhood exposures, etc.

APPENDIX B
OCCUPATIONAL MEDICINE CURRICULUM

The Academic year of the OEMR requires matriculation into the MPH or MOH degree program. Forty credits are required; 45 credits maximum are available without additional fees. Residents (students) may take or audit additional courses at HSPH, MIT, Harvard Business School, or the Kennedy School of Government. The traditional course of study for residents consists of three sessions: summer session in the HSPH Clinical Effectiveness Program plus the usual Fall and Spring semesters. The sample curriculum follows:

Clinical Effectives Program (two summer sessions, 15 credits total)

BIO 206 and BIO 208	Introductory and Advanced Statistics for Medical Research
EPI 208	Introduction to Clinical Epidemiology
EH 202	Principles of Environmental Health
ID 251	Ethical Basis of the Practice of Public Health or
SHH 201	Society and Health

Fall Semester (15 credits, more or less)

BIO 213	Applied Regression for Clinical Research
EH 201	Introduction to Environmental Health
EH 243	Ergonomics and Human Factors
EHE 262	Introduction to the Work Environment
EH 504	Toxicology (either 2.5 or 5.0 credits)
ID 250	Ethical Basis of the Practice of Public Health or
SHH 201	Society and Health or approved option.

Winter Session (alternate years, offered the odd years, and taken by 1st & 2nd year residents))

EH 281	Occupational Health Care Delivery

Spring Semester (15 credits, more or less)

EH 231	Occupational Health Policy and Administration
EH 232	Introduction to Occupational and Environmental Medicine)
EH 241	Occupational Safety (an alternate to EH 243)
ID 215	Environmental and Occupational Epidemiology
ID 250	Practice of Occupational Health
MIT 10.805J	Technology, Law, and the Work Environment

During the fall semester of the practicum year, EH 236 The Epidemiology of the Environmental and Occupational Health Standards.

APPENDIX D
OCCUPATIONAL MEDICINE PUBLICATONS

Publications

Green R, Hauser R, Calafat AM, Weuve J, Schettler T, Ringer S, Huttner K, Hu H. Use of di(2-ethylhexyl) phthalate-containing medical products and urinary levels of mono(2-ethylhexyl) phthalate in neonatal intensive care unit infants. Environmental Health Perspectives. 2005 Sep; 113(9):1222-5.

Hatfield BH. The Association between Whole-Body Vibration Frequencies and Lower Back Disorders among Urban Taxi Drivers: J Occup Environ Med. 2005 Sep;47(9):977.

Weuve J, Sanchez BN, Calafat AM, Schettler T, Green RA, Hu H, Hauser, R. Exposure to phthalates in neonatal intensive care unit infants: urinary concentrations of monoesters and oxidative metabolites. Environmental Health Perspectives. 2006 Sep; 114(9):1424-31.

Kales SN, Huyck KL, Goldman RH. Elevated Urine Arsenic: Un-Speciated Results Lead to Unnecessary Concern and Further Evaluations. J Analytic Toxicol 2006;30:80-85.

Kales SN, Lee EC. Pseudo-latex allergy associated with "latex" paint exposure: a potential cause of iatrogenic disability. J Occup Environ Med. 2006;48:83-8.

Holder JD, Stalling L, Peeples L, Burress JW, Kales SN. Firefighter Heart Presumption Retirements in Massachusetts: 1997-2004. J Occup Environ Med. 2006 (in press).

Peters ES, McClean MD, Liu M, Eisen EA, Mueller N, Kelsey KT. The ADH1C polymorphism modifies the risk of squamous cell carcinoma of the head and neck associated with alcohol and tobacco use. Cancer Epidemiol Biomarkers Prev. 2005; 14(2):476-82.

Thompson D, Kriebel D, Quinn M, Wegman DH. Eisen EA. Occupational exposure to metalworking fluids and risk of breast cancer among female autoworkers. Am J Indus Med 2005; 47(2):153-60.

Quinn MM, Smith TJ, Schneider T, Eisen EA, Wegman DH. Determinants of airborne fiber size in the glass fiber production industry. J Occ Environ Hygiene. 2005; 2(1):19-28 .

Agalliu I, Eisen EA, Kriebel D, Quinn MM, Wegman DH. Biological approach to characterizing exposure to metalworking fluids and risk of prostate cancer. Cancer Causes and Control 2005; 16:323-31.

Agalliu I, Kriebel D, Quinn MM, Wegman DH, Eisen EA. Prostate cancer incidence in autoworkers exposed to metalworking fluids. Epidemiology 2005; 16:664-671.

Bardin J, Kriebel D, Gore R, Eisen EA. A registry based case-control study of liver and biliary cancers nested in a cohort of autoworkers exposed to metalworking fluids. Scand J Work, Health & Environ 2005;31(3):205-11.

Rennix CP, Quinn MM, Amoroso PJ, Eisen EA, Wegman DH. Risk of breast cancer among enlisted army women occupationally exposed to volatile organic compounds. Am J Indus Med 2005;48(3):157-67.

Wang XR, Zhang, H-X, Sun B-X, Dai H-L, Hang J-Q, Eisen EA, Wegman DH, Olenchock SA, Christiani DC. A twenty-year follow-up study on chronic respiratory effects of exposure to cotton dust. European Respir J 2005; 26:881-6.

Malloy EJ, Miller KL, Eisen EA. Rectal cancer and exposure to metalworking fluids in the automobile manufacturing industry. Occup Environ Medicine (Epub) August 15 2006.

Weller EA, Milton DK, Eisen EA, Spiegelman D. Regression calibration for logistic regression with multiple surrogates for one exposure. J Stat Planning and Inference 2007; 137:449-61; Epub 2006.

Fang SC, Eisen EA, Dai HL, Zhang HX, Sun BX, Wang XR, Christiani DC Cancer mortality among textile workers in Shanghai, China. Fang SC. J Occ Environ Med 2006; 48(9):955-8.

McClean MD, Wiencke JK, Kelsey KT, Varkonyi A, Ngo L, Eisen EA, Herrick RF.DNA adducts among asphalt paving workers. Ann Occup Hyg. (In press).

Soteriades ES, Hauser R, Kawachi I, Liarokapis D, Christiani DC, Kales SN. Obesity and Cardiovascular Disease Risk Factors in Firefighters: A Prospective Cohort Study. Obesity Research 2005;13: 1756-1763.

Kales SN, Christiani DC. "Hair and Metal Toxicity" In: DJ Tobin, ed. Hair in Toxicology: an important bio-monitor. The Royal Society of Chemistry 2005.

Lee EC, Kales SN. Chemical Weapons and Public Health. In: Levy BS, Sidel V, eds. War and Public Health, 2nd ed. 2007 (in Press).

Fang SC, Eisen EA, Dai H, Zhang H, Hang J, Wang X, Christiani DC. Cancer Mortality Among Textile Workers in Shanghai, China: A Preliminary Study. J Occup Environ Med. 2006 Sep;48(9):955-958.

Yu CL, Wang SF, Pan PC, Wu MT, Ho CK, Smith TJ, Li Y, Pothier L, Christiani DC; Kaohsiung Leukemia Research Group. Residential exposure to petrochemicals and the risk of leukemia: using geographic information system tools to estimate individual-level residential exposure. Am J Epidemiol. 2006 Aug 1;164(3):200-7. Epub 2006 Jun 5.

Breton CV, Houseman EA, Kile ML, Quamruzzaman Q, Rahman M, Mahiuddin G, Christiani DC. Gender-specific protective effect of hemoglobin on arsenic-induced skin lesions. Cancer Epidemiol Biomarkers Prev. 2006 May;15(5):902-7.

McCarty KM, Houseman EA, Quamruzzaman Q, Rahman M, Mahiuddin G, Smith T, Ryan L, Christiani DC. The impact of diet and betel nut use on skin lesions associated with drinking-water arsenic in Pabna, Bangladesh. Environ Health Perspect. 2006 Mar;114(3):334-40.

Yu CL, Wang SF, Pan PC, Wu MT, Ho CK, Smith TJ, Li Y, Pothier LJ, Christiani DC. No association between residential exposure to petrochemicals and brain tumor risk. Cancer Epidemiol Biomarkers Prev. 2005 Dec;14(12):3007-9. No abstract available.

Chen JC, Chen YJ, Chang WP, Christiani DC. Long driving time is associated with haematological markers of increased cardiovascular risk in taxi drivers. Occup Environ Med. 2005 Dec;62(12):890-4.

Kile ML, Houseman EA, Rodrigues E, Smith TJ, Quamruzzaman Q, Rahman M, Mahiuddin G, Su L, Christiani DC. Toenail arsenic concentrations, GSTT1 gene polymorphisms, and arsenic exposure from drinking water. Cancer Epidemiol Biomarkers Prev. 2005 Oct;14(10):2419-26.

Chen JC, Dennerlein JT, Chang CC, Chang WR, Christiani DC. Seat inclination, use of lumbar support and low-back pain of taxi drivers. Scand J Work Environ Health. 2005 Aug;31(4):258-65.

Chen JC, Chang WR, Chang W, Christiani D. Occupational factors associated with low back pain in urban taxi drivers. Occup Med (Lond). 2005 Oct;55(7):535-40. Epub 2005 Sep 1.

Liu Y, Woodin MA, Smith TJ, Herrick RF, Williams PL, Hauser R, Christiani DC. Exposure to fuel-oil ash and welding emissions during the overhaul of an oil-fired boiler. J Occup Environ Hyg. 2005 Sep;2(9):435-43.

Liu Y, Woodin MA, Hauser R, Williams PL, Herrick RFH, Christiani DC, and Smith TJ. Estimation of personal exposures to particulate matter and metals in boiler overhaul work. J Occup Environ Med. 2005;47:68-78.

Duty SM, Calafat AM, Ryan L, Silva MJ, Hauser R. Phthalate exposure and reproductive hormones in adult men. Hum Reprod. 2005;20:604-610.

Duty SM, Ackerman RM, Calafat AC, Hauser R. Personal care product use predicts urinary concentrations of some phthalate monoester. Environ Health Perspect. 2005;113:1530-1535.

Meeker JD, Ryan L, Barr DB, Hauser R. Exposure to non-persistent insecticides and reproductive hormones in adult men. Epidemiology 2005;17:61-68.

Meeker JD, Barr DB, Hauser R. Thyroid hormones in relation to urinary metabolites of non-persistent insecticides in men of reproductive age. Reprod Toxicol. 2006;22:437-442.

Meeker JD, Barr DB, Serdar B, Rappaport SM, Hauser R. Utility of 1-naphthol and 2-naphthol levels to assess environmental carbaryl and naphthalene exposure in an epidemiology study. J Exp Sci Environ Epid. (In Press)

Hauser R, Meeker JD, Duty S, Silva M, Calafat A. Altered semen quality in relation to urinary levels of phthalate monoester and oxidative metabolites. Epidemiology (In Press)

Meeker JD, Missmer SA, Cramer DW, Hauser R. Maternal exposure to secondhand tobacco smoke and pregnancy outcome among couples undergoing assisted reproduction. Human Reprod (In Press)

Presentations

2006 Amy Nuernberg, MD, MPH Invited speaker AOHC (Resident Presentation Award) Urinary 8-isoprostane and 8-OHdG Concentrations in Boilermakers with Welding Exposure.

2005 Brooke Maylie, MD, MPH. Talk. Current Industry Trends and Occupational Issues in Hotel Housekeeping, Cambridge Health Alliance, September 29.

2006 Brooke Maylie, MD, MPH. Talk. Synopsis for Proposed Hepatitis B Intervention Study of Nonresponders, Massachusetts General Hospital, April 26.

2006 Brooke Maylie, MD, MPH. Talk. Medical Surveillance for Personnel Working in a Laser Environment at MGH, Massachusetts General Hospital, March 29.

2006 Russ Hauser Invited Speaker, Postgraduate course, Human Teratogens: Environmental Factors Which Cause Birth Defects. Massachusetts General Hospital, Department of Pediatrics. Title of presentation: 'Phthalates and Reproductive and Developmental Health: Are Boys and Men at Risk?'

2006 Russ Hauser Invited Speaker, Seminar Series sponsored by the Center for Research on Reproduction and Women's Health, Department of Obstetrics and Gynecology, Division of Reproductive Biology, The University of Pennsylvania Medical Center. Title of presentation: 'Phthalates and Reproductive Health: Are Boys and Men at Risk?'

2005-07 Russ Hauser Advisory Group Member, Summit on Environmental Challenges to Reproductive Health and Fertility, Sponsored by the University of California, San Francisco School of Medicine, and Collaborative on Health and the Environment, Mission Bay Conference Center, UCSF, San Francisco, CA (Planned for January 2007)

2005 Russ Hauser Invited Speaker, New England College of Occupational and Environmental Medicine and Massachusetts Association of Occupational Health Nurses Annual Meeting, Bedford, MA. Title of presentation in Harvard OEM Research Session, 'Phthalates and Male Reproductive Health: Recent Studies Raise Concerns.'

2005 Russ Hauser Invited Site Visitor, Mount Sinai School of Medicine General Clinical Research Center, National Institutes of Health, National Center for Research Resources.

2005 Russ Hauser Invited Speaker, Workshop on Understanding Environmental Contaminants and Human Fertility: Science and Strategy, sponsored by Women's Health at Stanford University and the Collaborative on Health and the Environment. Menlo Park, California. Title of presentation, 'The State of the Science: An Overview of Environmental Effects on Male Fertility.'

2006 Stefanos Kales Invited Speaker, "Heart Disease Retirements in Massachusetts Firefighters," Public Employee Retirement Administration Commission, Commonwealth of Massachusetts.

2006 Stefanos Kales Invited Speaker, Medical Monitoring of Asbestos-exposed Workers," Current Concepts in Asbestos-Related Lung Disease, CME Course Harvard Medical School.

2005 Stefanos Kales Invited Speaker, New England College of Occupational and Environmental Medicine and Massachusetts Association of Occupational Health Nurses Annual Meeting, Bedford, MA. Title of presentation in Harvard OEM Research Session, 'Lead Poisoning due to Ayurvedic (Traditional Indian) Medications.'

2005 Stefanos Kales Keynote Speaker, "Mercury and Human Health". New England Hellenic Medical and Dental Society, 7th Annual Research Symposium, Tufts University School of Medicine, Boston, MA.

2006 Stefanos Kales Invited Speaker, "Hematopoietic Toxicity from Lead-Containing Ayurvedic Medications." American Occupational Health Conference. Current Research in Occupational and Environmental Medicine, Los Angeles, CA.

2005 Stefanos Kales Invited Guest, live television in Greek, on "Occupational Health." Radiotelefonic Foundation of Cyprus (RIK 1: first national Cypriot Television Channel), "Seven to Ten" morning show, Nicosia, Cyprus.

2005 Stefanos Kales Invited Speaker, "Lead and Other Metal Hazards in Construction". Symposium on Health and Safety in the Construction Industry, Technical Chamber of Commerce of Cyprus and Cyprus International Institute, Nicosia, Cyprus.

2006 Stefanos Kales Visiting Professor, "Risk Assessment for Heavy Metal Exposure" Department of Hygiene and Epidemiology, University of Athens School of Medicine, Athens, Greece.

2006 Stefanos Kales Visiting Professor, "Heart Disease in Firefighters" Department of Hygiene and Epidemiology, University of Athens School of Medicine, Athens, Greece.

2005 Ashok Nimgade Invited Speaker, New England College of Occupational and Environmental Medicine and Massachusetts Association of Occupational Health Nurses Annual Meeting, Bedford, MA. Title of presentation in Harvard OEM Research Session, 'Mental Stress and Occupational Health.'

A. Program Title

Occupational Epidemiology Special Component Core

B. Program Directors 2005-2006

David C. Christiani, MD, MPH

C. Program Description

i. Goals and Objectives

The primary goal of the Occupational Epidemiology Special Component is to train leaders in the discipline, capable of conducting independent research on populations exposed to workplace hazards. Program objectives include: educating trainees with doctoral preparation in occupational epidemiology, providing rigorous training in general epidemiologic methods, and enabling trainees to acquire expertise in the subject area of occupational epidemiology. Education occurs at the doctoral and post-doctoral levels, with eligible research topics including the gamut of occupational disorders.

ii. Responsible Conduct of Science

The Harvard School of Public Health is committed to the conduct of research in an ethical manner. Accordingly, an academic course has been developed that is directed at all students and fellows in doctoral or postdoctoral programs. All students supported by the training grant are required to enroll in this course. The required course is HPM 292, Research Ethics. The course reviews a series of ethical issues that arise in the conduct of research. Topics include informed consent, disclosure of conflicts of interest, multiple authorship issues, issues in mentoring, privacy, genetics, gender- and race-based discrimination, and the Federal oversight program. All investigators and researchers who are involved directly with human subjects, or with data or tissue which they can link back to individual subjects, must fulfill the following: Harvard University's on-line training module; attend the 90-minute "IRB Basics" workshop; and attend one special issues workshop offered by the Human Subjects Committee each academic year.

iii. Faculty Participation

The three core faculty in Epidemiology includes Dr. Richard Monson, Dr, David Christiani, and Dr. Russ Hauser. Each holds a joint appointment with the Department of Environmental Health and Department of Epidemiology in the Harvard School of Public Health.

The core faculty and associated faculty from the Departments of Biostatistics, Epidemiology, Environmental Health, Toxicology, and Health and Social Behavior, cover the entire gamut in research disciplines: from methodology to applied-field research. Indeed, the HSPH faculty is one of the most productive in epidemiologic and biostatistical research in the world today.

iv. Program Curriculum

Admitted students will either be recent college graduates in biology, natural science or mathematics, or will be students with a Master's degree in one of these disciplines. Accepted persons must have an outstanding record in science courses and a high quantitative GRE score. Preference will be given to students with a prior Master's degree and experience in fields relevant to epidemiology and occupational health. Usually, these students will enroll directly in the doctoral program.

Students without a prior Master's degree will spend most of their first two years in formal courses in epidemiology, biostatistics, occupational health, industrial hygiene and exposure assessment, toxicology and biostatistics. In their third or fourth semester at HSPH, pre-doctoral students identify a thesis topic and work on that until completion of the doctoral degree. The total time in training at HSPH is generally four or five years.

D. Program Activities and Accomplishments

i. Progress toward goals and objectives

Teaching and research are the principal commitments of the program faculty. During the past year, curriculum time devoted to occupational and environmental epidemiology has increased. Moreover, an increasing number of pre-doctoral and post-doctoral applicants have identified occupational epidemiology as their focus. A number of these individuals are pursuing joint degrees in Epidemiology and Occupational Health.

ii. Trainee honors, awards, and scholarships

Jennifer Cavallari received the Taplin Scholarship.

iii. Faculty honors, awards, appointments

The activities of the faculty in research presentation, scholarly papers, scientific committee and peer-review work and journal editorship have contributed substantially to the national importance of occupational epidemiology. For example, Dr. Monson is the author of an internationally acclaimed textbook on Occupational Epidemiology. Dr. Christiani has over 300 peer-reviewed publications, most dealing with Occupational Epidemiology. Dr. Dockery, a leader in respiratory epidemiology, has assumed directorship of the Department of Environmental Health. Dr. Hauser has established a well-funded research program in occupational and environmental male reproductive epidemiology and Dr Howard Hu, recently tenured as a full professor, is an established heavy metals epidemiologist. Professor Ellen Eisen, a Professor in the Work Environmental Department at UMASS-Lowell and Adjunct Professor in the Harvard ERC is at HSPH full time, and Dr. Gregory Wagner, formerly Director of NIOSH's Division of Respiratory Disease Studies in Morgantown, has completed his second year as a full-time Adjunct Professor of Occupational Health.

Areas of research in this program area are described in detail in the ERC Handbook and in Appendix B. These accomplishments demonstrate that each faculty member has proven ability to attract peer-reviewed grant support, an indication of their stature in the scientific community. Moreover, all faculty members have taken active roles in national, professional organizations such as ACOEM, ICOH, APHA, ACGIH, ATS, ACCP, SOH and SER, further increasing the viability of occupational health in general and occupational epidemiology in particular.

iv. Trainee theses and dissertations

Carrie Breton: Arsenic Exposure and Skin Disease
Hsien Hsaio Hsu: Measuring Occupational Exposure to Particulates, a master culminating project
Molly Kile: Biomarkers of Arsenic Exposure and Metabolism
Pradeep Rajan: δ-Aminolevulinic Acid Dehydratase (Alad) Polymorphism, Lead, and Neurobehavioral Function
Florence Wang: "Determinants and Genetic Modifiers of Lead Burden and Cognition." (Nov. 2005)

v. New faculty positions

We have developed a request for a new position in environmental and occupational neuroepidemiology, which will analyze the interplay between genetic and environmental exposures of neuro-degenerative diseases. This will be authorized for the 2006-07 academic year.

vi. New courses

A core faculty member (Hauser) has assumed the lead in the Occupational and Environmental Epidemiology spring term and summer course and in curriculum development and curriculum administration. There have been no changes in the curriculum for the Occupational Epidemiology training program.

vii. Trainee recruitment including diversity efforts

With respect to trainee diversity and recruitment efforts, The Harvard School of Public Health recognizes the need for increased participation of persons from underrepresented groups as students, fellows, and faculty. In 1985, the School established the Office of Professional Development to take the lead in developing a program for minority development and retention. Mr. Stan Hudson, Associate Dean for Students has responsibility for this program. Dean Hudson has targeted recruitment activities toward the Departments of Biostatistics, Environmental Health, Epidemiology, and Nutrition. Focus is on increasing the numbers of inquiries about our training programs, enhancing the number and quality of applications, and facilitating the admission and matriculation of high quality students.

Also, HSPH is a member of the National Consortium for Educational Access (NCEA). This consortium is comprised of 35 graduate degree-granting institutions and 47 historically Black colleges and universities. NCEA's goal is to increase the number of doctoral-trained minorities. Literature is distributed regularly to NCEA member institutions, and seven institutions have identified candidates as potential HSPH students.

In the ERC training programs, we have targeted the minority pool of candidates, including mailings to the traditionally Black Colleges and Universities, and to Schools of Medicine with large minority enrollments. The HSPH-wide minority recruiting activities use flyers describing the Program as well.

The Departments of Epidemiology and Environmental Health have been active in recruiting minority health professionals to the field. Over the past five years, the ERC and the School have implemented minority recruitment by targeted recruiting, by obtaining scholarship funds dedicated to underrepresented minorities, and by participating in summer minority internship and apprenticeship programs at the school.

E. Program Products

Trainee publications are listed in appendix D. In addition, a number of research projects were performed that have significant trainee involvement including an epidemiolgic study of the effects of pthalates on male reproductive parameters (PI: Hauser; trainee: Adibi); a study of the cardiac effects of welding exposures (PI: Christiani; trainees- Cavallari, Fang, Mehta), a study of parental occupational exposures and leukemia in offspring (PI: Christiani; trainees – Ali, Yu). In addition, several large studies were initiated, including a study of injuries in the meatpacking industry (PI: Perry; trainee- Lander), a study of repetitive upper extremity injuries (PI: Dennerlein; trainee - Lee), and a study of work organizational factors in the health care industry and their impact on worker health (PI: McNeely; trainee- Hopcia).

F. Future Plans

Our plans include continued recruitment of the best candidates for the doctoral program. Those receiving support will be chosen on a competitive basis and comprise the most promising future researchers in the field of epidemiology.

APPENDIX B
OCCUPATIONAL EPIDEMIOLOGY PROGRAM CURRICULUM

The following is a list of didactic courses that will be required for pre-doctoral students. Exceptions to these requirements will be made only if suitable prior training (e.g., MD degree, Master's degree) or alternate courses exist. A description of each course is provided in the school course catalogue. Ordinarily, a 2.5-credit course has 32 class-hours per semester and a 5.0-credit has 64 class-hours per semester. Courses listed as "F_1 and F_2" meet in the fall, and "S_1 and S_2" courses meet in the spring. Courses listed as "W" meet during Winter session.

COURSE	TITLE	CREDITS
BIO201 F_1F_2	Principles of Biostatistics	5.0
BIO210 S_1S_2 -or- BIO213	Analysis of Rates and Proportions Applied Regression for Clinical Research	5.0
EH205 F_1F_2	Human Physiology	5.0
EH231 S_1S_2	Occupational Health Policy and Administration	2.5
EH236 F_1F_2	Epidemiologic Basis of Occ and Env Health Standards	5.0
EH243 F_1F_2	Ergonomics/ Human Factors	2.5
EH262 F_1F_2	Introduction to the Work Environment	2.5
EH269 S_1S_2	Exposure Assessment for Env & Occ Epidemiology	2.5
EPI201 F_1	Introduction to Epidemiology	2.5
EPI202 F_2	Elements of Epidemiologic Research	2.5
EPI203 S_1	Design of Cohort and Case-Control Studies	2.5
EPI204 S_2	Analysis of Case-Control and Cohort Studies	2.5
HPM292 S_2	Research Ethics	1.25
EH508 F_1F_2	Principles of Toxicology	5.0
ID215 S_1S_2	Environ and Occupational Epidemiology	2.5
ID263 S_1S_2	Practice of Occupational Health	5.0

ELECTIVES - Among the electives, students supported by the ERC Occupational Epidemiology Core will take at least 10 credits from the following list of courses related to occupational and environmental exposures or to biomarkers:

COURSE	TITLE	CREDITS
BIO222 F_1F_2	Basics of Statistical Inference	5.0
BIO245 F_1F_2	Analysis of Multivariate and Longitudinal Data	5.0
EH201 F_2	Introduction to Environmental Health	2.5
EH201 S_2	Principles of Environmental Health	2.5
EH241 S_1S_2	Occupational Safety and Injury Prevention	2.5
EH282 S_2	Injury Epidemiology and Prevention	2.5
EH261 F_1	Properties of Environmental Contaminants	2.5
EH281 W	Occupational Health Care Delivery	2.5
EH292 S_1	Properties and Behavior of Airborne Particles	2.5
EH295 S_1S_2	Air Pollution and Energy Processes	5.0
EPI221 W	Pharmacoepidemiology	2.5
EPI240 S_2	Use of Biomarkers in Epidemiologic Research	1.25
EPI249 F_1	Molecular Biology for Epidemiologists	2.5
EPI 250 F_2	Molecular Epidemiology of Chronic Diseases	2.5
EPI251 S_1	Studies in Molecular Epidemiology	1.25
ID214 S_1S_2	Nutritional Epidemiology	2.5
ID228 S_2	Principles of Screening	2.5
RDS500 S_2	Risk Assessment	2.5

In addition, students will ordinarily take at least 10 credits from the following list:

COURSE	TITLE	CREDITS
BIO211 S_1S_2	Regression and Analysis of Variance in Experimental Research	5.0
BIO212 S_1S_2	Survey Research Methods in Community Health	2.5
BIO213 F_1F_2	Applied Regression for Clinical Research	5.0
BIO226 F_1F_2	Applied Longitudinal Analysis	5.0
BIO233 S_1S_2	Methods II	5.0
EH208 S_1S_2	Pathophysiology of Human Disease	5.0
EH232 S_1S_2	Introduction to Occ. and Environmental Medicine	2.5
EPI205 F_1F_2	Practice of Epidemiology	2.5
EPI207 F_1	Advanced Epidemiologic Methods	2.5
EPI213 S_1	Epidemiology of Cancer	2.5
EPI246 F_2	Applied Biomarkers in Cancer Epidemiology	2.5
EPI247 F_2	Epidemiologic Methods Development	2.5
EPI269 F_2	Epidemiologic Research in Obstetrics and Gynecology	2.5
EPI287 F_2	Epidemiology of Reproductive Morbidity	1.25
ID269 F_2	Respiratory Epidemiology	1.25
ID271 S_1	Advanced Regression for Environmental Epi	2.5

APPENDIX D
OCCUPATIONAL EPIDEMIOLOGY PUBLICATIONS

Fang SC, Eisen EA, Dai H, Zhang H, Hang J, Wang X, Christiani DC. Cancer Mortality Among Textile Workers in Shanghai, China: A Preliminary Study. J Occup Environ Med. 2006 Sep;48(9):955-958.

Yu CL, Wang SF, Pan PC, Wu MT, Ho CK, Smith TJ, Li Y, Pothier L, Christiani DC; Kaohsiung Leukemia Research Group. Residential exposure to petrochemicals and the risk of leukemia: using geographic information system tools to estimate individual-level residential exposure. Am J Epidemiol. 2006 Aug 1;164(3):200-7. Epub 2006 Jun 5.

Breton CV, Houseman EA, Kile ML, Quamruzzaman Q, Rahman M, Mahiuddin G, Christiani DC. Gender-specific protective effect of hemoglobin on arsenic-induced skin lesions. Cancer Epidemiol Biomarkers Prev. 2006 May;15(5):902-7.

McCarty KM, Houseman EA, Quamruzzaman Q, Rahman M, Mahiuddin G, Smith T, Ryan L, Christiani DC. The impact of diet and betel nut use on skin lesions associated with drinking-water arsenic in Pabna, Bangladesh. Environ Health Perspect. 2006 Mar;114(3):334-40.

Yu CL, Wang SF, Pan PC, Wu MT, Ho CK, Smith TJ, Li Y, Pothier LJ, Christiani DC. No association between residential exposure to petrochemicals and brain tumor risk. Cancer Epidemiol Biomarkers Prev. 2005 Dec;14(12):3007-9. No abstract available.

Chen JC, Chen YJ, Chang WP, Christiani DC. Long driving time is associated with haematological markers of increased cardiovascular risk in taxi drivers. Occup Environ Med. 2005 Dec;62(12):890-4.

Soteriades ES, Hauser R, Kawachi I, Liarokapis D, Christiani DC, Kales SN. Obesity and cardiovascular disease risk factors in firefighters: a prospective cohort study. Obes Res. 2005 Oct;13(10):1756-63.

Kile ML, Houseman EA, Rodrigues E, Smith TJ, Quamruzzaman Q, Rahman M, Mahiuddin G, Su L, Christiani DC. Toenail arsenic concentrations, GSTT1 gene polymorphisms, and arsenic exposure from drinking water. Cancer Epidemiol Biomarkers Prev. 2005 Oct;14(10):2419-26.

Chen JC, Dennerlein JT, Chang CC, Chang WR, Christiani DC. Seat inclination, use of lumbar support and low-back pain of taxi drivers. Scand J Work Environ Health. 2005 Aug;31(4):258-65.

Chen JC, Chang WR, Chang W, Christiani D. Occupational factors associated with low back pain in urban taxi drivers. Occup Med (Lond). 2005 Oct;55(7):535-40. Epub 2005 Sep 1.

Liu Y, Woodin MA, Smith TJ, Herrick RF, Williams PL, Hauser R, Christiani DC. Exposure to fuel-oil ash and welding emissions during the overhaul of an oil-fired boiler. J Occup Environ Hyg. 2005 Sep;2(9):435-43.

Liu Y, Woodin MA, Hauser R, Williams PL, Herrick RFH, Christiani DC, and Smith TJ. Estimation of personal exposures to particulate matter and metals in boiler overhaul work. J Occup Environ Med. 2005;47:68-78.

Duty SM, Calafat AM, Ryan L, Silva MJ, Hauser R. Phthalate exposure and reproductive hormones in adult men. Hum Reprod. 2005;20:604-610.

Green R, Hauser R, Calafat AM, Weuve J, Schettler T, Ringer S, Huttner K, Hu H. Use of di(2-ethylhexyl) phthalate containing medical products and urinary levels of mono(2-ethylhexl) phthalate in neonatal intensive care unit infants. Environ Health Perspect. 2005;113:1222-1225.

Duty SM, Ackerman RM, Calafat AC, Hauser R. Personal care product use predicts urinary concentrations of some phthalate monoester. Environ Health Perspect. 2005;113:1530-1535.

Meeker JD, Ryan L, Barr DB, Hauser R. Exposure to non-persistent insecticides and reproductive hormones in adult men. Epidemiology 2005;17:61-68.

Meeker JD, Barr DB, Hauser R. Thyroid hormones in relation to urinary metabolites of non-persistent insecticides in men of reproductive age. Reprod Toxicol. 2006;22:437-442.

Meeker JD, Barr DB, Serdar B, Rappaport SM, Hauser R. Utility of 1-naphthol and 2-naphthol levels to assess environmental carbaryl and naphthalene exposure in an epidemiology study. J Exp Sci Environ Epid. (In Press)

Weuve J, Sánchez BN, Calafat AM, Schettler T, Green R, Hu H, Hauser R. Exposure to phthalates in neonatal intensive care unit infants: urinary levels of monoesters and oxidative metabolites. Environ Health Perspect. 2006;114:1424-1431.

Hauser R, Meeker JD, Duty S, Silva M, Calafat A. Altered semen quality in relation to urinary levels of phthalate monoester and oxidative metabolites. Epidemiology (In Press)

Meeker JD, Missmer SA, Cramer DW, Hauser R. Maternal exposure to secondhand tobacco smoke and pregnancy outcome among couples undergoing assisted reproduction. Human Reprod (In Press)

Won, Jong Uk, Dembe, Allard E. Services Provided by Family Physicians for Patients With Occupational Injuries and Illnesses. Ann Fam Med 2006 4: 138-147

Phillip R. Hunt, Jong Uk Won, Allard Dembe, and Letitia Davis. Work-related hospitalizations in Massachusetts: racial/ethnic differences. Monthly Labor Review. October 2005, Vol. 128, No. 10.

Allard Dembe, JB Erickson, RG Delbos and SM Banks/ The impact of overtime and long work hours on occupational injuries and illnesses: new evidence from the United States. Occ and Environmental Medicine 2005:62:588-597.

Allard E. Dembe, Judith A. Savageau, Benjamin C. Amick, III, and Steven M. Banks, "Racial and Ethnic Variations in Office-Based Medical Care for Work-Related Injuries and Illnesses," Journal of the National Medical Association, April 2005, pp. 498–507.

Wasiak R, Kim JY, Pransky G. "Work disability and costs caused by recurrence of low back pain: longer and more costly than in first episodes." Spine 2006, 31(2):219-225

Thomas Oberlechner, Ashok Nimgade. Work stress and performance among financial traders (p 285-293). 28 Sep 2005 Work & Stress. Vol 1. Issue 5.

Wasiak, Radoslaw and Eileen McNeely. Utilization and costs of chiropractic care for work-related low back injuries: Do payment policies make a difference? The Spine Journal 2006. Volume 6 (2) 146-153.

McNeely,Eileen. A Health Check-up for Nurses: Job Stress and Nurses Health. Nursing Outlook. November 2005.

Wasiak, Radoslaw, McNeely, Eileen, Magnetti, Sandra. 2004. Chiropractic Care in Workers' Compensation. Journal of Workers' Compensation. October 2004.

Davis, ME, Smith, TJ, Laden, F, Hart, JE, Ryan, L and Garshick, E. Modeling particle exposure in US trucking terminals. Environmental Science and Technology: (in press), 2006.

Lee, BK, Smith, TJ, Garshick, E, Natkin, J, Reaser, P, Lane, K and Lee, HK. Exposure of trucking company workers to particulate matter during the winter. Chemosphere (in press), 2005.

Quinn, MM, Smith, TJ, Schneider, T, Eisen, EA and Wegman, DH. Determinants of airborne fiber size in the glass fiber production industry. Journal of Occupational and Environmental Hygiene 2: 1-10, 2005.

Beall C, Bender TJ, Cheng H, Herrick R, Kahn A, Matthews R, Sathiakumar N, Schymura M, Stewart J, Delzell E. Mortality among semiconductor- and storage device-manufacturing workers. J Occup Environ Med. 2005 Oct; 47(10):996-1014.

Bender TJ, Beall C, Cheng H, Herrick RF, Kahn AR, Matthews R, Sathiakumar N, Schymura MJ, Stewart JH, Delzell E. Methodologic Issues in Follow-Up Studies of Cancer Incidence Among Occupational Groups in the United States. Ann Epidemiol. 2005 Sep 19.

Herrick RF, Stewart JH, Blicharz D, Beall C, Bender T, Cheng H, Matthews R, Sathiakumar N, Delzell E. Exposure assessment for retrospective follow-up studies of semiconductor- and storage device-manufacturing workers. J Occup Environ Med. 2005 Oct; 47(10):983-95. Erratum in: J Occup Environ Med. 2005 Dec; 47(12):1319.

Meeker, JD, Barr DB, Ryan L, Herrick RF, Bennett DH, Bravo R, Hauser R. Temporal variability of urinary levels of nonpersistent insecticides in adult men. J Expo Anal Environ Epidemiol. 2005 May; 15 (3):271-81.

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Rudnick SN, MW First. Fundamental factors affecting upper-room ultraviolet germicidal irradiationPart II. Predicting effectiveness. Journal of Occupational and Environmental Hygiene In Press (2006).

First MW, SN Rudnick, KF Banahan, RL Vincent, PW Brickner. Fundamental factors affecting upper room ultraviolet germicidal irradiationPart I. Experimental. Journal of Occupational and Environmental Hygiene. In Press (2006).

Lander LL, SN Rudnick, MJ Perry. Assessing noise exposure in farm youths. Accepted conditionally by Journal of Agromedicine (2006).

McDevitt JJ, KM Lai, SN Rudnick, EA Houseman, MW First, and DK Milton. Characterization of UVC light sensitivity of vaccinia virus, Submitted to Applied Environmental Microbiology (2006).

Herrick RF, JD Meeker, MD McClean, LM Zwack, and K Hanley. Physical and chemical characterization of asphalt (bitumen) paving exposures. Submitted to Journal of Occupational and Environmental Hygiene (2006).

Levy JI, AM Wilson, and LM Zwack. Quantifying the efficiency and equity implications of power plant air pollution control strategies in the United States. Submitted to Environmental Health Perspectives (2006)

Tuchmann J, JI Levy, and LM Zwack. Perceptions of inequality among environmental justice and risk assessment professionals. Submitted to Risk Analysis (2006).

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Barrero LH, Hsu YH, Terwedow H, Perry MJ, Dennerlein JT, Brain JD, Xu X. Prevalence and physical determinants of low back pain in a rural Chinese population. Spine (In Press).

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Lander IL, Connor JA, Shah RK, Kentala E, Healy GB, Roberson DW. Otolaryngologists? responses to errors in their practice. Manuscript under review. Laryngoscope (accepted).

Lee DL, McLoone H, Dennerlein JT. Observed finger behavior during computer mouse use. Applied Ergonomics, Conditionally Accepted.

Lee DL, McLoone H, Fleisher J, Kotani K, Dennerlein JT. Alternative computer mouse design and testing to reduce static finger extensor muscle activity during mouse use. Human Factors, Conditionally Accepted

Nagata T, Hemenway D, Perry MJ. The effectiveness of the 2002 law targeting alcohol-impaired driving in Japan. Injury Preven (accepted pending revisions).

Pransky G, Verma SK, Okurowski L, Webster BS. Length of Disability prognosis in acute occupational low back pain: Development and testing of a practical approach. Accepted Spine.

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A. Program Title

Occupational Injury Prevention Research Training

B. Program Directors 2005-2006

Jack T. Dennerlein, PhD, Associate Professor of Ergonomics and Safety
Melissa J. Perry, ScD, Assistant Professor of Occupational Epidemiology

C. Program Description

i. Goals and Objectives

Occupational injury is a large public health burden in the United States and elsewhere. The occupational injury prevention research training program offers the Doctor of Science (SD) degree in Occupational Health and Masters of Science in Environmental Health. The goals and objectives of the program are:

1. To produce the next generation of qualified professionals and researchers with the multidisciplinary skills necessary to conduct studies designed to understand the etiology and prevention of occupational injury
2. To provide interdisciplinary-training for future professionals and researchers with traditional disciplinary backgrounds to expand the breadth and depth of their knowledge within the public health framework. This approach **emphasizes prevention** through:
    a. Identifying and evaluating risks for injury in the workplace,
    b. Intervening and reducing risks with the development of administrative and engineering controls in the design of workplace environments, and
    c. Managing and developing policies and programs to prevent workplace acute and chronic injuries as well as return to work of those injured.

ii. Responsible Conduct of Science

The Harvard School of Public Health is committed to the conduct of research in an ethical manner. Accordingly, an academic course has been developed that is directed at all students and fellows in doctoral or postdoctoral programs. All students supported by the training grant are required to enroll in this course. The required course is HPM 292, Research Ethics. The course reviews a series of ethical issues that arise in the conduct of research. Topics include informed consent, disclosure of conflicts of interest, multiple authorship issues, issues in mentoring, privacy, genetics, gender- and race-based discrimination, and the Federal oversight program. All investigators and researchers who are involved directly with human subjects, or with data or tissue which they can link back to individual subjects, must fulfill the following: Harvard University's on-line training module; attend the 90-minute "IRB Basics" workshop; and attend one special issues workshop offered by the Human Subjects Committee each academic year.

iii. Faculty Participation

The Harvard Occupational Injury Prevention Research Training Program unites an outstanding team of internationally recognized authorities in occupational safety and health, with extensive background and expertise in injury research, health policy and management, and biomechanics and ergonomics. The program is co-directed by Drs. Jack Dennerlein and Melissa Perry.

Dr. Jack Dennerlein teaches three of the core courses for the injury prevention program. These courses include EH243 "Ergonomics and Human Factors" and the EH241 Occupational Safety and Injury Prevention. He has worked hard to revitalize and strengthen these important injury prevention core

courses. Dr. Dennerlein also guest lectures and leads case studies about occupational injury prevention in Environmental and Occupational Epidemiology (ID 215), Introduction to Environmental Health (EH201), Principles of Environmental Health (EH202), Exposure Assessment for Epidemiology (EH267), Analytical Methods and Exposure Assessment (EH263), Field Methods of Environmental health (EH280), Occupational Health Standards (EH235), Practice of Occupational Health (ID263), Injury Epidemiology and Prevention (EH282) and Introduction to System Analysis (ES145). Dr. Dennerlein leads the occupational safety engineering and sciences aspect of the training program.

Dr. Melissa Perry has developed and teaches our new core course in Injury Epidemiology and Prevention, EH282, specifically to meet the training needs of our program. Dr. Perry has worked hard to integrate the various aspects of injury epidemiology methodology into the class syllabus. Drs. Perry, Lombardi and Smith have structured the course so students work in teams for their term project developing a research proposal for an injury epidemiology project. Students present their proposal for review and critique by the other students and faculty. She also lectures in ID215 Environmental and Occupational Epidemiology on agricultural injury and illness. Dr. Perry has developed the specific course curricula for the occupational injury prevention program, reviewing many of the course syllabi for injury topic content and methods appropriate for injury prevention research. Dr. Perry leads the injury epidemiology aspects of the training program.

Dr. Gordon Smith joined the research staff at the Liberty Mutual Research Institute for Safety in late 2001 and has been actively involved in the training program in the since 2003. A physician and epidemiologist, he brings considerable expertise in injury epidemiology, occupational injury research, alcohol research and injury surveillance systems to our program. Dr. Smith has a long history of research on occupational injuries, ranging from trench cave-in deaths to a review of alcohol and occupational injuries. He is also recognized for his methodological expertise in injury research including examining methodological approaches to study occupational injuries.

Dr. David Lombardi, an injury epidemiologist at the Liberty Mutual Research Institute and adjunct assistant professor at the University of Massachusetts at Amherst has also joined the program faculty in 2003. Dr. Lombardi has been integrally involved in advising trainees specifically working closely with several occupational medicine residents and occupational nursing students on hand injury studies.

Mr. Theodore Courtney is the Director of Research Operations at the Liberty Mutual Research Institute for Safety and is appointed as an Instructor in the Department of Environmental Health. Since 1995, he has taught in the graduate curriculum in occupational medicine, industrial hygiene, ergonomics, and occupational safety.

iv. Program Curriculum

General description of requirements: Students are expected to first master information and competencies in occupational injury prevention and control. The higher-level courses each relate different principles, methods and theories that are directly applicable to occupational injury prevention research and allow for the trainees to focus in either occupational injury epidemiology or occupational safety engineering and science. Training specialization is achieved through occupational health, environmental science and engineering, health and social behavior and health policy and management courses that offer advanced teachings in safety engineering, ergonomics, biomechanics, behavioral epidemiology and health services research.

For the doctoral program, the proposed curriculum requires a minimum of two years of course work for the completion of 80 credit hours plus an additional two to three years to complete a research thesis. Students must also complete a written comprehensive examination at the end of their coursework that demonstrates their proficiency in the field. Upon completing their research they must produce three publishable papers based on their doctoral research.

Doctoral Curriculum: The course curriculum for Doctoral training includes the following components: occupational injury prevention research, occupational safety engineering and science, occupational injury epidemiology. No changes have been made to the curriculum since the last progress report.

D. Program Activities and Accomplishments

Major and recent accomplishments of the training program include:

- For 2006-2007 academic year we have one masters, eight-doctoral students and four post-doctoral researcher trainees in the injury program. We recruited a trainee for the masters program in 2006-2007.
- 2005 saw three new NIOSH funded research projects initiated: Preventing falls from Ladders, Risk Factors for Lacerations in Meat Packing, and Tools for exposure assessment of physical risk factors.
- Through these and other new research initiatives we strengthened existing and developed new partnerships with the Center for the Protection of Workers Rights (CPRW), John Hopkins University, University of Nebraska, Partners Health Care (Massachusetts General Hospital and Brigham and Women's Hospital) the Dana Farber Cancer Institute, Boston University School of Public Health University of Massachusetts, the University of Washington and Beth-Israel Deaconess Orthopaedics Biomechanics Laboratory.
- We continued collaborative training efforts with the Liberty Mutual Research Institute for Safety, Harvard Injury Control Research Center, Massachusetts Institute of Technology and the Massachusetts State Department of Health.
- Through a set of outreach activities and proposed research projects we and our trainees developed new international research projects in Colombia, Cyprus (Cyprus International Institute for Environmental and Public Health), Japan, the Netherlands, and the Peoples' Republic of China.
- In 2005 we expanded our program faculty with the addition Drs. Ian Noy and Mary Bouxsein. Dr. Noy is the new director of the Liberty Mutual Research Institute for Safety with a strong research record in traffic safety and Dr. Bouxsein is an instructor at Harvard Medical School, a researcher in the Orthopaedics Biomechanics Laboratory and an expert in fracture mechanics and epidemiology.

E. Program Products

- In 2005 we had over 40 publications in peer reviewed journals and in conference proceedings by or with injury program trainees.
- 2005 saw the successful implementation of the Injury Epidemiology course by Drs. Perry, Lombardi, and Smith, the Occupational Biomechanics Class by Dr. Dennerlein and the continuing discussion of injury topics in pre-existing classes within the School of Public Health's courses continuing our efforts for the occupational prevention training curriculum.
- We saw an increase in our attendance in our continuing education class for Ergonomics and Human Factors with over 48 confirmed people registering for the class from around the country

F. Future Plans

Our future plans are to continue to build the program three ways. First we plan on submitting more research grants in the area of injury prevention from agriculture to office workers. We also plan to recruit more students for the fall of 2007 through our recruitment efforts. Finally, we plan on having an advisory board meeting to describe the progress and get new guidance on the program based on the local advisor board needs.

APPENDIX B
OCCUPATIONAL INJURY PREVENTION CURRICULUM

BIO 225 (Fall)
Multiple Regression Analysis - 2.5
EH 236 (Fall)
Epidemiology of Environmental and Occupational Health Regulations - 5.0
EH 262 (Fall)
Introduction to the Work Environment - 2.5
RDS 280 (Fall2)
Decision Analysis for Health & Medicine - 2.5
EH 231 (Spring)
Occupational Health Policy & Administration
EH 241 (Spring)
Occupational Safety and Injury Prevention - 2.5
EH 282 (Spring2)
Injury Epidemiology - 2.5
HPM 292 (Spring2)
Research Ethics - 1.25
ID 215 (Spring)
Environmental & Occupational Epidemiology - 2.5
ID 240 (Spring1)
Principles of Injury Control - 2.5
ID 263 (Spring)
Practice of Occupational Health - 5.0
RDS 500 (Spring1)
Risk Assessment - 2.5
EH 296 (Spring)
Occupational Biomechanics - 5.0
MIT 2.181
Human Factors Engineering - 5.0
MIT 2.182
Biomechanics and Neural Control of Movement

SAFETY ENGINEERING AND SCIENCE

EH 243 (Fall)
Ergonomics and Human Factors - 2.5
EH 250
Protecting Workers and Communities from Hazardous Substances
MIT 2.181
Human Factors Engineering - 5.0
MIT 2.182
Biomechanics and Neural Control of Movement - 5.0

INJURY EPIDEMIOLOGY TRACK

BIO 222 (Fall)
Basics of Statistical Inference 5.0
EH 236 (Fall)
Epidemiology of Environmental and Occupational Health Regulations 5.0
EPI 205 (Fall)
Practice of Epidemiology 5.0
ID 215 (Spring)
Environmental and Occupational Epidemiology 2.5
EH 231 (Spring)
Occupational Health Policy & Administration - 2.5
EH 250
Protecting Workers and Communities from Hazardous Substances - 2.5
(Not offered 2005-2006)
EH 254 (Spring every other)
Control of Noise and Vibration - 2.5
ENG SCI 145a (Fall)
System Analysis and Physiology Applications - 5.0
a ENG SCI is a course in the Harvard University Faculty of Arts and Sciences.

APPENDIX D
OCCUPATIONAL INJURY PREVENTION PUBLICATIONS

Balakrishnan AD, Jindrich DL, Dennerlein JT. Designing a keyswitch utilizing horizontal forces of the fingertip. Human Factors, In press, 2006.

Barrero LH, Hsu YH, Terwedow H, Perry MJ, Dennerlein JT, Brain JD, Xu X. Prevalence and physical determinants of low back pain in a rural Chinese population. Spine (In Press).

Chang CH, Amick BC III., Chaumont Menéndez C, Katz JN, Johnson PW, Robertson MM, Dennerlein JT. Daily computer usage correlated with undergraduate students' musculoskeletal symptoms. AJIM. Conditionally Accepted

Chaumont Menéndez C, Amick BC III., Jenkins M, Janowitz I, Rempel DM, Robertson M, Dennerlein JT, Chang CH, Katz JN. A Multi-Method Study Evaluating Computing-Related Risk Factors Among College Students. Work: A Journal of Prevention, Assessment, and Rehabilitation, Conditionally Accepted

Chen JC, Dennerlein JT, Chang CC, Chang WR, Christiani DC. Seat inclination, use of lumbar support and low-back pain of taxi drivers. Scand J Work Environ Health. 2005 Aug;31(4):258-65.

Courtney TK, Huang YH, Verma SK, Chang WR, Li KW, Filiaggi A. Factors Influencing Restaurant Worker Perception of Floor Slipperiness. Injury Prevention. Accepted.

Dennerlein JT, DiMarino MHJ. Forearm EMG changes with the use of a haptic force-feedback computer mouse. Human Factors 48(1): 130-141, 2006.

Hsu YH, Niu T, Terwedow H, Xu X, Feng Y, Bouxsein M, Brain J, Betensky R, Laird N, Rosen C, Xu X. Genetic variation in genes involved in the RANKL/RANK/OPG bone remodeling pathway are associated with bone mineral density at different skeletal sites in men. Human Genetics 2006; 118: 568-577

Hsu YH, Venners SA, Terwedow H, Niu T, Feng Y, Bouxsein M, Betensky R, Laird N, Brain J, Cummings SR, Rosen C, Xu X. Relationship of body composition, fat mass and serum lipids to osteoporotic fractures and bone mineral density in men and women. American Journal of Clinical Nutrition 2006; 83: 146-154

Jin K, Lombardi DA, Courtney TK, Sorock GS, Perry MJ, Cheng H, Wang X, Liang Y. The challenge of cross-cultural collaborative research: lessons learned from a pilot case-crossover study of severe occupational hand trauma in the P.R. China. Injury Preven (in press).

Kotani K, Barrero L, Lee D, Dennerlein, JT. Effect of horizontal position of the computer keyboard on upper extremity posture and muscular load during computer work. Ergonomics. Conditionally Accepted.

Kuo PL, Lee DL, Jindrich DJ, Dennerlein JT. Finger joint coordination during tapping. J. Biomechanics. In Press, 2006.

Lander IL, Rudnick SA, Perry MJ. Farm youth exposure to noise. J of Agromedicine (accepted pending revisions).

Lander IL, Connor JA, Shah RK, Kentala E, Healy GB, Roberson DW. Otolaryngologists? responses to errors in their practice. Manuscript under review. Laryngoscope (accepted).

Lee DL, McLoone H, Dennerlein JT. Observed finger behavior during computer mouse use. Applied Ergonomics, Conditionally Accepted.

Lee DL, McLoone H, Fleisher J, Kotani K, Dennerlein JT. Alternative computer mouse design and testing to reduce static finger extensor muscle activity during mouse use. Human Factors, Conditionally Accepted

Nagata T, Hemenway D, Perry MJ. The effectiveness of the 2002 law targeting alcohol-impaired driving in Japan. Injury Preven (accepted pending revisions).

Pransky G, Verma SK, Okurowski L, Webster BS. Length of Disability prognosis in acute occupational low back pain: Development and testing of a practical approach. Accepted Spine.

Pransky GS, Berndt E, Finkelstein SN, Verma SK, Agrawal A. Performance decrements resulting from illness in the workplace: the effect of headaches. J Occup Environ Med 2005; 47:34-40.

Shaw W, Verma SK. Validity of Interactive Voice Response systems for research of pain and disability. Pain Management (accepted).

Smith GS, Timmons RA, Lombardi DA, Mamidi DK, Matz S, Courtney TK, Perry MJ. Work-related Ladder Fall Fractures: Identification and diagnosis validation using narrative text. Accident Analysis and Prevention 2006; 38:973-980.

Verma SK, Sorrock G, Pransky G, Courtney T, Smith G. Occupational physical demands and risk of same level falls resulting in fracture. Inj Prev (in press).

Zalloua PA, Hsu YH, Terwedow H, Zang T, Wu D, Tang G, Li Z, Hong X, Azar ST, Wang B, Bouxsein M, Brain J, Cummings SR, Rosen C, Xu X. Impact of Seafood and Fruit consumption on Bone Mineral Density in Women (Revised, Maturitas)

Peer Revlewed Journal Articles (Submitted)

Johnson PW, Ciriello VM, Kerin KB, Johnson PW, Dennerlein JT. Using electrical stimulation to measure physiological changes in the human extensor carpi ulnaris muscle after prolonged repetitive ulnar deviation. European Journal of Applied Physiology Submitted.

Ouyang F, Wang X, Rosul LL, Venners SA, Arguelles L, Chen C, Hsu YH, Terwedow HT, Xu X. An association between prolonged menstrual cycle length and decreased bone mineral density. (submitted)

Rothman EF, Silverman JG, Perry MJ, Hemenway D. Health correlates of intimate partner and non-intimate partner sexual assault. J of Women's Health. (submitted)

Verma SK, Sorock GS, Pransky GS, Courtney TK, Smith GS. Are physical demands at work associated with fractures due to same level falls in women over 50 years old? Re-submitted , American Journal of Epidemiology.

Conference proceedings and abstracts

Courtney TK, Huang Y-H, Verma S, Chang WR, Li KW, Filiaggi A. Restaurant worker perception of floor slipperiness. Presented at the Ergonomics Society Annual Conference, Hatfield, Hertfordshire, UK, 2005.

Courtney TK, Lombardi DA, Sorock GS, Verma SK, Wellman HM, Bell J, Collins J, Wolf L, DeMaster E, Matz M, Chang WR, Grönqvist R. Slips, trips, and falls in US health care workers. Presented at the XVII World Congress on Safety and Health at Work, Orlando, FL, September, 2005.

Fisher JL, W.N. Newberry, R. Krishnan, J. Pierce and T.L.A. Moore. Late-phase occupant rebound after rear-end impact. Presented by Jacob L. Fisher at the 2005 Summer ASME Bioengineering Conference, Vail, Colorado, June 22-26, 2005.

Jin K, Lombardi DA, Courtney TK, Sorock GS, Perry MJ, Chen H, Wang X, Liang Y. A pilot study of severe hand trauma in small enterprises in the People's Republic of China. Presented at the XVII World Congress on Safety and Health at Work. Orlando, FL, September, 2005.

Krishnan R, S. Hu, J.T. Dennerlein, N. Wang. Measurement of single-cell generated tractions in response to localized repetitive mechanical loading. Submitted to the 5th World Congress of Biomechanics, Munich, Germany, July 29-Aug4, 2006.

Lander IL, Connor JA, Shah RK, Kentala E, Healy GB, Roberson DW. Otolaryngologists? responses to errors in their practice. Research Grand Rounds presentation, Children's Hospital Boston, September 14, 2005

Lander IL, Shah RK, Chesnulovitch K, Forbes P, Healy GB, Roberson DW. Development of trigger tool for the identification of errors and adverse events in pediatric otolaryngology. Poster presented at the Triological Society Annual Meeting, Boca Raton, Florida, May 15, 2005

Lander IL, Shah RK, Chesnulovitch K, Forbes P, Healy GB, Roberson DW. Development of trigger tool for the identification of errors and adverse events in pediatric otolaryngology. Research Grand Rounds presentation, Children's Hospital Boston, September 14, 2005

Smith GS, Timmons RA, Lombardi DA, Mamidi DK, Matz S, Courtney TK, Perry MJ. Identifying ladder fall fractures and coding verification using narrative text analysis. Paper e presented at the International Ergonomics Association 16th Congress, Maastricht, The Netherlands, July 10-14 2006.*

Verma SK, Sorock GS, Pransky GS, Courtney TK, Smith GS. Are physical demands at work associated with fractures due to same level falls in women over 50 years old? Presented at the American Public Health Association, 33rd Annual Meeting & Exposition, December 10-14, 2005. Philadelphia, PA.

Webster BS, Verma SK. Relationship of Narcotic Prescribing and Disability Duration in Occupational Low Back Pain: The Influence of "Severity." Workers' Compensation Research Group 2005

A. Program Title:

Hazardous Substance Academic Training (HSAT) Program

B. Program Director:

Stephen N. Rudnick, ScD, CIH

C. Program Description

i. Goals and Objectives

The goals and objectives of the Hazardous Substance Academic Training Program (HSAT) at the Harvard School of Public Health are to train competent master of science (MS) level industrial hygienists 1) to protect the health and safety of workers involved with hazardous substances, 2) to develop leaders in the field of industrial hygiene who have an in-depth knowledge about controlling the risks associated with hazardous substances, and 3) to prepare them for doctoral programs and go on to teach and do research in industrial hygiene, focusing on hazardous substances. In addition, a secondary goal of the HSAT Program is to make coursework available to non industrial hygiene environmental health students that will help them to protect workers and communities from hazardous substances.

ii. Responsible Conduct of Science

Although we do not require HSAT students to take a specific course devoted to the ethical practice of industrial hygiene, in many of the required industrial hygiene related courses at Harvard, issues related to the ethical practice are discussed. In particular, four lectures in Occupational Health Policy and Administration (EH 231) are directed toward professional ethics and related topics: 1) Ethics in Environmental and Environmental Health, 2) Confidentiality Issues in Occupational Health, 3) Occupational Health Law, and 4) The Role of the Occupational Health and Safety Professional in the Courtroom.

iii. Faculty Participation

Stephen N. Rudnick, ScD, CIH, is Program Director for the Hazardous Substance Training Programs both for academic and continuing education. This dual directorship is advantageous to both Programs because he functions as a liaison, allowing each to benefit from the other. As an example of how this benefits the HSAT Program, we allow students to take any of the continuing–education courses offered by the HST Program, although this is frequently not possible due to scheduling conflicts with academic courses. Dr. Rudnick has been a member of the Industrial Hygiene faculty at Harvard since 1988. He presently teaches four graduate courses: 1) Protecting Workers and Communities from Hazardous Substances (EH 250), 2) Behavior and Properties of Airborne Particles (EH 292), 3) Ventilation (EH 253), and 4) Control of Noise and Vibration (EH 254). He is also a co-director (and has been for the past 20 years) of the annual week-long course "In-Place Filter Testing Workshop". Since 2000, he has been and continues to be a co-director of the annual week-long course "Comprehensive Industrial Hygiene: Practical Application of Basic Principles." During the past year, he was also a co-director of three other continuing-education courses.

Because the curriculum for the HSAT Program relies to a large extent on the existing curriculum of the industrial hygiene program, the roster of regular faculty and teaching staff members is the same as for the industrial hygiene program. In addition to Dr. Rudnick, three full-time faculty members are involved in teaching courses important to the HSAT Program: 1) Thomas J. Smith, PhD, CIH, is the director of

the industrial hygiene program, and he teaches "Practice of Occupational Health" [ID 263]; 2) Robert F. Herrick, ScD, CIH, is in charge of the internship program, and he teaches "Introduction to the Work Environment" [EH 262], "Practice of Occupational Health" [ID 263], and "Industrial Hygiene Seminar" [EH 267]; and 3) John S. Evans, ScD, CIH, teaches "Risk Assessment" [RDS 500]. In addition, a number of local CIH practitioners teach in industrial hygiene courses: 1) Robert Spielvogel, CIH, CSP [formerly, Manager of Health & Safety, Clean Harbors], 2) Louis DiBerardinis, CIH, CSP [MIT], 3) Michael Walters, ScD, CIH [Polaroid], 4) Martin Horowitz, CIH [Analog Devices], 5) Elizabeth Gross, CIH, [Dana Farber Hospital], and 6) James Stewart, PhD, CIH [Environmental Health & Engineering, a consulting company].

Students obtaining a Harvard M.S. degree in Industrial Hygiene with emphasis on hazardous substances are generally required to take eighty credits over a two-year period. The HSAT Program curriculum for the 80-credit, two-year, Master of Science degree as presently structured is given in Appendix B. In this Appendix, two options are shown. In the first option, students take 60 credits of coursework over three semesters. In addition, they complete an industrial hygiene internship related to hazardous substances (EH 303). This internship requires six months: the entire fall semester of their second year and the preceding summer. A minimum stipend of $12,000 is paid to the student by the sponsor. Students are graded on a special project focusing on hazardous substances, which they conduct during their internship. Results from this special project are submitted in a written report and presented orally in the course "Industrial Hygiene Internship Seminar" (EH 267). In addition, the students are required to submit their findings for presentation at the student poster section of the annual American Industrial Hygiene Conference or an equivalent forum. In the second option,students take 80 credits of coursework over four semesters. In addition, they are required to complete a practicum related to hazardous substances. This practicum is usually completed during the summer between their first and second year, but may extend into the academic year. Although this practicum is requirement for graduation, no academic credit is awarded.

iv. Program Curriculum

Five of the courses that are listed in Appendix B deal with hazardous substances in a significant manner; their descriptions follow:

EH 250 Protecting Workers and Communities from Hazardous Substances (Rudnick, Martin, Spielvogel) Covers the recognition, evaluation, and control of workers exposures to chemical, biological, and physical agents during remediation of hazardous waste sites, emergency response activities, and related operations. (2.5 credits)

GSD 6323 Brownfields Practicum - Sustainable Redevelopment of Brownfield Sites in Somerville MA (Kirkwood) The class examines the economic, environmental, community, regulatory, engineering and development conditions surrounding brownfields. This includes lectures and discussions with stakeholders from federal, city and community agencies, as well as other professionals from the legal, financial, planning, engineering, and environmental risk assessment professions. Through a rigorous practice component, student teams apply their general brownfield knowledge to particular challenges in the field on behalf of a local-based city authority and gain hands-on experience in applied environmental and economic development research and analysis, community practice, and sustainability planning and design. In this way, class members are exposed to brownfield challenges and constraints alongside creative inquiry and innovative design opportunities. (5.0 credits)

EH 279. The Radiation Environment: Its Identification, Evaluation & Control (Maher) Starting with the fundamentals of radiation protection, this course treats in-depth selected topics in occupational

and environmental radiation protection such as risk assessment of exposures to diagnostic and therapeutic x rays; use of lung and metabolic models in evaluation of the hazard from inhalation and ingestion of radioactive chemicals; hazard from indoor radon; radiological assessments

regarding nuclear power, war, and radiological terrorism; hazards from microwaves, cellular phones and other sources of nonionizing radiation; case studies of radiation accidents; and management of university and hospital radiation programs. (2.5 credits)

EH 267. Industrial Hygiene Internship Seminar (Herrick) Refines communication skills of students who have participated in the Industrial Hygiene Internship (EH 280) or have done an IH practicum. (2.5 credits)

EH 250 (Protecting Workers and Communities from Hazardous Substances) was specifically designed for the HSAT Program. It was first offered in 1993 and continues to be a key course for HSAT students. Although GSD 6323 (Brownfields PracticumSustainable Redevelopment of Brownfield Sites) is recommended, it can be replaced with one of the following three courses: 1) Brownfields Policy and Practice (MIT 11.370), 2) Regulation of Chemicals, Radiation, and Biotechnology (MIT 1.812J), or 3) Toxic Use Reduction & Pollution Prevention (UMAL 19.557).

D. Program Activities and Accomplishments

During this past year (7/1/05 – 6/30/06), we had two trainees supported by the HSAT Program: 1) Leonard Zwack and 2) Jennifer Lynn. Len, who did very well academically, graduated in June 2006 with a master of science degree in industrial hygiene (with a subspecialty in hazardous substances). For his practicum, he was involved in three independent projects:

1. participated in a study to identify and characterize the sources and mechanisms of exposure to dermal polycyclic aromatic compounds (PAC) in a cohort of asphalt paving workers. His contribution included analyzing the PAC data, creating mass and concentration graphs and tables, and manuscript preparation.
2. worked on a project looking at the interactions between efficiency and equity in deciding optimal pollution control strategies at power plants. Tasks that he was directly involved in included collecting population-level exposure and risk data, helping with model construction, generating scenarios, running the model, analyzing the data, and helping with manuscript preparation.
3. He worked on a project examining how perceptions of health and income inequality of risk professionals and environmental justice advocates differ. He distributed an electronic survey to various risk and environmental justice groups by finding email listservs or newsgroups to which people in these two divergent areas were likely to belong. He conducted some initial summary analyses and created more formal statistical analyses.

Len is presently enrolled in a doctoral program in our department.

Jennifer Lynn, a first-year half-time HSAT Master of Science student, satisfactorily completed the Fall 2005 semester, but then decided to take a leave of absence for one semester. She planned to rejoin the HSAT Program for the Spring 2007 semester, but in January 2006, she decided not to. We were very disappointed about this and hope that she will return at some future date. In addition to Len and Jennifer, Victoria Jackson, a Native American, who is now a second-year Master of Science industrial hygiene student, joined the HSAT Program. Victoria is being supported by the U.S. Navy.

In addition to the Harvard School of Public Health website, we have utilized various strategies to attract qualified students. Dr. Rudnick manned booths at the School's open houses for prospective students. He talked to prospective students and handed out written material. With the help of the New England

chapter of American Industrial Hygiene Association, we have advertised the HSAT Program at local meetings and in their newsletter.

E. Program Products

All three of the projects in which Len Zwack had participated while he was pursuing a Master of Science degree from the HSAT Program have resulted in manuscripts suitable for publication. Three manuscripts in which Len is a coauthor were submitted for publication and are listed in Appendix D.

During the past year, Dr. Rudnick has been a coauthor of four publications, which are listed in Appendix D. He has also been co-director of a number of continuing-education courses: 1) Comprehensive Industrial Hygiene: Practical Applications of Basic Principles (June 19-23, 2006), 2) Integrated Emergency Planning: A Step-By-Step Approach to "One Plan" (May 25, 2006), 3 Advanced Hands-On CAMEO Training (May 22-24, 2006), 4) Basic Hands-On CAMEO Training (March 20-22, 2006), and 5) In-Place Filter Testing Workshop (August 22-26, 2005). At the International Academy of Indoor Air Sciences in Beijing on September 4, 2005, Dr. Rudnick was presented with the Indoor Air Journal "Best Paper Award" for 2002-2004.*

F. Future Plans

In order to enhance the HSAT Program in the future, we plan to direct our efforts to effect the following improvements:

- Heighten the visibility of the HSAT Program in New England in order to attract a greater number of qualified applicants to the Program.
- Search for supplemental sources of funding for students.
- Better utilize our HST/HSAT Advisory Committee, the ERC Advisory Committee, and the Harvard Industrial Hygiene Alumni Guild to enhance the HSAT Program.
- Promote our relationships with companies and government agencies involved with hazardous waste site remediation; treatment, storage, and disposal facilities; emergency response activities; and related activities. These relationships, hopefully will aid in providing financial aid for students, internship sponsors, knowledgeable instructors for lectures, and useful teaching material, such as case studies and audiovisual material related to protecting workers involved with hazardous substances.

*Rudnick SN and DK Milton. Risk of indoor airborne infection transmission estimated from carbon dioxide concentration. Indoor Air. 13:237-245 (2003).

APPENDIX B
HAZARDOUS SUBSTANCE ACADEMIC TRAINING PROGRAM CURRICULUM

		Credits
FALL SEMESTER, FIRST YEAR		
BIO 201	Introduction to Statistical Methods	5.0
EH 205	Human Physiology	5.0
EH 243	Ergonomics/Human Factors	2.5
EH 510	Fundamentals of Human Environmental Exposure Assessment	2.5
EH 262	Introduction to the Work Environment	2.5
EPI 201	Introduction to Epidemiology	2.5
	Total	20.0
WINTER SESSION, FIRST YEAR		
EH 280	Field Methods in Environmental & Occupational Health	2.5
SPRING SEMESTER, FIRST YEAR		
EH 241	Occupational Safety & Injury Prevention	2.5
EH 254	Evaluation and Control of Noise and Vibration	2.5
EH 292	Properties & Behavior of Airborne Particles	2.5
EH 231	Occupation Health Policy & Administration	2.5
RDS 500	Risk Assessment	2.5
ID 263	Practice of Occupational Health	5.0
	Total	20.0
FALL SEMESTER, SECOND YEAR		
EH 303	IH Internship (related to hazardous substances)	20.0
	or	
EH 504	Principles of Toxicology	5.0
EH 279	Radiation Environment: Identification, Evaluation & Control	2.5
EH 256	Aerobiology	2.5
SHH 201	Society & Health	2.5
Electives		7.5
	Total	20.0
WINTER SESSION, SECOND YEAR		
Elective course or no-credit IH-related activity		
SPRING SEMESTER, SECOND YEAR		
EH 250	Protecting Workers & Communities from Hazardous Substances	2.5
EH 253	Ventilation	2.5
EH 263	Analytical Methodology & Exposure Assessment	5.0
EH 267	IH/Ergonomics/Hazardous Substance Seminar	2.5
GSD 6323	Brownfields Practicum - Sustainable Redevelopment of Brownfield Sites in Somerville MA	5.0
ID 215	Environmental & Occupational Epidemiology	2.5
	Total	20.0

APPENDIX D
HAZARDOUS SUBSTANCE ACADEMIC TRAINING PUBLICATIONS

Publications of HSAT Trainee Leonard Zwack

1. Herrick RF, JD Meeker, MD McClean, LM Zwack, and K Hanley. Physical and chemical characterization of asphalt (bitumen) paving exposures. Submitted to Journal of Occupational and Environmental Hygiene (2006).

2. Levy JI, AM Wilson, and LM Zwack. Quantifying the efficiency and equity implications of power plant air pollution control strategies in the United States. Submitted to Environmental Health Perspectives (2006)

3. Tuchmann J, JI Levy, and LM Zwack. Perceptions of inequality among environmental justice and risk assessment professionals. Submitted to Risk Analysis (2006).

Publications of HSAT Director Stephen Rudnick

1. First MW, SN Rudnick, KF Banahan, RL Vincent, and PW Brickner. Fundamental factors affecting upper room ultraviolet germicidal irradiation—Part I. Experimental. Accepted by Journal of Occupational and Environmental Hygiene (2006).

2. Lander LL, SN Rudnick, and MJ Perry. Assessing noise exposure in farm youths. Accepted conditionally by Journal of Agromedicine (2006).

3. Rudnick SN and MW First. Fundamental factors affecting upper-room ultraviolet germicidal irradiation—Part II. Predicting effectiveness. Accepted conditionally by Journal of Occupational and Environmental Hygiene (2006).

4. McDevitt JJ, KM Lai, SN Rudnick, EA Houseman, MW First, and DK Milton. Characterization of UVC light sensitivity of vaccinia virus, Submitted to Applied Environmental Microbiology (2006).

A. Program Title

Health Services Research

B. Program Director 2005-2006

Eileen McNeely, PhD, MS, RNC

C. Program Description

i. Goals and Objectives

This program aims overall to attract and prepare researchers to conduct studies about the quality and effectiveness of health programs or policies associated with the employment relationship. These health programs encompass a broad perspective of work-related programs such as benefits plans (including group health care insurance, disability and personal leave policies), in addition to, workers compensation insurance, worksite health clinics, health promotion programs, safety programs, management policies (specifically, job design and work organization) and organizational culture. Also, students are taught to recognize the broader political, economic and cultural context for the coordination and continuity of these programs, such as; the influence of regulatory policy, labor policy and practice, family policy, changing demographics, work-home conflicts and pressures, and increasing global market competition. Importantly, researchers learn skills in research methods and principles of human subjects protections, statistics, epidemiology, environmental and occupational health, organizational behavior and leadership, economics, and policy-analysis, in order to identify research questions and to translate study findings into recommendations for policies that will optimize approaches to health in the workplace, such the prevention of disease and disability, the promotion of well-being and productivity, and the rehabilitation of injured or ill workers/employees.

The specific goals of the program are:

- To train qualified researchers with the skills and experience to design and conduct studies concerning the delivery and impact of health services associated with the employment relationship.

- To provide cross-training opportunities for individuals who already have preparation in either health services research or occupational health or a related field and also, to expand the breadth and depth of their knowledge through coursework, seminars, and discussion groups.

- To bring together into a combined program leading occupational health services researchers, research centers, and faculties from disparate universities and research organizations in the greater Boston area.

- To build a national locus of expertise in occupational health services research that could benefit NIOSH and other researchers and government agencies throughout the nation.

ii. Responsible Conduct of Science

The Harvard School of Public Health is committed to the conduct of research in an ethical manner. Accordingly, an academic course has been developed that is directed at all students and fellows in doctoral or postdoctoral programs. All students supported by the training grant are required to enroll in this course. The required course is HPM 292, Research Ethics. The course reviews a series of ethical issues that arise in the conduct of research. Topics include informed consent, disclosure of conflicts of interest, multiple authorship issues, issues in mentoring, privacy, genetics, gender- and race-based discrimination, and the Federal oversight program. All investigators and researchers who are involved directly with human subjects, or with data or tissue which they can link back to individual subjects, must fulfill the following: Harvard

University's on-line training module; attend the 90-minute "IRB Basics" workshop; and attend one special issues workshop offered by the Human Subjects Committee each academic year.

iii. Faculty Participation

Two core faculty members, Eileen McNeely and the ERC Director, David Christiani lead the training of occupational health services researchers. However, the program draws faculty expertise and experiences also from across the departments in the Harvard School of Public Health, (including the Health Policy and Management, Health and Social Behavior, Environmental and Occupational Health, and Biostatistics), the Harvard University John F. Kennedy School of Government, the Harvard Business School, the Harvard Medical School, and from the surrounding world renown research and health care institutions in the Boston area (such as Massachusetts General Hospital, Brigham and Womens' Hospital, Dana Farber Cancer Institute), as well as industry partners (such as Liberty Mutual Insurance Research Institute, The Workers Compensation Research Institute), and state and labor groups (such as Massachusetts Department of Health and the Massachusetts Coalition of Occupational Safety and Health).

iv. Program Curriculum

Historically, the program has had 3 types of training: a) doctoral preparation, b) post-doctoral preparation and c) specific training opportunities aimed at promoting knowledge and inquiry about occupational health services within other academic disciplines. Although the post-doctoral training program has been discontinued since 2005, based on funding imperatives, and the doctoral training is closing out the last year of funding, the subject of occupational health services remains an integral part of graduate education in occupational health. Special lectures and courses (EH281: Occupational Health Services) are continually offered to occupational medical and nursing students, post doctoral trainees in other disciplines, and other School of Public Health students.

D. Program Activities and Accomplishments

Since the beginning of the occupational health services training program in 2002, we have graduated 5 post doctoral students. Two of these researchers have returned to their universities in South Korea to develop course work and research activities in the field of occupational health, one graduate has gone on to work for a major health care insurer and one has returned to school to extend her education even further. During their tenure at Harvard, these trainees completed coursework and internships with mentors across the Boston area. Internships experiences included research at Liberty Mutual Insurance Research Institute, Massachusetts State Department of Public Health and Workers' Compensation Research Institute. These collaborations resulted in numerous presentations and publications. (See recent publications in Appendix).

In addition to the post doctoral students, we have trained 2 doctoral students, expected to graduate in 2007 and 2008. One of these students has become expert in the analysis of workers compensation data and OSHA data. The other student is examining the issues of health disparities within the context of occupational health. Each has already made presentations about their work to the academic and public health community.

Although there is no formal plan to expand upon the current student body in occupational health services training because of financial constraints, the efforts made in the establishment of this program have insinuated themselves in the activities of most of the occupational health students within the ERC. For example, the occupational medical and nursing students are now required to take a core course in occupational health services (EH281). This course provides hands on experience fro practitioners in the field of occupational health and continually receives exceptional reviews from students, i.e. "This is the most relevant course to my work I have taken to date". In addition, the numerous seminars and learning

activities that have been developed because of this training program are expected to continue, such as the doctoral teleconference series with University of Washington and the University of Minnesota. Allard Dembe, the former Co-Director of the Occupational Health Services training program has been tapped to Chair the Health Services program at Ohio State University, although he continues to maintain mentorship relationships with the HSPH trainees.

E. Program Products

1) Recruited and enrolled seven well-prepared graduate students
2) Developed and offered a new course in occupational health care delivery
3) Developed and ran a three-campus monthly occupational health services journal club
4) Identified and established productive research site placements
5) Established an identity and operative for occupational health services research
6) Conducted research projects resulting in publications.

F. Future Plans

Due to financial constraints and lack of funding, there are no future plans.

APPENDIX B
HEALTH SERVICES RESEARCH CURRICULUM

FALL SEMESTER, FIRST YEAR
HPM 206 (Fall)
Economic Analysis - 5.0
ID 250 (Fall2)
Ethical Basis of Public Health - 2.5
RDS 280 (Fall2)
Decision Analysis - 2.5
Elective - 2.5
SPRING SEMESTER, FIRST YEAR
ID 215
Environmental and Occupational Epidemiology - 2.5
HPM 208
Health Care Regulation and Planning - 5.0
HPM 292 (Spring)
Research Ethics - 1.25
EH 231
Occupational Health Policy and Administration - 2.5
RDS 285
Decision Analysis Methods- 5.0
FALL SEMESTER, SECOND YEAR
EH 281 (Winter Session)
Occupational Health Care Delivery - 2.5
EH 243
Ergonomics and Human Factors - 2.5
SHH 201 (Fall)
Society and Health - 2.5
BIO 213
Applied Regression - 5.0
BIO 222
Basics: Statistical Inference - 5.0
EH 236
Epidemiology of Environmental and Occupational Health Regulations - 5.0
SPRING SEMESTER, SECOND YEAR
ID 215
Environmental and Occupational Epidemiology - 2.5
HPM 247
Political Analysis for Health Policy - 5.0
RDS 282 (Spring2)
Cost Effectiveness/Benefit Analysis- 2.5
HPM 232
Operations Management - 2.5
HPM 516
Health Care: Quality Improvement - 2.5
Elective - 2.5
Elective - 2.5
a Either BIO 200 fall or BIO 201 fall required.
b Either EPI 200 fall or EPI 201 fall required.

APPENDIX D
HEALTH SERVICES RESEARCH PUBLICATIONS

Publications and Presentations

Won, Jong Uk, Dembe, Allard E. Services Provided by Family Physicians for Patients With Occupational Injuries and Illnesses. Ann Fam Med 2006 4: 138-147

Phillip R. Hunt, Jong Uk Won, Allard Dembe, and Letitia Davis. Work-related hospitalizations in Massachusetts: racial/ethnic differences. Monthly Labor Review. October 2005, Vol. 128, No. 10.

Allard Dembe, JB Erickson, RG Delbos and SM Banks/ The impact of overtime and long work hours on occupational injuries and illnesses: new evidence from the United States. Occ and Environmental Medicine 2005:62:588-597.

Allard E. Dembe, Judith A. Savageau, Benjamin C. Amick, III, and Steven M. Banks, "Racial and Ethnic Variations in Office-Based Medical Care for Work-Related Injuries and Illnesses," Journal of the National Medical Association, April 2005, pp. 498–507.

Wasiak R, Kim JY, Pransky G. "Work disability and costs caused by recurrence of low back pain: longer and more costly than in first episodes." Spine 2006, 31(2):219-225

Thomas Oberlechner, Ashok Nimgade. Work stress and performance among financial traders (p 285-293). 28 Sep 2005 Work & Stress. Vol 1. Issue 5.

Wasiak, Radoslaw and Eileen McNeely. Utilization and costs of chiropractic care for work-related low back injuries: Do payment policies make a difference? The Spine Journal 2006. Volume 6 (2) 146-153.

McNeely,Eileen. A Health Check-up for Nurses: Job Stress and Nurses Health. Nursing Outlook. November 2005.

Wasiak, Radoslaw, McNeely, Eileen, Magnetti, Sandra. 2004. Chiropractic Care in Workers' Compensation. Journal of Workers' Compensation. October 2004.

POSTER PRESENTATIONS

Hopcia, K., Packard, C., & Weker, R. (2006, March). An Ergonomic Assessment of Outpatient and Phlebotomy Activities on a Research Unit. Poster presented at the annual meeting of the General Clinical Research Centers, Washington, D.C.

ORAL PRESENTATIONS (recent)

Ashok Nimgade and Eileen McNeely, Workers' Comensation Research Group. November. 2006. "The fate of occupational and non-occupational low back injury in a community HMO sample: LBP injuries and "spill-over" health effects?" Boston, MA

Hopcia, K., June, K.J., McNeely, E. (March 3, 2006). Ageing Nurses: Increased Stress but Lower Injury Rates in the Hospital Setting? Presented at the Work, Health & Stress: Making a Difference in the Workplace Conference, Miami, FL.

June, K.J., Hopcia, K., McNeely, E. (March 3., 2006). Minority Nurses: Stress and Injury Rates in the Hospital Setting. Presented at the Work, Health & Stress: Making a Difference in the Workplace Conference, Miami, FL.

Hopcia, K. (December 2, 2005). Physical Therapy and Disability Duration in Occupational Knee Injuries. Presented at the NECOEM/MaAOHN 2005Annual Conference: Expanding Horizons – Local and Global Bedford, MA.

June, K.J., Hopcia, K., McNeely, E. (October 29, 2005) Attributing CVD to Work: The contrast of the US and Korea. Presented at the Optimizing Global Health through Nursing Science Conference, Chicago, IL.

Hopcia, K., (July 19, 2005). Organochlorines, Toxicity and Health Effects. Presented at the Environmental Nursing Symposium, Harvard School of Public Health, Boston MA.

Hopcia, K., (2005, July). Evidence-Based Practice Poster Presentations. Presentation at Nursing Grand Rounds, Massachusetts General Hospital, Boston MA.

Ashok Nimgade. "Mental stress and Occupational Health". New England Occupational and Environmental Medicine Conference Dec. 2005.

Hopcia, K., (2005, February). Research Utilization and Poster Presentations. Presented at Nursing Grand Rounds, Massachusetts General Hospital, Boston MA.

Hopcia, K., (2005, March). Research with Administrative Databases. Presented at the Advanced Practice Nurse Seminar Series, Massachusetts General Hospital, Boston MA.

Hopcia, K., (2004, March). Research Nurse or Nurse Researcher?. Presented at the Advanced Practice Nurse Seminar Series, Massachusetts General Hospital, Boston, MA.

A. Program Title

Pilot Projects Research Training Program (PPRT)

B. Program Director

Russ Hauser

C. Program Description

The purposes of the Pilot Project Research Training Program are:

1) To foster new research projects at the pilot project level that enhance the research training capacity of the Harvard ERC and other occupational safety and health training institutions in Region I.
2) To promote research in one or more of the 21 priority areas defined in the National Occupational Research Agenda (NORA)
3) To promote increased interdisciplinary interaction in the field of occupational safety and health.
4) To promote research that addresses regional occupational safety and health concerns.
5) To promote collaborative research and training activities among Training Program Grantees and other institutions and entities in Region I that focus on occupational safety and health.

D. Program Activities and Accomplishments

The ERC continues to collaborate in this research training program with the NIOSH funded Training Project Grantees and other occupational health and safety research training programs in Region I. There are currently three TPG's (Yale, U-Conn, UMass-Lowell) in Region I who have agreed to participate as collaborators.

To foster collaboration between the ERC and other research training institutions we published and disseminated an annual Pilot Project Research Report. All investigators funded by the PPRT Program were required to prepare and present a report describing their project both to other scientists and to the non-scientific community. We grouped the annual reports into an annual pilot project symposium which is scheduled with the monthly Visiting Scholars' meetings. The daylong symposium enhances interactions between grantees, ERC faculty and trainees; between ERC members, TPG faculty and students; and between ERC/TPG faculty, trainees and visiting scholars. All investigators funded by the PPRT Program are required to prepare a presentation (verbal or poster) describing their project, both to other scientists and to the non-scientific community. Recipients of pilot grants, who are not from the immediate Boston area, will be provided with travel funds to support the daylong event. Our most recent symposium was held on September 15, 2006, for the recipients of the 2004-06 year PPRT awards. A copy of the agenda is included in the appendix.

D. Program Products

Please see appendix for a detailed description of the outcomes from the pilot funding. Outcomes include publications, obtaining additional funding and other activities that resulted from the pilot projects. In summary, at least five of the pilot projects from 2004-2006 received additional funding, this includes university and governmental funding. Several pilots led to the completion of a doctoral dissertation for students in occupational health training programs. At professional meetings and in academic settings, there have been numerous research presentations of the data generated from the pilot projects. Finally, several research groups have published or are in the process of publishing their results in peer reviewed journals.

E. Future Plans

The request for proposals for the 2007-2008 year will be posted in April, 2007. We will require the proposals to be submitted by May 2007 so they can be sent out for external review and the pilot project review committee will have time to meet to evaluate and identify those pilots that will be funded. The committee will also meet and evaluate the overall success of the approach to supporting pilot research. Additionally, the ERC Executive Committee (Core Directors) as well as the ERC Advisory Board will receive a summary of the status of the Research Training Program and will provide input as part of the evaluation mechanism for the PPRT Program.

We will continue to track the pilot proposal generated publications that are submitted or accepted, as well as the number of presentations, abstracts, and grant applications. Investigators will be asked to submit copies of their publications and abstracts so that a record of all disseminated information based on the pilot projects can be maintained and reviewed.

The committee's annual review of the overall program quality and success will include: the number of proposals submitted; the number funded; the number of institutions represented among submitted and funded projects; the mean review scores of submitted and funded projects; a tabulation of NORA priority areas represented by projects; the disciplines represented by investigators; number of publications/presentations based on funded projects; and evidence that research training capacity has been enhanced for institutions engaged in the program. The committee will track and consider trends evidenced by these data over time and will recommend improvements to address program weaknesses. For example, if participation by outside institutions is noted to be minimal or to decrease, improved efforts to announce the program and solicit proposals will be made.

Below is a table of our most recently funded pilot projects for the 2006-2007 budget year.

Project Title	PI Name	CoPI Name	Home Institution	Funding Received
Field Sampling and Exposure Assessment of Hardwood Floor Finishes	Azaroff	Woskie	UMASS - Lowell	$10,000
Physical exposure assessment for epidemiologic research of musculoskeletal disorders: Pilot study	Dennerlein	Barrero	HSPH	$10,000
On-Duty CHD Events in Firefighters: Predictors of Fatal incidents	Holder	Geibe	HSPH	$10,000
Use of Solid Phase Microextraction (SPME) to Assess Biomarkers of Inhalation and Dermal Exposures to Mixed Solvents	Woskie	Van Snipe	UMASS - Lowell	$10,000
Social consequences of occupational injury: depression and suicide	McNeely	Kim	HSPH	$10,000
Development of an ergonomic job exposure matrix (JEM) for the healthcare sector	Punnett	Boyer	UMASS - Lowell	$10,000
Evaluation of usefulness of a near-miss reporting system in reducing the number of OSHA recordable injuries.	Perry	Lander	HSPH	$10,000
Protein Expression Changes and Work Stress in Pregnant Women	Wright	Wang	HSPH	$10,000

Pilot Project Symposium
Harvard-NIOSH ERC
Occupational Health Program
Harvard School of Public Health
Kresge Building/Room G-3
September 15, 2006

Agenda

9:00 a.m.	Continental Breakfast
9:20 a.m.	Welcome and Introductions Dr. David C. Christiani, Director, Harvard-NIOSH ERC Dr. Russ Hauser, Director, Pilot Project Research Training
9:30 a.m.	Kerry Souza/David Weil *Evaluation of Personal Characteristics of Immigrant Workers Who Died of Traumatic Occupational Injury*
9:45 a.m.	Q & A
9:50 a.m.	Lenard Kaye/Sandra Butler *The Health and Safety of Older Workers in Maine Pilot Project*
10:05 a.m.	Q & A
10:10 a.m.	Jennifer Cavallari/Shona Fang *Occupational Exposure to Fine Particulate Matter and Arterial Stiffness among Boilermaker Construction*
10:25 a.m.	Q & A
10:30 a.m.	Mike Wang *Exploratory Proteomic Analysis using SELDI-TOF MS Technology in Serum Samples from Individuals Exposed to Metal Fume*
10:45 a.m.	Q & A
10:50 a.m.	BREAK
11:05 a.m.	Kenneth Dangman/Nancy Simcox *A Sampling Strategy for Personal Bioaerosol Exposure Monitoring among Teachers in Connecticut*
11:20 a.m.	Q & A
11:25 a.m.	DeWei Li/James LaMondia *A Pilot Study of Workers' Exposure to Airborne and Phylloplane Fungi in Greenhouses in Connecticut with a Traditional Method and QPCR*
11:40 a.m.	Q & A
11:45 a.m.	Discussion
12:00 p.m.	LUNCH Visit Earl Dotter's Photography Exhibit "Our Future in Retrospect? Coal Miner Health in Appalachia: Photographs by Russell Lee - 1946 & Earl Dotter – 2006" Kresge Atrium
1:00 p.m.	Jungkeun Park/Bryan Buchholz *An Evaluation of Muscle Activity and Posture of Upper Extremity during Simulated Pipette Work*
1:15 p.m.	Q & A

1:20 p.m.	Elizabeth Scott/Susan Duty *Characterization and Quantification of Bacterial and Viral Pathogens and Indicator Organisms in Household Environments*
1:35 p.m.	Q & A
1:40 p.m.	Lu Yuan/Bryan Buchholz *Biomechanical Analysis of the Low Back and Shoulder during Drywall Installation*
1:55 p.m.	Q & A
2:00 p.m.	Melissa Perry/Aqiel Dalvie *Chromosomal Effects of Organochlorine Exposure in Human Sperm*
2:15 p.m.	Q & A
2:20 p.m.	Discussion
3:00 p.m.	Adjournment

Below is a list of our 2005-06 Pilot Projects

Project Title	PI Name	CoPI Name	Project Status	Additional Funding Received	Publication
Exposure Determinant Modeling of Welding Fume Exposures Among Union Trades Apprentices	M. Song	S. Woskie	Completed	No	Dissertation 2006
A pilot study to develop methods for assessing respiratory and dermal exposure to cleaning agents	M. Quinn	A. Bello	Completed	UMASS Lowell	Dissertation - in progress
Health Experience of Workers Receiving Lump-Sum Payments from the Maine Workers' Compensation System during the period 1998-2003, Part I Survey Development	I. Most	/	Competed Phase 1, Begun Phase 2	Maine Workers Compensation Board	Phase 1 published as a poster presentation at the April 18-20, 2006 NORA symposium
Occupational Health Survey of Vietnamese Americans	L. Azaroff	C. Roelofs	Survey complete, analysis underway	No	Not yet published. Subset of findings were presented at the American Public Health Association Meeting and the American Industrial Hygiene Conference and Exhibition. The findings were key to the development of our outreach tool -- the Calendar for a Healthy Nail Salon Work Environment -- as they "told" us which issues to include (MSDs, chemicals in air, mask use, how to get information)
Profile of Massachusetts Firefighters Retiring under Heart Presumption Legislation: 1997-2003	S. Kales	J. Holder	Initial paper completed(for residency requirement), Second in progress	PERAC (Public Employees Retirement Administration Commission)	First paper is currently being reviewed by JOEM
Sources of variance in exposure to risk factors for knee injury	L. Punnett	S. Tak	Completed	No	No
Evaluation of personal characteristics of immigrant workers who died of traumatic occupational injury	K.Souza	D. Weil	In process	No	No
Effect of sharps injury rates with various denominators on rank order of hospitals	D. Kriebel	H. Kim	In process	No	Presentation in 2006 North American Congress of Epidemiology

Characterizing Phthalate Exposure Among Nail Salon Workers	S. Duty	R.Hauser	Recruitment is complete, data analysis and manuscript preparation are in progress	$1500 grant from Simmons college for translating all study documents into Vietnamese /$500 grant from the New England Deaconess Hospital School of Nursing Alumnae Association	Manuscript in preparation stage
Piloting the use of a Daily Work Diary (DWD) in pregnancy	J. Meyer	J. Fifield	Data collection and questionnaires completed. Data analysis current and ongoing.	Longitudinal measurement of work stressors in pregnancy. CDC/NIOSH R21 OH008543-01. This current funding has some relationship to the data collected and to the measures assessed in the pilot	No
Assessing Worker Exposure to Lead-Based Paint as a Result of Mechnically Removing Lead Paint from Wood Siding Recovered from Dismantled Buildings	S. Eller		Completed	No	No
Exposure Assessment in Lobstermen's Sheds	R. Donahue	J. Spengler	Completed	No	No (Honorable mention at HSPH poster presentation)
The Health and Safety of Older Workers in Maine Pilot Project	L. Kaye	S. Butler	Completed	No	no publications but there have been 3 professional presentations based on the research: Butler, Sandra S. & Kaye, Lenard W. (May 25, 2005). "Employer and Worker Perceptions About Older Worker Health and Safety: The Maine Older Worker Pilot Study," Paper presentation at the 3rd Maine Occupational Safety & Health Research Symposium, Biddeford, ME/ Butler, Sandra S., Kaye, Lenard W., Lamstein, Lynn, & Nadeau, Kristin. (November 21, 2004). "Comparative Analysis of Employer and Employee Perceptions of Workplace Health and Safety of Older Worker/ Kaye, Lenard.W. (May 6, 2004). The Changing Face of the Older Worker," Symposium presentation at the 19th Annual Maine Human Resources Convention, Rockland, ME.

A. Program Title

Hazardous Substance Training (HST) Program

B. Program Director

Stephen N. Rudnick, ScD, CIH

C. Program Description

The goals and objectives of the Hazardous Substance Training Program (HST) at the Harvard School of Public Health are to offer continuing-education courses to professionals who have environmental health and safety responsibilities for hazardous waste sites, emergency response operations, or other activities involving hazardous substances where a potential for significant exposures to workers and communities exists. In addition, the 9/11 terrorist attacks have resulted in an increased perceived and real threat of hazardous chemicals, biological agents, and nuclear materials being used by terrorists. Our goal is to respond to this possibility by providing courses for professional training in emergency response and clean-up of hazardous substance releases that are appropriate to this threat.

Stephen N. Rudnick, ScD, CIH, is Program Director for the Hazardous Substance Training Programs--both for academic and continuing education. This dual responsibility provides a synergism that benefits both the HST and HSAT Programs. Dr. Rudnick has been a member of the industrial hygiene faculty at Harvard since 1988. During the past year, he was a co-director of five continuing-education courses: 1) Basic Hands-On CAMEO Training (March 20-22, 2006), 2) Integrated Emergency Planning: A Step-By-Step Approach to "One Plan" (May 25, 2006), 3) Advanced Hands-On CAMEO Training (May 22-24, 2006), 4) Comprehensive Industrial Hygiene: Practical Applications of Basic Principles (June 19-23, 2006), and 5) In-Place Filter Testing Workshop (August 22-26, 2005). He teaches four graduate courses: 1) Protecting Workers and Communities from Hazardous Substances, 2) Behavior and Properties of Airborne Particles, 3) Ventilation, and 4) Control of Noise and Vibration.

The School's Center for Continuing Professional Education (CCPE) assists Dr. Rudnick in marketing and implementing the continuing-education courses offered by the HST Program. The staff of CCPE working directly with Dr. Rudnick includes Barbara Blanchard, Deputy Director of CCPE, Lynn Fitzgerald, Associate Director of Programming, and Francine Pratt, Marketing Manager.

D. Program Activities and Accomplishments

We have been relatively successful meeting our goals and objectives. We have offered a diverse selection of courses that are important to environmental health and safety professionals who help protect workers and communities from deleterious effects of hazardous substances. A list of these courses and the number of participants in each course are given in the next section. We have begun planning for a formal needs assessment to determine what other hazardous substance courses are needed. We are hopeful that this will aid us in developing and offering additional courses that fulfils the needs of professionals

E. Program Products

All of the courses offered by the HST Program from July 1, 2005 through June 30, 2006 were given at the Harvard School of Public Health in Boston MA. The course titles, duration, and the number of attendees and scholarships awarded are listed below in chronological order:

- Radiological Emergency Planning—The New Face of Emergency Planning: Terrorism, Security, and the Public, August 9 - 12, 2005 (39 participants; 3 scholarships)

- Advanced Hands-On CAMEO Fm Training, August 15 – 17; 2005 (26 participants; 10 scholarships)
- Basic Hands-On CAMEO Training, March 20 – 22, 2006 (18 participants; 2 scholarships)
- Advanced Hands-On CAMEO Training, May 22 – 24, 2006 (15 participants; 4 scholarships)
- Integrated Emergency Planning: A Step-by-Step Approach to "One Plan", May 25, 2006 (16 participants; 4 scholarships)
- Radiation Safety Officer Training for Laboratory Professionals, June 12-16, 2006 (36 participants; 1 scholarship)

The two CAMEO (Computer-Aided Management of Emergency Operations) courses, "Basic Hands-On CAMEO Training" and "Advanced Hands-On CAMEO Training," provide significant assistance in understanding and utilizing the CAMEO system, a group of software applications used widely by government and industry to plan for and respond to chemical emergencies. CAMEO integrates a chemical database, an air dispersion model, mapping, and data management capability. The CAMEO system contains response information and recommendations for a large number of chemicals, models to assist in evaluating release scenarios and evacuation options, and several easily adaptable databases and computational programs that address the emergency planning provisions of SARA Title III, the Emergency Planning and Community Right-to-Know Act of 1986. CAMEO can include such diverse information as facility floor plans with chemical storage locations, lists of people who may need to be contacted, locations of schools, hospitals, and other population concentrations, transportation corridor analysis, available resources, historical weather information, and digitized maps of the planning area using overlays of plumes and other critical information.

"Integrated Emergency Planning: A Step-by-Step Approach to One Plan" is a course designed for facilities that need to develop or review their existing emergency response plans to meet rules from nine different regulatory agencies including EPA, DOL/OSHA, DHS, DOI, and DOT. The course provides significant help in writing and utilizing a "One Plan" to consolidate multiple plans into one functional emergency response plan or integrated emergency plan. Both the CAMEO and "One Plan" courses are presented in collaboration with the Environmental Protection Agency.

"Radiological Emergency Planning: Terrorism, Security, and Communication" examines the latest principles and regulatory requirements for responding to radiological emergencies, the new federal framework for Homeland Security, and terrorist incidents involving radioactive materials. It also looks at lessons learned in communicating with the media and the public and updates on emergency preparedness issues for nuclear utilities.

Biotechnology, university, hospital and medical laboratories throughout the country that use radionuclides in their research and clinical practice are required to appoint a qualified Radiation Safety Officer (RSO) to oversee the use, application, monitoring, and disposal of radionuclides. The person occupying this position must meet the training and experience qualifications specified in licenses issued by the NRC or Agreement States. "Radiation Safety Officer Training for Laboratory Professionals" is a fundamental forty-hour training program for RSOs designed to provide them with the necessary skills to implement a radiation protection program in a biotechnology, university, hospital or medical laboratory and comply with state regulations standards regarding the use of radionuclides. We believe that this is the only single program available in the U.S. that specifically trains individuals for the radiological safety issues faced by the biotechnology, university, hospital, and medical laboratory.

F. Future Plans

The following courses, which are presently advertised on our website (http://www.hsph.harvard.edu/ccpe/calendar.html), have been scheduled for the upcoming year:

- August 8 – 11, 2006: Radiological Emergency Planning: Terrorism, Security, and Communication
  Note: this course has already been given (39 participants)
- March 26– 28, 2007: Basic Hands-On CAMEO Training
- May 21 – 23, 2007: Advanced Hands-On CAMEO Training
- May 31, 2007: Integrated Emergency Planning: Step-By-Step Approach to "One Plan"
- June 11-15, 2007: Radiation Safety Officer Training for Laboratory Professionals
- August 7 – 10, 2007: Radiological Emergency Planning: Terrorism, Security, and Communication

Additional courses may be offered in the upcoming year based on the results of our planned needs assessment.

A. Program Title

NORA Research Support Program Area

B. Program Director

David C. Christiani, MD, MPH

C. Program Description

The Harvard ERC NORA Support has been invaluable in providing flexible support in a number of key areas not sufficiently covered by the traditional Core or Special Component Support. Hence the goals of NORA support include: studies to assess regional and national research needs in occupational safety and health; provide key technical support for students, trainees and faculty; coordinate interdisciplinary research; support graduate students theses that specifically focus on NORA priorities; and assist and coordinate with the CE and Outreach programs to translate and apply Center research findings relevant to NORA priorities.

D. Program Activities and Accomplishments

Assessing Regional Research Needs

Since the Region I (New England) economy is very diverse, regional needs tend to reflect national needs in occupational safety and health. Our regional research needs assessments are updated regularly and derive from several activities. Firstly, our ERC Advisory Committee, with representation from various stakeholder sectors, meets annually to review our training program, including both research and professional training. The Advisory Committee also advises the ERC faculty on research needs. Secondly, individual cores/special components have their own advisory committees, which meet regularly (annually to semi-annually) and assess research training needs and progress. Thirdly, the Visiting Scholars Program (see Outreach Core) is a group of multi-disciplinary professionals from academia, federal and state governments, industry, and non-profit organizations in Region I. This group intensifies our links with various entities in the region in a bi-directional, mutually beneficial way. Specifically (as part of their learning experience), the scholars raise issues related to gaps in OSH research while they interact with faculty and students. Fourthly, all ERC faculty are members of the regional branches of their respective professional organizations (e.g., occupational medicine, occupational health nursing, industrial hygiene), and regular meetings of these groups include discussions of the state-of-the-art research needs for the region and the nation. Fifthly, many of the ERC faculty members have served on NIOSH Advisory Committees (e.g., Mine Health and Safety Research Advisory Committee; Board of Scientific Counselors), which have targeted research needs. Lastly, a number of NIOSH faculty members serve on NORA committees for NIOSH and attend regularly NORA research meetings organized by NIOSH.

This year, we have also initiated a study to assess national research needs, and professional opportunities for graduates in OSH program areas represented in our Center.

Providing Technical Research Support

The NORA research budget has been critical in supporting research training at the Harvard ERC. To date, we have targeted the student support for doctoral candidates and post-doctoral (esp. MD) trainees only, ensuring maximal effect for research productivity and for output of graduate level, doctorally-prepared researchers in the field of occupational safety and health. Priority funding for scholarships and stipends (available on a competitive basis) is aimed at candidates whose theses address a NORA research priority area. Research administrative support is made possible by the NORA supplement, and includes: computer/IT services; library, copying, and search services; limited travel support for trainees to scientific meetings; minority student recruitment initiatives; and faculty and teaching assistant support for interdisciplinary courses.

Coordinating Interdisciplinary Research

The NORA research support has enabled the ERC to expand interdisciplinary research. Most of the large projects funded by NIOSH, NIH, or other agencies obtained by ERC faculty accommodate two or more doctoral students—usually one focused on exposure assessment, and one focused on epidemiology/health outcomes.

NORA support has also made it possible for doctoral students to pursue broader NORA research goals. Doctoral training support in Occupational Epidemiology, Industrial Hygiene, Occupational Health Services, and Occupational Injury Prevention has been extremely limited. In addition, education in workplace health promotion and behavioral science is needed, and cross-training has not been possible in the traditional academic components. The NORA supplement has expanded interdisciplinary research training support, and is open to students in all academic cores and special components.

Supporting Graduate Students with NORA Focus

All students supported by this component are pre-doctoral, and all do thesis research that focuses directly on a NORA research priority topic. The students come from all of the cores/special components (see individual progress reports for each). Faculty advisors meet regularly with students, and full, formal doctoral committee meetings occur at least semi-annually. The committee consists of the thesis advisor, plus two or three other faculty members in relevant areas (e.g., biostatistics, epidemiology, industrial hygiene). The final thesis consists of three chapters (which usually translates into three papers to be submitted for publication). Faculty experience and funded research relevant to NORA research priorities are listed in the Administrative Core report.

All ERC NORA research trainees take the following didactic courses together:

EH 262	Introduction to Work Environment
ID 263	Practice of Occupational Health
EH 241	Occupational Safety
EH 243	Ergonomics and Human Factors
EH 231	Occupational Policy and Administration
EHE 215	Environmental and Occupational Epidemiology
EHE 235	Epidemiologic Basis of Occ Health Standards

Coordination with CE/Outreach to apply NORA Research Findings

The Harvard ERC CE and Outreach programs are designed to present current advancements in occupational safety and health to OSH professionals (CE), and, through the Visiting Scholars program, disseminate and translate current research results from NORA-related activities.

Continuing Professional Education: NORA research supplements have enhanced the CE program by providing administrative support for new programs relevant to the NORA mission. For example, over the past year, ERC faculty members developed and presented a new course for first-responders to chemical accidents and terrorism. The course was well attended (100) and will be offered yearly. Another example is the research update roundtable done at the yearly NECOEM/NEOHNA meetings in Region I.

Outreach Program: The NORA research support has assisted in administering the Visiting Scholars program, a nationally recognized outreach program in OSH (see above). In addition, enhanced support for the ERC outreach website, faculty outreach, and ERC research services all serve to provide translational activities aimed at serving all OSH stakeholders in Region I.

E. Program Products

The principal product of our research, technical and educational/training support is our publication record. A list of NORA-related publications for the 2005-6 year is provided in appendix D of each of the respective academic core programs.

Our needs assessment project is still on-going and is expected to finish by 12/31/06.

As for interdisciplinary education and training, all ERC graduate students have taken the didactic courses listed above.

CE and Outreach products are described in their respective sections.

F. Future Plans

We plan to continue to use the majority of NORA support for tuition and stipend of graduate students and trainees in doctoral programs dedicated to theses that relate directly to NORA. The amount of such support from traditional cores is insufficient to support these future leaders. For example, the Occupational Epidemiology Component budget supports about 1.0 FTE trainees, yet we have 18 full time doctoral candidates, with 9 eligible to receive ERC funding. Despite an envious sponsored research portfolio of our faculty (with mostly NIH, and some CDC funding), there would be no way to provide opportunities for these students to develop independent theses under faculty guidance without the NORA support mechanism.

A. Program Title

Continuing Education Core

B. Program Directors 2005-2006

Lynn C. Fitzgerald

C. Program Description

The Center for Continuing Professional Education (CCPE) is a well-established and innovative educational entity at the Harvard School of Public Health (HSPH), providing continuing education for the Harvard Education and Research Center (ERC) within the Occupational Health Program in the Department of Environmental Health.

The goal of HSPH/ERC continuing education is to extend the research and discovery of HSPH faculty, and to provide opportunity to occupational safety and health professionals to develop public health perspectives, a sensitivity about political climates, and the knowledge and leadership skills needed to identify and prevent occupational impairments, disease, and injuries. As part of this goal, CCPE strives to provide continuing education credits and professional education designations as needed.

All CCPE activities meet HSPH standards of excellence which focus on academic rigor, meeting the educational needs of public health professionals, and showcasing the expertise and research of Harvard University faculty. In addition to various industry recognized certification credits, CCPE provides continuing education units for all of its programs. In addition, CCPE is a long-term supporter of the Accreditation Council for Continuing Medical Education (ACCME) and ensures that all activities are compliant with ACCME Essential Areas and Standards. CCPE provides CME credits to ERC programs that count occupational medicine physicians and clinicians in their audience.

CCPE works closely with program directors and directors of the ERC academic core to stay current with industry needs by providing targeted and innovative course development, and course revitalization. Many have had significant roles as advisors in state, federal and international agencies. They are frequent contributors to professional journals, and teach from the perspective of their many years of research, peer-reviewed publications in professional journals, and relevant consulting experiences.

ERC faculty play an integral role in CCPE operations driving program content and acting in key advisory roles on CCPE administrative policy. CCPE has two Advisory Committees that provide continuous quality improvement through critical review of its activities and initiatives:

- **CME Advisory Committee** –HSPH faculty review all new and existing CCPE activities. This vital peer-review ensures that all activities are meeting the HSPH standards of excellence, serving unmet educational needs, and are compliant with the ACCME Essential Areas and Standards. Drs. David Christiani, Robert Herrick, and Jack Dennerlein serve as members.

- **CCPE Policy Committee** – HSPH senior faculty and administrators who provide strategic review of the CME Program, advise CCPE on matters of policy and resources in an effort to help CCPE better serve its target audiences. Dr. David Christiani is a member of this committee.

The development process is the hallmark of all CCPE programs. New and existing programs are put through extensive analysis through the completion of the Program Assessment Survey (PAS) document. The PAS requires program directors to provide a well-sourced needs assessment that is linked to educational objectives and development of faculty and agenda. The program is then vetted through peer-review by the chair of the host academic department and the CME Advisory Committee. This rigorous process allows for a high level of success in meeting the educational needs of the participants and therefore meeting the mission of HSPH, CCPE and the ERC.

D. Program Activities and Accomplishments

- Expanded **Program Review and Planning** meetings with program directors emphasize measures of effectiveness, outcomes, and content evaluation.
- Improved quality of communication with faculty through departmental and content-related meetings, email updates and a revised, **Program Director Feedback Form.**
- Implemented **CCPE's New Program Development Fund**, which awards grants of $2-5,000 to encourage research and development of new continuing education programs in occupational and environmental health. Funds are now available to upgrade materials for existing courses as well. This year funds were used as follows:
    - **Acute and Chronic Noise Exposure: Strategies for preventing, Diagnosing, and Treating Hearing Loss**. The funds are being used for needs assessment and research that includes attending a national conference on new issues regarding traumatic noise.
    - **Management Skills for Emerging Leaders in Environmental Health and Safety.** The funds are being used to develop new case studies.
    - **Occupational and Environmental Radiation Protection**. Funds were awarded to update audio visuals.
- Continued to improve production timelines to ensure consistency and excellence within the ERC portfolio. This includes conducting review/planning meetings to examine program performance and to recommend changes and identify need for future activities.
- Implemented recommendations from an internal financial and organizational audit by the Harvard University Auditing and Risk Management Office, to enhance the strategic planning and operations of CCPE programs:
    - Strategic Planning is a standing agenda item on the CPE Advisory Committee Meeting
    - Faculty contracts defining the terms of the relationship as well as rate and method of payment for a program.
- Received renewed accreditation from the Accreditation Council for Continuing Medical Education (CME). CME is an important credit distinction for physicians practicing in occupational medicine who attend ERC/CE programs.
- Implemented most features of CCPE's new Customer Relationship Management Database, which enables CCPE to implement secure online credit card transactions, increase productivity with its seamless integration with website, improve efficiency with automated workflow processes, improve communication by allowing information flow between all departments, improve fact-based management decision-making with real-time reporting capability, and create ability to prospect for new customers and appropriately service current customers.
- Listed ERC programs with the Massachusetts Workforce Training Fund, which is funded by Massachusetts employers to provide resources to Massachusetts businesses (especially small businesses), and workers to train current and newly hired employees. This collaboration allowed 4 people from a small company to attend Radiation Safety Officer Training.

Additionally, the ERC/CE Director, Lynn Fitzgerald, attends and presents at the annual ERC Faculty Retreat, the ERC Advisory Committee meeting, and periodic faculty meetings to keep updated on the changes within the core areas. Lynn Fitzgerald also works closely with Ann Backus, Director of Outreach, on special projects such as the annual poster session, and display table for the New England College of Occupational and Environmental Medicine's annual conference and the Massachusetts Association of Occupational Health Nurses Professional Development Conference.

E. Program Products

Industrial Hygiene

- Comprehensive Industrial Hygiene: Practical Applications of Basic Principles
- Occupational & Environmental Radiation Protection: Principles and Practices of Radiation Safety Environmental Radiation Monitoring – in development

Occupational Medicine/OHN

- Acute and Chronic Noise Exposure: Strategies for Preventing, Diagnosing, and Treating Hearing Loss (received new program development funding)
- Grand Rounds in Occupational and Environmental Medicine
- New England College of Occupational and Environmental Medicine/Massachusetts
- Association of Occupational Health Nurses annual connference
- Occupational & Environmental Research Seminars
- Seminars in Occupational Health

Occupational Safety

- Ergonomics and Human Factors: Applications in Occupational Safety & Health (revised to include laboratory design and architect continuing education credit)
- Sixth International Scientific Conference on Prevention of Work-related Musculoskeletal Disorders (PREMUS, August 2007) – technology in place to begin registration and acceptance of abstracts and poster sessions.

Hazardous Substance Training

- Advanced Hands-On Cameo Training
- Hands-On CAMEO Training
- Integrated Emergency Planning: A Step-by-Step Approach to One Plan
- Radiation Safety Officer Training for Laboratory Professionals
- Radiological Emergency Planning: The New Face of Emergency Planning – Terrorism, Security and the Public

Other

- Analyzing Risk: Science, Assessment and Management (newly revised with new program director, faculty, and focus)
- Guidelines for Laboratory Design
- Management Skills for Emerging Leaders in Environmental Health & Safety (based on feedback from focus group session, new case study being developed)
- Risk Communication Challenge (newly revised with new program director, faculty and focus)
- Risk Communication Challenge/Toronto, (custom program)

F. Future Plans

- **New program development**: Outreach methods include attendance at ERC meetings and events to identify new content areas. This year our focus is on developing a continuum of interdisciplinary programs around a Healthy Workplace Initiative.
- **Outcomes assessment**: CCPE will further assess the long-term value and impact of its programs through post-course surveys at set intervals (three-months and six-months following the conclusion of an activity). As a demonstration of our commitment to outcomes measurement this element has been added to the job description of the ERC/CE Director, Lynn Fitzgerald.
- **Extend our reach**: CCPE is endeavoring to expand the reach of its programs to a wider audience. This process has begun through the implementation of custom program promotion; more actively highlighting the publications of faculty on the CCPE website; attendance at conferences; implementing needs assessments both formerly using an independent consultant and informally using the Zoomerang survey tool and focus group.
- **Promote multiple learning formats and channels of distribution.** This includes virtual seminars, certificate programs, and off-site activities, and CD-ROMS and other enduring materials.
- **Seek program collaboration:** CCPE has actively sought opportunities to collaborate with the ERC program on departmental conferences (e.g. providing CME credit for content or operational and logistical support). In 2006 CCPE began a collaboration with University of Massachusetts Lowell to host the 2007 Sixth International Scientific Conference on Prevention of Work-Related Musculoskeletal Disorders (PREMUS) to be held in Boston in 2007. Details about this conference may be found on the PREMUS website: http://www.premus2007.org. The organizing committee includes Jack Dennerlein, Harvard School of Public Health; Laura Punnett, University of Massachusetts Lowell, Glenn Pransky, Liberty Mutual Research Institute, and Nick Warren, University of Connecticut Health Center. Additionally, there are nine members on the International Scientific Committee.

A. Program Title

Outreach

B. Program Director

Ann S. Backus, M.S.

C. Program Description

i. Goals and Objectives

The basic goals of outreach are to translate the research findings of the ERC faculty in the fields of injury prevention, epidemiology, occupational health nursing, occupational medicine, and industrial hygiene to an audience consisting of other academics outside the field, practicing professionals, workers, industry managers, and unions among others.

The programs we have established for implementing these goals include1) the Visiting Scholars Program; 2) "vendor" posters with interactive components at regional conferences; 3) direct work with industries; 4) membership on policy-making councils and task forces; 5) HSPH academic course support, and 6) special projects and events (such as the NORA Town Halls, this year).

D. Program Activities and Accomplishments

1) The **Visiting Scholar Program** has recently completed its 18th year as an activity of the Harvard ERC. This is one of our **Research to Practice** translation programs. At present we have the following active visiting scholars in the program:

Ellen Ceppetelli, MS, RNC, Director of Nursing Education, Dartmouth Hitchcock Medical Center (NH)
Jeffrey Ciampa, Safety and Health Manager, Aggregate Industries (MA)
Richard Donahue, MD, an MPH student; former community-based doctor (ME)
Peter Doran, PhD, CHES, Professor Emeritus, Univ. of Maine- Farmington (ME)
Earl Dotter, Photojoumalist (MD)
Stanley Eller, Esq., MS, Auburn Enterprises (ME)
Russell Farnen, PhD, Prof. of Political Science, Univ. of CT, West Hartford (CT)
Hollie Shaner-McRae, RN, MSA, FAAN, Coordinator, Professional Nursing Practice, Fletcher Allen Health Care (VT)

Each scholar works on at least one project a year. Miniconferences (listed below), with speakers from the faculty and from outside experts, provide the backbone for transferring knowledge from faculty to the field. Three of the eight scholars apply new knowledge in the academic setting; four use the knowledge in health care or heavy industry; and one reaches a wide audience through photographic exhibits.

Awards and Honors

1) Ellen Ceppetelli received the Nurse Luminary Award in 2005 from Health Care Without Harm for her work on reducing the risk of back injury when lifting patients. Rick Donahue received honorable mentioned in the HSPH poster day with his poster, *Lobstermen's Workshop Exposure Assessment,* and Peter Doran received an honorary PhD from the University of Maine, Farmington.

2) Posters outlining research results from faculty have been presented at a "vendor" table at the New England College of Occupational and Environmental Medicine and Massachusetts Association of Occupational Health Nurses Annual Conference for the past six years. These posters are expanded by an interactive component that engages the doctors and nurses with recent research findings and related information. Our most successful interactive poster involved measuring peak flow for nurses and doctors in association with a poster on pulmonary disease. At the 2004 and 2005 conferences we demonstrated phthalate-free self-care and health care products in association with our phthalate research results poster. This set-up allows us to promote faculty and resident research as well as to inform doctors and nurses about our occupational medicine and health training programs. We share the vendor table with the ERC Continuing Education Program in order to promote the following year's continuing education offerings.

3) Ann Backus works very closely with the northern New England fishing industry, and largely with the lobstermen. Outreach to this industry includes bimonthly articles in two industry publications: *FISH SAFE* appears in Commercial Fisheries News and *The Voice of Safety* appears in The Fishermen's Voice (beginning August 2006). Ann "manned" a vendor table at The Fishermen's Forum in Rockport, Maine, March 3, 4, 2006, talked with fishermen and handed out our newly developed Safety/Search/Rescue Checklist with a refrigerator magnet for easy reference as well as the NIOSH Workplace Solutions (Publication No. 2005-137) entitled *Dangers of Entanglement during Lobstering* which is a NIOSH outreach product that is based on an ERC Pilot Project headed by Ann Backus.

4) Ann Backus continues to serve on the Maine Commercial Fishing Safety Advisory Council as an appointee of Governor Baldacci of Maine. She has recently been re-appointed by the Commissioner of Marine Resources for a three year term until 2009. This Advisory Council is working on parity legislation that will ensure that both state registered boats and federally documented boats have the same safety gear requirements. The Council is presently developing the legislation at the federal level that is required before Maine can develop regulations that exceed the federal standards.

In collaboration with the Department of Marine Resources and the U.S. Coast Guard Marine Safety Office in Portland Maine, Ann Backus developed a Harbor Visits Program which featured visits by the Marine Patrol and USCG to Corea Harbor, Southwest Harbor, Vinalhaven, Boothbay Harbor, South Harpswell, and Cape Porpoise. The program provided voluntary dockside exams by the USCG Marine Safety Officers, a walk-through of the fully-equipped marine patrol vessels to demonstrate the proper installation of required safety gear, and in-water immersion suit drills for fishermen. These visits took place over two weeks in June 2006 and enjoyed a substantial turnout. In South Harpswell, the editor of the Harpswell Anchor showed up to report on the events and take pictures.

5) In the 2005-2006 academic year, we continued our support of EH 243, Occupational Safety by providing the highly-rated session on the importance of safety training that involves HSPH students donning survival suits and engaging in an abandon vessel drill. The US Coast Guard Region I office provides the survival suits and demonstrates the use of inflatable life rafts.

Through our connection with Jeff Ciampa, Visiting Scholar, we were able to arrange a worksite visit to Aggregate Industries for the students in ID 251, The Practice of Occupational Health. On sight in Saugus, Massachusetts, they were able to observe, discuss, and evaluate the hazards associated with surface mining, stone crushing, concrete/asphalt mixing.

6) The special project this year involved the NIOSH NORA Town Meetings. Ann Backus testified in Seattle at the Fishing, Forestry and Farming Town Meeting hosted by NIOSH and the University of Washington, January 19, 2006. For the March 20, 2006 NIOSH NORA Town Meeting, jointly sponsored by NIOSH, the Harvard ERC, and UMASS Lowell, Ann served on the planning committee with Craig Slatin and David Wegman, UMASS Lowell; Max Lum and Sidney Soderholm, NIOSH; and David Christiani, HSPH; she moderated the afternoon town meeting session.

E. Program Products

Mini-Conferences

Six miniconferences were provided for the Visiting Scholars. A list of the speakers and topics appears below.

At Saybrook Connecticut - Annual Visiting Scholars Retreat
July 29, 30, 2005
Annual Reports, Interpreted River Cruise
Presenters: Visiting Scholars; Captain Jeremy Soboleski, Connecticut Riverboat
Renwick "Wick" Griswold, University of Hartford
Topic: History of the Economic and Ecologic Development of the Connecticut River

At Harvard School of Public Health - Harvard-NIOSH Pilot Project Presentation Day

September 30, 2005

Presenters: Pilot Project Awardees (please refer to report on Pilot Projects)

Topics: Please see the list of pilot project presentations in the Pilot projects section of this report.

At Dartmouth-Hitchcock Hospital – Worker Safety Initiatives

November 18, 2005

Lebanon, New Hampshire

Presenter: Ellen Ceppetelli, MS, RN

Director of Nursing Education, Dartmouth-Hitchcock Medical Center
Topics: Readiness Plan for Epidemic Respiratory Infection – Dartmouth Hitchcock Hospital; and Healthcare Worker Health Promotion Project

At Harvard School of Public Health - Tar Creek Videoconference

February 17, 2006

Children's Environmental Health and Prevention Researchers

U.S. EPA HQ-DC

U.S. EPA Region VI-Dallas

ATSDR – Atlanta/Dallas

Presenters: Karl Kelsey, Professor of Cancer Biology and Environmental Health; Adrienne Ettinger, Research Associate, Metals Epidemiology Group; Jack Spengler, Akira Yamaguchi Professor of Environmental Health; Robert Wright, Pediatrician and Assistant Professor in Department of Environmental Health; and Vaughn Wascovich, MFA, Assistant Professor of Photography, University of Missouri and HSPH Visiting Scholar

Topics: Presentation of Photographs of Tar Creek Area;
Research Updates;
Placental Gene expression as a New Biomarker in Epidemiologic Studies; and
Ambient Occupational Exposure Assessment during Military Breaching Exercises.

At Harvard School of Public Health - Ambient Air Quality

March 17, 2006

Presenters: Jalal Ghaemghani, PhD, Principal Toxicologist, Boston Public Health Commission and Ona Ferguson, Associate, Consensus Building Institute
Topics: Ambient Air Quality: Urban Development and Community Partnership;
Consensus Building to Improve Decision-making on Public Policy Issues.

At Nyanza Superfund Site - Site Visit

May 24, 2006

Ashland, MA

Presenters: James Murphy, Community Involvement Coordinator for Nyanza and James DiLorenzo, Remedial Project Manager (Nyzanza)

Topic: Environmental Pollution on the Site of a Former Textile Manufacturer

Program Products – R2P

Industrial Hygiene
Visiting Scholar Peter Doran, Ph.D, CHES, continues to serve on the Maine Occupational Safety and Health Research Agenda (MORA) Steering Committee that meets monthly. MORA has established within the Maine Department of Labor an ongoing Work Group on Occupational Safety and Health Data Collection and Injury Prevention. In February 2006, a "Legislative Report" was published by the Work Group forwarding recommendations to the Joint Legislative Labor Committee to improve collection and processing of Medical-Only First Reports of Injury/Illness. This was meant to address a backload of Workers' Compensation cases promptly and effectively. The Maine Indoor Air Quality Council (IAQ) which Doran helped found, held their annual major conference and provided technical training for contractors on "Keeping Foundations Warm and Dry" the purpose of which was to introduce construction practices that improve indoor air quality in residences. This year, the focus was shifted to "Ventilating New and Existing Homes," five regional workshops were provided on ventilation and an additional four workshops on foundations.

Injury Prevention
Visiting Scholar Jeff Ciampa, Health and Safety Manager, Aggregate Industries – Northeast Region, Inc. Saugus developed four products for his industry designed to reduce lost work days. 1) Built on *previous* outreach group experience to develop risk index survey tool to measure behavioral based safety conditions for drivers of concrete delivery trucks; 2) Advanced development of graphic based temporary traffic control plans to improve construction worker and public traffic safety conditions for inner state highway

construction projects; 3) Developed public assess website to improve worker and traffic safety conditions; 4) Developed cost of loss economic models to help understand business impacts associated with injuries and other losses.

Visiting Scholar Earl Dotter, nationally recognized photojournalist, developed an exhibit entitled "*Our Future in Retrospect? Coal Miner Health in Appalachia: Photographs by Russell Lee - 1946 & Earl Dotter – 2006"* that revisits, through photography, the coal mining region of West Virginia originally chronicled in the 1946 Medical Survey of the Bituminous Coal Industry by Navy Rear Admiral Joel T. Boone. This 1946 Boone Report lead to the first industrial union health and retirement funds in the US. The exhibit, sponsored by the Appalachian Institute at Wheeling Jesuit University, opened on January 9, 2006 at Wheeling's Artisan Center just days after twelve miners lost their lives in the Sago mine disaster. In late January 2006, Earl Dotter attended and photographed the Senate hearings on mining safety.

In order to improve safety knowledge and rescue opportunity for fishermen, Ann Backus collaborated with the wife of a Gloucester fishermen, who survived burns when his vessel caught on fire while he was fishing. Angela San Filippo and Ann revised a check list previously developed by Richard Hiscock when he was assistant Harbor Master in Chatham, Massachusetts. The four-page update was designed to help fishermen and their families have accurate safety and rescue information. Improvements addressed readability, safe work practices, safety gear, and extension information for use in the event of rescue by USCG. A refrigerator magnet was designed and produced by a third party which enables the fisherman's family to respond to an emergency call to the family from USCG safety officers with accurate vessel information. The checklist and magnets were distributed at the Fishermen's Forum in March 2006.

F. Future Plans

In addition to continuing the establish outreach activities mentioned above such as the Visiting Scholars Program, work with the fishing industry and the commercial fishing safety advisory council, and the academic course support, the Outreach Program will host an Earl Dotter exhibit from September 14, 2006 to October 2, 2006. Our Future in Retrospect? Coal Miner Health in Appalachia: Photographs by Russell Lee - 1946 & Earl Dotter – 2006" as discussed above compares 1946 with today's mining life and raises the questions, "How different is life in mining communities today?" "Have safety, health care access, or quality of life improved over the past 60 years?" With 38 miners killed in U.S. mines in 2006 and two mine safety officer suicides (August and September 2006), the issues of mine safety are serious and need to be brought forward for discussion and action.

We will raise money to support the development of another photographic project by Earl Dotter to chronicle the migrant workers harvesting crops in Maine. Exhibit will feature the ergonomic improvements to harvesting tool by migrants and the migrant worker health program in Maine.

Finally, a new course for the ERC Continuing Education Program is being developed by the Outreach Program. In response to an inquiry by John Talty, Harvard will design, develop, and offer a comprehensive two-day course entitled Acute and Chronic Noise Exposure: Strategies for Preventing, Diagnosing, and Treating Hearing Loss to be given March 29, 30, 2007. The HSPH Center for Continuing Professional Education awarded Ann Backus and the course faculty $3000 to develop and market the course. The audience will be general medical practitioners, pediatricians, nurses, physicians' assistants, audiologists, industrial hygienists, and engineers. State-of- the art research on hearing loss will be featured along with a strong emphasis on strategies for hearing loss prevention in the workplace.

APPENDIX D
OUTREACH PUBLICATIONS

Presentations

2006 Ann Backus Testimony NIOSH NORA Town Hall Meeting on Fishing, Forestry, and Farming, Seattle, WA, January 19, 2006.

2006 Ann Backus Planning Committee Member and Moderator, NIOSH-Nora Town Hall Meeting, cosponsored by Harvard-NIOSH ERC and UMASS Lowell, March 20, 2006.

2006 Ann Backus Vendor table with handouts. Fishermen's Forum, Rockport, Maine, – March 3, 4, 2006

2005 Ann Backus Poster and Vendor Table on Health Effects of Phthalates and Demonstration of Phthalate-free Products for Self Care and Health Care– NECOEM December 1, 2, 2005. Presented the work of Russ Hauser, Susan Duty, and resident Ronald Green.

2006 Russ Hauser Invited Speaker, European Council for Plasticizers and Intermediates sponsored workshop on Phthalate Esters and Reproductive Health: State of the Science and Future Directions. Gouvieux, France. Title of presentation: 'Phthalates and male reproductive health: Advances in our understanding'.

2005-2006 Russ Hauser Grant Reviewer, MRC Research Grants Management System, Title: 'DDT, genetics and male reproductive health'. [MRC is the statutory science council responsible for managing and funding research in South Africa].

2005 Russ Hauser Invited Speaker, Resolve, The National Infertility Association, Marlboro, MA. Title of presentation, 'Environmental Factors and Infertility'.

2005 Russ Hauser Invited Speaker, Seminars in Investigative Medicine at the North Shore-Long Island Jewish Institute for Medical Research, NY. Title of presentation, 'Male Reproductive Health and the Environment: Phthalates as a Case Study'.

Publications – not peer-reviewed.

Backus A. 2006. Question for the crew: Can you run the boat? *Commercial Fisheries News.* 33(11):12B.

Backus A. 2006. ME patrol vessels plan June harbor visits. *Commercial Fisheries News.* 33(9):24A.

Backus A. 2006. Fishing operation info aids rescuers. *Commercial Fisheries News.* 33(7):12C.

Backus A. 2006. Survival suit, dockside exam save fisherman. *Commercial Fisheries News.* 33(5):11B

Backus A. 2005. Lobstermen precautions for shop work. *Commercial Fisheries News.* 33(3):11A.

Backus A. 2005. Give bacterial infections serious attention. *Commercial Fisheries News.* 33(1):17A.

Backus A. 2005. No strings attached! Avoid entanglement. *Commercial Fisheries News.* 32(11):6B.

ERC Applicant Institution: Harvard School of Public Health

Rev. 11/05

ERC Program Director: David C. Christiani

Academic 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 Students Enrolled	# Full-Time NIOSH-Supported Students	# Part-Time Students Enrolled	# Part-Time NIOSH-Supported Students	# Other Students Taking OS&H Courses*	# Students Graduated
Master's Degree	SM (2-year) Environmental Health, Concentrating in Industrial Hygiene	4	2	0	0	12	3
Doctorate Degree	ScD (2-year) Environmental Health, Concentrating in Industrial Hygiene	3	1	0	0	13	1
Postdoctoral	N/A	2	0	0	0	0	2

ERC Applicant Institution: Harvard School of Public Health
ERC Program Director: David C. Christiani
Academic Discipline: Industrial Hygiene

Table 13
Minority Recruitment Data
Previous Budget Period: July 1, 2005 to June 30, 2006

Training Area	# of Minorities Applied	# of Minorities Offered Admission	# of Minorities Entered Program	For those who entered program: Anonymous id#	Current Status (in training, graduated, left the program, etc.)	Sources of Support	Subsequent Career Development/ Employment
IH	0	0	0				

hb

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
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 Students Enrolled	# Full-Time NIOSH-Supported Students	# Part-Time Students Enrolled	# Part-Time NIOSH-Supported Students	# Other Students Taking OS&H Courses*	# Students Graduated
Master's Degree	MSN, Master of Science in Nursing	2	2	2	1	0	0
	SM, Master of Science in Environmental Health Concentrating in Environmental Health	0	0	0	0	0	0

ERC Applicant Institution: Harvard School of Public Health
ERC Program Director: David C. Christiani
Discipline: Occupational Health Nursing

Table 13

Minority Recruitment Data

Previous Budget Period: July 1, 2005 to June 30, 2006

Training Area	# of Minorities Applied	# of Minorities Offered Admission	# of Minorities Entered Program	For those who entered program: Anonymous id#	Current Status (in training, graduated, left the program, etc.)	Sources of Support	Subsequent Career Development/ Employment
OHN	0	0	0				

ERC/TPG Applicant Institution: Harvard School of Public Health
ERC/TPG Program Director: David C. Christiani
Academic Discipline: Occupational Medicine

Table 13
Minority Recruitment Data
Previous Budget Period: July 1, 2005 to June 30, 2006

Training Area	# of Minorities Applied	# of Minorities Offered Admission	# of Minorities Entered Program	For those who entered program: Anonymous id#	Current Status (in training, graduated, left the program, etc.)	Sources of Support	Subsequent Career Development/ Employment
OM	5	1	1	106-3544-60	In Training	NIOSH	clinical/teaching /research

Lb

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Discipline: Occupational Medicine

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

Degree Awarded	How Does Degree Read?	# Full-Time Students Enrolled	# Full-Time NIOSH-Supported Students	# Part-Time Students Enrolled	# Part-Time NIOSH-Supported Students	# Other Students Taking OS&H Courses*	# Students Graduated
MPH	Occupational and Environmental Health	7	3	2	2	127	6

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Discipline: Epidemiology Special Non-Core

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

Degree Awarded	How Does Degree Read?	# Full-Time Students Enrolled	# Full-Time NIOSH-Supported Students	# Part-Time Students Enrolled	# Part-Time NIOSH-Supported Students	# Other Students Taking OS&H Courses*	# Students Graduated
Master's Degree	SM in Environmental Health	1	0	0	0	35	1
Doctorate Degree	ScD in Environmental Health	18	9	0	0	5	4

*does not include students counted in any of the full-time or part-time categories

ERC Applicant Institution: Harvard School of Public Health
ERC Program Director: David C. Christiani
Academic Discipline: Epidemiology Special Non-Core

Table 13
Minority Recruitment Data
Previous Budget Period: July 1, 2005 to June 30, 2006

Training Area	# of Minorities Applied	# of Minorities Offered Admission	# of Minorities Entered Program	For those who entered program: Anonymous id#	Current Status (in training, graduated, left the program, etc.)	Sources of Support	Subsequent Career Development/ Employment
EPI	1	0	0				

001

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Discipline: Injury Prevention

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

Degree Awarded	How Does Degree Read?	# Full-Time Students Enrolled	# Full-Time NIOSH-Supported Students	# Part-Time Students Enrolled	# Part-Time NIOSH-Supported Students	# Other Students Taking OS&H Courses*	# Students Graduated
Master's Degree	SM in Environmental Health, Concentrating in Injury Prevention	0	0	0	0	40	0
Doctorate Degree	ScD in Environmental Health, Concentrating in Injury Prevention	7	3	1	0	20	0
Post-Doctoral		4	0	0	0	5	0

*does not include students counted in any of the full-time or part-time categories

ERC Applicant Institution: Harvard School of Public Health
ERC Program Director: David C. Christiani
Discipline: Injury Prevention

Table 13
Minority Recruitment Data
Previous Budget Period: July 1, 2005 to June 30, 2006

Training Area	# of Minorities Applied	# of Minorities Offered Admission	# of Minorities Entered Program	For those who entered program: Anonymous id#	Current Status (in training, graduated, left the program, etc.)	Sources of Support	Subsequent Career Development/ Employment
Injury	0	0	0				

ERC Applicant Institution: Harvard School of Public Health
ERC Program Director: David C. Christiani
Academic Discipline: Health Services

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

Degree Awarded	How Does Degree Read?	# Full-Time Students Enrolled	# Full-Time NIOSH-Supported Students	# Part-Time Students Enrolled	# Part-Time NIOSH-Supported Students	# Other Students Taking OS&H Courses*	# Students Graduated
Doctorate Degree	ScD (2-year) Environmental Health, Concentrating in Health Services	2	1	0	0	15	0
PostDoctoral	N/A	1	0	0	0	0	1

ERC Applicant Institution: Harvard School of Public Health
ERC Program Director: David C. Christiani
Academic Discipline: Health Services

Table 13
Minority Recruitment Data
Previous Budget Period: July 1, 2005 to June 30, 2006

Training Area	# of Minorities Applied	# of Minorities Offered Admission	# of Minorities Entered Program	For those who entered program: Anonymous id#	Current Status (in training, graduated, left the program, etc.)	Sources of Support	Subsequent Career Development/ Employment
HSRU	0	0	0				

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Discipline: Hazardous Substance Academic Training Program

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

Degree Awarded	How Does Degree Read?	# Full-Time Students Enrolled	# Full-Time NIOSH-Supported Students	# Part-Time Students Enrolled	# Part-Time NIOSH-Supported Students	# Other Students Taking OS&H Courses*	# Students Graduated
Master's Degree	SM in Environmental Health Concentrating in Hazardous Substance	2	1	1	1	≈ 30	1

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Discipline: Hazardous Substance Academic Training

Table 13
Minority Recruitment Data
Current Budget Period (07/01/05-6/30/06)
Previous Budget Period: July 1, 2005 to June 30, 2006

Training Area	# of Minorities Applied	# of Minorities Offered Admission	# of Minorities Entered Program	For those who entered program: Anonymous id#	Current Status (in training, graduated, left the program, etc.)	Sources of Support	Subsequent Career Development/ Employment
HSAT	1	1	1	406-3362-6	In Training	U.S. Navy	U.S. Navy

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ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Academic Discipline: Continuing Education

Table 12a
CE Course Offerings by Program Area
Past Year Only

					# Trainees by Profession					# Trainees by Employer						
Course/Seminar Title*	Program Area	Total Trainees	Length of Course	Total Pers Days	MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
Comprehensive Industrial Hygiene June 19 - 23, 2006	IH	43	5	215	5	0	0	24	14	29	4	3	2	2	3	0
In-Place Filter Testing Workshop August 22 - 26, 2005	IH	31	4.5	139.5	0	0	0	0	31	18	9	1	0	3	0	0
Occupational & Environmental Radiation Protection: Principles and Practices of Radiation Safety April 24-27, 2006	IH	34	2	68	2	2	2	11	17	16	4	5	0	4	5	0
Subtotal IH		**108**	**11.5**	**422.5**	**7**	**2**	**2**	**35**	**62**	**63**	**17**	**9**	**2**	**9**	**8**	**0**
Currently not offering OHN Programs	OHN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal OHN		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Ergonomics and Human Factors September 13 - 16, 2005	OS	30	4	120	2	2	5	13	8	19	4	1	0	6	0	0
Subtotal OS		**30**	**4**	**120**	**2**	**2**	**5**	**13**	**8**	**19**	**4**	**1**	**0**	**6**	**0**	**0**
9/23/2005 Pleural and Parenchymal Pulmonary Findings in a Man with Asbestos Exposure	OM	9	1 hour	1.3	5	0	1	0	3	0	3	0	0	0	1	5
10/7/2005 A 41-Year-Old Female Neuroscientist with Elevated Levels of Lead and Mercury of Unknown Origin	OM	16	1 hour	2.3	7	0	0	0	9	0	6	0	0	0	2	8
10/21/2005 Evaluating Patient Concerns about Mercury Exposure	OM	14	1 hour	2.0	6	0	1	0	7	0	7	0	0	0	1	6
11/4/2005 43 Year-Old Male with Chronic Polyneuropathy: Is It Toxin Related?	OM	9	1 hour	1.3	6	0	0	0	3	0	5	0	0	0	1	3
12/16/2005 "The Case of the Forgotten Sharp" plus discussion of the Massachusetts Sharps Injury Surveillance and Prevention Project	OM	11	1 hour	1.6	5	0	0	0	6	0	5	0	0	0	1	5
2/10/06 New Bedford Study Results: PCBs and Childhood Development	OM	13	1 hour	1.9	5	0	2	0	6	0	5	0	0	0	0	8
2/24/06 An Evidence based Approach to a Mortality in the Workplace	OM	11	1 hour	1.6	4	0	0	0	7	0	5	0	0	0	0	6
3/10/06 Male Infertility: Genetic, Environmental and Occupational Risk Factors	OM	14	1 hour	2.0	5	0	1	0	8	0	9	0	0	0	0	5
4/7/06 Appropriate Use of Narcotic and Neuropathic Drugs for Chronic Pain	OM	11	1 hour	1.6	6	0	0	0	5	0	5	0	0	0	0	6
4/12/06 Update on TB Screening	OM	11	1 hour	1.6	7	0	0	0	4	0	6	0	0	0	0	5
5/19/06 Multiple Chemical Sensitivity: Presentation of a Classic Case and Discussion	OM	9	1 hour	1.3	5	0	0	0	4	0	4	0	0	0	0	5
Subtotal OM		**128**	**1.57**	**18.4**	**61.0**	**0.0**	**5.0**	**0.0**	**62.0**	**0.0**	**60.0**	**0.0**	**0.0**	**0.0**	**6.0**	**62.0**

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Academic Discipline: Continuing Education

Table 12a
CE Course Offerings by Program Area
Past Year Only

Course/Seminar Title*	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
Hands-On CAMEO Training March 20 - 22, 2006	HST	18	2	36	1	0	2	3	12	4	3	1	7	3	0	0
Advanced Hands-On Cameo Training August 15 - 17, 2005	HST	26	3	78	0	0	0	17	9	7	1	4	11	1	2	0
Advanced Hands-On Cameo Training (2nd Iteration) May 22 - 24, 2006	HST	15	3	45	1	0	0	0	14	4	4	1	3	2	1	0
Integrated Emergency Planning: A Step-By-Step Approach to One Plan May 25, 2006	HST	16	1	16	1	1	0	6	8	3	1	2	4	2	3	1
Radiation Safety Officer Training for Laboratory Professionals June 12 - 16, 2006	HST	36	5	180	0	0	3	19	14	24	0	0	0	0	12	0
Radiological Emergency Planning: The New Face of Emergency Planning – Terrorism, Security, and the Public August 9 - 12, 2005	HST	39	3.5	136.5	1		2	26	10	3	16	8	5	3	4	0
Subtotal HST		**150**	**17.5**	**491.5**	**4**	**1**	**7**	**71**	**67**	**45**	**25**	**16**	**30**	**11**	**22**	**1**
	Ag S&H															
	Ag S&H															
	Ag S&H															
Subtotal Ag S&H		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Academic Discipline: Continuing Education

Table 12a
CE Course Offerings by Program Area
Past Year Only

					# Trainees by Profession					# Trainees by Employer						
Course/Seminar Title*	Program Area	Total Trainees	Length of Course	Total Pers Days	MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
9/19/2005 Low Back Injuries and the Effect of Using Lifting Belts	All Cores	2	1 hour	0.3	0	0	0	0	2	0	0	0	0	0	0	2
10/24/2005 Environmental Hazards for Returning Residents and Workers after Hurricane Katrina (Experiences and photos collected as guest of CNN in New Orleans)	All Cores	5	1 hour	0.7	3	0	0	0	2	0	2	0	0	0	1	2
10/31/2005 Twelve Toxic Tales: The Art of Telling Stories about Science	All Cores	0	1 hour	0.0	0	0	0	0	0	0		0	0	0	0	0
11/14/2005 Brazilian Ragpickers: An Epidemiologic Study About Work Conditions and Health	All Cores	0	1 hour	0.0	0	0	0	0	0	0	0	0	0	0	0	0
11/28/2005 Sentinel Events: Interpreting Warning Signals in Environmental Epidemiology	All Cores	2	1 hour	0.3	1	0	0	0	1	0	1	0	0	0	0	1
12/1/2005 Designing a Framework of Global Occupational Health Operations	All Cores	5	1 hour	0.7	1	0	0	0	4	0	3	0	0	0	0	2
12/19/2005 Biomarkers of Manganese Exposure and Toxicity in Welders: MRI, MRS and Hormones	All Cores	2	1 hour	0.3	0	0	0	0	2	0	2	0	0	0	0	0
1/23/2006 Combining Theory and Practice: An Effort of Improve Highway Work Zone Safety	All Cores	1	1 hour	0.1	0	0	0	0	1	0	0	0	0	0	0	1
2/13/06 The Next Decade of NORA (National Occupational Research Agenda): An Interactive Disccussion of the Occupational Research Needs in the New England Region and the Nation	All Cores	2	1 hour	0.3	0	0	0	0	2	0	1	0	0	0	0	1
3/13/06 Understanding the Odds Against Nurses and their Patients	All Cores	6	1 hour	0.9	2	1	0	0	3	0	3	0	0	0	0	3
3/27/06 Lifetime Exposure to Low Manganese Levels: A Possible Cause of Increased Parkinsonian Disturbances	All Cores	4	1 hour	0.6	1	0	0	0	3	0	3	0	0	0	0	1
4/10/06 Nanotechnology and Risk: A NIOSH Perspective	All Cores	17	1 hour	2.4	3	0	2	0	12	0	13	0	0	0	0	4
5/1/06 Report from the Risk Assessment Front: Adding Procedure to Paralysis by Analysis	All Cores	7	1 hour	1.0	3	0	0	0	4	0	5	0	0	0	0	2
5/8/06 Export of Hazard	All Cores	3	1 hour	0.4	0	0	0	0	3	0	2	0	0	0	0	1
ERC Seminars		**56**	**2.00**	**8.0**	**14**	**1**	**2**	**0**	**39**	**0**	**35**	**0**	**0**	**0**	**1**	**20**

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Academic Discipline: Continuing Education

Table 12a
CE Course Offerings by Program Area
Past Year Only

Course/Seminar Title*	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
9/16/2005 *Presentation I:* Gap Analysis of Mass General Hospital's Occupational Health Services Dept. *Presentation II:* Relationship Between Weather and Heart Attacks in the Firefighter Population	All Cores	16	1 hour	2.3	5	0	0	0	11	0	7	0	0	0	2	7
9/30/2005 *Presentation I:* 8-isoprostane and 8-OH-dG as Acute Inflammatory Biomarkers in Welding Exposure *Presentation II:* Lead Exposure and Postural Change in Blood Pressure	All Cores	17	1 hour	2.4	7	0.00	1	0	9	0	8	0	0	0	1	8
10/14/2005 *Presentation I:* Domestic Disaster Management Lessons from Hurricanes Katrina & Rita *Presentation II:* A Study of Pain Outcome Measures and Psychosocial Occupational Issues in a Population with Work-Related RSI (Repetitive Strain Injuries)	All Cores	18	1 hour	2.6	7	0	0	0	11	0	10	0	0	0	2	6
10/28/2005 *Presentation I:* Alternative Computer Mouse Designs to Reduce Static Finger Lifting Behavior *Presentation II:* Gender Specific Protective Effect of Hemoglobin on Arsenic-Induced Skin Lesions	All Cores	18	1 hour	2.6	7	0	0	0	11	0	9	0	0	0	1	8
11/18/2005 *Presentation I:* Longer Computer Usage Time Is Followed By Moderate Self-Reported Symptom Level Among College Students *Presentation II:* Physically Demanding Jobs and Risk of Same Level Falls Resulting in Fracture in Female Workers	All Cores	16	1 hour	2.3	7	0	1	0	8	0	6	0	0	0	2	8
12/8/2005 Comparing Smoothing Techniques for Modeling Exposure-Response Curves in Cox Models	All Cores	14	1 hour	2.0	7	0	0	0	7	0	5	0	0	0	1	8
1/13/2006 Dermal Exposure to Isocyanates: Issues and Concerns	All Cores	9	1 hour	1.3	6	0	0	0	3	0	4	0	0	0	0	5
1/20/2006 *Presentation I:* Healthy Worker Survivor Effect in the Vermont Granite Workers Study *Presentation II:* Examining Model Fit for Penalized Splines in Cox Models	All Cores	13	1 hour	1.9	3	0	0	0	10	0	8	0	0	0	1	4
2/3/06 Presentation I: A comparison between sign language interpreting and other occupations in terms of biomechanical responses Presentation II: Physical exposure and low back pain assessment for large epidemiological cohorts	All Cores	18	1 hour	2.6	6	0	1	0	11	0	9	0	0	0	0	9

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ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Academic Discipline: Continuing Education

Table 12a
CE Course Offerings by Program Area
Past Year Only

Course/Seminar Title*	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
2/17/06 Presentation I: Placental Gene Expression as a New Biomarker in Epidemiologic Studies: Preliminary Results Presentation II: Ambient Occupational Exposure Assessment during Military Breaching Exercises	All Cores	9	1 hour	1.3	6	0	0	0	3	0	7	0	0	0	0	2
3/3/06 Evaluating Fungal Populations on Wide-Body Commercial Passenger Aircraft	All Cores	17	1 hour	2.4	5	0	3	0	9	0	7	0	0	0	0	10
Symptoms and the Modifying Influence of the δ-Aminolevulinic Acid Dehydratase (ALAD) Polymorphism: The Normative Aging Study Presentation II: Can work area measurements predict personal endotoxin exposure in the cotton textile industry?	All Cores	18	1 hour	2.6	7	0	2	0	9	0	10	0	0	0	1	7
4/14/06 Presentation I: Dilution Ventilation to Control Welding Fumes in a Crude Oil Tank at a Shipyard in Singapore Presentation II Soil Contamination Around PCB-Containing Buildings	All Cores	18	1 hour	2.6	4	0	3	0	11	0	9	0	0	0	0	9
5/12/2006 Presentation I: Occupational Health and Safety Practice in Taiwan: A Comparative Approach Presentation II Occupational Exposure Assessment in a Cogeneration Plant	All Cores	15	1 hour	2.1	6	0	2	0	7	0	9	0	0	0	0	6
6/2/06 Presentation I: The Impact of Physical Therapy Interventions on Disability Duration in Subjects Following Occupational Knee Injury and Meniscal Surgery Presentation II Genes, Lungs, and Surfactant: Why Should I Care?	All Cores	4	1 hour	0.6	0	0	0	0	4	0	1	0	0	0	1	2
10-point Numeric Rating Scale to the Short-Form McGill Pain Questionnaire for Measuring the Impact of Psychosocial and Occupational Factors on Pain Presentation II Lead Exposure and Postural Changes in Blood Pressure: The Normative Aging Study	All Cores	7	1 hour	1.0	5	0	0	0	2	0	3	0	0	0	0	4
6/23/06 Presentation I: Ambient Occupational Exposure Assessment during Military Breaching Exercises Presentation II: 8-isoprostane and 8-OH-dG as Acute Inflammatory Biomarkers in Welding Exposure	All Cores	4	1 hour	0.6	2	0	0	0	2	0	1	0	0	0	0	3
Research Seminars		**231**	**2.43**	**33.0**	**90**	**0**	**13**	**0**	**128**	**0**	**113**	**0**	**0**	**0**	**12**	**106**

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Academic Discipline: Continuing Education

Table 12a
CE Course Offerings by Program Area
Past Year Only

Course/Seminar Title*	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
Analyzing Risk: Science, Assessment, and Management September 27 - 30, 2005	Other	62	3.5	217	2	0	6	7	47	20	15	1	0	22	4	0
Management Skills for Emerging Leaders in Environmental Health and Safety June 12 - 14, 2006	Other	41	3	123	1	3	2	22	13	26	3	0	1	3	8	0
Risk Communication Challenge May 22 - 24, 2006	Other	67	3	201	4	1	0	5	57	20	16	2	7	20	2	0
Guidelines for Laboratory Design May 1 - 5, 2006	Other	43	5	215	0	0	5	9	29	16	5	2	0	12	8	
Subtotal Other Category		**213**	**14.50**	**756**	**7**	**4**	**13**	**43**	**146**	**82**	**39**	**5**	**8**	**57**	**22**	**0**
12/1/05, 12/2/2005 NECOEM/MaAOHN Annual Conference (1 day attendance)	MD, NURS, IH	53	1 day	53	16	29	2	0	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12/1/05, 12/2/2005 NECOEM/MaAOHN Annual Conference (2 day attendance)	MD, NURS, IH	144	2 days	288	53	78	7	0	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NECOEM Conference		**197**	**3.00**	**341**	**69**	**107**	**9**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
GRAND TOTALS (All Program Areas		**1113**	**56.5**	**2190**	**254**	**117**	**56**	**162**	**524**	**209**	**293**	**31**	**40**	**83**	**71**	**189**

*Group together by Program Area and Provide Sub-Totals for Each Program Area- You may add or delete rows as necessary

ERC Applicant Institution: Harvard School of Public Health
Program Director: David C. Christiani
Academic Discipline: Continuing Education

Table 12b
CE Course Offerings - Summary by Program Area
Past Year Only

					# Trainees by Profession					# Trainees by Employer						
Program Area	Number of Courses	Total Trainees	Length of Course (in days unless otherwise noted)	Total Pers Days	MD	NURS	HYG	SAFETY	OTHER	Private Industry	Fed Gov	State Gov	Local Gov	Foreign Country	Academic	Other
Industrial Hygiene (IH)	3	108	11.5	422.5	7	2	2	35	62	63	17	9	2	9	8	0
Occupational Health Nursing (OHN)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Occupational Safety	1	30	4	120	2	2	5	13	8	19	4	1	0	6	0	0
Occupational Medicine (OM) Grand Rounds	11	128	1.57	18.4	61	0	5	0	62	0	60	0	0	0	6	62
Hazardous Substance Training (HST)	6	150	17.5	491.5	4	1	7	71	67	45	25	16	30	11	22	1
Agricultural Safety and Health (Ag S&H)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ERC Seminars	14	56	2.00	8.03	14	1	2	0	39	0	35	0	0	0	1	20
Research Seminars	17	231	2.43	33.00	90	0	13	0	128	0	113	0	0	0	12	106
Other OS&H (e.g. Toxicology, Epidemiology, Ergonomics, Biostatistics)	4	213	14.50	756	7	4	13	43	146	82	39	5	8	57	22	0
NECOEM Conference	2	197	3.00	341	69	107	9	0	12	0	0	0	0	0	0	0
TOTAL	58	1113	56.5	2190.46	254	117	56	162	524	209	293	31	40	83	71	189