MIDWEST CENTER FOR OCCUPATIONAL HEALTH AND SAFETY EDUCATION AND RESEARCH CENTER

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SUBMITTED BY:

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MIDWEST CENTER FOR OCCUPATIONAL HEALTH AND SAFETY (MCOHS)
EDUCATION AND RESEARCH CENTER (ERC)

SECTION I:

ERC Summary:

The mission of the Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC), as a center of excellence, is to provide: 1) cutting-edge interdisciplinary academic and research training to prepare exceptional leaders who make significant contributions to occupational safety and health (OSH), and 2) continuing education (CE) to prepare professionals to address current and emerging threats to the nation's workforce.

Objective:

To address the need for an adequate supply of qualified personnel to carry out the purposes of the Occupational Safety and Health Act and reduce the national burden of work-related injury and illness in the Midwest region served by the MCOHS, and beyond.

Rationale:

A previous conclusion in an Institute of Medicine report, that remains true, stated, "…the continuing burden of largely preventable occupational diseases and injuries and the lack of adequate occupational safety and health (OSH) services …indicate a clear need for more OSH professionals at all levels." Further confirmation is noted in the recent NIOSH-commissioned report, "National Assessment of the Occupational Safety and Health Workforce," identifying needs that greatly exceed available trained OSH professionals.

Design:

An innovative administrative structure, guided by a strategic plan and committed advisory board, supports enhanced efforts in interdisciplinary research, education, and outreach, including research-to-practice, and strengthens diversity recruitment. Rigorous graduate academic and research programs enable quality training for degrees in Industrial Hygiene (PhD, MS, MPH); Occupational and Environmental Medicine (MPH); Occupational and Environmental Health Nursing (PhD, MPH); Occupational Health Services Research and Policy (PhD); Occupational and Environmental Epidemiology (PhD, MPH); and Occupational Injury Prevention Research (PhD). In addition, a major CE Program offers novel courses in-person and through distance learning to meet the needs of a diverse workforce.

ERC Relevance:

The MCOHS ERC serves the region of Minnesota, Wisconsin, North Dakota, and South Dakota and is a resource for industry, labor, federal, state, and local government agencies, agriculture, and numerous other partners. Recognized regionally, nationally, and internationally, it provides outstanding academic and research training programs and innovative Continuing Education programs to ensure the Center is positioned to continue to produce leaders who make important contributions to occupational safety and health.

Key Personnel:

MCOHS ERC Director

Susan Goodwin Gerberich, PhD, MSPH
Leon S. Robertson Professor in Injury Prevention
and Mayo Professor in Public Health
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MCOHS ERC Deputy Director

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Bond Professor of Environmental and Occupational Health Policy
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Academic Programs and Overall MCOHS ERC Key Personnel:

Industrial Hygiene

Academic Program Director**:** *Peter C. Raynor, PhD, Associate Professor*
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Occupational and Environmental Medicine

Academic Program Director**:** *Jeffrey H. Mandel, MD, MPH, Associate Professor*
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Occupational and Environmental Health Nursing

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Occupational Injury Prevention Research Training Program

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Occupational Health Services Research and Policy

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Occupational and Environmental Epidemiology

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Continuing Education and Outreach in Occupational Health and Safety

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SECTION II:

Program Highlights

Industrial Hygiene (Five Highlights):

Program Director*: *Peter C. Raynor, PhD, Associate Professor

1. Exposure Science and Sustainability Institute (ESSI)

The University of Minnesota Exposure Science and Sustainability Institute (ESSI), led by Dr. Susan Arnold, was established in 2015 to provide excellence in exposure science research and training. The Institute's activities include both services and products that help address specific research questions and provide specific deliverables to pre-defined customers. ESSI had a very successful first year. The Institute conducted several studies for industry clients involving occupational and non-occupational exposure simulations in our exposure chamber, providing guidance on a variety exposure factors. Two relevant manuscripts are in progress. Several trainees from the Industrial Hygiene Masters' and PhD programs gained hands-on experience through their participation in this work. Future studies will include new experiential opportunities for trainees. The Institute is exploring the feasibility of offering one or two short courses on exposure modeling for the practicing professional. The ESSI website is http://essi.umn.edu/.

2. Modeling and Checklists for Decision Making in Industrial Hygiene

Dr. Arnold and Dr. Ramachandran have developed checklists based on simple heuristics and mathematical models to improve industrial hygiene decision-making accuracy. NIOSH-funded research investigated the accuracy and determinants of such decisions. The study involved both desktop assessments, where participating industrial hygienists viewed summary descriptions of tasks, and more detailed quantitative modeling exercises, where quantitative measurements of exposure determinants were used. Industrial hygienists from major companies and professional consultants collaborated in the study. In addition, members from several local AIHA sections (Minnesota, Alabama, Georgia) carried out assessments with their member industrial hygienists. Key findings regarding qualitative judgments made without monitoring data are that, a) the accuracy of exposure judgments made by hygienists is low (~30%% correct judgments) and not significantly better than random chance (25%), and b) there is a significant underestimation bias in the exposure judgments, i.e., there is marked tendency to assign a lower exposure category than the correct one, thus increasing occupational risk to workers. A training focused on simple checklist-based heuristics significantly

improves accuracy to ~70%. Using exposure models also improves judgment accuracy, and efforts on verifying and evaluating the performance of these models in different occupational scenarios is underway.

3. Measurement of Particle Sizes Associated with Airborne Viruses

Dr. Raynor has been working for several years with colleagues in the University of Minnesota College of Veterinary Medicine and Department of Mechanical Engineering to find optimal ways to measure the particle sizes with which live airborne viruses are associated. The long-range goal of this research is to identify ways to minimize the transmission of infectious viruses through air to people working in professions at risk. To determine what technologies and procedures will be most effective at reducing the transmission of virus-containing particles, we must know the size of particles with which viruses are associated. Therefore, the objectives of the research are to develop and validate methods to measure low concentrations of live viruses and viral RNA in air as a function of particle size and to use the methods to measure the particle sizes with which airborne viruses are associated in occupational settings. To date, the research team has successfully used non-viable impactors to sample viruses in laboratory tests and in field work. For example, concentrations of influenza viruses and pig-specific viruses have been measured by particle size in swine production facilities. In 2015, the team sampled air inside and outside of facilities housing sick chickens and turkeys during an outbreak of highly-pathogenic avian influenza in the poultry industry. They found virus outside of some facilities associated with relatively large particles. Future work will involve designing a custom-built sampler to collect the largest amounts of size-differentiated virus possible, while still keeping as much of the sampled virus live as possible. This research will lead to greater understanding about how far infectious airborne viruses can be transmitted, how deeply into the lungs they may be inhaled, and the most effective manner for controlling airborne exposures to the viruses.

4. Influence of Evolving Production Practices on Air Pollutants in Swine and Poultry Production

Evolving production practices in the swine and poultry industries may alter the working environment. Dr. Raynor has studied the influence of production practice on air contaminant concentrations. Concentrations of ammonia, hydrogen sulfide, respirable dust, and endotoxin were measured regularly throughout a year in a swine facility with parallel gestation stall and open pen housing, and with parallel finishing pens that use dry and wet feed delivery systems. Hazard indices were calculated using ammonia, hydrogen sulfide, and endotoxin concentrations and relevant occupational exposure limits. The researchers found that, due to ventilation requirements, season affected pollutant levels more than other factors, with concentrations approximately one order of magnitude greater in the winter than during the summer. Ammonia, dust, and endotoxin levels were higher, on average, in the room with gestation pens than in the room with stalls. Endotoxin concentrations were more than five times higher, on average, with the dry feed system than with wet feed. While individual contaminant concentrations were generally below regulatory limits, hazard index calculations suggested that the effects of combined exposures on respiratory health may present a risk to workers. Elevated levels of respirable endotoxin and hydrogen sulfide were observed during power washing.

Similar methods were applied to a newly-developed small-scale poultry production system. Although no air pollutants exceeded regulatory limits set by the Occupational Safety and Health Administration, ammonia concentrations exceeded the short-term exposure limit (STEL) established by the American Conference of Governmental Industrial Hygienists and endotoxin concentrations exceeded an occupational exposure limit recommended in the Netherlands. In addition, the coops in which the chickens were housed presented significant tripping and slipping hazards. This work has established that air contaminant concentrations are a significant level in animal production operations, especially during particular work tasks such as power washing or dispensing feed. However, new production practices may not present a greater exposure risk than traditional practices.

5. Midwest Emerging Technologies Public Health and Safety Training (METPHAST) Program

The key to avoiding health and safety issues with emerging technologies is to anticipate exposure risks and take action to mitigate them before they occur. To ensure that we anticipate these risks so that emerging industries grow without causing illness or injury to workers or the public, the University of Minnesota, the University of Iowa, and Dakota County Technical College formed the METPHAST Program in 2016 with funding from the National Institute for Environmental Health Sciences. Dr. Raynor is the principal investigator for the program and Dr. Ramachandran has been a co-investigator. The objective of the METPHAST Program is to develop a comprehensive array of focused, web-based modules that can be used by instructors to tailor education and training initiatives on nanotechnology health and safety to serve the unique needs of different learners. To achieve the objective, the METPHAST Program team creates web-based materials to train

professionals to work safely with engineered nanomaterials, teaches blended-learning academic courses on working safely with nanomaterials, and develops continuing education courses using the web-based materials. Training modules are freely available on Youtube at http://www.youtube.com/METPHASTProgram and on the Nano-Link website at http://nano-link.org/. This program is innovative because it streamlines and integrates academic and professional training to meet the needs of specific learners.

***Occupational and Environmental Medicine Academic Training Program* (Three Plus Highlights)**

Academic Program Director*: *Jeffrey H. Mandel, MD, MPH, Associate Professor*; *Clinical Residency Program Director:* *Ralph Bovard, MD, MPH

1. An Investigation of Minnesota's Iron Ore Mining Industry (portions still in progress)

This six-year study, funded by the State of Minnesota, consisted of multiple components (see below) and was led by Dr. Mandel (PI). It included faculty from occupational/environmental medicine, pulmonary medicine, industrial hygiene, occupational epidemiology and geology. This is the most extensive investigation of this industry that has been undertaken. It included all current and former mining operations, dating back to the origin of the industry in Minnesota. The goal of this research was to determine health risks related to several exposures in the industry. A key feature of this work was the insight provided into health risks associated with exposure to non-asbestiform amphibole fibers that occur in the eastern part of the Mesabi Iron Range. Further details may found at http://www.taconiteworkers.umn.edu. Several OEM residents, OEE PhD Students and IH master's/doctoral students participated in projects related to this investigation.

a. The investigation included a comprehensive industrial hygiene exposure assessment of all currently active mines. This work focused on three primary exposures including elongate mineral particles, silica and respirable dust. Dr. Ramachandran (IH) oversaw this area of research with input from Dr. Peter Raynor (IH). Over 2000 measures were taken across all currently active mines. Historical data from the mining companies and from the Mining Safety and Health Administration were used to estimate past exposures. A job-exposure matrix was created which included estimated concentrations for all three exposures for each year beginning in the 1950s and extending through 2010. Data from this assessment was incorporated into the epidemiological investigations mentioned below.

b. A general cohort mortality study was completed. This study assessed the vital status and cause of death for all taconite miners who worked in the industry between 1960 and 2010. The cohort included 31,067 workers with at least one year of documented employment. This work resulted in a paper that was published in the journal Occupational and Environmental Medicine. Three areas of higher than expected mortality were identified, lung cancer, mesothelioma and cardiovascular mortality.

c. Nested case-control studies were completed for the lung cancer and mesothelioma cases. Case ascertainment was done using mortality data as well as the state's tumor registry for both of these diseases. Information on exposure estimates, from the above exposure assessment, was used to explore the role of mining and disease risk. The lung cancer case-control study was published in Occupational and Environmental Medicine. The case-control mesothelioma paper is in review by the same journal. The former study does not suggest an association between EMP exposure in taconite mining and lung cancer.

d. A cross-sectional screening of current and former workers and their spouses was completed. This included 1188 workers and 496 spouses. Using chest x-rays and on-site, screening spirometry, individuals with non-malignant lung disease were identified. Exposure information obtained through the above industrial hygiene work was used to explore exposure-disease relationships. This work was conducted with Drs. Mandel, Alexander and MacLehose in conjunction with Dr. Nnaemeka Odo, a doctoral student who recently graduated from the OEE program. He has published one paper in the British Medical Journal Online and has presented at multiple national meetings on this topic. His work demonstrated the importance of having pulmonary function tests meet usability and repeatability criteria in advance of their use in epidemiologic investigations.

e. An environmental exposure characterization related to taconite mining in Minnesota. This effort was led by Dr. George Hudak and was part of the overall Taconite Workers Health Study. The goal of this work is to characterize community exposures to dusts generated in the mining and processing of taconite ore.

2. Additional areas of research collaboration have been funded and involve OEM faculty as collaborators.

These projects will add to existing research projects as potential areas for resident research involvement. The new projects include:

a. Enhanced exposure characterization of elongate mineral particles in the taconite industry of Minnesota. This work is headed by Dr. Ramachandran with Drs. Mandel, MacLehose and Alexander as co-investigators. This work is designed to obtain better characterization of EMP dimensions to try to improve the understanding of associations of EMPs and health outcomes.

b. Environmental exposures and Parkinson's Disease in Minnesota. Dr. Mandel is working with Dr. Timothy Church (UMN Division of Environmental Health Sciences) and Dr. Paul Tuite (UMN Neurology) to explore the association between environmental exposures in Minnesota and risk for Parkinson's Disease. This work is being done in conjunction with laboratories at the University of Minnesota that have developed expertise in identification of environmental pollutants. Another goal of this research is to establish a Parkinson's Disease registry in Minnesota, which has one of the highest rates of this disorder in the United States.

c. Development of a potential biomarker of silica exposure in taconite workers. Dr. Zeke McKinney analyzed and reported on the relation between a DNA adduct (M1dG) and cumulative silica exposure in taconite workers. This work is a preliminary step in the assessment of this biomarker for potential use in workers with silica exposure. The utility of a biomarker in this setting is that high exposures could be identified in advance of disease progression. Dr. McKinney is working with Drs. Irina Stepanov and Mandel in this effort.

d. Assessment of PM 2.5 exposures in the taconite mining industry. Dr. Olaoluwa Lediju is working with Drs. Mandel and Hudak (UMN Geology) to convert gravimetric exposure measurements to size-specific measures. The goal of this work is to assess the effect of size-specific measures to health outcomes in taconite miners. The health endpoints used in this investigation were obtained during the cross-sectional screening mentioned above. Since particle size is important in dust-related lung disease, this information will be key in understanding exposure-disease relationships.

3. Other Highlights

a. Drs. McKinney and Cusic hold board positions in the Central States Occupational/Environmental Medicine Association.

b. Dr. Shawn Olson serves on ACOEM's Residents and Recent Graduates Section.

c. Drs. Mandel and Ramachandran participated in the first and second international conference designed to develop collaborative relationships with scientists from the Chinese Academy of Sciences and other universities in China. This interaction has led to collaborative discussions about the use of biomarkers of exposure to PM 2.5 in Chinese cities with high degrees of air contaminants. A follow-up meeting will be held in the Twin Cities in October 2015 to further these collaborative efforts. Drs. Mandel and Ramachandran are chairing the section on health effects for this meeting.

d. Drs. Bovard and McGovern will be collaborating in a project that tests the impact of a worksite health improvement intervention.

e. Dr. Isabel Pereira is a resident member of the CSOEMA and Dr. McKinney is on the Board of Governors of this organization.

f. Dr. Bovard is on the planning committee for the 2016 American College of Preventive Medicine meeting in Washington, D.C. He monitored a symposium on Worksite Welnness with colleagues in Kalispell, MT. Dr. Bovard was also a member of the 2016 Impairment without Disability planning committee held in St. Paul, October 6-7, 2016 and will be presenting at the American College of Lifestyle Medicine in Naples, FL October 24, 2016.

g. Dr. Christina Cusic MD, a recent resident, is the program chair for the 2017 AOHC Protective Services (LEO) injury session in Denver. Dr. Bovard will be presenting in this session.

***Occupational and Environmental Health Nursing* (Three Highlights):**

***Program Director*:** *Patricia M. McGovern, PhD, MPH, RN, Bond Professor of Environmental and Occupational Health Policy*

1. Necessary Drugs, Unnecessary Consequences: An Intervention to Protect Oncology Health Workers

Catherine Graeve, MPH (OEHN PhD student), was awarded a Graduate School Dissertation Fellowship for her research," Necessary Drugs, Unnecessary Consequences…" (Advisor: Dr. McGovern). Her study designed and tested an intervention to decrease exposure among nurses and pharmacists to antineoplastic drugs while they provide care for cancer patients in three oncology units. This is significant for health care workers as no regulations govern their handling of these highly toxic drugs. Moreover, the literature has established that approximately 8 million health care workers are potentially exposed to these drugs, which are carcinogenic, mutagenic, and teratogenic. Pre-intervention findings revealed that use of Personal Protective Equipment (PPE) was lower than recommended and chemical residue on work surfaces was identified in several locations. Post-intervention findings showed increased worker awareness of safe handling precautions and improved PPE use. Study findings are *in press* with **Oncology Nursing Forum** (Graeve, McGovern, Arnold and Polovich, January 2017).

2. Family Medical Leave Duration and Protection from Maternal Postpartum Depression

Rada Dagher, PhD, (Alumna, MCOHS Pilot Projects Research Training Program) collaborated with faculty member, Dr. McGovern, to examine identify workplace-related barriers and facilitators associated with breastfeeding initiation and cessation in the first 6 months postpartum in a prospective cohort of women 18 years of age and older Study findings revealed that the likelihood of breastfeeding cessation by six months postpartum was higher for women who returned to work at any time during the 6 months postpartum (versus those who did not return), held clerical occupations (vs. professional), were single (versus married), less educated and had no family or friends who breastfed. Given that the majority of employed women return to work in the first three months postpartum, work policies that support longer duration of breastfeeding and workplace policies and support for breastfeeding in line with Healthy People 2020 goals are warranted. (See: Dagher R, McGovern P, et al. Determinants of breastfeeding initiation and cessation among employed mothers. BMC Pregnancy and Childbirth. February, 2016:16;197. (DOI 10.1186/s12884-016-0965-1)

3. Research to Practice (r2p): Facilitating Employers' Implementation of Worksite Lactation Programs Using Best Practices

Julie Alcorn-Webb, MA (OEHN MPH student) and director of MCOHS Continuing Education and her advisor, Dr. McGovern, partnered with the Minnesota Breastfeeding Coalition and the Minnesota Department of Health (MDH) on their efforts to encourage Minnesota employers to create Breastfeeding Friendly Workplaces that would be publically recognized by the MDH for following published best practices consistent with provisions of the Affordable Care Act and state regulations. Specifically, Julie led the development of a toolkit outlining a process and resources to guide Coalition members to identify local employers throughout Minnesota who would work with them to meet the MDH criteria for a Breastfeeding Friendly Workplace. (See: http://www.health.state.mn.us/divs/oshii/bf/BFFworkplace.html and https://mnbreastfeedingcoalition.org/). Julie will be presenting her work at the Minnesota Breastfeeding Coalition's Annual Meeting, October 28, 2016, Maplewood, Minnesota.

***Occupational Injury Prevention Research Training* (Five Highlights):**

Program Director: *Susan Goodwin Gerberich, PhD, Mayo Professor and Leon S. Robertson Professor in Injury Prevention*

Program Co-Director: *Bruce Alexander, PhD, Professor*

1. Workload, Health, and Injury Study Among Janitors

This is a cooperative study between the University of Minnesota and the SEIU Local 26 union, comprised of approximately 4,000 janitors. The purpose of this project is to determine the incidence and consequences of injuries and identify health and workload factors that may contribute to injuries among all janitors. Specially designed questionnaires enable comprehensive data collection relevant to workload, health status and injury incidence collected over two six-month sequential periods. Approximately 100 janitors are also participating in a substudy of the project that assesses workload using FitBit bands. Another substudy involves participation in an on-the-job assessment by ergonomists to determine potential physical workload. Deirdre Green, MS, PhD

Candidate and Adam Schwartz, MS, PhD Student, are advised by a research team including Drs. Gerberich and Kim (OIPRTP), McGovern (OEHN; OHSRP), and Mr. Ryan (MCOHS).

2. Incidence of and Risk Factors for Occupational Injury among Transit Bus Operators

Among a total of 2,095 bus operators, included in this study, designed and conducted by Dr. Chia Wei, former OIPRTP doctoral student, the overall unintentional injury rate with 95% C.I. was 17.8 (16.1-19.7) per 100 FTEs. Multivariable analysis identified increased risks for operators who: were female, compared to male (HR=2.4; 2.0-2.8); worked <7, compared to 7-<12 hours per day (HR=4.6; 3.8-5.5); and drove <7 compared to 7-<12 hours per day (HR=3.2; 2.7-3.8). Operators who worked split, versus straight shifts, demonstrated a suggestive increased injury risk (HR=1.2; 1.0-1.4). Bus operators also tended to have an increased injury risk when driving limited versus regular bus routes (HR=1.36; 1.0-1.8). The overall intentional injury rate was 1.4 (1.1-1.7) per 100 FTEs.

Operators who commenced working between 3 p.m. and 6 p.m. (HR=2.4; 1.2-5.1) and 12 a.m. and 3 a.m. (HR=5.3; 1.6-18.2), had higher risks of intentional injury, compared to those who commenced work between 9 a.m. and 12 p.m. Moreover, those who worked overtime had 30% higher risks, compared to those who did not. Results of this study serve as a basis for further studies and are used for the development and application of relevant targeted intervention strategies in a metropolitan transit system to reduce occupational injuries among bus operators. Associated manuscripts are in review. (Funding: NIOSH Pilot Project T42 OH008434)

3. An Epidemiological Approach to Emergency Vehicle Advanced Warning System Development: A Two-Phase Study

Motor vehicle crashes involving civilian and emergency vehicles (EVs; police, fire trucks, ambulances, etc.) have been a known problem that contribute to fatal and nonfatal injuries; however, characteristics associated with civilian drivers had not been examined adequately. This two-phase study designed and conducted by former OIPRTP doctoral student, Dr. Chris Drucker, analyzed data from: **Phase 1**) The National Highway Traffic Safety Administration's Fatality Analysis Reporting System and the National Automotive Sampling System General Estimates System to identify driver, roadway, environmental, and crash factors, and consequences for civilian drivers involved in fatal and nonfatal crashes with in-use and in-transport EVs and **Phase 2**) design and examination of the impact (based on driving performance and usability measures under distracting and non-distracting conditions) of two in-vehicle driver support systems which alert drivers to approaching EVs in a simulated urban environment.

Phase 2, using a portable driving simulator, indicated improved driver responses and roadway safety among drivers presented with the designed driver support system compared to drivers presented with no driver support system. Most notably, drivers were at decreased risk of collisions with EVs when given a driver support system and when the presence of the systems did not increase in-vehicle distractions. In addition, drivers indicated a moderate level of trust and lower mental workload scores when driving with the driver support systems and reported the systems to be somewhat useful and satisfying. The findings of this two-phase study suggest drivers may have difficulties in visually detecting EVs in different environments and that the use of technology may be beneficial as an intervention to mitigate roadway crashes between civilian drivers and EVs. Future research must continue to examine interactions between civilian drivers and EVs to identify methods to improve roadway safety. Associated manuscript in review. (Funding: NIOSH Pilot Project T42 OH008434)

4. Surveillance of Agricultural Injuries and Risk Factors using Worker's Compensation Data, 2016-2021

New faculty member, Dr. Marizen Ramirez, is collaborating with Nationwide Insurance and the University of Iowa to conduct two studies. For study 1, the team will analyze agricultural injuries captured in two overlapping datasets: Iowa's Statewide Trauma System and Nationwide's Iowa-based Worker's Compensation program during a ten-year study period (2005-2015). The aims of the study are to a) estimate the incidence of agricultural injury in Iowa reported through two sources: the Iowa Trauma Registry, and Nationwide Insurance's Worker's Compensation program; and b) compare agricultural injuries by severity, type, mechanism and demographics reported by agricultural operations in the Nationwide Worker's Compensation database with those reported in Iowa's Trauma registry. Injury incidence will be calculated in both datasets, and characteristics of these injuries and the demographics of the injured workers will be compared. For study 2, a new agricultural hazard surveillance tool, to be developed by Nationwide Insurance over the next year, will be evaluated in its ability to predict injuries reported to Nationwide's program. The tool is scheduled to be implemented longitudinally with a cohort of U.S. agricultural operations. This project represents a unique academic-industry partnership, and has promise to improve surveillance of both agricultural injuries and risk factors.

5. Comparative Effectiveness of Response, Resiliency and Resources and Critical Incident Stress Debriefing: two programs designed to reduce occupational stress among traumatized hospital clinic workers, 2016-2017

Occupational stress impacts one-third of workers each year, and healthcare workers are among those workers with the highest rates of occupational stress. A number of "critical incidents" occur in hospital settings that lead to stress, including experiences with patients (death/injury, aggression, dealing with patient pain, presence of family), non-patient factors (co-workers, conflict between work and family roles, being physically threatened and witnessing physical threat/assault of co-workers), and organizational factors (high workload, poor career development, lack of support). Because reducing stress in the workplace can adversely impact the professional and personal lives of workers, reducing occupational stress is a Total Worker Health priority. Delivery of stress reduction interventions by chaplains in hospital settings is an innovation with great potential for sustainability. Dr. Marizen Ramirez has brought together investigators from Chaplain Services at the University of Iowa Hospitals and Clinics and the University of Queensland (Australia) to conduct a pilot comparative effectiveness study of two early interventions (Response, Resiliency and Resources [RRR] and Critical Incident Stress Debriefing [CISD]) delivered by chaplains to reduce stress among healthcare workers involved in direct patient care. Using a group-randomized design, 24-30 clinical groups will be randomized to receive RRR or CISD from chaplains. Baseline, 6-week and 3-month follow-up surveys will be completed by participants of group sessions, and stress measures, coping, resiliency and quality of life will be compared between the two modalities of care.

***Occupational Health Services Research and Policy Program* (Three Highlights)**

Program Director: *Patricia M. McGovern, PhD, Bond Professor of Environmental and Occupational Health Policy*

Program Co-Director: *Brian Dowd, PhD, Professor*

1. Katy Backes Kozhimannil, Ph.D., M.P.A. was the 2016 winner of the *Alice S. Hersh New Investigator Award at the AcademyHealth Annual Research Meeting held in Boston, Massachusetts June, 2016.*

Dr. Kozhimannil is an associate professor in the Division of Health Policy and Management, director of research at the University of Minnesota Rural Health Research Center and a supporting faculty member of the OHSRP program. Her research focuses on applying the tools of health policy and health services research to the field of women's health, with a focus on maternal and child health. She conducts research to inform the development, implementation, and evaluation of health policy that impacts health care delivery, quality, and outcomes during the perinatal period. This award recognizes scholars early in their careers as health services researchers who show exceptional promise for future contributions to the field.

2. Breastfeeding among Employed Women and the Affordable Care Act.

The Affordable Care Act (ACA) of 2010 includes workplace-related provisions to address breastfeeding barriers among employed women (Patient Protection and Affordable Care Act, 2010). Section 4207 of the ACA amends the Fair Labor Standards Act and applies to all employees who are nonexempt from Section 7 of the Fair Labor Standards Act, including employees working for companies engaged in interstate commerce whose total annual sales exceed $500,000, health care facilities, schools, or public agencies. The amendment requires employers to provide reasonable break times and a private place, other than a bathroom, for breastfeeding mothers to use a breast pump to express their breast milk during the workday for at least one year postpartum. Employers with fewer than 50 employees can file for exemption if these accommodations pose an undue hardship. (Kozhimannil, KB, Jou J, Gjerdingen DK, McGovern PM. Access to Workplace Accommodations to Support Breastfeeding After Passage of the Affordable Care Act. Women's Health Issues. (2016) 26(1):6-13.)

3. Tractor Rollover Protective Structures: A Policy Initiative

Dr. Adrienne Landsteiner, OHSRP alumna, and Epidemiologist from the Minnesota (MN) Department of Health Center for Occupational Health and Safety collaborated with representatives of the MN Department of Labor and Industry and the MN Department of Agriculture to address the number of fatalities occurring within Minnesota's agricultural sector. Representatives of the MN legislature, agricultural industry, health and safety personnel, and other interested parties worked together to support a bill for a Rollover Protective Structure Rebate Program initiative based on a successful initiative in New York and other states (https://www.nycamhoutreach.com/ropsr4u/) that was introduced in the 2016 MN legislative session. The bill

was approved and $250,000 was allocated to the program and over $27,000 has been received from private donations. (Related publications from dissertation: **Landsteiner** AM, McGovern PM, Alexander BH, Lindgren PG, Williams AN. Incidence Rates and Trend of Serious Farm-Related Injury in Minnesota, 2000-2011.J Agromedicine. 2015;20(4):419-26, and **Landsteiner** AM, McGovern PM, Nyman JA, Alexander BH, Lindgren PG, Williams AN. The Economic Impact for Farm Injury in Minnesota, 2004-2010. J Agromedicine. 2016;21(2):171-177.

Occupational and Environmental Epidemiology Program (Three Highlights)

Program - Director*: Bruce H. Alexander, PhD, Professor*
Program – Co-Directors:
Richard F. MacLehose, PhD, Associate Professor
Jeffrey H. Mandel, MD, MPH, Associate Professor

1. Zoonotic Disease Risk from Agricultural Exposures

Dr. Alexander, Dr. Jeffrey Bender, and OEE PhD trainee, Evan Sorley, are collaborating with colleagues of the Upper Midwest Agricultural Safety and Health Center (UMASH) to characterize the risk of zoonotic infections in people working in agriculture in Minnesota. Drs. Kirk Smith and Joni Sheftel of the Minnesota Department of Health are directing a UMASH study that extends the Minnesota reportable infectious disease program to do more comprehensive follow-up on people with a history of agricultural exposures. This multidisciplinary collaboration will include the estimation of rates of zoonotic infections in agricultural populations and those with occupational exposure to animals compared to the general population. Further analyses will explore patterns of microbial resistance and severity of illness in these populations.

2. Occupational Ionizing Radiation Exposure and Cataract formation in Radiologic Technologists.

Drs. MacLehose and Alexander and Craig Meyer (PhD trainee) are finalizing a study of cataract occurrence from the U.S. Radiologic Technologists (USRT) study. The USRT is the largest study of workers exposed to medical ionizing radiation in the world. There is considerable growth in the use of medical imaging procedures and radiotherapy, which has contributed to a six-fold increase in average annual population dose from medical radiation since 1980. These frequently used procedures carry the risk of exposure to health providers. This research examined the potential effect of long-term, low dose ionizing radiation exposure on the risk of developing cataracts in a population of over 90,000 radiologic technologists. An association between radiation exposure and cataract was further explored to evaluate the potential impact of the healthy worker survivor biases that are commonly found in occupational epidemiologic cohorts. Additionally, this research applied boosted regression trees, a model developed in the computer science field, to build more efficient prediction model for cataracts.

3. **Developing Biomarkers of Pulmonary Inflammatory Response to Taconite Dust Exposure**.

Drs. Stepanov, Mandel, and Alexander are working with OEE PhD trainees Shannon Sullivan and Rony Arauz on studies to develop biomarkers to detect early evidence of exposure and response to silica and other components of taconite exposure. The relation between silica exposure and silicosis is well known; but, the health effects of silica exposure are not recognized until an irreversible disease is present. Understanding the inflammatory pathways that occur when the body mounts a response to silica exposure will improve the understanding of silicosis and the ability to recognize it early. This, in turn, will also better characterize what level of exposure is safe for workers. A unique aspect of the taconite exposures is the high level of iron in the dust. Iron is a potentially important element for stimulating the inflammatory response to dust exposures. This work will integrate biomarker research with epidemiology using data and biological samples collected as part of the Taconite Worker Health Study (http://www.taconiteworkers.umn.edu).

Continuing Education in Occupational Health and Safety

Program Director: *Julie Alcorn-Webb, RN, MA*

The MCOHS Continuing Education (CE) Program conducted 66 total courses during the past grant year. This program reached 3,859 trainees, totalling 11,453 hours of training. Diverse training needs were met by offering a variety of course formats, including 21 online modules awarding CE credit, 36 in-person courses, and nine hybrid courses, with attendees representing occupational health and safety professionals across disciplines. The CE Program continued to strengthen collaborations with the Wisconsin State and Minnesota Associations of Occupational Health Nurses, the Impairment Without Disability Occupational Medicine physicians, and local chapters of the American Industrial Hygiene Association and the

American Society of Safety Engineers, by collaborating on regularly scheduled professional development programs and events. In collaboration with the Minnesota Association of Occupational Health Nurses, a new yearly professional development conference was started. New corporate training partnerships extended our reach within Minnesota and Wisconsin. Geographically, the MCOHS CE program extended to 50 states and 137 countries, with participants representing 78 counties from our regional service area of Minnesota, North Dakota, South Dakota and Wisconsin.