

HARVARD EDUCATION AND RESEARCH CENTER ANNUAL REPORT

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Boston, MA

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Section I

ERC summary

The Harvard Education and Research Center's primary objective is the training of leaders in occupational health and safety specialties: occupational (industrial) hygiene, occupational medicine, occupational epidemiology, and occupational injury prevention and control. Through a combination of practical and research oriented coursework and field experiences, graduate students at the Center examine current problems relating to the workplace and learn methods and approaches for establishing health and safe work environments. Our goal is to prepare our students to be national and international leaders for improved understanding and prevention of work-related disease through research and practice.

The Master's program in Occupational Hygiene includes didactic and internship placements, allowing rapid entry to industry government, and academia. Physicians training in the Occupational and Environmental Medicine Master's and Residency programs are trained for clinical practice, OHS management and leadership, and for academia. The Occupational Epidemiology Program Area confers doctoral degrees in all population aspects of occupational health and safety. In addition, the ERC offers a doctoral preparation in Occupational Epidemiology and Occupational Injury Prevention and Control. The Pilot Project Research Training Program makes awards in Region I where graduate trainees in occupational health and safety are supported in advanced research responsive to NORA-2 priorities. The programs in Continuing Professional Education and Outreach are dynamic and creative efforts at serving the occupational safety and health needs of New England and providing an integrative force to link the community. The Continuing Education Program, in collaboration with the Center and the School's Office of Executive and Continuing Professional Education (ECPE) offers an impressive slate of courses that meet regional and national needs. The Outreach Program has been successful in impacting the curriculum of other schools of higher education within the region, establishing a network of professionals in New England who are interested in occupational safety and health. Finally, the Targeted Research Training Program aims to provide trainees with multi-disciplinary research education and experience in cutting-edge research projects aimed at addressing NORA priorities and research-to-practice (r2p), including Total Worker Health.

Relevance:

The Harvard ERC plays a vital role in the New England region as well as in the nation in providing interdisciplinary education and training for graduate level professions in key disciplines of occupational health and safety, and providing continuing education and outreach in these key disciplines. The Harvard ERC produces researchers and practitioners vital to maintaining workplace health and safety, and a healthy workforce.

Harvard ERC web link: <http://www.hsph.harvard.edu/erc/>

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Section II

The period from 2015-16 has been very productive for the Education and Research Center (ERC) at Harvard T.H. Chan School of Public Health. Despite tight federal funding for biomedical and public health research, the Harvard ERC faculty has continued to expand its research portfolio in occupational safety and health (OSH) projects. Moreover, we have maintained our academic programs' quality and enrollment. We currently have 32 trainees, 16 supported by the ERC, and have graduated 1 MS and 6 ScD degree candidates in 2016. Surveys of our graduates indicate that about 90% have been placed in careers related to occupational health and safety. We recognize the importance of underrepresented minority recruitment, and with the 2016 graduation of 1 trainee in this category, we will step up recruitment activities.

Occupational Medicine Core

RecoverMe, a new patient-centric application launched out of the Harvard Innovation Lab, is poised to change the way people heal by digitizing the recovery process. Our second-year resident, Jeffrey E. Vogel, M.D., has developed a patient-centric application designed to improve return-to-work times following occupational injury. It focuses on evidenced-based home therapy, and includes content-focused education for the patient with milestone assessment designed to drive positive outcomes during the recovery process. This app is an improvement over the usual linear models of recovery in that it employs a multidimensional methodology combining physiologic, psychosocial, and biophysical modalities to achieve recovery outcomes. RecoverMe has the capacity to improve transmission of important health and recovery information in a centralized, user-friendly digital platform. Moreover, the framework can be used to tackle a variety of complex medical issues beyond recovery and provide a platform for educating the patient-user on general health topics. The RecoverMe app is currently in Beta testing on an invitation-only basis at multiple sites in New England. Dr. Vogel was awarded the 2016 AOHC OPSF Resident Scholarship Award which provided financial aid for his attendance at AOHC in 2016.

One of the hallmarks of the Harvard Occupational and Environmental Medicine Residency program is the breadth of research topic areas available to residents. Recent research includes TB, patient handling, health issues related to law enforcement and firefighting, as well as sleep disorders in transportation workers. Chief

Resident Dr. Deborah Barbeau's research with Dr. Thomas Winters titled Optimizing annual tuberculosis screening for healthcare workers in low risk settings has implications for hospital policy as does Dr. Erin Teeple's study in collaboration with rheumatologist Dr. Jeffrey Katz, Outcomes of safe patient handling and mobilization programs: A systematic review. On the other hand both Dr. Kevin Loh's study, Entry Fitness Levels and Subsequent Academy Performance Outcomes in Massachusetts Police Recruits and Dr. Samuel Turner's research, Self-reported Stress Related Illnesses among US Law Enforcement Officers: A National Survey focused on issues related to law enforcement. These studies were mentored by OEM Program Director, Dr. Stefanos Kales. Dr. Loh, an Air Force scholar, and Dr. Turner, a Navy scholar, presented their respective research as resident posters at AOHC 2016 in Chicago. Dr. Vogel's research paper titled, Returning to work after occupational injury: A new approach to an old problem, described the RecoverMe app platform that he developed.

Career highlights of some of our recent graduates include: Marcelo C. Targino, MD, MPH, Chief Health Officer & Corporate Medical Director, Johnson & Johnson Global Health Services, Dr. Aaron Thompson, OM residency director and Assistant Prof at Univ of Toronto; Dr. Gerardo Durand (OEMR '15) corporate medical physician reporting to the Global Medical Director of 3M; Dr. Michael Lippi (OEMR '06) Global Medical Director of GE Aviation, Dr. Sony Mathew (OEMR '15) corporate medical physician at GE Aviation.

Our strong relationship with the Liberty Mutual Research Institute for Safety (LMRIS) offers residents additional interdisciplinary resources for research. In January 2016 JOEM published an article co-authored by Dr. Mason Harrell (OEMR '15) and LMRIS faculty Drs. Besen and Pransky titled Lag Times in Reporting Injuries, Receiving Medical Care, and Missing Work: Associations With the Length of Work Disability in Occupational Back Injuries (PMC4697957).

In March 2016, a [landmark study](#) was released showing that commercial truck drivers with obstructive sleep apnea (OSA) who failed to adhere to treatment had a rate of preventable crashes five times higher than that of truckers without the ailment and those who fully comply with treatment. Dr. Kales was the paper's senior author.

Occupational (Industrial) Hygiene Core

In the Occupational Hygiene (OH) Core, our goal is to train leaders who will rise to the top of the field and have a broad impact. One of the major critiques of epidemiology is the weakness of its exposure assessment. Epidemiologic researchers with an SM in OH have strong training in exposure assessment. In the past 10 years, we graduated 4 doctoral students in Occupational Epidemiology with previous SM degrees in OH, and most Occupational Epidemiology majors declare a minor in exposure assessment. This is consistent with our philosophy to have an important impact on a closely related discipline.

High impact activities by ERC supported Occupational (Industrial) Hygiene students:

- Kelli Smith worked as a project assistant at the MIT Environment, Health, and Safety Office. Activities included entering various labs on campus to test emissions from 3D printers and quantify particulate exposures, conducting regular noise surveys of MIT facilities and maintenance activities as well as requested noise surveys in various labs, and compiling documents on EHS programs and activities for use in an award application from CSHEMA.
- Ariane Dumas interned with Harvard's Environmental Health Services Department to establish a set of Laboratory Risk Safety Guidelines. Chemicals commonly used in Harvard research laboratories will be included. Each hazardous chemical will be written about in a 1-2 page safety guideline that outlines safe handling procedures, first aid, disposal techniques, storage techniques, and recommended usage and clean-up processes. Her activities also included establishing a control banding system for inhalation risks in research laboratories.

Occupational Epidemiology Core

The Occupational Epidemiology academic training program enjoyed growth and is quite large due to our success in leveraging other training grants (such as the NIEHS-funded Environmental Epidemiology T32

grant), TRT supplement research support, and accessing scholarship resources available at Harvard. Currently, this academic program has the largest number of doctoral candidates in any of the ERC core programs. The Core is extremely successful in producing researchers in this field, as evidenced by the publication record and jobs the graduates have secured. Examples of recent successes are Jennifer Cavallari, who is now an assistant professor at University of Connecticut Health Sciences Center in Occupational Health; Shona Fang, a research scientist at New England Research Institute, focusing on occupational epidemiology; Christine Dobson, who has taken a job with the State of California Health Department, focused on occupational health; Kerry Sousa, an epidemiologist with NIOSH, and Jinming Zhang, epidemiologist in the Occupational and Environmental Epidemiology Branch of the National Cancer Institute. Recent advances include describing new markers of cardiac responses to metal particulates (Acceleration Capacity, AC, and Deceleration Capacity, DC) among welders; the pattern of lung function abnormalities in endotoxin exposed workers and CT images of both airway and interstitial remodeling in their lungs.

Occupational Injury Prevention Program

The Occupational Injury Prevention Research Training Program continues to succeed with both the quality of trainees and funded research, in part due to our strong collaborations and integration with the Liberty Mutual Harvard program in Occupational Safety and Health, the Harvard T.H. Chan School of Public Health's Center for Work, Health and Wellbeing, and the Harvard Clinical Orthopedic and Musculoskeletal Education and Training (COMET) T32 program. In the past year the program graduated two doctoral students and enrolled one new doctoral student. Trainees from the program published 8 peer reviewed articles with 3 of those from NIOSH ERC funded trainees. The program is under the direction of Jack T. Dennerlein, PhD, adjunct professor of ergonomics and safety, and David A. Lombardi, PhD, instructor of injury epidemiology. Consistent with NIOSH and NORA strategic goals, the injury program seeks to produce the next generation of diverse and qualified researchers and public health professionals that have the multidisciplinary skills necessary to design, conduct, and evaluate research studies that identify emerging and critical issues in the etiology and prevention of occupational injury. Specifically, the program aims to provide interdisciplinary training for future professionals and researchers with traditional disciplinary backgrounds to expand the breadth and depth of their knowledge within the transdisciplinary public health framework.

Targeted Research Training (TRT)

TRT support is essential in providing support for trainees to obtain *multidisciplinary* and *research to practice* (*r2p*) doctoral education and training. In the current year, we added a trainee whose doctoral program is committed to Total Worker Health, and represents another collaboration with the Harvard T.H. Chan School of Public Health Center for a Healthy Workforce. It is important to note that all trainees are part of an ERC academic core that offers a doctoral degree, further integrating TRT research support into our approved doctoral programs (Occupational Epidemiology, Occupational Hygiene, and Injury Prevention and Control). TRT *r2p* activities are closely linked to the Outreach Program and the Total Worker Health Center. Highlights from 2015-16 include development of methods to assess multiple simultaneous exposures to metals in welding fumes in a population of boilermakers, and publication of field research results of pre and post exposure surveys of inflammatory markers among wild-land firefighters.

Other ERC Highlights and Accomplishments:

The Harvard ERC Continuing Education program, which is a part of the Center for Executive and Continuing Professional Education (ECPE), continues to grow in the area of program development and program improvement. The CE programs benefit from the wide range of expert faculty at the Harvard T.H. Chan School of Public Health.

A few notable program highlights:

Many of the ERC CE programs have been offered for many years because of the fundamental nature of the subject matter. However, ECPE puts an emphasis on updating sessions and materials to keep the program timely and relevant.

An example of this is our *Work, Health, and Well-Being: Integrating Wellness and Occupational Health and Safety in the Workplace* course which was offered for the fourth time in 2016. The program continues to

receive strong feedback from participants and the enrollment numbers continue to increase This program, was a joint production of the ERC and the NIOSH-funded Total Worker Health Center (Center for Health and Well-being).

However, our participants shared that although they thought all the information in the class was valuable they felt that the program price and travel expenses made the program cost prohibitive for many people. To address this concern we have shortened the program thus lowering the price and cutting down on the hotel costs.

In the interest of continuous quality improvement we have also altered some of the content. Discussion groups have been a key component of this program since the beginning but we continue to refine them so that they have the highest impact. We have created affinity groups through which participants can problem solve with other participants who face similar real world problems from their industry and geographic location. This has been very well received.

We have offered our popular *Guidelines for Laboratory Design: Health and Safety Considerations* course for over 10 years. The design and construction of a laboratory, regardless of its use, involves many stakeholders. While providing a safe environment for laboratory users to perform their work is imperative, competing stakeholders' needs often cause health and safety considerations to be overlooked. Participants in this program explore and address health and safety considerations for diverse laboratory types and gain the skills they need to create a safe laboratory environment. This program covers general laboratory design challenges, as well as issues specific to chemistry, microelectronics clean room, engineering, animal, biosafety, clinical, and sustainable laboratories. This course provides a unique opportunity for architects, engineers, laboratory users, lab managers, and EHS professionals to collaborate on laboratory design.

The Harvard ERC CE team is committed to continuous quality improvement and regularly reviews our courses to ensure high quality. The average quality rating for our programs is a 4.6 on a 5-point scale and the faculty's teaching effectiveness received a 4.59. Because we put a great deal of focus on making sure that our programs have enough applied content one of our most important measures is how useful the content is to professionals and that score was 4.44 on a 5-point scale.

Our program *Ergonomics and Human Factors: Strategic Solutions for Workplace Safety and Health* continues to evolve as the needs of our audience changes. Our goal is for the program to be as practical as possible. The program focuses on improving worker health and safety, offering practical advice for implementing and optimizing workplace ergonomics programs. In addition, the technical skills required for occupational ergonomic interventions are explored through lectures, group work, and in-depth discussions. This course is unique in considering both the public health and industry perspectives.

In collaboration with the Fishing Partnership Support Services and the MIT Sea Grant program, Director of Outreach, Ann Backus, and colleagues completed a survey (HSPH IRB 22434) of fishermen and others in the fishing ports of Gloucester and New Bedford Massachusetts and published, through the MIT Sea Grant, **RESCUES: Responding to Emergencies at Sea and to Communities Under Extreme Stress**. At the March 23, 2016 launch of the RESCUES handbook at the U.S. Coast Guard Station in Gloucester, Ann Backus joined the roster of speakers which included JJ Bartlett, President of the Fishing Partnership Support Services, the Commandant of the U.S. Coast Guard Station, Boston, Sefatia Theken, the mayor of Gloucester, Angela Sanfilippo, of Gloucester Fishermen's Wives, and Madeleine Hall-Arber, co-author and principal investigator. The handbook covers fishing safety, describes the roles of emergency responders such as the U.S. Coast Guard, discusses how professional services including counseling, legal, and financial services can be helpful, and lists community-based organizations that provide support to fishing families after a fishing fatality or disabling injury. A similar launch of RESCUES was held in New Bedford, MA at the new New Bedford Fishing Heritage Center on April 27, 2016 in conjunction with the Commercial Marine Expo. RESCUES can be found at <http://fishingpartnership.org/services/rescuemanual/>. Ann Backus will present this research at the American Public Health Association meeting in Denver on October 31, 2016.

Ann Backus is currently serving on the advisory board of the MassCOSH (Massachusetts Coalition of Occupational Safety and Health) intervention study to address violence and harassment among Latina workers in Massachusetts. The program, Latina TRASH (Translating Research to Action to Stop Harassment) and Violence at Work, is currently underway in collaboration with UMASS Lowell.

With a NIOSH-based grant from the Northeast Center for Occupational Safety – Agriculture, Forestry and Fishing, Ann Backus and Joe DeStefano completed a sea trial of an innovative drum winch emergency shut-off guard for trawlers. The Active Pressure Sensitive Winch Guard was designed by Jay Gallup of Rhode Island Engine and installed by Mr. Gallup on the fishing vessel Lightning Bay. A video showing the successful sea trial in which the drum winch stopped within milliseconds of being activated is available at <https://vimeo.com/154893452>. A counterbalance valve was designed-into the device to help ensure controlled extrication of a crew member who might have been caught in the drum winch during the haul-back process. Dissemination of the availability of the device and marketing towards adoption by trawler captains is ongoing. Ann Backus published a total of 12 articles in fishing industry trade papers: *Fishermen's Voice* (5), *Commercial Fisheries News* (4), and *Landings* (3), and was a vendor at the Maine Fishermen's Forum (March) and The Commercial Marine Expo 2016 (New Bedford, April).

The **Outreach Program** is responsible for three seminars series: The Monday ERC seminars (8), essentially monthly which include regional and national OSH practitioners and educators; the Friday Research Seminar work-in-progress series (20) which features ERC doctoral and masters level students; and Friday Grand Rounds (13) in which second year OEM residents present challenging toxicological or injury-related workplace cases and OM physicians discuss these cases from the aspects of history, etiology, epidemiology, prevention, and treatment. The most notable seminar of the year was presented by Linda Reinstein, CEO, of the Asbestos Disease Awareness Organization (ADAO) and Earl Dotter, photojournalist, in conjunction with their jointly developed exhibit titled *Badges*, which was displayed at HSPH from October 28 through Dec 2, 2015. This exhibit was subsequently presented at the NECOEM conference and at several NIOSH venues.

The **Pilot Project Research Training Program** has supported master, doctoral, and postdoctoral trainees who work with their mentors on specific occupational health and safety topics. This program has led to new research directions in several areas, including musculoskeletal injury (construction, home care aides, food-service) and disease mechanisms (metabolomics, toxicogenomics metal fume exposure) and nanoparticles. The pilot projects have also led to several successful new grant applications and publications and formed the basis for doctoral dissertations.

Another important accomplishment of the ERC has been **strengthening ties with other training programs and centers in** Harvard T.H. Chan School of Public Health, thus extending the reach of the ERC as well as opening up additional cross-disciplinary opportunities for ERC students. These ties include the Work-Life Center, funded by NIOSH and led by Dr. Glorian Sorensen, and co- led by Dr. Jack Dennerlein of the ERC; the Environmental Epidemiology Training T32 grant, led by Dr. David Christiani, the musculoskeletal disorders T32 led by Dr. Jeff Katz and the summer minority training programs in Biostatistics and in Epidemiology.

In **summary**, the Harvard ERC has met the NIOSH mandate to provide an adequate supply of qualified OSH personnel to carry out the purposes of the OSHA Act by educating and training an outstanding cadre of professionals in several OSH disciplines who have gone on to regional and national recognition in their respective fields. Moreover, we have continued a tradition of academic excellence by training educators and investigators who have become leaders in key government agencies (e.g., the NIOSH director, Dr. Howard, is a Harvard ERC graduate), in academia (e.g., Dr. Howard Frumkin is Dean of the University of Washington School of Public Health and Dr. Howard Hu is the dean of Dalla Lana School of Public Health; as well as numerous department chairs and a number of other ERC directors), and in Industry (e.g., Shannon Magari is a Principal Senior VP of Colder Corp.). We serve as a regional resource for industry, labor, government, and the general public, conduct extensive peer-reviewed research essential to standard-setting, continue professional education and outreach, and balance our research and practice portfolio with innovative research to practice initiatives. We are cross-cutting and interdisciplinary in our research and training, and provide multi-level practitioner and research training of the highest quality. The evidence of our success is found in the number

and quality of our publications, the positions that our graduates secure upon graduation, the leadership roles of many of our graduates, the impact on OSH standards and practice from our research, and the regional and national resource we have been for OSH stakeholders (industry, labor, government and academia).