

FINAL PERFORMANCE REPORT

September 30, 2020

Midwest Center for Occupational Health and Safety (MCOHS)
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**MIDWEST CENTER FOR OCCUPATIONAL HEALTH AND SAFETY
EDUCATION AND RESEARCH CENTER**

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ABSTRACT

The mission of the Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) is to provide: 1) cutting-edge interdisciplinary academic training to prepare exceptional professionals and practitioners who address current and emerging threats to occupational safety and health (OSH), and 2) high-impact outreach through continuing education (CE) and translation of research-to-practice. The funding period for this report is July 1, 2015 to June 30, 2020.

Objective: To provide a supply of qualified personnel with skills and competencies to recognize, manage, study and control OSH hazards to meet the goal of reducing the burden of work-related injury and illness in the Midwest and beyond.

Design: The MCOHS is composed of an Administrative Planning and Education Core, an Academic Training Core, and an Outreach Core guided by advisory boards and strategic plans. Graduate academic and research programs enable quality training in Industrial Hygiene, Occupational and Environmental Medicine, Occupational and Environmental Health Nursing, Occupational Health Services Research and Policy, Occupational and Environmental Epidemiology, and Occupational Injury Prevention. A CE Program and research-to-practice activities will reach wide audiences to meet the needs of a diverse workforce.

Key Accomplishments:

- MCOHS positioned itself to establish strategic leadership to ensure its sustainability. A new director was appointed, mid-career faculty promoted to director positions, and new, diverse junior faculty were recruited. This increase faculty breadth, depth and diversity supports emerging and ongoing needs for research and training expertise in the center programs.
- From 2015-2020, across all programs, a total of 104 students matriculated into the MCOHS (69 new admissions, and 35 continuing students admitted prior to 2015). An impressive 27% were underrepresented racial/ethnic students, and 56 MCOHS trainees (26 MPH, 9 MS and 21 PhD) graduated from their respective programs. Student retention was excellent at 94%.
- The majority of alumni (95%) were immediately employed upon graduation into a variety of settings: 25% in industry, 23% in government agencies, 19% in academia, 21% in hospital/clinic/integrated health care systems, and 3% in consulting.
- The breadth of research pursued by MCOHS faculty and trainees is impressive, representing major NORA sectors and addressing topics such as occupational disparities, surveillance, biomarkers, intervention/policy evaluation, and stress.
- The Pilot Project Research Training Program served as an incubator for new research ideas, supporting students, post-doctoral researchers and faculty in our region. During this past performance period, 29 pilot grants were awarded that supported students, faculty associated with MCOHS, researchers elsewhere at the University of Minnesota, and investigators at other institutions in Minnesota, Wisconsin, and South Dakota.
- Our Continuing Education program trained practitioners on up-to-date practices and research in Occupational Safety and Health. During the performance period, 19,219 trainees were served by the MCOHS CE program through 451 courses from 50 states and 47 countries. A total of 1000+ outreach engagement activities were completed by MCOHS faculty and students. These included Education Development, Presentations/Lectures/Seminars, Consultations, and Community Engaged Research.
- Guided by MCOHS's strategic plan, the MCOHS has grown in its leadership, breadth in research and strategies for training.

LIST OF ABBREVIATIONS

Abbreviation	Definition
AAOHN	American Association of Occupational Health Nurses
ABET	Accreditation Board for Engineering and Technology
ABPM	American Board of Preventive Medicine
ACGIH	American Council of Governmental Industrial Hygienists
ACGME	American Council on Graduate Medical Education
ACOEM	American College of Occupational and Environmental Medicine
AIHA-UM	American Industrial Hygiene Association-Upper Midwest section
AIHCE	American Industrial Hygiene Conference and Exposition
AOHC	American Occupational Health Conference
APHA	American Public Health Association
ASSE-NW	American Society of Safety Engineers – Northwest
ATSDR	Agency for Toxic Substances and Disease Registry
BAE	Biosystems and Agricultural Engineering
BS	Bachelor of Science
CDC	Centers for Disease Control and Prevention
CE	Continuing Education
CEPH	Council on Education for Public Health
CIH	Certified Industrial Hygienist
CSP	Certified Safety Personnel
EnHS or EHS	Division of Environmental Health Science
ERC	Education and Research Center
FAAN	Fellow of the American Academy of Nursing
HPM	Health Policy and Management
HSAT	Hazardous Substances Academic Training Program
HST	Hazardous Substances Training
IH	Industrial Hygiene
IT	Institute of Technology
JD	Doctor of Jurisprudence
MD	Medical Doctor
MAOHN	Minnesota Association of Occupational Health Nurses
MCOHS	Midwest Center for Occupational Health and Safety
MNDOT	Minnesota Department of Transportation
MPH	Master of Public Health degree
MS	Master of Science degree
NACCHO	National Association of County and City Health Officials
NCIPC	National Center for Injury Prevention and Control
NIOSH	National Institute for Occupational Safety and Health
NORA	National Occupational Research Agenda
OEE	Occupational and Environmental Epidemiology
OEHN	Occupational and Environmental Health Nursing
OEM	Occupational and Environmental Medicine
OHSRP	Occupational Health Services Research and Policy Program
OIPR	Occupational Injury Prevention Research Training Program
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration

P&A	Professional and Administrative
PDCs	Professional Development Courses
PH Cert-OHS	Public Health Certificate in Occupational Health and Safety
PhD	Doctor of Philosophy degree
PHI	Public Health Institute
PPRTP	Pilot Projects Research Training Program
PubH	Public Health
R2P	Research to Practice
RN	Registered Nurse
ScD	Doctor of Science
SEP	Special Emphasis Panel
SPH	School of Public Health

**MIDWEST CENTER FOR OCCUPATIONAL HEALTH AND SAFETY
EDUCATION AND RESEARCH CENTER**

TECHNICAL REPORTS

CENTERWIDE TECHNICAL REPORT

Marizen R. Ramirez, PhD, Director
Patricia M. McGovern, PhD, Deputy Director

THE MIDWEST CENTER FOR OCCUPATIONAL HEALTH AND SAFETY CENTERWIDE TECHNICAL REPORT

1. MISSION AND OBJECTIVES

The mission of the Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) [<http://www.mcohs.umn.edu>] is to prepare occupational health and safety professionals to address current and emerging threats to the nation's workforce through: 1) cutting-edge interdisciplinary academic and research training to prepare exceptional leaders in occupational health and safety, and 2) high-impact outreach through continuing education and translation of research-to-practice.

2. HISTORY, BURDEN, AND NEED

History. For over 40 years, the MCOHS has provided academic and research training at the graduate level, and continuing education and outreach activities for agriculture, industry, labor, federal, state, and local government agencies. In 1977, the National Institute for Occupational Safety and Health originally designated the Upper Midwestern United States as MCOHS's service area: Minnesota, Wisconsin, North Dakota, and South Dakota. Two states are from Federal Region V, and two are from Region XIII. However, the MCOHS has extended its reach beyond these borders to communities and partners across the globe. Since its inception, the MCOHS has trained over 400 graduate students (322 graduated; 98 currently enrolled), many of whom have been placed in academic, industry, healthcare and governmental positions across the world. Over the past five years, more than 500 companies, institutions, and agencies have received professional consultation, educational content, research findings, and numerous web-based resources from MCOHS faculty, staff and students. To achieve this level of impact, MCOHS has managed an outreach core that includes a continuing education program and six graduate-level academic training programs in 1) Industrial Hygiene (IH), 2) Occupational and Environmental Health Nursing (OEHN), 3) Occupational and Environmental Medicine (OEM), 4) Occupational Injury Prevention (OIP) and 5) Occupational and Environmental Epidemiology (OEE) and 6) Occupational Health Services Research and Policy (OHSRP).

The MCOHS's Administrative Planning and Evaluation Core (MCOHS Admin Core) has led the pursuit of strategies, managed financial and intellectual resources, and coordinated interdisciplinary activities to address these objectives. The MCOHS Admin Core ensured that its six academic programs and its outreach core (which includes a continuing education program) engaged collectively and synergistically to offer high-quality interdisciplinary academic and research training, and outreach. Furthermore, the MCOHS Admin Core has been guided by an executive community, an external advisory board, our center evaluator, and a strategic plan. From these efforts, we expect to continue to produce highly qualified OSH professionals with multidisciplinary skillsets to effectively practice health and safety in diverse workplace settings.

PERFORMANCE / ACCOMPLISHMENTS OF MCOHS, 2015-2020

3. LEADERSHIP

After leading the MCOHS for 12 years, Dr. Susan Gerberich stepped down from her position but continues to serve as senior faculty advisor to a new generation of MCOHS leaders. In 2016, Dr. Marizen Ramirez (Associate Professor), an injury epidemiologist, was recruited from the University of Iowa, and for the past two years has been groomed into the Director position by Dr. Gerberich. Dr. Ramirez also leads the Occupational Injury Program (OIP), after having served as its Co-Director for three years. Dr. Patricia McGovern has served as Deputy Director for more than twelve years.

With anticipated retirements and faculty transfers to new institutions, the MCOHS's individual programs have undergone changes in leadership. However, the strategic leadership structure of each program (composed of at least two faculty as directors, co-directors, or core faculty) offered institutional stability and smooth transitions. Industrial Hygiene (IH) Program Director, Dr. Pete Raynor (Professor) seamlessly assumed the IH Director position in 2016 after being core IH faculty for 18 years. Dr. Raynor replaced Dr. Gurumurthy Ramachandran, who was recruited by Johns Hopkins Education and Research Center. Dr. Richard MacLehose (Associate Professor) stepped easily into the Occupational and Environmental Epidemiology (OEE) Program Director Position after serving as Co-Director since OEE's inception in 2011. He replaced Dr.

Bruce Alexander, who was recruited by Colorado State University's Department of Environmental and Radiological Health Sciences to serve as its department chair. Finally, with the anticipated retirement of Dr. Jeff Mandel (Occupational and Environmental Medicine (OEM) Academic Program Director from 2008 to 2018), the MCOHS was fortunate to have recruited an experienced occupational medicine physician, Dr. Steven Kirkhorn (Associate Professor), in 2018. Previously, he served as the OEM Residency Director, a center external advisor for 25+ years, Medical Director of the National Farm Medicine Center, and practicum supervisor of eight OEM students. Dr. Kirkhorn co-leads the Academic OEM program with Residency Director, Dr. Ralph Bovard. Leadership of Occupational and Environmental Health Nursing (OEHN) and Occupational Health Services Research and Policy (OHSRP) Programs remained stable (both led by Dr. McGovern, and OHSRP co-led by Dr. Bryant Dowd). To support OEHN's sustainability, Dr. Carolyn Porta, UMN Professor of Nursing, was appointed as Co-Director. Leadership of the Continuing Education (CE) Program and the Outreach Core also remain stable under 10+ years of leadership by Ms. Julie Alcorn-Webb.

Also aligning with this vision of sustainability and growth, the MCOHS has successfully recruited young new faculty with diverse training, practical experience, and strong research portfolios:

- Dr. Kimberly Anderson (Assistant Professor), recruited from University of New York at Albany (University of Iowa IH graduate, Colorado ERC post-doctoral fellow), has been core faculty of IH since 2017. She is mentored by Dr. Peter Raynor, IH Program Director.
- Dr. Susan Arnold (Assistant Professor), a graduate of the University of Minnesota IH program with more than 20 years of experience working in industry, has been an IH Core Faculty since 2015. Dr. Arnold is being reviewed for tenure and promotion in 2019; she is mentored by Dr. Ramirez.
- Dr. Hyun Kim (Assistant Professor), recruited in 2015 from Zucker School of Medicine at Hofstra (University of Massachusetts, Lowell, graduate), has been core faculty and is now co-Director of OIP and OEE. Dr. Kim is currently being reviewed for tenure and promotion to Associate Professor.

The MCOHS has a strategic objective critical to its sustainability - ***increase faculty breadth, depth and diversity to support emerging and ongoing needs for research and training expertise in the center programs***. With the recruitment of Dr. Ramirez and the promotions of Drs. Raynor and MacLehose, MCOHS has supported the advancement of mid-career/experienced OSH faculty to senior leadership positions. With institutional support from the School of Public Health, MCOHS has recruited talented junior OSH faculty. In less than five years, our new and experienced MCOHS faculty have brought innovation, diversity and promise for the sustainability of the MCOHS into the future (see research and training below). Each training program has two to four core faculty functioning at optimal levels to support teaching, research and outreach.

3.1. STUDENT TRAINEES

During this past cycle, the MCOHS has enhanced recruitment strategies to boost its applicant pool. Standard approaches continue to draw applicants, which include web-based marketing, recruitment through alumni networks and professional organizations, and personal communications with prospective applicants. However, new recruitment efforts were also employed to increase applicants. OEHN, for example, expanded enrollment to Public Health Certificate students, and is collaborating closely with the School of Nursing graduate program to recruit students to pursue masters' degrees along with another nursing degree (e.g., Doctor of Nursing Practice). Newly recruited faculty particularly in IH and OIP increased the center's leadership diversity, research portfolios, and availability of advisors. From 2015-2020, across all programs, a total of 104 students matriculated into the MCOHS (69 new admissions, and 35 continuing students admitted prior to 2015). An impressive 27% were underrepresented racial/ethnic students, and 56 MCOHS trainees (26 MPH, 9 MS and 21 PhD) have graduated from their respective programs, thus far. Notably, with active grants from new faculty and access to student fellowships and research and teaching assistantships, MCOHS has leveraged additional resources to support far more than the NIOSH budget supports.

3.2. RETENTION

Student retention has been excellent at 94%. Several types of support services, facilitated by the MCOHS, are provided to students. These include one-on-one mentorship provided by faculty and a Senior Research Fellow (Mr. Andrew Ryan) in multiple areas including data management, analytic guidance, job placement, and work-life balance. Peer mentorship is encouraged and fostered particularly through the interdisciplinary research

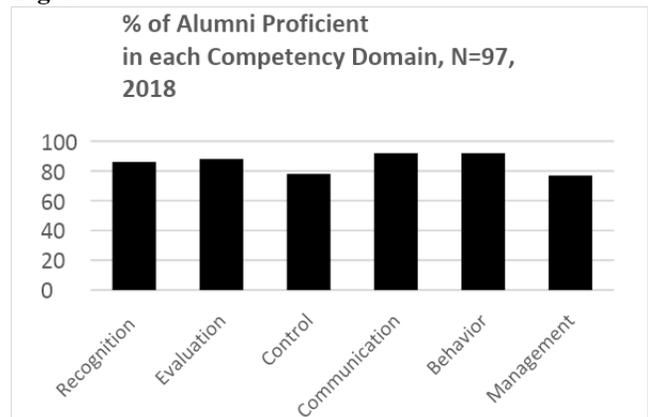
seminar (PubH 8120). MCOHS also collaborated with the School of Public Health Mentoring Program, to link 13 MCOHS students with a professional mentor in the field for career and professional development. The UMN Graduate Office for Diversity's Community of Scholars (COS) Program supported two MCOHS students of color by providing writing support, mentorship and travel grants.

3.3. TRAINING

Training: Students receive rigorous training in occupational safety and health (OSH) through coursework, research experiences, and professional development. New faculty brought fresh ideas to teaching that include flipped classrooms, use of technology in the classroom, hands-on student activities, student-centered learning, case studies, interdisciplinary group projects, and student-led assessments of hazards and interventions on worksites. New core courses or electives are now offered or resurrected (Geographic Information Systems, Violence Prevention), and older ones refreshed with new content (Injury Prevention, Epidemiology of Occupational and Environmental Health). Guest lecturers from the Health Department, Department of Labor and Industry, and Corporations also share their practical experiences with students.

Alumni Survey Results. Of 119 alumni, 82% (n=97) responded to the survey. Five domains of interdisciplinary competencies were assessed: recognition, evaluation, communication, behavior and management. Nine of ten alumni reported being proficient in recognition skills, evaluation skills, communication, and behavior; seven to eight of ten alumni were proficient in controlling OSH hazards, and management skills. By *specific* competencies, alumni reported high proficiency in identifying hazards, understanding relations between exposures and outcomes, interpreting scientific findings, communicating with other OSH professionals, writing, functioning on a team, and respecting diversity. However, three of ten alumni reported low proficiency in recognizing opportunities for total worker health interventions (recognition); designing health promotion programs (control); developing screening or surveillance programs (control); formulating or implementing OSH guidelines (management); and managing financial resources and staff (management).

Fig. 1



Job Placement and Professional Contributions. An overwhelming majority of alumni (95%) were immediately employed upon graduation into a variety of settings: 25% in industry, 23% in government agencies, 19% in academia, 21% in hospital/clinic/integrated health care systems, and 3% in consulting. Ninety percent used their knowledge and skills from the graduate education in their current job. Alumni reported their most important professional contributions were: developing a policy or program (50%), participating in research (50%), translating research to practice (41%) and teaching (41%). A number of graduates were placed in prestigious organizations, some in leadership positions. Examples include:

- Dr. Deirdre Green is an epidemiologist at National Institute for Occupational Safety and Health, Division of Surveillance, Hazard Evaluations and Field Studies (OIP graduate 2018)
- Dr. Jason Kunz is a training manager at 3M Company (IH graduate 2014)
- Dr. Catherine Greave is Associate Professor at St. Catherine's University School of Nursing (OEHN graduate 2016)
- Dr. Ryan Klein, a Senior Analyst with ABT Associates, has analyzed OSHA standards on workplace violence prevention in the health sector (OHSRP graduate 2016)
- Dr. Zeke McKinney is Director of Research at HealthPartners Research Institute (OEM graduate 2015)
- Dr. Mei Wang was a Senior Research Fellow at the University of Washington and now has a faculty position at University of Illinois Champaign-Urbana (IH graduate 2015)
- Dr. Laura Scott is an Epidemiologist and Statistician at the Department of Defense (OEE graduate 2018)
- Dr. Rony Arauz is a Post-Doctoral research fellow at the National Cancer Institute (OEE graduate 2019)

- Dr. Joshua Gramling is Director of Occupational Health, Wellness and Jail Services, Hennepin Healthcare Systems in Minnesota (OEHN graduate 2017)

4. RESEARCH

The breadth of research pursued by MCOHS faculty and trainees is impressive, representing major NORA sectors and addressing topics such as occupational disparities, surveillance, biomarkers, intervention/policy evaluation, and stress. Some research included student-designed dissertations. For other research, students were integrated into interdisciplinary teams led by faculty with externally funded studies.

Agriculture. The MCOHS has a strong portfolio of agricultural research, several in collaboration with two NIOSH-funded agricultural safety and health centers in the Midwest (Upper Midwest Center for Agricultural Safety and Health, and the Great Plains Center for Agricultural Health). Dr. Ramirez (OIP, PI of project) and OIP trainee Baidwan collaborated with University of Iowa faculty to study various sources and methods for surveillance of agricultural injuries. Dr. Jeff Bender (OEE supporting faculty, UMASH Director, PI of project) and OEE trainee Sorley characterized zoonotic infections among agricultural workers.

Construction. Dr. McGovern (OEHN, PI of project) and Ramirez (OIP, Co-PI of project) are working with two MCOHS trainees on contract from MN Department of Labor and Industry to study the impacts of a legislative proposal to lower the age of workers in construction from 18 to 16.

Healthcare and Social Assistance. OHSRP trainee Rosebush received an MCOHS pilot grant with OHSRP and OIP faculty to evaluate the effectiveness of safe patient handling laws. OEHN trainee Greave also received a pilot grant and UMN university-wide Doctoral Dissertation Fellowship to develop an intervention to protect healthcare workers from exposure to chemotherapy.

Manufacturing Dr. Ramirez (OIP) was Co-I of a NIOSH-funded R21 to study workplace violence in a large multinational manufacturing company, in collaboration with University of Iowa ERC faculty.

Mining. The MN Taconite Workers Health Study was led by OEM (Dr. Mandel), IH (Dr. Raynor) and OEE (Drs. Alexander and MacLehose) faculty to study health issues among miners working on Minnesota's Iron Range. Two OEE trainees (Hernandez and Arauz) received pilot grants to study cardiovascular disease, and biomarkers of pulmonary inflammatory in response to taconite dust exposure.

Oil and Gas. North Dakota has among the highest rates of oil/gas injury and illness in the country. IH graduate Otis Heymann worked with IH and OEHN faculty on a surveillance study of oil/gas injuries using North Dakota's workers' compensation data.

Public Safety. OIP/OEE Co-Director, Dr. Kim (PI of NIOSH grant), and OIP trainee Baidwan studied injuries and illnesses among first responders to the World Trade Center disaster. With the support of two MCOHS pilot grants, Dr. Kim and OIP trainees DeMoulin and Jacobs are studying post-traumatic stress disorder and moral injury among Minnesota firefighters. Dr. Kim has submitted proposals to FEMA and NIOSH to further this work.

Services. Janitors Study. Graduates Green and Schwartz worked with OIP faculty and the SEIU Local 26 union (comprised of ~ 4,000 janitors) to determine the incidence, risk factors and consequences of injuries to janitors. Both trainees received MCOHS pilot grants, and Green received the prestigious UMN Dissertation Fellowship. Beauty Salon Professionals. OEHN, OIP and IH faculty and trainees studied chemical exposures, precarious employment and risk of asthma and dermatitis among hair dressers and nail salon professionals.

Transportation, Warehousing and Utilities. OIP trainee Tian received an MCOHS pilot grant to develop a dissertation on rural roadway driving behaviors in collaboration with OIP faculty and Dr. Nichole Morris (Director of HumanFirst Laboratory, Center for Transportation Studies). OEHN and OEM faculty mentored a student on a study of sleep apnea among drivers for the MN Veteran's Administration.

5. PILOT PROJECT RESEARCH TRAINING PROGRAM (PPRTP)

The PPRTP has served as an incubator for new research ideas, supporting students, post-doctoral researchers and faculty in our region. During this past performance period, 29 pilot grants were awarded that supported: 17 students or faculty associated with MCOHS; 3 to researchers elsewhere at the University of Minnesota, and 9 to investigators at other institutions in Minnesota, Wisconsin, and South Dakota. The

principal investigators (PIs) for 15 of the awards were doctoral students, while 3 awards were made to post-doctoral researchers, 9 to junior faculty, and 2 to experienced faculty conducting research relevant to occupational health and safety for the first time. The PPRPT has supported nine completed PhD dissertations, 15 peer-reviewed publications with two in review, and 29 poster presentations.

6. INTERDISCIPLINARY TRAINING

Trainees received interdisciplinary training through common core courses (e.g., Introduction to Occupational Health and Safety (PubH 6170), Interdisciplinary Fields Problems (PubH 6150), and the Interdisciplinary Research Seminar (PubH 8120)). Both PubH 6170 and PubH 6150 foster team work through interdisciplinary projects and discussions with faculty and students from various MCOHS disciplines. The PubH 8120 Occupational and Environmental Health and Safety Research Seminar, in particular, brings students, faculty and MCOHS staff together every week for two hours to engage in thought-provoking discussions on research methods to facilitate their theses and professional development. The seminar is taken by students multiple times throughout the training program, and facilitates networking, peer-to-peer mentorship, and career development. In addition to these formal courses, students also participate as members of interdisciplinary research teams with MCOHS faculty as described above in the research section. Finally, the annual National Occupational Research Agenda (NORA) Symposium coordinated by MCOHS in partnership with the Upper Midwest Center for Agricultural Health and Safety is a key interdisciplinary activity that brings all students, faculty, pilot grantees, external advisors, community partners and stakeholders together (<http://www.mcohs.umn.edu/nora-symposium/>).

7. CONTINUING EDUCATION (CE)

Our CE program is essential for training practitioners on up-to-date practices and research in OSH. During the performance period, 19,219 trainees were served by the MCOHS CE program through 451 courses from 50 states and 47 countries. Trainees were from core OSH disciplines (Industrial Hygienists (4484), Occupational Safety (4970), OEHN (4142), OEM (1495) and others (4128)). A variety of learning formats were offered including hands-on experience with equipment, panel presentations, site visits with industry experts, scenario-based exercises, case studies and innovative audiovisual technology. Collaborations with professional organizations (especially those in the Upper Midwest Region) and specific companies (e.g., 3M and Proctor and Gamble) have expanded CE training to include hearing conservation trainings in China, four international occupational health conferences, and regular CE trainings in local businesses.

8. ACCOMPLISHMENTS IN OUTREACH

The MCOHS developed an Outreach Tracking Database to catalogue all outreach activities by type of outreach (Education Development, Presentations/Lectures/Seminars, Consultations, Community Engaged Research, and Other); faculty and/or student(s) involved; training program; description; and date. In all, a total of 1000+ outreach engagement activities were completed by MCOHS faculty and students. A substantive proportion of MCOHS's outreach activities were related to educational development which included developing educational tools and materials, developing online modules, website redesign, and developing or refreshing new course content for Continuing Education. Several outreach activities involved active delivery of presentations, lectures or seminars to reach a variety of audiences such as university students, researchers, public health and OSH professionals, business or community stakeholders (e.g., National Pork Board Committee, Professional Conferences, Departments of Health, local professional organizations, career forums). Consultations was also common outreach activities. Examples are as follows: The MN Attorney General consulted with Dr. Ramirez to describe the value of OSHA first-report of injury to the research community. The Central States Occupational and Environmental Health Association and the WI Occupational Nurse Organization consulted with Ms. Alcorn-Webb to guide their local planning in continuing education. The St. Paul Fire Department Health and Wellness Taskforce sought the expertise of Dr. Bovard (OEM). Other outreach activities included memberships on special boards or task forces, attending state OSHA meetings, and developing outreach products (e.g., Dr. Kim's articles for lay audiences in *Fortune* and *Time*).

Community-engaged research. In addition to the specific outreach activities described above, several faculty are pursuing community-engaged research, which integrates community/business stakeholders into the research process. Drs. Arnold (IH) and McGovern (OHSRP) formed strong partnerships with the MN State

Board of Cosmetology as well as local Somali and Vietnamese beauticians to conduct engaged research on the health and wellbeing of hair and nail salon workers. Dr. Gerberich (OIP) and doctoral students Green and Schwartz adopted community-engaged approaches to conduct research on injuries to janitors.

9. STRATEGIC PLANNING

Guided by MCOHS's strategic plan, the MCOHS has grown in its leadership, breadth in research and strategies for training. As a dynamic process, our strategic plan and its logic model have also undergone review and refinement to respond to emerging needs, enhance impact and ensure sustainability. After multiple strategic planning activities, input from advisors, and an assessment of needs and the future of graduate education, we decided to sunset the Occupational Health Services Research and Policy Program, and to dedicate MCOHS resources to develop an Occupational Safety (OS) program at the UMN at Duluth. The new OS program dovetails with a vibrant Master's of Environmental Health and Safety Program to integrate public health and interdisciplinary foci. A policy emphasis will remain in the MCOHS within the Occupational Injury Program with the expertise of Drs. Ramirez, McGovern and Erickson (Supporting Faculty). As we plan for the future, the MCOHS is well-positioned to build on its 40-year history to address both emerging and persistent threats to the safety and health of our workforce.

Table 1. Academic Training Report July 1, 2015 – June 20, 2020¹

Degree Awarded	How Does Degree Read?	Total # Applicants to Degree Program	Total # Applicants Admitted to Degree Program	Total # Under Represented Minority Applicants Admitted	# Full-Time Students Enrolled²	# Full-Time NIOSH-Supported Trainees	# Part-Time Students Enrolled²	# Part-Time NIOSH-Supported Trainees	# Trainees Graduated During Reporting Period
Master's degree ³									
	Master of Public Health	39	14	2	7	7	17	12	17
	Master of Science	32	17	4	18	15	5	3	9
Doctorate degree									
	Doctor of Philosophy in Environmental Health	48	28	7	36	29	9	5	21
Post-doctoral									
	Master of Public Health	10	10	4	12	12	0	0	9
Certificate Program									

¹ Reporting period for renewals is from the start date of prior competing award. New applicants should report past five years.

² Full-time and part-time students should include all students in approved programs, regardless of source of support.

³ OM residents may be double-counted under Masters degree training and post-doctoral training.

PILOT PROJECT RESEARCH TRAINING PROGRAM

PILOT PROJECT RESEARCH TRAINING PROGRAM

1. Background

NIOSH's National Occupational Research Agenda (NORA) encourages innovative research that results in healthier and safer workplaces. NORA identifies high priority research needs in ten occupational sectors and seven cross-sector subject areas. As part of Education and Research Centers (ERCs), pilot project research training must support projects relevant to NORA. During the 2015-2020 award period, the Midwest Center for Occupational Health and Safety (MCOHS) Pilot Project Research Training Program (PPRTP) funded pilot research projects with the objectives to explore and develop new and creative exploratory, prevention/intervention, and translation projects relevant to the NORA and regional needs; enhance research capacity in occupational safety and health (OSH) in the region served by the MCOHS ERC; support investigators from other fields to apply their expertise to OSH issues; develop collaborative partnerships with local and regional institutions to address emerging safety and health concerns; and provide a forum for dissemination of research. MCOHS has been uniquely positioned to achieve these objectives as the only ERC in the Upper Midwest. In particular, MCOHS has the ability to promote and supervise research efforts across a broad array of OHS disciplines including industrial hygiene, safety, nursing, medicine, injury prevention, and epidemiology.

The MCOHS PPRTP was first funded by NIOSH in 1999, under the leadership of Dr. Lisa Brosseau. Due to funding reductions and a reorganization of MCOHS, the PPRTP was suspended from 2005-2010. Funding to reopen the PPRTP was obtained in 2010. The program has continued since that time under the direction of Dr. Gurumurthy Ramachandran from 2010-2016 and Dr. Peter Raynor since 2016.

From 2015-2020, the PPRTP made pilot project awards totaling approximately \$100,000 annually to colleges and universities in the Upper Midwest states of Minnesota, Wisconsin, North Dakota, and South Dakota, with funding levels for each project ranging from \$5,000 to \$20,000, but usually close to the upper end of this range. Guided by the PPRTP Director and with the input of a Scientific Review Board, the PPRTP developed and circulated requests for proposals (RFPs), reviewed applications, made awards, monitored award progress, and documented program outputs and outcomes. At least one cycle of applications and reviews were carried out each year. If funds were not exhausted from a first RFP during a program year, a second RFP was issued. Awards were made for one year, with no-cost extensions possible upon request.

Applications were encouraged from researchers in educational institutions throughout the Upper Midwest as well as from the University of Minnesota. Eligible applicants included junior faculty in OHS disciplines, faculty investigators from other fields initiating research in OHS for the first time, and mentored doctoral and postdoctoral research trainees. Special preference was provided to applications that demonstrated a clear plan to develop the line of research through additional funding and emphasized research-to-practice (r2p) applications of results. A final written report was required of the awardee after the end of the award period. Awardees were required to present the results of their research as a poster at the annual NORA Symposium at the University of Minnesota. Due to the COVID-19 pandemic, a poster session was not held as part of the virtual NORA Symposium in 2020.

2. Response to Previous Reviews

For the most recent competitive renewal application, the summary statement from the Special Emphasis Panel (which met on February 23, 2015) stated in the Center Wide Activities section, "The Pilot Projects Program is comprehensive, includes a thorough and appropriate review process, addresses the target region, and aims to increase the research capacity among junior investigators, doctoral students, and academicians in other disciplines." However, reviewers also indicated that weaknesses of MCOHS overall included "the weak productivity reported from previously funded pilot projects (in terms of publications, presentations, and the failure to leverage additional funding)". In the Center Wide Activities section, weaknesses identified by reviewers included: "the pilot projects program has not generated R01-type funding; of the 21 pilot projects funded in the past reporting period, only 2 peer-reviewed manuscripts were published; the lack of tracking for the impact of the funded pilot projects." The identified weaknesses have been addressed as follows:

- **Change of requirements for pilot project awardees:** The PPRTP's requests for proposals now state that the program is applicable only to educational institutions and targets (1) newly-independent principal investigators (PIs); (2) experienced PIs pursuing occupational health and safety as a new direction for

research; and (3) doctoral research trainees working under the supervision of a PI. Previously, investigators from non-academic institutions were eligible to apply and many awards were made to these researchers, who did not focus strongly on publishing research results and applying for additional funding. This change has resulted in a significant improvement in program outputs. During the most recent five-year funding period, pilot project awards yielded or contributed to 15 peer-reviewed publications with 2 submissions under review, 2 non-peer-reviewed publications, 9 PhD dissertations, 15 oral presentations at professional conferences or meetings, 29 poster presentations at professional conferences or meetings, and 1 article in an alumni magazine. Three additional research awards have been obtained based on pilot project results: an R01 award from NIOSH, a grant from the Minnesota Department of Transportation, and a grant from the City of St. Paul, MN. Three federal grant applications were submitted but not funded: an R01 to the National Institute of Environmental Health Sciences (NIEHS), an R21 to NIEHS, and an R21 to the National Institute for Nursing Research. An application for a University of Minnesota Futures Award that was an extension of one of the projects was not selected for funding. In the last two years, several of the pilot project awards have been made to junior faculty who plan to use results in applications for K01, R01, and R21 awards. PPRTP grantees will likely leverage additional federal funding in the next few years.

- **Improved tracking of outputs and impacts from pilot projects:** The PPRTP has implemented a tracking system for outputs and impacts from its pilot project awards. The tracking is in the form of an annual Qualtrics survey that is sent to all participants in each pilot project from the time the award has been made until five years after its completion date. The first survey included all projects awarded in the previous ten years. Items requested from the awardees include peer-reviewed publications, other publications, student dissertations, oral conference presentations, poster presentations, media articles, products of the research, additional funding, submitted funding applications, partnerships/collaborations developed from the research, research-to-practice (r2p) results, and any other outputs and impacts that the researchers would like to share. This tool has been a tremendous source of data on PPRTP outputs and impacts.

3. Past Performance/Accomplishments from July 1, 2015-June 30, 2020

During the previous five-year funding period, the primary objectives of the PPRTP have been to: (1) explore and develop new and creative exploratory, prevention/intervention, and translation projects relevant to the NORA and regional needs; (2) enhance research capacity in occupational safety and health (OSH) in the region served by the MCOHS ERC; (3) stimulate investigators from other fields to apply their expertise to OSH issues; (4) develop collaborative partnerships with local and regional institutions to address emerging safety and health concerns; and (5) provide a forum for dissemination of research. Performance and accomplishments regarding the objectives are provided in the following sections. In addition, a complete list of outputs and impacts of PPRTP awards during the 2015-2020 award period is provided in the Appendix.

1. **Explore and develop new and creative exploratory, prevention/intervention, and translation projects relevant to the NORA and regional needs.** The PPRTP has developed a comprehensive mechanism to administer the program including developing and circulating RFPs, providing review of applications, making awards, monitoring progress of projects, and documenting outputs and outcomes. During the 2015-2020 award period, the PPRTP has funded 29 pilot projects, including 21 classified as exploratory research, 6 as prevention/intervention efforts, and 2 as translation projects. These awards covered 9 out of 10 of the NORA sectors including Agriculture, Forestry and Fishing; Construction; Healthcare and Social Assistance; Manufacturing; Mining; Public Safety; Services; Transportation, Warehousing and Utilities; and Wholesale and Retail Trade. They also encompassed 6 out of 7 of the NORA cross-sectors including Cancer, Reproductive, Cardiovascular and Other Chronic Disease Prevention; Immune, Infectious and Dermal Disease Prevention; Musculoskeletal Health; Respiratory Health; Traumatic Injury Prevention; and Healthy Work Design and Well-Being. All of these awards address needs specific to the Upper Midwest.
2. **Enhance research capacity in OSH in the region served by the MCOHS ERC.** PPRTP requests for proposals are open to applicants at colleges and universities in the Upper Midwest states of Minnesota, Wisconsin, North Dakota, and South Dakota. In addition to posting RFPs on the MCOHS website at <http://www.mcohs.umn.edu/pilot-projects/>, RFPs are sent via email to the MCOHS listserv and the PPRTP Director forwards RFPs to an email list of administrators responsible for research efforts at 23

academic units or institutions in the Upper Midwest. Of the 29 awards in the most recent funding period, 24 were made to researchers in Minnesota, 4 in Wisconsin, and 1 in South Dakota. These awards have served the purpose of building research capacity, particularly among mentored student trainees. The PIs for 15 of the awards were PhD students, and the data resulting from the projects have been used in 9 doctoral dissertations so far. Other awards helped to build research capabilities of postdoctoral associates, junior faculty at the Assistant Professor level, and experienced faculty conducting OHS research for the first time.

3. ***Stimulate investigators from other fields to apply their expertise to OSH issues.*** Of the 29 pilot projects funded in the 2015-2020 award period, 5 were led by experienced or junior faculty members from disciplines not related to OHS who were applying their expertise to OHS issues for the first time. These fields include industrial engineering, toxicology, psychology, pharmacy, and veterinary sciences.
4. ***Develop collaborative partnerships with local and regional institutions to address emerging safety and health concerns.*** Development of partnerships was documented by awardees in the first annual PPRTP awardee Qualtrics survey. These partnerships are listed among the impacts provided in Appendix A. For example, an award to PhD student Jennifer Saunders has strengthened engagement between the University of Minnesota and the local Cosmetology Health and Safety Collaborative. Dr. Robert Radwin's award has led to a collaboration between the University of Wisconsin-Madison and Target Corporation to evaluate the ability of computer vision technology to identify risks in manual lifting tasks. Dr. Lisa Peterson at the University of Minnesota is using the results of her pilot project research to work with Centers for Disease Control and Prevention (CDC) scientists to evaluate data on furan levels in humans caused by exposures to diesel- and gasoline-powered vehicle exhaust and other combustion sources.
5. ***Provide a forum for dissemination of research.*** Annually, MCOHS hosts the NORA Symposium on the University of Minnesota campus to delve into important issues in occupational health and safety and to highlight research projects associated with the ERC. The symposium includes a poster session each year. Pilot project awardees are expected to present a poster about each project and its results at least once. This provides a special opportunity for awardees from institutions outside the Twin Cities to interact with MCOHS trainees and faculty, and attendees from various OHS disciplines.

Aside from these accomplishments directly connected to PPRTP objectives, research funds provided by the PPRTP from 2010-2020 have contributed to important, lasting impacts. A pilot project at the University of Wisconsin-Whitewater led administrators to establish a new Occupational Safety Laboratory with funds for new industrial hygiene instrumentation. The Mayo Clinic developed a prototype for a microsurgery armrest that will be used in future research. Several projects led to impactful outreach with healthcare workers, agricultural workers, and school staff. Mayo Clinic instructors utilize a tactile feedback system developed in part with PPRTP funding as a training tool to educate surgical assistants on ergonomic practices during surgery. A website (<http://nfmcfarmmapper.com/Home/About>) developed at Marshfield Clinic Research Institute using PPRTP support allows farming operations to upload digital maps to provide emergency responders information about hazards and resources, with the goals of expediting responses to farm emergencies and protecting responders who may be unfamiliar with an individual farm's layout. A pilot project awarded to SFM Mutual Insurance has led to safer practices among employees in school districts insured by the company, such as moving away from student holds and using ladders rather than standing on desks to hang decorations.

4. Program Deliverables

During the 2015-2020 funding period, 29 awards were made for pilot project research. Some of the funding for these projects was made using carry-forward funds from the 2010-2015 MCOHS award period. Of these 29 awards, 17 were made to students or faculty associated with MCOHS, 3 to researchers elsewhere at the University of Minnesota, and 9 to investigators at other institutions in Minnesota, Wisconsin, and South Dakota. The principal investigators (PIs) for 15 of the awards were doctoral students, while 3 awards were made to post-doctoral researchers, 9 to junior faculty, and 2 to experienced faculty conducting research relevant to occupational health and safety for the first time. Projects were completed in a timely manner; at the time of this writing, only projects awarded for the 2019-2020 years are open because no-cost extensions were provided due to the COVID-19 pandemic. Several of the PIs have advanced in their careers subsequent to their awards:

one faculty member was promoted from Assistant Professor to Associate Professor with tenure, a doctoral student and a postdoctoral associate have become faculty members, a doctoral student has become an epidemiologist at CDC, and two doctoral students hold postdoctoral positions – at University of Alabama-Birmingham and the National Cancer Institute. Six of the funded projects have strong connections to race-based occupational health disparities. The list of funded projects is presented below, along with the PI name, position, and institution as well as the names of mentors for projects for which doctoral and postdoctoral researchers were the PIs. The abstracts for the projects are available on the MCOHS website at <http://www.mcohs.umn.edu/funded-pilot-projects/>.

1. Acetaldehyde-derived DNA Adducts for the Investigation of Alcohol Hangover, PI: Silvia Balbo, PhD, Assistant Professor, Masonic Cancer Center & Division of Environmental Health Sciences, School of Public Health, University of Minnesota.
2. Pilot Intervention Study to Reduce Chemical Exposures of Beauty Salon Professionals, PI: Susan Arnold, MSOH, CIH, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Gurumurthy Ramachandran, PhD, CIH, Professor.
3. Exposure Assessment and Intervention for Reducing Musculoskeletal Stresses and Work-related Injuries among Allied Health Professionals in Surgical Care, PI: Denny Yu, PhD, Post-doctoral Student, Mayo Clinic; Mentor: Susan Hallbeck, PhD, PE, CPE, Professor of Health Care Systems Engineering.
4. Pilot Study to Assess the Quantitative Dermal Transfer Efficiencies of Solids for Multiple Transfer Pathways, PI: Jennifer Sahmel, MPH, CIH, CSP, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Gurumurthy Ramachandran, PhD, CIH, Professor.
5. A Meta-analytic Comparison of Universal versus Industry-Specific Safety Climate Measures, PI: Lixin Jiang, PhD, Assistant Professor, Department of Psychology, University of Wisconsin Oshkosh.
6. Injury Severity in Alternative Workers' Compensation Arrangement in Minnesota, PI: Katherine Schofield, PhD, CSP, Assistant Professor, Department of Mechanical and Industrial Engineering, University of Minnesota Duluth.
7. Health and Injury Study of Janitorial Service Employees, PI: Deirdre Green, MS, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Susan Gerberich, PhD, Professor.
8. Association Between Personal and Work-Related Exposures and the Occurrence of Occupational Injuries in an Aging Working Population, PI: Navneet Baidwan, MPH, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Susan Gerberich, PhD, Professor.
9. Janitors' Workload and Injury Study, PI: Adam Schwartz, MS, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Susan Gerberich, PhD, Professor.
10. Caring for Care-Givers: Testing the Impact of a Worksite Health Improvement Intervention, PI: Hyun Kim, ScD, Assistant Professor, Division of Environmental Health Sciences, School of Public Health, University of Minnesota.
11. Air Pollutants, Categories of Biomarkers and Health Outcomes in Taconite Workers in Minnesota, PI: Rony Arauz, MPH, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Jeffrey Mandel, MD, MPH, Associate Professor.
12. Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs, PI: Marit Johnson, MSPT, Doctoral Student, Biomedical Engineering Program, South Dakota School of Mines and Technology, Mentor: Adam Piper, PhD, CSP, Associate Professor.
13. A Randomized Controlled Trial of Driving Behaviors among Teenage Drivers during the First Year of Licensure: Implications for Prevention of Occupational Transportation-Related Mortality and Morbidity, PI: Disi Tian, MS, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Susan Gerberich, PhD, Professor.
14. Microsurgery Exposure Assessment and Intervention to Improve Musculoskeletal Health, PI: Amro Abdelrahman, MBBS, Post-doctoral Student, Center for the Science of Health Care Delivery, Mayo

- Clinic; Mentors: Valerie Lemaine, MD, MPH, FRCSC, FACS, Assistant Professor of Plastic Surgery & Susan Hallbeck, PhD, PE, CPE, Professor of Health Care Systems Engineering.
15. Geospatial Trends in Occupational Injury and Workers' Compensation Utilization, PI: Katherine Schofield, PhD, CSP, Assistant Professor, Department of Mechanical and Industrial Engineering, University of Minnesota Duluth.
 16. The Association between Particulate Matter 2.5 with Cardiovascular Disease and Chronic Obstructive Pulmonary Disease Mortality in Minnesota Taconite Workers, PI: Ashley Hernandez, MSPH, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Bruce Alexander, PhD, Professor.
 17. Coping with Low Back Pain (LBP): An Industrial Cohort's Experience, PI: Ruoliang Tang, PhD, Post-doctoral Fellow, Occupational Science and Technology, College of Health Sciences, University of Wisconsin-Milwaukee, Mentor: Jay Kapellusch, PhD, Associate Professor.
 18. Assessing Burden of Post-Traumatic Stress Disorder among Firefighters in Minnesota, PI: Hyun Kim, ScD, Assistant Professor, Division of Environmental Health Sciences, School of Public Health, University of Minnesota.
 19. Occupational Lower Back Pain and Trunk Dynamics During Manual Lifting Using Computer Vision, PI: Robert Radwin, PhD, Professor Department of Industrial and Systems Engineering, University of Wisconsin-Madison.
 20. Understanding the Occupational Health and Safety Needs of Cosmetologists in Minnesota, PI: Jennifer Saunders, MSW, Doctoral Student, Division of Health Policy and Management, School of Public Health, University of Minnesota, Mentor: Patricia McGovern, PhD, Professor.
 21. An Effectiveness Evaluation of the Minnesota Safe Patient Handling Act, PI: Christina Rosebush, MPH, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Patricia McGovern, PhD, Professor.
 22. Characterizing Emissions Generated by 3D Printing Operations, PI: Rebecca Burton, MPH, CIH, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Susan Arnold, PhD, CIH, Assistant Professor.
 23. Moral Injury: Need for a Measurement Tool for Firefighters, Doug DeMoulin, MS, GSP, Doctoral Student, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Mentor: Hyun Kim, ScD, Assistant Professor.
 24. Evaluation of the Effectiveness of a Smoke Extraction System at Reducing Veterinarian Exposures to Surgical Smoke during Electrocautery, PI: Shiori Arai, DVM, PhD, DACVS-SA, Assistant Professor, Veterinary Clinical Sciences Department, College of Veterinary Medicine, University of Minnesota.
 25. Impacts of the 'Shared Environment' on the Microbiome and Antimicrobial Resistance Transmission between Swine and Swine Workers in Animal Production Facilities, PI: Ilya B. Slizovskiy, DVM, MPH, Doctoral Student, Department of Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota, Mentor: Noelle Noyes, MA, DVM, PhD, Assistant Professor.
 26. Subjective and Objective Assessment of Pharmacist Fatigue, PI: Michelle Chui, PharmD, PhD, Associate Professor, School of Pharmacy, University of Wisconsin-Madison.
 27. Evaluation of the Efficacy of Commercially Available Downdraft Tables for Controlling Exposures in Nail Salons, PI: Kimberly Anderson, PhD, Assistant Professor, Division of Environmental Health Sciences, School of Public Health, University of Minnesota.
 28. Predicting Trends in Hypertension among Black and White Healthcare Workers: The Critical Assessment of an Upstream Factor, PI: Tongtan Chantararat, MPH, Doctoral Student, Division of Health Policy and Management, School of Public Health, University of Minnesota, Mentors: Eva Enns, PhD, Assistant Professor & Rachel Hardeman, PhD, MPH, Assistant Professor.
 29. Investigation of the Reaction Chemistry of Antineoplastic Drugs and a Cleaning Product, PI: Susan Arnold, PhD, Assistant Professor, Division of Environmental Health Sciences, School of Public Health, University of Minnesota.

Summary

The PPRTP is a stable, valuable, and successful component of MCOHS. The response to the previous reviews demonstrates that the PPRTP made changes during the 2015-2020 award period to improve program

performance and incorporate reviewer feedback. PPRTP awardees completed their pilot projects in an appropriate timeframe. More than half of the student awardees during the most recent five-year funding period have already completed their dissertations; several of the others are still working on the projects funded by their grants. This shows that mentored students have completed their training activities in a suitable timeframe and reached their research capacity. The awards have helped to advance careers by contributing to 9 PhD dissertations, 15 peer-reviewed publications and 2 more submissions, 15 oral presentations, 29 poster presentations, new faculty and postdoctoral appointments, and faculty promotions. More than 40% of the award PIs are researchers from underrepresented racial or ethnic groups. A few of the PIs have competed successfully for additional research funding to build upon their pilot projects. Others are working on resubmissions or new applications to federal agencies. The program will continue to build upon these successes going forward.

APPENDIX A
Pilot Projects Research Training Program
Publications

(MCOHS faculty/staff identified with bold font; MCOHS students identified with underline)

Papers Published in Peer-Reviewed Journals

- Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan AD**, **Church T**, Capistrant B (2020). A marginal structural model approach to analyse work-related injuries: An example using data from the health and retirement study. *Injury Prevention*, 26:248-253.
- Green D, **McGovern P**, Erdman A, Arauz R (2020). The association between janitor physical workload, mental workload, and stress: The SWEEP study. *Work*, 65(4):837-846.
- Green DR, **Gerberich SG**, **Kim H**, **Ryan AD**, **McGovern PM**, **Church TR**, Schwartz A, Arauz RF (2019). Occupational injury among janitors: Injury incidence, severity and associated risk factors. *Journal of Occupational and Environmental Medicine*, 61(2):153-161.
- Green DR, **Gerberich SG**, **Kim H**, **Ryan AD**, **McGovern PM**, **Church TR**, Schwartz A, Arauz RF (2019). Janitor workload and occupational injuries. *American Journal of Industrial Medicine*, 62(3):222-232.
- Green DR, **Gerberich SG**, **Kim H**, **Ryan AD**, **McGovern PM**, **Church TR**, Schwartz A, Arauz R (2019). Knowledge of work-related injury reporting and perceived barriers among janitors. *Journal of Safety Research*, 69:1-10.
- Schwartz A, **Gerberich SG**, **Kim H**, **Ryan AD**, **Church TR**, Albin TJ, **McGovern PM**, Erdman AE, Green DR, Arauz RF (2019). Janitor ergonomics and injuries in the Safe Workload Ergonomic Exposure Project (SWEEP) study. *Applied Ergonomics*, 81:102874.
- Schwartz AH, Albin TJ, **Gerberich SG** (2019). Intra-rater and inter-rater reliability of the rapid entire body assessment (REBA) tool. *International Journal of Industrial Ergonomics*, 71:111-116.
- Schwartz A, **Gerberich S**, Albin T, **Kim H**, **Ryan A**, **Church T**, Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan A**, **Church T**, Capistrant B (2019). A longitudinal study of work-related psychosocial factors and injuries: Implications for the aging United States workforce. *American Journal of Industrial Medicine*, 62(3):212-221.
- Weichert B, Yoder A, Bendixsen C, Pilz M, Minor G, Keifer M (2018). Augmented reality Farm MAPPER development: Lessons learned from an app designed to improve rural emergency response. *Journal of Agromedicine*, 23(3):284-296.
- Abdelrahman AM, Lowndes BR, Mohan AT, Noland SS, Finnie DM, Lemaine V, Hallbeck MS (2018). Surgeons' perspectives on user-designed prototypes of microsurgery armrests. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 62(1):1047-1051.
- Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan AD**, **Church TR**, Capistrant B (2018). A longitudinal study of work-related injuries: Comparisons of health and work-related consequences between injured and uninjured aging United States adults. *Injury Epidemiology*, 5:35.
- Gramling JJ, **McGovern PM**, **Church TR**, Nachreiner NM, Gaugler JE (2018). Effectiveness of conducted electrical weapons to prevent violence-related injuries in the hospital, *Journal of Emergency Nursing*, 44(3):249-257.
- Graeve C, **McGovern PM**, **Arnold S**, Polovich M (2017). Testing an intervention to decrease healthcare workers' exposure to antineoplastic agents. *Oncology Nursing Forum*, 44(1):E10-E19.
- Graeve CU, **McGovern PM**, **Alexander B**, **Church T**, **Ryan A**, Polovich M (2017). Occupational exposure to antineoplastic agents: An analysis of health care workers and their environments. *Workplace Health & Safety*, 65(1):9-20.
- Grill AE, Schmitt T, Gates LA, Lu D, Bandyopadhyay D, Yuan JM, Murphy SE, Peterson LA (2015). Abundant rodent furan-derived urinary metabolites are associated with tobacco smoke exposure in humans. *Chemical Research in Toxicology*, 28(7):1508-1516.

Manuscripts Submitted to Peer-Reviewed Journals

Schwartz A, Gerberich S, Albin T, Kim H, Ryan A, Church T, McGovern P, Erdman A, Green D, Arauz R.
Mental workload, psychosocial factors, physical fitness, and injury in the SWEEP study, submitted to
Ergonomics.

Vosburgh DJH, Barnhart RT, Carrington C, Drewek M. Dust and noise exposure while using a portable wood
dust collector, submitted to *Journal of Environmental Health*.

Non-Peer-Reviewed Publications

Greene R, Lu ML, Barim MS, Wang X, Hayden M, Hu YH, Radwin RG (2019). Estimating trunk angles during
lifting using computer vision bounding boxes, *Proceedings of the Human Factors and Ergonomics Society
International Annual Meeting*, Human Factors and Ergonomics Society.

Lowndes B, Abdelrahman A, Yu D, Lachman N, Hallbeck S (2017). Tactile feedback wearable during a
surgical simulation task: Pilot study indicates no distraction, frustration or performance decrement for
users. *Proceedings of the Design of Medical Devices Conference*, American Society of Mechanical
Engineers, p. V001T10A002.

Media Article

Ray CM (2018). Engineering an End to Back Pain. *The Hardrock* (South Dakota School of Mines &
Technology Alumni Magazine), Winter/Spring 2018 edition, URL:
<https://www.sdsmt.edu/Research/Research@Mines/Engineering-End-to-Back-Pain/#.XQqkOIhKiUI>

APPENDIX B
Pilot Projects Research Training Program
PhD Dissertations

(MCOHS faculty/staff identified with bold font; MCOHS students identified with underline)

1. Rony F. Arauz: *Airborne Particulates Exposure Assessments and Potential Impact on Inflammatory Markers and Health Outcomes in Taconite Workers in Minnesota*. University of Minnesota, School of Public Health, Division of Environmental Health Sciences, Advisor: **Jeffrey Mandel**, MD, MPH (2018).
2. Navneet K. Baidwan: *Analysis of the Associations between Physical and Psychosocial Work-Related Factors and the Work-Related Injuries among the Aging United States Workforce*. University of Minnesota, School of Public Health, Division of Environmental Health Sciences, Advisor: **Susan Gerberich**, PhD; Co-advisor: **Hyun Kim**, PhD (2018).
3. Catherine U. Graeve: *Necessary Drugs, Unnecessary Consequences: An Intervention to Protect Healthcare Workers from Exposure to Chemotherapy*. University of Minnesota, School of Public Health, Division of Environmental Health Sciences, Advisor: **Patricia McGovern**, PhD (2016).
4. Joshua Gramling: *Protecting the Protectors: Violence-Related Injuries to Hospital Security Personnel and the Use of Conducted Electrical Weapons*. University of Minnesota, School of Public Health, Division of Environmental Health Sciences, Advisor: **Patricia McGovern**, PhD (2017).
5. Deirdre R. Green: *Health and Injury Study of Janitorial Service Employees*. University of Minnesota, School of Public Health, Division of Environmental Health Sciences, Advisor: **Susan Gerberich**, PhD (2018).
6. Marit E. Johnson: *Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs*. South Dakota School of Mines and Technology, Biomedical Engineering Program, Advisor: Adam K. Piper, PhD (2019).
7. Jennifer Sahmel Elliott: *Quantitative Dermal Transfer Efficiencies of Solids for Multiple Transfer Pathways*, University of Minnesota, School of Public Health, Division of Environmental Health Sciences, Advisor: Gurumurthy Ramachandran, PhD; Co-advisor: **Peter Raynor**, PhD (anticipated 2020).
8. Adam Schwartz: *The Janitor Safe Workload Ergonomic Exposure Project (SWEEP) Study*. University of Minnesota, School of Public Health, Division of Environmental Health Sciences, Advisor: **Susan Gerberich**, PhD (2018).
9. Mei W. Tessum: *Effects of Spray Surfactant and Particle Charge on Respirable Dust Control*. University of Minnesota, School of Public Health, Division of Environmental Health Sciences, Advisor: **Peter Raynor**, PhD (2015).

APPENDIX C
Pilot Projects Research Training Program
Presentations

(MCOHS faculty/staff identified with bold font; MCOHS students identified with underline)

Oral Presentations

Baidwan N. Modeling Repeated Outcomes using Marginal Structural Models, University Alabama-Birmingham Postdoctoral Research Day, Birmingham, AL, February 2019.

Green D, **Gerberich SG**, **Kim H**, **Ryan A**, **McGovern PM**, **Church T**, Schwartz A, Arauz RF. Occupational Injuries among Janitors in a Major Metropolitan Area, American Public Health Association Annual Meeting & Expo, Philadelphia, PA, November 2019.

Abdelrahman AM, Lowndes BR, Mohan AT, Noland SS, Finnie DM, Lemaine V, Hallbeck MS. Surgeons' Perspectives on User-Designed Prototypes of Microsurgery Armrests, Human Factors and Ergonomics Society International Annual Meeting, Philadelphia, PA, October 2018.

McGovern P, Bey J, French S, **Kim H**, **Ryan A**. Caring for Care-Givers: Findings from a Pilot-test of a Health Promotion Intervention, Presentation to Vista Prairie Communities Board of Directors, Brooklyn Center, MN, March 2018.

Sahmel Elliott J, Ramachandran G. Pilot Study to Assess the Quantitative Dermal Transfer Efficiencies of Solids for Multiple Transfer Pathways, American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.

Schwartz A, Kuehn S. Janitor Ergonomics. Presentation to Upper Midwest Section - American Industrial Hygiene Association, Roseville, MN, April 2018.

Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan A**. Work-Requirement Factors and Workplace Injuries among the Aging American Workforce, 2017 Expanding Research Partnerships: State of the Science Conference, Denver, CO, June 2017.

Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan A**. Work-Related Psychosocial Exposures and the Occurrence of Work-Related Injuries Among the Aging United States Workforce, Work, Stress and Health Conference, Minneapolis, MN, June 2017.

Schwartz A, **Gerberich S**, **Kim H**, **Ryan A**, **McGovern P**, Green D. Occupation of Janitors at Risk: The Safe Workload Ergonomic Exposure Project (SWEEP) Study, American Public Health Association Annual Meeting & Expo, Atlanta, GA, November 2017.

Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan A**. A Marginal Structural Model Approach to Analyzing Injuries: An Example Using Data from the Health and Retirement Study (HRS), American Public Health Association Annual Meeting & Expo, Atlanta, GA, November 2017.

McGovern P, Bey J. Caring for Care-Givers: Testing the Impact of a Pilot Health Promotion Intervention, Investigators provided brief presentation and facilitated discussion with other researchers at Global Carework Summit, Lowell, MA, June 2017.

Baidwan NK, **Gerberich S**, **Kim H**, **Ryan A**. The Association between Work-related Exposures and Occupational Injuries in the Aging United States Workforce, Canadian Society for Epidemiology and Biostatistics National Student Conference, Winnipeg, Canada, June 2016.

Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan A**. Analysis of the Association between Work-Related Exposures and the Occurrence of Occupational Injuries among Aging American Workers, American Public Health Association Annual Meeting & Expo, Denver, CO, November 2016.

Graeve C. Necessary Drugs, Unnecessary Consequences: An Intervention to Protect Healthcare Workers from Exposure to Chemotherapy, American Nurses Association Conference, Orlando, FL, March 2016.

McGovern P, Bey J. Caring for Care-Givers: A Pilot Program for Health Improvement, Vista Prairie Communities Board of Directors, Hopkins, MN, July 2016.

Poster Presentations

2019

Greene R, Lu ML, Barim MS, Wang X, Hayden M, Hu YH, Radwin RG. Estimating Trunk Angles during Lifting Using Computer Vision Bounding Boxes, University of Wisconsin-Madison Department of Industrial and Systems Engineering Graduate Student Research Symposium, Madison, WI, 2019.

Saunders J, **McGovern P**, **Arnold S**, Landsteiner A. Occupational Hazards and Stress Among Minnesota Cosmetologists, Estheticians and Nail Technicians, Work, Stress, and Health 2019, Philadelphia, PA, November 2019.

2018

Abdelrahman A, Lowndes B, Mohan A, Noland S, Lemaine V, Hallbeck S. Microsurgery Exposure Assessment and Intervention to Improve Musculoskeletal Health, NORA Symposium, Minneapolis, MN, May 2018.

Johnson ME, Piper AK, Karges JK. Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs - Pilot Project Phase 1 Findings, Orthopedic Research Society (ORS) Annual Meeting, New Orleans, LA, March 2018.

Johnson ME, Piper AK, Karges JK. Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs - Pilot Project Phases 1 and 2 Findings, NORA Symposium, Minneapolis, MN, May 2018.

Johnson ME, Piper AK, Karges JK. Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs - Pilot Project Phase 1 Findings, European Cells & Materials: Cartilage & Disc Repair & Regeneration, Davos, Switzerland, June 2018.

Johnson ME, Piper AK, Karges JK. Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs - Pilot Project Phases 1 and 2 Findings, Biomedical Engineering Society (BMES) Annual Conference, Atlanta, GA, October 2018.

Johnson ME, Piper AK, Karges JK. Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs - Complete Three-Phase Pilot Project Findings, 7th Annual Regenerative Rehabilitation Symposium, Seattle, WA, October 2018.

Green D. Poster presented at University of Minnesota Doctoral Dissertation Showcase, Minneapolis, MN, April 2018.

Green D. Poster presented at NORA Symposium, Minneapolis, MN, May 2018.

Green D, **Gerberich SG**, **Kim H**, **McGovern PM**, **Ryan A**, Schwartz A, Arauz RF. Determining Physical Workload among Janitorial Service Employees Using Fitness Bands, American Public Health Association Annual Meeting & Expo, San Diego, CA, November 2018.

Saunders J, **McGovern P**, **Arnold S**. Understanding the Relationship between Work and Health: Occupational Health and Safety Knowledge and Behaviors Among Cosmetologists in Minnesota, School of Public Health Research Day, Minneapolis, MN, April 2018.

Saunders J, **McGovern P**, **Arnold S**. Understanding the Occupational Health and Safety Knowledge and Behaviors Among Cosmetologists in Minnesota, Society for Chemical Hazard Communication Spring Meeting, Orlando, FL, April 2018.

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2017

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- Johnson ME, Piper AK, Karges JK. Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs - Pilot Project Phase 1 Findings, 6th Annual Regenerative Rehabilitation Symposium, Pittsburgh, PA, November 2017
- Lowndes B, Abdelrahman A, Yu D Lachman, N, Hallbeck S. Tactile Feedback Wearable during a Surgical Simulation Task: Pilot Study Indicates No Distraction, Frustration or Performance Decrement for User. 2017 Design of Medical Devices Conference, Minneapolis, MN, April 2017.
- Green D. Poster presented at NORA Symposium, Minneapolis, MN, May 2017.
- Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan A**. Analysis of the Association between Work-Related Exposures and the Occurrence of Occupational Injuries among the Aging American Workforce, Society for Epidemiologic Research, Seattle, WA, June 2017.
- Baidwan N. Stressors at Work and Work-Related Injuries: Implication for the Aging United States Workforce, School of Public Health Research Day, Minneapolis, MN, April 2017.
- Schwartz A, **Ryan A**. Stress Outcomes in the Safe Worker Ergonomic Exposure Project (SWEEP) Study. University of Minnesota School of Public Health Research Day. Minneapolis, MN, April 2017.
- Vosburgh DJH, Barnhart RT, Drewek MR. Noise Exposure While Using a Woodworking Mobile Dust Collector, American Industrial Hygiene Conference and Exposition, June 2017.

2016

- Barnhart RT, Vosburgh DJH. Noise Exposure from Dust Collection, University of Wisconsin-Whitewater Undergraduate Research Day, Whitewater, WI, March 2016.
- Carrington C, Vosburgh DJH. Real-Time Monitoring of Wood Dust Aerosol Size Concentrations, University of Wisconsin-Whitewater Undergraduate Research Day, Whitewater, WI, March 2016 (Winner of the University of Wisconsin-Whitewater's Spring Undergraduate Research Day 2016 Award for Business and Professional Studies).
- Graeve C, **McGovern P**. Necessary Drugs; Unnecessary Exposures: An Intervention to Protect Oncology Healthcare Workers, University of Minnesota's Doctoral Dissertation Fellowship Showcase, June 2016 (Received award for community impact).
- Sahmel Elliott J, Ramachandran G. Pilot Study to Assess the Quantitative Dermal Transfer Efficiencies of Solids for Multiple Transfer Pathways, Occupational and Environmental Exposure of Skin to Chemicals (OEESC) Conference, Manchester, United Kingdom, September 2016.

APPENDIX D
Pilot Projects Research Training Program
Additional Funding Based on PPRTP Awards

(MCOHS faculty/staff identified with bold font; MCOHS students identified with underline)

Funded Projects

1. Robert G. Radwin (PI), University of Wisconsin-Madison: A Computer Vision Lifting Monitor. NIOSH, R01OH011955, 1/1/2020-12/31/2022.
2. Stefan Saravia, Minnesota Department of Health: "As a result of this study we have been asked to conduct a study this summer [2019] with St. Paul fire where we will be analyzing the sweat and urine from firefighters for polycyclic aromatic hydrocarbons and their metabolites. We are a subrecipient of a grant from the City of St. Paul to HealthPartners." This new funding is associated with a pilot project award from the previous MCOHS funding period.
3. Disi Tian, University of Minnesota: "Additional funding was obtained from the Minnesota Department of Transportation to support a continuing research effort for the pilot project. This currently active project is titled 'Effectiveness of Teenage Driver Support System (TDSS) on Reducing Traffic Violation Behaviors for Teenage Drivers at the Early Time of Licensure', which followed up the same cohort of teenage drivers (i.e., now young adult drivers) as investigated in the pilot project."

Applications Not Funded

1. Lisa Peterson, University of Minnesota: Inhalation Toxicology of Furan. R01 application submitted to National Institute of Environmental Health Sciences. Application was resubmitted July 2019. This application is associated with a pilot project award from the previous MCOHS funding period.
2. Jennifer Sahmel Elliott, University of Minnesota (with Gurusurthy Ramachandran, Johns Hopkins University): Study to Assess the Quantitative Dermal Transfer Efficiencies of Solids for Multiple Transfer Pathways. R21 grant application to NIEHS.
3. **Patricia McGovern**, University of Minnesota: R21 application submitted to National Institute for Nursing Research.
4. **Patricia McGovern**, University of Minnesota: University of Minnesota Futures Award application, 2018.

APPENDIX E
Pilot Projects Research Training Program
Selected Impacts

(MCOHS faculty/staff identified with bold font; MCOHS students identified with underline)

1. Dr. Matt Kiefer, Marshfield Clinic Director Emeritus: "Currently, the RF-DASH project has taken Farm Mapper into its emergency response training and has added augmented reality to it to guide Emergency Responders (ERs) to resources, allow ERs to avoid hazards, and assist ERs to rescue victims. RF-DASH has done training in Wisconsin, New York, and is planning for trainings for Illinois ERs and Minnesota and Iowa ERs." The Rural Firefighters Delivering Agricultural Safety and Health (RFDASH) project provides farm safety tools and knowledge to rural firefighters through community colleges, emergency responder training events, and individual training officers. Fire departments, community colleges, and insurance companies in Wisconsin, Minnesota, New York, Massachusetts, Illinois, Vermont, and Ohio are currently participating. RF-DASH (<https://marshfieldresearch.org/rf-dash>) includes Farm Mapper, developed as part of the PPRTP, in its training. A website (<http://nfmcfarmmapper.com/Home/About>) developed at Marshfield Clinic Research Institute using PPRTP support allows farming operations to upload digital maps to provide emergency responders information about hazards and resources, with the goals of expediting responses to farm emergencies and protecting responders who may be unfamiliar with an individual farm's layout.
2. Dr. Lisa Peterson, University of Minnesota: "Working with CDC scientists evaluating NHANES data on furan levels in humans."
3. Jennifer Sahmel Elliott, University of Minnesota: "The research under this grant has been used as part of multiple training courses to teach both professional industrial hygienists currently in practice and also industrial hygiene students. It will also be used to continue to refine the exposure models used to evaluate dermal exposure potential."
4. Dr. Robert Radwin, University of Wisconsin-Madison: "[A] Partnership with Target Company [was initiated] to test developed technology. We anticipate that this research will lead to new exposure assessment methodologies that can be effectively implemented in the workplace for evaluation, reduction, and prevention of occupational musculoskeletal disorders."
5. Craig Stroinski, SFM Mutual Insurance Company: "Used the findings to produce a two page marketing sheet presented to numerous Minnesota school districts. They used the information for benchmarking their district to our findings. It has enlightened our school district policyholders on where and how injuries are occurring. In turn, they have become more willing to work with our loss prevention staff to reduce employee injuries. For example our policyholders are moving away from using student holds, for students acting out, to deescalation practices. There have been improved practices, i.e. teachers using ladders vs. standing on desks when decorating their classrooms. We have also been discouraging the staff from participating in physical activities with students. Many times the staff is no longer conditioned to participate in such activities. This study produced useful information for the end user, our school district policyholders. It provided statistical support for what we knew anecdotally was causing injuries to workers in our schools. It also caused a redirection of resources to focus on injury prevention in rifle fashion vs. the shotgun approach."
6. Dr. Donna Vosburgh, University of Wisconsin-Whitewater: "This research helped the Occupational and Environmental Safety and Health Department at University of Wisconsin-Whitewater secure funds for additional industrial hygiene equipment (along with the budget to keep the monitors calibrated) and a new Occupational Safety laboratory. This research was key in showing the research potential of Occupational and Environmental Safety and Health faculty and undergraduate students. The new lab will double the size of the current lab and will be used for multiple courses (such as SAFETY 479 Principles and Methods of Industrial Hygiene, SAFETY 382 Safety in the Construction Industry, etc.) and research for faculty and students. The first courses in the new lab will be taught fall of 2019."
7. Stefan Saravia, Minnesota Department of Health: "This study helped strengthen the body of knowledge indicating that firefighters are exposed to toxic particulate material when responding to fires. It is becoming more and more common for firefighters to wear respiratory protection while on the fire ground and during

- overhaul; not just when actively fighting fire. This study boosted the MN State Public Health Laboratory's reputation for responding to emerging health concerns. It provided an avenue for working more closely with emergency responders and other occupational health professionals."
8. Dr. Susan Hallbeck, Mayo Clinic: "The armrest has been prototyped and tested in the simulation lab for microsurgery skills. Further funding is required to make the prototype smaller and more flexible as well as more cleanable before taking it into the operating room. Discussions were underway with Hill-Rom [a leading provider of medical technologies for the health care industry including hospital beds, patient lifts, and non-invasive therapeutic products] to take it to the next level."
 9. Dr. Bethany Lowndes, formerly Mayo Clinic, currently University of Nebraska Medical Center: "This prototype [a wearable vibrotactile device that can provide postural feedback during surgical assistant training and clinical practice for reducing musculoskeletal fatigue and injuries] has been piloted as a training tool for surgical first assistants to educate them on ergonomic practices in surgery."
 10. Disi Tian, University of Minnesota: "Additional funding was obtained from the Minnesota Department of Transportation to support a continuing research effort for the pilot project. This currently active project was entitled 'Effectiveness of Teenage Driver Support System (TDSS) on Reducing Traffic Violation Behaviors for Teenage Drivers at the Early Time of Licensure', which followed up the same cohort of teenage drivers (i.e., now young adult drivers) as investigated in the pilot project. An informative survey measurement was developed to inquire about these drivers' driving frequency, driving behaviors, and perceived driving risks and other driving related-information. The state recorded data on driving violation outcomes, including crashes; traffic citations/tickets were also obtained over approximately seven years since these teenagers were licensed. The pilot project, together with the present follow-up project, enabled researchers to systematically review the perceived and actual driving risks among this unique cohort of drivers throughout the entire period from late adolescence to early adulthood. Data collected from the follow-up project will be combined with the existing data for the same individuals in the pilot project. The analyses of this combined dataset will help provide new knowledge of the long-term effectiveness of the smartphone-based teenage coaching system on reducing a variety of risky driving outcomes as well as inform the development of effective early driving education intervention."
 11. Jennifer Saunders, University of Minnesota: " This project has strengthened the University of Minnesota's engagement in and relationship with the Cosmetology Health and Safety Collaborative. Members of the Collaborative include City of Minneapolis, Minnesota Technical Assistance Program, the Minnesota Department of Health, the Minnesota Board of Cosmetology, Minnesota OSHA, the Minnesota Pollution Control Agency, and other advocates. The Collaborative has provided input and feedback on research activities, including the development of the statewide survey of salon professionals."
 12. Career Advancement:
 - Dr. Silvia Balbo, from the University of Minnesota, was promoted from Assistant Professor to Associate Professor with tenure.
 - Dr. Denny Yu, formerly a postdoctoral trainee at Mayo Clinic, has become an Assistant Professor of Industrial Engineering at Purdue University.
 - **Dr. Susan Arnold**, a doctoral student at the University of Minnesota at the time she received her first PPRTP grant, has become an Assistant Professor in the School of Public Health at the University of Minnesota.
 - Dr. Deirdre Green, a doctoral student at the University of Minnesota at the time she received a PPRTP grant, has become an epidemiologist at the Centers for Disease Control and Prevention.
 - Dr. Navneet Baidwan, a doctoral student at the University of Minnesota at the time she received a PPRTP grant, has advanced to a postdoctoral position at the University of Alabama-Birmingham.
 - Dr. Rony Arauz, a doctoral student at the University of Minnesota at the time he received a PPRTP grant, has advanced to a postdoctoral position at the National Cancer Institute.

OUTREACH PROGRAM

OUTREACH CORE

PROGRESS REPORT

1. Background

The Midwest Center for Occupational Health and Safety (MCOHS) is dedicated to providing state-of-the-art outreach to contribute to the reduction of the nation's burden of work-related illness and injury within our region and beyond. In addition to the typical workforce issues, an aging population, the opioid crisis, mental health issues, and workforce shortages are increasing the complexity of occupational health and safety across existing and emerging industries, changing the nature of work and associated hazards in our region. Industry in the Upper Midwest relies heavily on the sectors of agriculture, mining, gas and oil extraction, service, and construction - industries with high risk of fatal and nonfatal injury and illness on the job. Specific occupations such as service workers (e.g., firefighters, police, food servers, nurse/home health aides, janitors, and beauty-salon professionals), transportation and material movers (e.g., truck drivers and bus/taxi drivers), and construction workers have the highest risk for injury and illness. A priority for MCOHS is to translate our diverse research into practice, which Occupational Safety and Health (OSH) professionals can use in their own unique work locations.

MCOHS's Continuing Education (CE) staff work to facilitate the outreach activity of this Education and Research Center (ERC) in collaboration with the leadership, program faculty, and relevant partners throughout the region. Key Outreach Program personnel include:

Julie Alcorn-Webb, MPH, MA, RN, Outreach Program Director, has served in this capacity for six years and also directs the CE Program. Ms. Alcorn-Webb has 10+ years of experience in curriculum planning, adult education, and needs assessments. She will oversee all project activities. Ms. Alcorn-Webb will coordinate with Program Leadership to obtain r2p products for dissemination and develop outreach plans, including identifying target audiences and media for communications.

MCOHS has the full commitment of SPH and University of Minnesota (UMN) to support Outreach efforts. A majority of the proposed outreach activities have been interdisciplinary in nature and have provided academic and/or CE experiences for the professionals in Occupational and Environmental Health Nursing (OEHN), Industrial Hygiene (IH), Occupational and Environmental Medicine (OEM), Injury Prevention, and allied areas detailed below.

2. Past Performance/Accomplishments July 1, 2015 – June 30, 2020

During the period of 2015-2020, over 1,000 individual outreach activities were conducted by MCOHS. The majority of outreach activities were presentations, lectures, and awareness seminars, followed by other activities (e.g., task force memberships and review panels), educational development, and consultations. For a complete listing, see individual program appendices.

Educational Development and Presentations/Seminars/Lectures. Outreach activities have focused on academic course development and lectures to our professional scientific organizations. However, many of those reached by these lectures/seminars were outside of the formal graduate-level courses (e.g., undergraduate students, students from other universities, including international ones, and practitioners without prior OSH training).

Technology. Our website includes pages on outreach activities by faculty and students and provides resources to the public. Two topics are notable - sleep apnea in truck drivers and beauty-salon worker safety. Furthermore, outreach seminars and workshops tended to be delivered using traditional lecture formats. We found that live presentations were preferred by audiences despite the availability of online technology. This causes some strain to faculty and students due to limited travel resources, time, and availability. Outreach activities shifted primarily to online delivery starting in early 2020 with the advent of the Covid-19 pandemic. The online format has been well-received by audiences, with both synchronous and asynchronous outreach were used when in-person outreach was not possible.

Consultations. MCOHS faculty were asked to consult on a number of OSH topics. For example, companies consulted with IH, OEM, OEE, and OIP faculty on occupational health risks in their organizations. Legislative bodies and state and local governmental bodies have sought the expertise of MCOHS faculty to provide feedback on policies. For example, in response to new policies eliminating the requirement to submit OSHA 100A logs, legislators in MN asked faculty to characterize the scientific value of OSHA 100A logs (which are used to track nonfatal injuries) to researchers and OSH practitioners. OEM faculty provided expert opinion to a company in Ohio about non-pulmonary cancers and asbestos exposure.

Student Involvement. Notably, over 15% of outreach activities involved students. A few highlights are as follows. Trainee Sullivan (OEE) presented her research to the Undergraduate Public Health Research Association at UMN. Trainee Saunders (OHSRP) presented her focus group findings related to health and wellness among beauty salon workers to the MN Board of Cosmetology. Trainee Green (OIP) was co-chair of the student committee of the Injury Control and Emergency Health Services section of the American Public Health Association.

NORA Symposium

The NORA Symposium is our annual interdisciplinary conference bringing together faculty, students, and stakeholders from across our region. We co-sponsor this event with the Upper Midwest Center for Occupational Safety and Health (UMASH), another National Institute for Occupational Safety and Health (NIOSH) funded center focused on agricultural safety and health that involves UMN and Marshfield (Wisconsin) Farm Medicine Clinic. Students, faculty, and stakeholders are invited to present research/master’s project posters during the symposium. Our featured speakers, attendance, number of posters, number of views of online lecture, and archived seminars were as follows:

Table 1. NORA Symposia, 2015-2020

Year	Speaker	Topic	# Attendees	Poster Presentations	# views (online links)
2015	W. Kent Anger, PhD Oregon Health & Sciences	Total Worker Health	126	32 (14 student, 9 faculty, 9 UMASH)	163
2016	John Howard, MD, MPH, JD, LLM NIOSH	Critical Challenges Facing OSH	104	33 (9 student, 4 faculty, 11 UMASH, 9 other)	229
2017	Thomas Wickizer, PhD Ohio State University	Prescription Opioid Use in Occupational Health Care	84	33 (13 student, 9 faculty, 10 UMASH, 1 other)	154
2018	Fran Sepler President, Sepler & Associates	Workplace Harassment	126	16 (7 student, 1 faculty, 6 UMASH, 2 other)	288
2019	Stacy Holzbauer, DVM, U.S. Public Health Service Doris Mold , America Agri-Women Joe Meuwissen , Bloomington Fire	Stressed Out from Work: An Occupational Hazard	85	25 (14 student, 4 faculty, 6 UMASH, 1 other)	142
2020	James W. Grosch, Ph.D. Senior Research Psychologist Co-Director, National Center for Productive Aging and Work NIOSH/CDC	Productive Aging at Work: Creating an Age-Friendly Workplace	143	NA (Online Only)	NA

Outreach Collaborations

Internal collaborations across core academic programs leverage the unique expertise of faculty and students to create outreach products in a variety of formats, tailored to meet the needs of each outreach audience. Dr. Maria Starchook-Moore (OEM graduate), Dr. Bovard, and Dr. Kirkhorn at the VA are interested in the risks of Obstructive Sleep Apnea (OSA) and prevention of potential crash injuries for truckers and drivers; both Health Partners and the VA programs currently have quality improvement projects underway. Dr. Starchook-Moore evaluated variation in screening tests performed at Xcel Energy. Dr. Kirkhorn worked with Dr. McGovern

(OEHN Program) and a School of Public Health alumna, Sarah Moon, planned to pilot test the use of educational video clips to increase VA volunteer drivers' awareness of OSA and its symptoms, self-reported screening for and diagnosis and treatment of OSA and willingness to seek such services, if needed. The pilot testing was temporarily put on hold due to COVID-19. Additionally, Ms. Moon's work on OSA in truckers is available in an online module format for OHS professionals, and as a free YouTube video for general audiences.

Coordinated outreach efforts with other institutions increased both efficiency and impact. One of our most effective partnerships has been with the UMASH in coordinating the annual NORA symposium. Dr. Ramirez had research projects with colleagues from University of Iowa's Injury Prevention Research Center, University of Iowa ERC, and the Great Plains Center for Occupational Health. Because of these partnerships, her research has had increased dissemination. For example, her research on roadway crashes involving farm equipment and farmer suicide received extensive press in media outlets throughout the country (e.g., MN Star Tribune, Washington Post, and U.S. Agricultural Safety and Health Centers webinars). Dr. Raynor collaborated with the University of Iowa ERC on his Midwest Emergency Technology Public Health and Safety Training Center. We conducted a joint seminar in December 2019, entitled "Assessing Exposures from E-cigarettes," with the Johns Hopkins Occupational Safety and Health Education.

MCHOHS faculty collaborations resulted in curriculum development and outreach with an international reach. Dr. McGovern collaborated with Dr. Betsy Wattenberg (risk assessment and toxicology) from the Division of Environmental Health Sciences to design and implement a two-day faculty development workshop, "Developing a Strategic Communications Plan in Public Health," for approximately 55 interdisciplinary faculty from throughout India at Jamia Millia Islamia (JMI) University in Delhi, India in January 2019. The faculty used this platform for teaching case examples from occupational and environmental health. They adapted the workshop content for use in environmental health classes initially in Environmental Health Science, Politics and Policy (PubH 6109), and in the online version of issues in Environmental and Occupational Health (PubH 6102) which is required of all students in the School of Public Health. Associated with this event, Dr. McGovern provided mentoring to a junior faculty member related to research and career development and her application for a tenured faculty position. The curriculum from the two day workshop was adapted and integrated in the online version of PubH 6102, Environmental and Occupational Health Issues (2 credits) which is required for all MPH students in the School of Public Health and is taught by Dr. Elizabeth Wattenberg, Associate Dean for Education, School of Public Health, University of Minnesota.

Research to Practice and Outreach collaborations involving local and state health departments, as well as clinics and medical systems in our area provide valuable connections between academia and the practice community. Both EnHS and EpiCH divisions have several occupational cohorts that students have access to, including the ongoing studies of taconite miners in Minnesota and the United States Radiologic Technologists Cohort Study (USRT). These studies provide opportunities for research in occupational causes of cancer, lung disease, cardiovascular disease, and neurological diseases as well as the application of biological markers in research. Trainees interested in occupational infectious disease are collaborating with epidemiologists from the Upper Midwest Agriculture Safety and Health Center, Minnesota Department of Health, and the Marshfield Clinic to explore several areas of research. These outreach collaborations are mutually beneficial and often lead to additional outreach opportunities.

Partnerships. Unique partnerships provide channels for reaching diverse audiences and pursuing creative engagement projects. The VA and HealthPartners reach clinicians who do not have OSH backgrounds but will likely treat patients suffering from occupational injuries and illnesses and occupational health clinics for six companies run by HealthPartners. Three centers also housed within UMN SPH also provide access to diverse companies and learning audiences - the Exposure Science Sustainability Institute, Upper Midwest Center for Occupational Safety and Health, and Midwest Emerging Technologies Training Center. Relationships with the MN, SD, and ND DLIs have led to shared expertise and access to data sources that will lead to community-engaged policy projects, dissertations, and knowledge translation products.

MCOHS faculty (OEHN and OHSRP Program Director, Dr. McGovern, Industrial Hygiene Program Faculty, Dr. Arnold and Dr. Anderson) and OHSRP PhD student, Jennifer Saunders collaborated with the MN Department

of Health Industrial Hygienist, Kathy Norlien, MS and the Minnesota Board of Cosmetology on a various research projects investigating: risk factors for health and safety, exposure assessment, precarious employment, engineering controls and use of and use of personal protective equipment among licensed cosmetologists, nail technicians and estheticians. Study findings have informed recommendations to the MN Board of Cosmetology regarding the content of continuing education to be designed to increase awareness of risk factors for occupational injury and illness and protective strategies. This information will be developed into curriculum and classes that will be required for renewal of workers' professional licenses in a population of ~35,000 members of this female- and minority/new immigrant-dominated industry sector.

Community-Engaged Projects Addressing Health Disparities. With our new focus on occupational health disparities, we have already begun our community-engaged projects that involve janitorial service workers and salon workers, many of whom come from racial/ethnic minority populations.

Recent worker shortages in the construction industry (predominantly minority, immigrant, and day laborer population) led to efforts to lower the minimum allowed age in construction from 18 to 16. Dr. McGovern (PI) and Dr. Ramirez (Co-PI, Andy Ryan, Senior Research Fellow, MCOHS and Dr. Katie Schofield, Assistant Professor, University of Minnesota, Duluth, and Mr. David Cossi, JD, Affiliate Faculty, Division of Environmental Health Sciences, and OSHRP PhD student, Adam Moskowitz, worked with the MN Department of Labor and Industry (MNDLI) to study new legislative policies that lower the minimum age in construction. We investigated national and state fatal and nonfatal injuries in construction in association with demographics and other factors. Federal and state child labor laws were analyzed and applied to the policy question. Study findings were integrated into a final report for the state legislature in January 2020 that was written by the Commissioner and the Director of Legislative Affairs, MN Department of Labor and Industry.

Another industry in our region employing a predominantly minority, immigrant and highly-mobile worker population, meat production and processing, is a focus of our center. Evan Sorley (PhD graduate) formed a collaboration with investigators in the Upper Midwest Agricultural Safety and Health Center (UMASH) and Minnesota Department of Health to examine the risk of campylobacteriosis in poultry workers.

COVID-19 Outreach Efforts

MCOHS has also made an effort to make outreach more widely available during the pandemic through creative dissemination. One example of this effort is a specialized website maintained by our center to provide the public with easy access to reliable information related to Covid-19. MCOHS Outreach has also been able to provide valuable newly-developed outreach on pandemic-related topics. In some cases, these topics are reaching audiences previously not associated with MCOHS. For example, outreach in the form of new CE courses developed to meet a variety of OSH professionals' needs during the pandemic include: Telehealth and Injury Prevention; Covid-19 Aerosol Transmission and Implications for Masks and Respirators; and How OSHA's New 2 ½ Minute Fit Test is Revolutionary for Respiratory Protection Programs. In response to the sudden mask shortage and need for publicly-available face coverings, Dr. Arnold was invited to collaborate with a group of designers to create and test the efficacy of a no-sew face covering design to be released to the public. In an effort to reach an even broader audience with outreach, Dr. Raynor and Dr. Arnold participated in numerous press interviews on occupational health and safety and public health topics related to the COVID-19 pandemic. With the advent of Covid-19 and outbreaks centering around meat processing plants in the upper Midwest, the need to address health disparities in this sector became urgent. Many of the highly-publicized outbreaks linked to meat processing took place in or near our service region (MN, WI, ND, SD). In response, a "just-in-time" course on controlling Covid-19 in the meat packing industry was offered, helping to establish new training and outreach relationships between our center and agricultural OSH professionals.

Strategic Planning

In spring 2019, both the Executive (Internal) and External Advisory Committees convened to specifically discuss outreach activities and priorities for this upcoming year and the new 2020-2025 cycle. A strong emphasis was made by MCOHS advisors to leverage community partnerships for outreach. Communications experts can guide the outreach process to ensure consideration of multicultural populations. Various outreach

products (social media, online coursework, traditional print, videos, and word of mouth) are possible, depending on the target audiences. Trusted allies and champions are key for certain communities, especially marginalized populations of workers and rural communities. Leveraging partnerships will inform priorities and develop community-engaged research. The goal of outreach should be to reach workers and facilitate changes in the culture of work and adopt the motto: "Safety is good business." These key inputs were used to develop our new objectives for 2020-2025, which emphasize community partnerships in developing sound outreach plans that address messaging and language barriers. In addition to faculty lecturers, MCOHS will continue to identify community partners to serve as affiliate/supporting lecturers, provide PhD students opportunities to present, and archive lectures to reduce the burden of live presentation of repeated topics.

ACADEMIC TRAINING PROGRAMS SECTION

INDUSTRIAL HYGIENE (IH)
ACADEMIC TRAINING PROGRAM

Peter Raynor, PhD – Director

INDUSTRIAL HYGIENE PROGRAM

INDUSTRIAL HYGIENE TRAINING PROGRAM

1. Background

The University of Minnesota Industrial Hygiene (IH) Program offers Doctor of Philosophy (PhD), Master of Science (MS), and Master of Public Health (MPH) degrees. It has been one of the core programs since the inception of the Midwest Center for Occupational Health and Safety (MCOHS), the University's Education and Research Center (ERC), in 1977. During this time, approximately 345 students have been enrolled for degrees in the IH Program. Many graduates have become leaders in the field, working in academia, industry, and government, as well as becoming certified industrial hygienists (CIHs), certified safety professionals (CSPs), and certified hazardous materials managers (CHMMs). All graduates in the last five years have found employment as occupational health and safety professionals or moved on to a doctoral program. More than half of the graduates are employed in the Upper Midwest region of Minnesota, Wisconsin, North Dakota, and South Dakota. The IH Program alumni strongly support the program: they serve on the IH Program Advisory Board, recruit applicants to the program, offer internships to students, provide locations for field trips and student research projects, lecture in classes, and hire graduates.

The rationale for the IH Program is that it produces graduate-trained hygienists needed to address the burden of workplace illness and injuries in the Upper Midwest. The educational objectives of the IH Program for MS and MPH graduates state that within three years of completing their degrees, students will be able to:

- Demonstrate a high level of technical and scientific competence in recognizing, evaluating, and controlling occupational and environmental hazards.
- Solve complex problems through a combination of observation, literature review, measurement, and data analysis.
- Communicate effectively both orally and in writing with a wide range of constituents.
- Design and develop long-range goals and programs.
- Act and behave responsibly and ethically according to the industrial hygiene professional code of ethics.
- Understand the limits of their profession and seek on-going education and work experience for their professional advancement leading to professional certification.
- Interact competently and professionally at all levels of an organization working as a fully-contributing member of a team and accepting independent work responsibilities with a high level of self-discipline.
- Use skills to benefit the community in recognizing work and environmental hazards and educating those responsible for eliminating these hazards.

These objectives are met through rigorous coursework, real-world work experience, and a culminating project. The MS and MPH degrees are accredited by ABET. Accreditation assures applicants that the program is one of high quality, and that their education will prepare them for future employment and certification.

The educational objective of the PhD program is to produce graduates who conduct independent research in occupational hygiene. Doctoral students in the IH Program are expected to develop deep knowledge in the discipline and contribute to the peer-reviewed literature. The PhD program focuses on research, supplemented with advanced coursework, developed under the guidance of a faculty advisor and a doctoral committee.

To meet the educational objectives, the IH Program is led by a highly-qualified faculty with demonstrated teaching and research expertise. The faculty members hold tenured or tenure-track academic appointments. The director of the program, Dr. Peter Raynor, is a Full Professor who has been a member of the faculty since 1998. He is an established researcher who has published nearly sixty articles and book chapters and received numerous grants and contracts to support research activities. He became Director of the IH Program after the former Director, Dr. Gurumurthy Ramachandran, moved to Johns Hopkins University in 2016. Two tenure-track Assistant Professors, Dr. Susan Arnold and Dr. Kimberly Anderson, were hired as IH Program faculty members in 2015 and 2017, respectively. They joined the faculty with excellent preparation as researchers, and have been building their research and teaching portfolios since that time. Dr. Arnold is a Certified Industrial Hygienist (CIH) and serves as the Director of the Exposure Science and Sustainability Institute (ESSI). Each of

the faculty members teaches and advises students in accordance with their faculty rank in addition to their research endeavors, and they are active in service activities within and outside the University.

The IH Program complements and is integrated within MCOHS activities throughout the Center. Extensive interdisciplinary connections include not only participation by trainees in required and elective coursework, but also in seminars, team research activities, and informal interactions that enable communication among disciplines and promote greater understanding of the field of occupational health and safety. IH Program core competencies are reflected in the course requirements for all degree-seeking students in the Division of Environmental Health Sciences and School of Public Health at the University of Minnesota. IH Program faculty and students conduct research with colleagues in the University of Minnesota School of Public Health, College of Science and Engineering, and College of Veterinary Medicine. During the COVID-19 pandemic, Dr. Arnold has established project connections with the University's Institute for Engineering in Medicine and University Health and Safety.

The MCOHS ERC financial support for IH Program trainees is integral to successful delivery of the comprehensive, rigorous program in IH practice and research offered at the University of Minnesota. Many students would not be able to enroll in the program without the financial support for tuition, stipends, and health insurance. The prospect of a traineeship encourages highly-qualified applicants to consider industrial hygiene as a career, when they may at first overlook such a specialized discipline. In addition, funds provided under training-related expenses were used for the following purposes:

- Salary support for IH Program faculty for their efforts in developing, managing, and evaluating the program. Faculty responsibilities include teaching; advising MS, MPH, and PhD students as academic or research mentors; and administering the program.
- Expenses for the annual meeting of the IH Program Advisory Board, which provides invaluable feedback and advice on program direction. Funds were used to pay for hosting this event and for attendee parking.
- Laboratory supplies such as tubing, connectors, filters, detector tubes, sorbent tubes, diffusion badges, and test gases and particles that are used in the required laboratory course.
- Periodic calibration by manufacturers of instruments used in the laboratory course or for student research.
- Software for statistical analyses, numerical modeling, and video production that students utilize for their Master's projects and PhD dissertations, and for outreach efforts.
- Student recruitment expenses including website development and mailings.
- Travel for faculty development to the annual American Industrial Hygiene Conference and Exposition (AIHce) to make scientific presentations and meet other occupational health and safety researchers.
- Travel for PhD student trainees to attend at least one conference annually.
- Travel for MS and MPH student trainees to attend AIHce once during their time in the program.

2. Past Performance/Accomplishments from July 1, 2015-June 30, 2020

The long-range goal of the IH Program is to provide well-qualified, well-rounded professional industrial hygienist practitioners and researchers who meet the continuing needs of industry and society, both in the region served by the program, and nationally. For the 2015-2020 funding period, the specific objectives for the IH Program were to: (1) provide an academic curriculum that emphasizes the multi-disciplinary elements of IH while maintaining a strong emphasis on practical applications and relevance to issues in occupational and environmental health; (2) provide opportunities for field experience and culminating experience work that enable students to develop their practical professional and investigative skills and opportunities for doctoral research that enable the development of expertise to meet the needs of the National Occupational Research Agenda; (3) maintain an active advisory board that includes representation from stakeholders; (4) maintain student enrollment into the Master's and doctoral programs; and (5) support the Midwest Center's continuing education mission by providing training sessions and course content to persons outside the Center interested in industrial hygiene. The following sections summarize the performance and accomplishments for these objectives.

1. ***Provide an academic curriculum that emphasizes the multi-disciplinary elements of industrial hygiene while maintaining a strong emphasis on practical applications and relevance to issues in occupational and environmental health.*** The curricula for the MS and MPH degrees in the IH Program

have been designed to ensure that students obtain the skills, knowledge, and attitudes necessary to become occupational and environmental health leaders. Required and elective courses focus on building knowledge and skills in the anticipation, recognition, evaluation and control of health hazards. For both the MS and MPH degrees, required School of Public Health (SPH) courses include foundations of public health, environmental health, biostatistics, epidemiology, and ethics. For MPH students, additional SPH coursework in behavioral science and management is required. Courses required of all MS and MPH students enrolled in occupational health and safety tracks include Introduction to Occupational Health and Safety, Occupational Medicine, and Interdisciplinary Evaluation of Occupational Health and Safety Field Problems. Seven IH courses are required of all MS and MPH students in the IH Program: Industrial Hygiene Applications, Measurement and Properties of Air Contaminants, Advanced Topics in Human Exposure Science, Environmental Measurements Laboratory, Exposure to Physical Agents, Control of Workplace Exposures, and Principles of Toxicology. At least 11 credits of electives related to industrial hygiene are required of MS students, and at least 7 credits of industrial hygiene electives are required for MPH students. An applied practice experience and a research-related project are required for both degrees. Both the MS and MPH degrees require a minimum of 52 credits. The curriculum has changed modestly during the current funding period. For example, the SPH courses and the toxicology course have been redesigned. Coursework at the PhD level is individualized to the needs of each student. A minimum of 24 course credits and 24 dissertation credits are required.

2. ***Provide opportunities for field experience and culminating experience work that enable students to develop their practical professional and investigative skills and opportunities for doctoral research that enable the development of expertise to meet the needs of the National Occupational Research Agenda (NORA).*** MS and MPH students must undertake paid or unpaid applied practice experiences, lasting at least 135 hours, as part of their required coursework. During the most recent five-year funding period, students have carried out these applied practice experiences at companies and organizations such as 3M Company, Pace Analytical, Minnesota OSHA, the Minneapolis Veterans Affairs Medical Center, Pacific Northwest National Laboratory, Cummins Corporation, Solvay S.A., Environmental Health & Safety Inc., and the University of Minnesota Department of Environmental Health and Safety. Master's students must also complete a required Plan B project or integrative learning experience in the form of a laboratory-, field-, or literature-based research project. The results of many of these studies are presented annually at poster sessions at the American Industrial Hygiene Conference and Exposition (AIHce), School of Public Health Research Day on campus, or MCOHS NORA Symposium. Some of these projects are published as articles in peer-reviewed journals. Research conducted by IH Program PhD students focuses on NORA-related topics. Doctoral student research is typically funded either by federal agencies or private industry.
3. ***Maintain an active advisory board that includes representation from stakeholders.*** The IH Program's Advisory Board consists of representatives from industry, consulting companies, government agencies, and academic institutions. The Board meets with program faculty annually to participate in the program's evaluation and improvement processes, and provides input regarding specific ideas as needed throughout the year. During the most recent funding period, Board members provided valuable feedback on curriculum changes and course modifications, the importance of maintaining a dedicated toxicology course, and fundraising. Board member Dr. John Mulhausen served on the Search Committee that hired Dr. Anderson. During the 2019-2020, several members were asked to retire from the Board and several new members were added in order to make membership more balanced by gender and age.
4. ***Maintain student enrollment into the Master's and doctoral programs.*** During the 2015-2020 reporting period, 42 students were active in the IH program. Thirty of the students were at the Master's level, including 22 MS and 8 MPH students. Eight MS students and eight MPH students graduated during the reporting period. Twelve students have been enrolled in the doctoral program during the reporting period, with two graduates.
5. ***Support the Midwest Center's continuing education mission by providing training sessions and course content to persons outside the Center interested in industrial hygiene.*** IH Program faculty regularly make presentations regarding issues related to occupational hygiene. These presentations include a variety of topics: nanotechnology health and safety, exposure model validation, and exposure assessment and control of air pollutants, among others. Dr. Arnold and Dr. Raynor regularly teach in

professional development courses (PDCs) at the annual AIHce and elsewhere. Dr. Raynor has led the development of a series of one-hour online continuing education courses related to occupational hygiene principles and nanotechnology health and safety that are offered for continuing education units through the School of Public Health. Seventeen of these courses are available so far at <http://www.sph.umn.edu/academics/ce/courses/>. Dr. Raynor and Dr. Arnold participated in numerous press interviews on occupational health and safety and public health topics related to the COVID-19 pandemic.

3. Program Deliverables

In 2017, the IH Program developed a logic model for the program. The logic model presents inputs, activities, and components for the program, as well as listing outputs and outcomes. This evolving document provides a way to evaluate the program's progress over time. The outputs and outcomes below refer to elements of the logic model. Other outputs are presented throughout this application.

IH Program faculty and students have so far published 35 peer-reviewed publications and 9 non-peer-reviewed publications during the current 5-year funding period. In addition, they have made 44 professional presentations. Refer to the Appendix for details of these outputs.

A program of continuous evaluation of IH Program coursework has been developed and implemented. Surveys of industrial hygiene alumni are conducted every few years to assess suitability of coursework. The most recent survey, in 2018, indicated that 91% of IH program alumni who graduated since 2007 were very satisfied with their graduate education while the remaining 9% were somewhat satisfied. The industrial hygiene-specific competencies with more than 80% of ratings as "very valuable" included: recommend, evaluate and implement appropriate engineering, administrative, and personal protective controls (97%), identify hazards associated with specific sources and processes (94%), assess aspects of exposure assessment, dose response and risk characterization (94%), describe physical, chemical, and biological aspects of the generation of hazards (91%), design and implement an appropriate exposure assessment strategy (88%), prioritize hazards and exposures and the actions necessary for eliminating or controlling them (88%), select the most appropriate control methods for a given situation (88%), understand basic principles of sampling and its use for evaluating exposures and controls (84%), and validate the effectiveness of selected control methods (84%). In all of these most-valuable discipline-specific competencies, at least 89% of the IH alumni perceived themselves as "very proficient" or "proficient" as follows: recommend, evaluate and implement appropriate engineering, administrative, and personal protective controls (94%), identify hazards associated with specific sources and processes (100%), assess aspects of exposure assessment, dose response and risk characterization (97%), describe physical, chemical, and biological aspects of the generation of hazards (100%), design and implement an appropriate exposure assessment strategy (94%), prioritize hazards and exposures and the actions necessary for eliminating or controlling them (89%), select the most appropriate control methods for a given situation (91%), understand basic principles of sampling and its use for evaluating exposures and controls (97%), and validate the effectiveness of selected control methods (91%). The percentage of respondents who considered themselves "very proficient" or "proficient" for the rest of the specific competencies included: demonstrate familiarity with and be able to use a professional code of ethics (100%), calculate, interpret, and apply statistical and epidemiological data (94%), understand the relationship of occupational health and safety professionals with management and employees (88%), apply industrial hygiene principles of recognition, evaluation, and control to emerging technologies (86%), use simple models to estimate exposures (85%), and manage hazardous materials and waste (71%).

Other methods have been used to assess the curricula as well. We have surveyed potential employers several times, most recently in 2013, regarding their expectations of competencies when hiring entry-level Master's-trained industrial hygienists. Students evaluate each academic course at the end using quantitative measures and qualitative remarks. The MS and MPH degrees are reviewed and accredited by ABET.

The IH Program students and faculty participate in relevant research-to practice (r2p) projects, including:

1. **Exposure Science and Sustainability Institute (ESSI):** ESSI, led by Dr. Arnold, addresses and responds to industry identified needs by recommending practices to minimize exposures that can occur during product use, conducting field and laboratory studies, and modeling exposures. These activities provide the data needed by companies to develop product use and stewardship guidance. Projects have included

- measuring emissions of acetic acid during use in a cleaning solution, evaluating emissions from a fiber cement board using various cutting saws, and assessing exposures of a plumber to diesel fuel.
2. **Midwest Emerging Technology Public Health and Safety Training (METPHAST) Program:** The METPHAST Program is a collaboration of the University of Minnesota, the University of Iowa, and Dakota County Technical College. The objective of the program is to develop a comprehensive array of focused, web-based modules on the health and safety of emerging technologies. The modules are designed for flexible use by instructors to create academic lessons and continuing education initiatives that serve the unique needs of different learners. Dr. Raynor is using past research related to nanotechnology health and safety to develop aspects of these practice-based education and training activities. PhD student Adepeju Adesina, MPH student Chinomso Ibe, and MS student Puleng Moshele have participated in this project.
 3. **Characterizing and Controlling Beauty Salon Professional Exposures to Chemicals Associated with Formulated Hair and Nail Products:** To fill critical knowledge gaps, this research first seeks to characterize exposures resulting from the airborne emission of chemicals that emanate from beauty salon products. The exposure assessments, including detailed habits and practices data, have expanded the worker exposure data set for this female- and minority/new immigrant-dominated industry sector. Dr. Arnold led this research with participation by MPH student Chinomso Ibe. In addition, Dr. Anderson is investigating exposure control methods, especially downdraft tables, for removing pollutants from the air in nail salons before workers are exposed.
 4. **Healthcare Worker Exposures to Antineoplastic Drugs:** Eight million healthcare workers worldwide are at risk of being exposed to antineoplastic drugs through direct or indirect contact, with epidemiologic evidence of excessive risk of breast cancer and adverse reproductive outcomes. Dr. Susan Arnold and MS student Hannah Kaup found that antineoplastic drugs may be dispersed widely across surfaces in healthcare workplaces based on observations of patterns of contact from the contaminated hands of clinical staff. Dermal exposures among the staff and other workers are likely. In addition, Dr. Arnold and Ms. Kaup collaborated with colleagues at the University of British Columbia to collect and analyze thousands of samples from clinics. A website is being developed to make data publicly available.
 5. **Airborne Measurements of Dust, Endotoxin, and Contaminant Gases in Swine Production:** This three-year study, led by Dr. Raynor and supported by the NIOSH-funded Upper Midwest Agricultural Safety and Health (UMASH) Center, studied how changing production practices and facilities in the swine industry relate to worker exposures to airborne pollutants. Findings indicated that season is the most important factor influencing pollutant levels in Minnesota, primarily due to changes in ventilation. In addition, regular power washing of empty rooms provided significant exposure risks for workers, indicating that respiratory protection should be considered for workers using high-pressure cleaners.
 6. **Efficacy of Low Cost Particle Sensors:** Dr. Anderson developed a line of research to assess the ability of low-cost sensors to measure particle concentrations accurately. This has involved laboratory validation of sampler performance and use of sensors in the outdoor environment. Key applications may be to evaluate the impacts of various types of transportation on particles to which workers and the public are exposed.

Appendix A Industrial Hygiene Publications

(MCOHS faculty/staff identified with bold font; MCOHS students identified with underline)

Peer-Reviewed Publications

2020

1. Benjamin ML, **Arnold S**, Rao M, Davis K, Maierb A, Virkutyte J (2020). Ventilation and posture effects on inhalation exposures to volatile cleaning ingredients in a simulated domestic worker cleaning environment. *Indoor Air*, in press.
2. Pratt GC, Stenzel MR, Kwok RK, Groth CP, Banerjee S, Arnold SF, Blair A, Engel LS, Sandler DP, Stewart PA (2020). Modeled air pollution from in situ burning and flaring of oil and gas released following the Deepwater Horizon disaster. *Annals of Work Exposures and Health*, in press.
3. Ruttenberg R, **Raynor PC**, Tobey S, Rice C (2020). Perception of impact of frequent short training as an enhancement of annual refresher training. *New Solutions*, 30(2):102-110.
4. **Arnold S**, Ramachandran G, Kaup H, Servadio J (2020). Estimating the time-varying generation rate of acetic acid from an all-purpose floor cleaner. *Journal of Exposure Science & Environmental Epidemiology*, 30:374-382.

2019

5. Shao Y, Hwang J, Alexander BH, **Mandel JH**, **MacLehose RF**, Ramachandran G (2019). Reconstructing historical exposures to elongate mineral particles (EMPs) in the taconite mining industry for 1955-2010. *Journal of Occupational and Environmental Hygiene*, 16(12):817-826.
6. **Arnold SF**, Kaup HM (2019). Assessing variability of antineoplastic drugs handling practices in clinical settings. *Journal of Occupational and Environmental Hygiene*, 16(12):757-762.
7. Naumann BD, **Arnold SF** (2019). Setting surface wipe limits for skin sensitizers. *Toxicology and Industrial Health*, 35(9):614-625.
8. Marcham CL, Floyd EL, Wood BL, **Arnold S**, Johnson DL (2019). E-cigarette nicotine deposition and persistence on glass and cotton surfaces. *Journal of Occupational and Environmental Hygiene*, 16(5):349-354.
9. Abdalla N, Banerjee S, Ramachandran G, **Arnold S** (2019). Bayesian state space modeling of physical processes in industrial hygiene. *Technometrics*, 62(2):147-160.
10. Huynh T, Ramachandran G, Quick H, Hwang J, **Raynor PC**, **Alexander BH**, **Mandel JH** (2019). Ambient fine aerosol concentrations in multiple metrics in taconite mining operations. *Annals of Work Exposures and Health*, 63(1):77-90.
11. Koivisto AJ, Kling KI, Hänninen O, Jayjock M, Löndahl J, Wierzbicka A, Fonseca AS, Uhrbrand K, Boor BE, Jiménez AS, Hämeri K, Dal Maso M, **Arnold SF**, Jensen KA, Viana M, Morawska L, Hussein T. (2019). Source specific exposure and risk assessment for indoor aerosols. *Science of the Total Environment*, 668:13-24.

2018

12. Stewart PA, Stenzel M, Ramachandran G, Banerjee S, Huynh T, Groth C, Kwok RK, Blair A, Engel LS, Sandler DP (2018). Development of a total hydrocarbon ordinal job-exposure matrix for workers responding to the Deepwater Horizon disaster: The GuLF STUDY. *Journal of Exposure Science & Environmental Epidemiology*, 28(3):223-230.
13. **Raynor PC**, Engelman S, Murphy D, Ramachandran G, Bender JB, **Alexander BH** (2018). Effects of gestation pens versus stalls and wet versus dry feed on air contaminants in swine production, *Journal of Agromedicine*, 23(1):40-51.

2017

14. Shao Y, Ramachandran S, **Arnold S**, Ramachandran G (2017). Turbulent eddy diffusion models in exposure assessment - determination of the eddy diffusion coefficient, *Journal of Occupational and Environmental Hygiene*, 14(3):195-206.
15. Tessum MW, **Raynor PC** (2017). Effects of spray surfactant and particle charge on respirable coal dust capture, *Safety and Health @ Work*, 8(3):296-305.
16. **Arnold SF**, Shao Y, Ramachandran G (2017). Evaluation of the well mixed room and near-field far-field models in occupational settings, *Journal of Occupational and Environmental Hygiene*, 14(9):694-702.
17. Prieve K, Rice A, **Raynor PC** (2017). Compressed air noise reductions from using advanced air gun nozzles in research and development environments, *Journal of Occupational and Environmental Hygiene*, 14(8):634-641.
18. **Arnold SF**, Shao Y, Ramachandran G (2017). Evaluating well-mixed room and near-field-far-field model performance under highly controlled conditions, *Journal of Occupational and Environmental Hygiene*, 14(6):427-437.
19. Hwang J, Ramachandran G, **Raynor PC**, **Alexander BH**, **Mandel JH** (2017). A comprehensive assessment of exposures to respirable dust and silica in the taconite mining industry. *Journal of Occupational and Environmental Hygiene*, 14(5):377-388.
20. Alonso C, **Raynor PC**, Goyal S, Olson BA, Alba A, Davies PR, Torremorell M (2017). Assessment of air sampling methods and size distribution of virus-laden aerosols in outbreaks in swine and poultry farms, *Journal of Veterinary Diagnostic Investigation*, 29(3):298-304.
21. Alonso C, Olson BA, Goyal S, **Raynor PC**, Davies PR, Torremorell M (2017). Comparison of two size-differentiating air samplers for detecting airborne swine viruses under experimental conditions, *Aerosol Science and Technology*, 51(2):198-205.
22. Quick H, Huynh T, Ramachandran G (2017). A method for constructing informative priors for Bayesian modeling of occupational hygiene data. *Annals of Work Exposures and Health*, 61(1):67-75.
23. Graeve C, **McGovern P**, Polovich M, **Arnold S** (2017). Testing an intervention to decrease healthcare workers' exposure to antineoplastic agents, *Oncology Nursing Forum*, 44(1):E10-E19.

2016

24. Torremorell M, Alonso C, Davies PR, **Raynor PC**, Patnayak D, Torchetti M, McCluskey B (2016). Investigation into the airborne dissemination of H5N2 highly pathogenic avian influenza virus during the 2015 spring outbreaks in the Midwestern United States, *Avian Diseases*, 60(3):637-643.
25. Alonso C, **Raynor PC**, Davies PR, Morrison RB, Torremorell M (2016). Evaluation of an electrostatic particle ionization technology for decreasing airborne pathogens in pigs. *Aerobiologia*, 32(3):405-419.
26. **Arnold SF**, Stenzel M, Drolet D, **Ramachandran G** (2016). Using checklists and algorithms to improve qualitative exposure judgment accuracy. *Journal of Occupational and Environmental Hygiene*, 13(3):159-168.
27. **Mandel JH**, **Ramachandran G**, **Alexander BH** (2016). Increased lung cancer mortality in taconite mining: The potential for disease from elongate mineral particle exposure. *Chemical Research in Toxicology*, 29(2):136-141.
28. Huynh T, Quick H, **Ramachandran G**, Banerjee S, Monteiro JVD, Groth C, Stenzel M, Blair A, Sandler DP, Engel LS, Kwok RK, Blair A, Stewart PA (2016). A comparison of the β -substitution method and a Bayesian method for analyzing left-censored data. *Annals of Occupational Hygiene*, 60(1):56-73.
29. **Mandel JH**, **Alexander BH**, **Ramachandran G** (2016). A review of mortality associated with elongate mineral particle (EMP) exposure in occupational epidemiology studies of gold, talc, and taconite mining. *American Journal of Industrial Medicine*, 59:1047-1060.

2015

30. Allen EM, **Alexander BH**, **MacLehose RF**, Nelson HH, **Ryan AD**, **Ramachandran G**, **Mandel JH** (2015). Occupational exposures and lung cancer risk among Minnesota taconite mining workers. *Occupational and Environmental Medicine*, 72(9):633-639.

31. Wattenberg EV, Bielicki JM, Suchomel AE, Sweet JT, Vold EM, **Ramachandran G** (2015). Assessment of the acute and chronic health hazards of hydraulic fracturing fluids. *Journal of Occupational and Environmental Hygiene*, 12(9):611-24.
32. Alonso C, **Raynor PC**, Davies PR, Torremorell M (2015). Concentration, size distribution, and infectivity of airborne particles carrying swine viruses, *PLoS ONE*, 10(8):e0135675.
33. **Odo NU**, **Raynor PC**, Beaudoin A, Somrongthong R, Scheffel JM, Donahue JG, Bender JB (2015). Personal protective equipment use and hand washing among animal farmers: A multi-site assessment, *Journal of Occupational and Environmental Hygiene*, 12(6):363-368.
34. **Mandel JH**, Wendt CH, Lo C, Zhou G, Hertz M, **Ramachandran G** (2015). Ambient air pollution and lung disease in China: Health effects, study design approaches and future research. *Frontiers of Medicine*, 9(3):392-400.
35. Wendt CH, **Ramachandran G**, Lo C, Hertz M, **Mandel JH** (2015). Increasing fine particulate air pollution in China and the potential use of exposure and biomarker data in disease prevention. *Chemical Research in Toxicology*, 28(3):319-324.

Non-Peer-Reviewed Publications

1. Davies H, **Arnold S**, Jeronimo M, Astrakianakis G, Chambers C (2020). Surface sampling for chemotherapy drugs: lessons learned from the surveillance for anti-cancer drugs exposure study, *The Synergist*, 31(3):24-28.
2. **Ramachandran G** (Editor). *Assessing Nanoparticle Risks to Human Health*. Elsevier, 2016, Second Edition.
3. Peters TM, **Ramachandran G**, Park JY, **Raynor PC** (2016). Assessing exposures to nanomaterials in the workplace, in *Assessing Nanoparticle Risks to Human Health*, 2nd edition (G Ramachandran, ed.), Oxford: Elsevier Inc., pp. 21-44.
4. Beaudrie CEH, Kandlikar M, **Ramachandran G** (2016). Using expert judgment for risk assessment. In: *Assessing Nanoparticle Risks to Human Health*, 2nd edition (G Ramachandran, ed.), Oxford: Elsevier Inc., pp. 91-119.
5. **Raynor PC**, Peters TM (2016). Controlling nanoparticle exposures, in *Assessing Nanoparticle Risks to Human Health*, 2nd edition (G Ramachandran, ed.), Oxford: Elsevier Inc., pp. 153-177.
6. **Arnold S**, **Illies A** (2016). The TLV journey. Reflections on the evolution and significance of the TLV committee, *The Synergist*, 27(8):30-33.
7. **Arnold S**, Stenzel M, **Ramachandran G** (2015). Approaches to improving professional judgment accuracy, Chapter 6, in *A Strategy for Assessing and Managing Exposures*, 4th edition (S Jahn, J Ignacio, W Bullock), AIHA Press.
8. Logan PW, **Ramachandran G** (2015). Bayesian decision analysis for industrial hygiene. Chapter 22, in *A Strategy for Assessing and Managing Exposures*, 4th edition (S Jahn, J Ignacio, W Bullock), AIHA Press.
9. Stenzel M, **Arnold S** (2015). Rules and guidelines to facilitate professional judgment, Chapter 26, in *A Strategy for Assessing and Managing Exposures*, 4th edition (S Jahn, J Ignacio, W Bullock), AIHA Press.

Appendix B
Industrial Hygiene
Selected Presentations

(MCOHS faculty/staff identified with bold font; MCOHS students identified with underline)

2020

1. Davies H, **Arnold S**, Jeronimo M: Advancing Surveillance Protocols for Antineoplastic Drug Exposures in Health Care Settings, Virtual Presentation to WorkSafeBC, Vancouver, Canada, June 2020.
2. **Arnold S**: Masks 101: Respiratory Protection Today – Applied Concepts, Hennepin County Medical Center Grand Rounds Webinar, Minneapolis, MN, April 2020.
3. **Raynor PC**: Assessing Airborne Hazards in Animal Agriculture, University of Minnesota College of Veterinary Medicine Research Seminar, St. Paul, MN, February 2020.
4. Aboubakr HA, Adesina A, Yang M, **Raynor PC**, Torremorell M, Goyal SM: Comparison of Air Samplers for Efficient Recovery of Airborne Viruses from Bioaerosols, American Society for Microbiology Biothreats Conference, Arlington, VA, January 2020.

2019

5. Adesina A, **Raynor PC**, Aboubakr H, Goyal SM, Yang M, Torremorell M: Detection and Measurement of Airborne Viral Particle Concentration, School of Public Health Research Day, Minneapolis, MN, April 2019.
6. Adesina A, **Raynor PC**, Aboubakr H, Goyal SM, Yang M, Torremorell M: A Comparison of Sampling Methods for Detection and Measurement of Airborne Viral Particle Concentrations, 2019 American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
7. **Arnold S**: Tools and Methods for Integrating Total Worker Exposure Into IH Core Competency and Practice Areas, American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
8. **Arnold S**, Kaup H: SurFACES: Lessons Learned in the Field, American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
9. Burton R: What Is Total Worker Exposure, and Why Is It Important to the Practice of Occupational and Industrial Hygiene?, American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
10. Burton RM, **Arnold SF**: Use of Core Industrial Hygiene Competencies and Tools to Assess Total Worker Exposure during Additive Manufacturing, 2019 American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
11. Burton RM, **Arnold SF**: Occupational Exposures in Binder Jetting and Photopolymerization Additive Manufacturing Operations, 2019 American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
12. Jiang M, **Anderson KR**: Evaluation of personal inhalable exposures to cleaning sprays, 2019 American Industrial Hygiene Conference and Exposition, Minneapolis MN, May 2019.
13. Kaup H, **Arnold S**, Schroeder E, Johnson DM, Davies H, Jeronimo M, Chambers C: Establishing Antineoplastic Drug Surveillance in Healthcare Settings, 2019 American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
14. Wong J, Carlson N, **Anderson KR**: Evaluation of area noise in intercollegiate basketball and hockey games, NORA Symposium, Minneapolis MN, May 2019.

2018

15. Adesina A, **Raynor PC**, Aboubakr H, Goyal SM, Torremorell M. Evaluating Aerosol Samplers for Characteristics Improving Their Limits of Detection for Influenza Virus, 2018 American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.
16. Adesina A, **Raynor PC**, Aboubakr H, Goyal SM, Yang M, Torremorell M. A Comparison of Sampling Methods to Measure Concentrations and Sizes of Airborne Virus-Containing Particles, Allen D. Leman Swine Conference, St. Paul, MN, September 2018.
17. **Arnold S**: Sustainability Trends and Challenges in Product Safety. University of Minnesota School of Public Health Winter Alumni Event: Eat, Learn, Gather, St. Paul, MN, January 2018

18. Harstad K, **Raynor PC**: Pulse Tools and Hand-Arm Vibration While Fastening and Unfastening Bolts, 2018 American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.
19. Jensen B, **Raynor PC**: Evaluation of Real-Time Low-Cost Sensors in a Controlled Environment, 2018 American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.
20. Jeeva K, Carlson N, **Raynor PC**: The Influence of Solid Flooring with Straw Bedding versus Slatted Flooring with Manure Pits on Air Contaminant Concentrations in Swine Facilities, 2018 American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.
21. Kaup H, **Arnold S**: Antineoplastic Drugs in Clinical Healthcare Settings: Understanding Potential Exposure Pathways to Healthcare Professionals. International Occupational Hygiene Association Conference, Washington, DC, September 2018.
22. Kaup H, **Arnold S**: Antineoplastic Drugs in Clinical Healthcare Settings: Understanding Potential Exposure Pathways to Healthcare Professionals, American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.
23. Kruse M, Johnson C, **Arnold S**: Applicability of Self-Reported Noise Questionnaires for Noise Exposure Assessment in Electrical Generator Manufacturing Lines, 2018 American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.
24. **Raynor PC**, Adesina A, Aboubakr H, Yang M, Torremorell M, Goyal SM: Toward Identifying the Most Effective Samplers for Airborne Viruses, Allen D. Lemn Swine Conference, St. Paul, MN, September 2018.
25. Shao Y, Ramachandran G, **Alexander BH**, **Mandel JH**, **MacLehose RF**: Reconstructing Historical Exposures to Elongate Mineral Particles (EMP) in the Taconite Mining Industry for 1955-2010, 2018 American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.
26. Shao Y, **Alexander BH**, **MacLehose RF**, Ramachandran G, **Mandel JH**: Mesothelioma Risks and Dimension-based Elongate Mineral Particle (EMP) Definitions in Minnesota Taconite Mining Industry: An Update of the Minnesota Mesothelioma Case-Control Study, 2018 American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.

2017

27. **Arnold S**: Employing a Research-to-Practice Approach to Improving Our Exposure Judgment Accuracy Using Models and Checklists. Occupational Hygiene Association of Ontario Spring Meeting, Mississauga, Ontario, Canada, March, 2017.
28. **Arnold S**: Estimating and Evaluating an Evaporation Rate Constant for Acetic Acid Emanating from a Consumer Product Floor Cleaning Product. American Industrial Hygiene Conference and Exposition, Seattle, WA, June 2017.
29. **Arnold S**: Streamlining Exposure Assessment: Tools for Efficient, Accurate Decision Making. American Industrial Hygiene Conference and Exposition, Seattle, WA, June 2017.
30. **Arnold S**: Exposure Risk Assessments: Better, Faster, More Accurate. American Industrial Hygiene Fall Conference on Leadership and Management, Tampa, FL, October 2017.
31. **Arnold S**: Precarious Employment and Beauty Salon Professionals' Exposure to Toxic Chemicals. Minnesota Population Center Seminar, Minneapolis, MN, December 2017.
32. Hansen G, **Arnold S**: Noise Exposure Assessment for Animal Care Workers in Canine Facilities. American Industrial Hygiene Conference and Exposition, Seattle, WA, June 2017.
33. **Raynor PC**, Peters TM, Newberry DM, Dorman C, Adesina A: Midwest Emerging Technologies Public Health & Safety Training (METPHAST) Program Update, 2017 Superfund Research Program Annual Meeting, Philadelphia, PA, December 2017.
34. **Raynor P**: University of Minnesota IH Program Update + Measurement of Virus Aerosols in the Workplace, American Industrial Hygiene Association Upper Midwest Local Section Meeting, Roseville, MN, October 2017.
35. Shao Y: Elongate Mineral Particles (EMPs) in Taconite Mining. American Industrial Hygiene Conference and Exposition, Seattle, WA, June 2017.

36. Shao Y, Hwang J, **MacLehose RF**, **Alexander BH**, **Mandel JH**, **Raynor PC**, Ramachandran G: Reconstructing Historical Exposures to Respirable Dust and Respirable Silica in the Taconite Mining Industry for 1955-2010. American Industrial Hygiene Conference and Exposition, Seattle, WA, June 2017.
37. Shao Y, **MacLehose RF**, Lin L, Hwang J, **Alexander BH**, **Mandel JH**, Ramachandran G: A Bayesian Approach for Defining Numerical Relationships Between Different Elongate Mineral Particles (EMP) Definitions. American Industrial Hygiene Conference and Exposition, Seattle, WA, June 2017.

2016

38. Ibe C, **Arnold S**: Chemical Exposure Assessment in a Nail Salon, Society for Chemical Hazard Communication Fall 2016 Meeting, Washington, DC, September 2016.
39. Shao Y, Ramachandran S, **Arnold S**, **Ramachandran G**: Turbulent Eddy Diffusion Models in Exposure Assessment: Determination of the Eddy Diffusion Coefficient Yuan Shao, 2016 American Industrial Hygiene Conference and Exposition, Baltimore, MD, May 2016.
40. Shao Y, **Ramachandran G**, **Mandel JH**, **Alexander BH**, **MacLehose RF**, Arauz R: Occupational Iron Exposures and Pleural Disease among Minnesota Taconite Mining Workers, 2016 American Industrial Hygiene Conference and Exposition, Baltimore, MD, May 2016.
41. Zhang A, **Raynor PC**: Analyzing Sound Pressure Level Distribution from Monitoring of Research Animal Cage Washers, 2016 American Industrial Hygiene Conference and Exposition, Baltimore, MD, May 2016.

2015

42. **Arnold S**, **Ramachandran G**, Shao Y: Evaluating model performance in highly controlled and real-world environments for Predicting Consumer Exposures to Acetic Acid Resulting from Floor Mopping Using a Floor Cleaning Formulation, International Society of Exposure Science, Henderson, NV, October 2015.
43. **Raynor P**, Engelman S, Murphy D, **Ramachandran G**, Bender J, **Alexander B**: Factors Affecting Particle and Gas Concentrations in Swine Production Facilities, Paper 8AG.5, Thirty-Fourth Annual Conference of the American Association for Aerosol Research, Minneapolis, MN, October 2015.
44. Torremorell M, Alonso C, **Raynor P**, Davies P: Viability and Particle Size Distribution of Airborne Influenza Virus from Acutely Infected Pigs, Paper 7AG.5, Thirty-Fourth Annual Conference of the American Association for Aerosol Research, Minneapolis, MN, October 2015.

Appendix C Industrial Hygiene Selected Outreach Activities

(MCOHS faculty/staff identified with bold font; MCOHS students identified with underline)

Educational Development/Outreach

- **Dr. Raynor** has participated in the development of education and training modules and hands-on activities related to occupational hygiene and nanotechnology health and safety. These modules are posted on YouTube at <http://youtube.com/METPHASTProgram>. The modules are also used as continuing education courses, accessible at <http://www.sph.umn.edu/academics/ce/courses/>.
- **Dr. Raynor** has developed, trialed, and revised an academic course on Nanotechnology Health and Safety that was offered under its own course number PubH 6177 for the first time during the Fall 2018 semester.
- **Dr. Raynor** and students Adepeju Adesina and Chinomso Ibe led nanoscience technology students at Dakota County Technical College (Rosemount, MN) through hands-on activities to educate them about nanotechnology health and safety.
- **Dr. Arnold** revised PubH 6150 (Interdisciplinary Evaluation of Occupational Health and Safety Field Problems) to enhance student interaction with practitioners across a broader range of OHS roles. The slate of guest speakers was expanded and in conjunction, interactive case studies or tours presented. Project report expectations were expanded to incorporate new skills and knowledge gained from engaging with these professionals.
- **Dr. Ramachandran** revised PubH 6193 (Advanced Topics in Human Exposure Science) to make it more focused on real-life case studies of exposure scenarios.
- **Dr. Ramachandran** was co-Chair of International Conference in New Delhi, India on "Public Health Infrastructure Needs in Developing Countries", 2015.

Presentations - Lectures - Awareness Seminars

- **Dr. Arnold** is conducting in-depth interviews and focus groups with East African and Latino salon workers, in collaboration with one of our community partners. This community engagement will help with study recruitment efforts associated with Dr. Arnold's proposed K01 project, "Investigating Precarious Employment, Chemical Exposures and Health Outcomes Among Hairdressers: A Mixed Methods Approach", 2019.
- **Dr. Arnold:** Lead Instructor for Professional Development Course, Exposure Judgement: Improving Inhalation Assessments, American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
- **Dr. Raynor:** Co-instructor for Professional Development Course, Nanotechnology: Old Theories and New Concepts, American Industrial Hygiene Conference and Exposition, Minneapolis, MN, May 2019.
- **Dr. Raynor:** Instructor, Nanotechnology Health & Safety: Anticipation, Recognition, Evaluation & Control, Navy and Marine Corps Public Health Conference, Hampton, VA, March 2019.
- **Dr. Arnold:** Lead Instructor for Professional Development Course, Exposure Judgement: Improving Inhalation Assessments, American Industrial Hygiene Conference and Exposition, Philadelphia, PA, May 2018.
- **Dr. Raynor:** Instructor, Nanotechnology Health & Safety: Recognition and Evaluation of Exposures to Nanomaterials, American Industrial Hygiene Association-Tidewater Local Section Spring Professional Development Symposium, Hampton, VA, May 2018.
- **Dr. Raynor:** Nanotechnology Risks and Risk Management in Healthcare, EHSENTIALS 2017, Environmental, Health & Safety Symposium for Healthcare, Rochester, MN, October 2017.
- **Dr. Arnold:** Lead Instructor for Professional Development Course Exposure Judgement: Improving Inhalation Assessments, American Industrial Hygiene Conference and Exposition, Seattle, WA, June 2017.

- **Dr. Arnold:** Instructor for Professional Development Course on Exposure Assessment Strategies and Statistics, American Industrial Hygiene Conference and Exposition, Seattle, WA, June 2017.
- **Dr. Arnold:** Course Coordinator and Instructor for Professional Development Course on Improving Inhalation and Dermal Exposure Judgments, American Industrial Hygiene Conference and Exposition, June 2017.
- **Dr. Raynor:** presented with G Gustafson and K Smith, Use of E-learning Technologies and Resources in WTP: Mobile Apps/Online, Best Practices in Using Technology in HAZMAT Training", NIEHS Worker Training Program Technical Workshop, San Juan, PR, March 2017.
- **Dr. Arnold:** Instructor for Professional Development Course, Exposure Judgment: Improving Inhalation Assessments, American Industrial Hygiene Association Conference and Exposition, Professional Conference of Industrial Hygiene, Baltimore, MD, May 2016.
- **Dr. Ramachandran:** Instructor for Professional Development Course, Bayesian Decision-Making in Exposure Assessment. American Industrial Hygiene Association Conference and Exposition, Professional Conference of Industrial Hygiene, Baltimore, MD, May 2016.
- **Dr. Arnold:** Employing a Research to Practice Approach to Improving Our Exposure Judgment Accuracy - Using Models and Checklists, American Industrial Hygiene Association Gulf Coast Local Section Meeting, Houston, TX, March 2016.
- **Dr. Arnold:** Professional Judgment, Prediction, and Qualitative Exposure Assessments, American Industrial Hygiene Association Upper Midwest Local Section Annual Professional Development Conference, St. Paul, MN, November 2015.

Consultations

- **Dr. Arnold** served as an external reviewer for the NIOSH Occupational Exposure Banding draft document "Assessment and Control of Occupational Exposure to Peracetic Acid in Healthcare and Poultry and Meat Processing Facilities".
- **Dr. Arnold** serves as an external reviewer for the NIOSH Occupational Exposure Banding draft document "The NIOSH Occupational Exposure Banding Process: Guidance for the Evaluation of Chemical Hazards".
- **Dr. Ramachandran** consulted with Alcoa by serving on their Occupational and Environmental Health Science Advisory Board relating to an epidemiological investigation of cardiovascular health and exposures to PM2.5 in Alcoa workers, 2012-2016.
- **Dr. Ramachandran** consulted on an ongoing project with NIEHS on exposure assessment of workers engaged in clean-up efforts after the Deepwater Horizon BP oil spill, 2011-2016.
- **Dr. Raynor** has consulted with BreathableBaby LLC regarding the ability of air and heat to pass through fabrics used for infant bedding and sleep clothes, 2006-present.
- **Dr. Raynor** has served on the Clean Air Minnesota Working Group, organized by Environmental Initiative, 2013-present.

Other

Dr. Anderson

- Chair, Aerosol Technology Committee, American Industrial Hygiene Association, 2018-2019
- Vice Chair, Aerosol Technology Committee, American Industrial Hygiene Association, 2017-2018
- Secretary, American Industrial Hygiene Association Eastern Upstate New York Local Section, 2017-2018

Dr. Arnold

- Board Past Chair, American Conference of Governmental Industrial Hygienists, 2017
- Board Chair, American Conference of Governmental Industrial Hygienists, 2016
- At-Large Board Member, American Conference of Governmental Industrial Hygienists, 2013-2015
- Editorial Board Member, *Journal of Occupational and Environmental Hygiene*, 2017-present
- Director, Exposure Science & Sustainability Institute (ESSI), University of Minnesota, 2016-present

Dr. Ramachandran

- Editorial Board Member, *Journal of Occupational and Environmental Hygiene*
- Member, Residency Advisory Board, Occupational Medicine Program, HealthPartners, 2012-2016

Dr. Raynor

- International Advisory Board Member, *Annals of Work Exposures and Health*, 2017-present
- Editorial Board Member, *Safety and Health @Work*, 2013-present
- Member, Clean Air Minnesota Working Group, Environmental Initiative, 2013-present.

Trainee Accomplishments

(MCOHS students and alumni identified with underline)

1. PhD student Jennifer Sahmel served on the American Industrial Hygiene Association (AIHA) Board of Directors from 2014-2017.
2. PhD alum Dr. Susan Arnold served as Board Chair for the American Conference of Governmental Industrial Hygienists (ACGIH) in 2016.
3. MS alum Cathy Hovde served on the AIHA Board of Directors from 2016-2019.
4. PhD student Yuan Shao received a 3M Company Personal Safety Division Scholarship in 2016.
5. PhD student Yuan Shao received the TSI/Arthur J. Abrams Memorial Scholarship from the American Industrial Hygiene Foundation (AIHF) in 2016.
6. MS student Colton Porter received the Gary and Bonnie Olmstead Scholarship from AIHF in 2016.
7. MS student Amber Illies received the Harold R. Shipman Award for Excellence in Environmental and Occupational Health from the Division of Environmental Health Sciences in 2016.
8. MPH student Eli Miller was inducted into Delta Omega, the Public Health Honorary Society, in 2016.
9. MPH student Keerthanaa Jeeva served as President of the University of Minnesota School of Public Health Student Senate in 2016-2017.
10. PhD student Yuan Shao received the Best Student Poster Award from the AIHA Mining Working Group at the American Industrial Hygiene Conference and Exposition (AIHce) in 2017.
11. MPH student Greg Hansen was inducted into Delta Omega, the Public Health Honorary Society, in 2017.
12. MS student Colton Porter was inducted into Delta Omega, the Public Health Honorary Society, in 2017.
13. MPH student Keerthanaa Jeeva served as University of Minnesota Professional Student Government Vice President in 2017-2018.
14. MPH student Otis Heymann received the Kyle B. Dotson Scholarship from AIHF in 2018.
15. MPH student Shanna Kuehn was awarded a scholarship by the Northwest Chapter of the American Society of Safety Professionals (ASSP) in 2018.
16. MPH student Minghong Jiang was awarded a scholarship by the Northwest Chapter of the American Society of Safety Professionals (ASSP) in 2018.
17. MS student Hannah Kaup received the Best in Show Student Poster Silver Award at AIHce in 2018. The same poster also earned the best student poster awards from the AIHA Healthcare Working Group and the AIHA Communication and Training Methods Committee at AIHce.
18. MS alum Carl Johnson received the John J. Bloomfield Award from ACGIH in 2018.
19. MS alum Rena Goldman received the Social Responsibility Award from AIHA in 2018.
20. MS student Puleng Moshele served as the Director of Finance for the University of Minnesota School of Public Health Student Senate in 2018-2019.
21. PhD student Jennifer Sahmel was named a Fellow of the American Industrial Hygiene Association in 2019.
22. PhD student Hannah Kaup received a 3M Company Personal Safety Division Scholarship in 2019.
23. PhD student Hannah Kaup received the Upper Midwest Section/John Pendergrass Memorial Scholarship from AIHF in 2019.
24. PhD student Rebecca Burton received the Board of Certified Safety Professionals Scholarship from AIHF in 2019.

25. MS student Amanda Kramer received the Robert W. Wheeler Scholarship from AIHF in 2019.
26. PhD student Rebecca Burton received the best student poster awards from both the AIHA Exposure Assessment Strategies Committee and the AIHA Career and Employment Services Committee at AIHce in 2019.
27. PhD student Hannah Kaup received the best student poster awards from the AIHA Healthcare Working Group at AIHce in 2019.
28. PhD alum Dr. John Mulhausen is serving as Vice President of AIHA in 2019-2020 and will serve as President in 2020-2021.
29. MS student Dadee Saye received a 3M Personal Safety Division Scholarship in 2020.
30. PhD Katherine Serrano received a 3M Personal Safety Division Scholarship in 2020.
31. PhD student El'gin Avila received the TSI/Arthur J. Abrams Memorial Scholarship through the American Industrial Hygiene Foundation in 2020.
32. PhD student Katherine Serrano received the Upper Midwest/John Pendergrass Memorial Scholarship through the American Industrial Hygiene Foundation in 2020.
33. PhD student El'gin Avila received a Northwest Chapter ASSP Scholarship in 2020.
34. MS student Dadee Saye received a Northwest Chapter ASSP Scholarship in 2020.
35. MS student Puleng Moshele was inducted into Delta Omega in 2020.

Table 1. Academic Training Report July 1, 2015 – June 30, 2020¹
Industrial Hygiene

Degree Awarded	How Does Degree Read?	Total # Applicants to Degree Program	Total # Applicants Admitted to Degree Program	Total # Under Represented Minority Applicants Admitted	# Full-Time Students Enrolled²	# Full-Time NIOSH-Supported Trainees	# Part-Time Students Enrolled²	# Part-Time NIOSH-Supported Trainees	# Trainees Graduated During Reporting Period
Master's degree ³									
	Master of Public Health	31	6	2	5	5	4	2	8
	Master of Science	31	17	4	17	14	5	3	8
Doctorate degree									
	Doctor of Philosophy in Environmental Health	22	9	4	6	3	6	3	4
Post-doctoral									
Certificate Program									

¹ Reporting period for renewals is from the start date of prior competing award. New applicants should report past five years.

² Full-time and part-time students should include all students in approved programs, regardless of source of support.

³ OM residents may be double-counted under Masters degree training and post-doctoral training.

Table 2. Trainees and Graduates Supported July 1, 2015 – June 30, 2020¹
Industrial Hygiene

Trainees				Graduates				
Trainee ID, Year of Entry, Prior Degree & Institution, (Current Academic Advisor or Mentor and Department). Identify Under Represented Minority with (URM).	OM Trainees: Previous Residency Training Specialty	Title of Research Project or Research Topic	Degree Program (MS, MPH, PhD, DrPH, etc.)	Date Degree or Certificate Awarded (mm/yyyy)	Date of Certificate for OM (mm/yyyy)	Employed in OSH Field or in OSH Advanced Study (Y/N)	Current Employer	Current Position
100296, 2007, Masters, Medical College of Ohio, (G Ramachandran, Division of Environmental Health Sciences)		The Use of Heuristics and Exposure Models in Improving Exposure Judgment Accuracy	PhD	11/2015		Y	University of Minnesota	Assistant Professor
100344, 2011, Masters, University of Minnesota, (P Raynor, Division of Environmental Health Sciences)		Working title: Effectiveness of Bite Prevention Interventions in Veterinary Medicine Small Animal Clinics	PhD					
100346, 2013, Bachelors, Minnesota State University Moorhead, (P Raynor, Division of Environmental Health Sciences)		<i>Discontinued</i>	MPH					
100356, 2013, Masters, University of California, (G Ramachandran, Division of Environmental Health Sciences)		Dermal exposure assessment modeling and validation	PhD					

100358, 2013, Masters, Xi'an Jiaotong University, (G Ramachandran, Division of Environmental Health Sciences) (URM)		Turbulent Eddy Diffusion Models in Exposure Assessment - Determination of the Eddy Diffusion Coefficient	MS	07/2015		Y	Johns Hopkins University	Postdoctoral Fellow
100359, 2014, Bachelors, University of Minnesota, (G Ramachandran, Division of Environmental Health Sciences)		<i>Discontinued</i>	MS					
100360, 2014, Bachelors, University of Minnesota, (G Ramachandran, Division of Environmental Health Sciences)		Re-examination of the Validity of ACGIH TLVs	MS	11/2018		Y	3M Company	Industrial Hygienist
100363, 2014, Bachelors, Saint Olaf College, (G Ramachandran, Division of Environmental Health Sciences)		Evaluation of Potential Airborne Exposures to Noncritical Surface Disinfectants during Simulated Cleaning	MPH	08/2017		Y	3M Company	Industrial Hygienist
100361, 2014, Bachelors, China University of Geosciences, (P Raynor, Division of Environmental Health Sciences) (URM)		Analyzing Sound Pressure Level Distribution from Monitoring of Research Animal Cage Washers	MS	11/2016		Y	Environmental Resources Management (ERM)	Project Manager
100362, 2014, Masters, Southern Illinois University, (G Ramachandran, Division of Environmental Health Sciences) (URM)		Characterization of Volatile Organic Compound Exposures in One Nail Salon and Manicure Table Orientation Concept as an Exposure Control Method	MPH	12/2017		Y	Certified Industrial Hygiene Consulting Ltd.	Industrial Hygiene Technologist

100379, 2014, Bachelors, Westminster College (UT), (G Ramachandran, Division of Environmental Health Sciences) (URM)		Noise Survey Analysis of Gopher Football Games	MS	12/2016		Y	United States Navy	Lieutenant Commander
100384, 2016, Masters, East Carolina University, (P Raynor, Division of Environmental Health Sciences) (URM)		Working title: Detection and Measurement of Airborne Viral Particle Concentrations	PhD					
100385, 2015, Bachelors, Viterbo University, (P Raynor, Division of Environmental Health Sciences)		Working title: Accuracy of Low Cost Airborne Particle Sensors	MS					
100386, 2015, Doctoral, University Of California, (G Ramachandran, Division of Environmental Health Sciences)		<i>Discontinued</i>	MS					
100387, 2015, Bachelors, Brigham Young University, (P Raynor, Division of Environmental Health Sciences)		Effects of Differing Noise Criteria on Noise Assessment in a Film Manufacturing Pilot Plant	MS	08/2017		Y	3M Company	Industrial Hygienist
100358, 2015, Masters, University of Minnesota, (G Ramachandran, Division of Environmental Health Sciences) (URM)		Respiratory Diseases and Exposures to Taconite Dust Components	PhD	04/2018		Y	Johns Hopkins University	Postdoctoral Fellow
100388, 2015, Bachelors, University of Minnesota, (G Ramachandran, Division of Environmental Health Sciences)		Noise Exposure Assessment for Animal Care Workers in Canine Facilities	MPH	01/2018		Y	SUEZ-Water Technologies & Solutions	Safety Manager

100397, 2016, Bachelors, Saint Mary's University Of Minnesota, (P Raynor, Division of Environmental Health Sciences)		Pulse Tools and Hand Arm Vibration while Fastening and Unfastening Bolts	MPH	06/2018		Y	3M Company	EHS Field Engineer
100398, 2016, Bachelors, University of Minnesota, (P Raynor, Division of Environmental Health Sciences)		An Analysis of Fatal and Non-fatal Injury Data among Midwestern States Compared to the United States in Four Industry Sectors: 2012- 2016	MPH	03/2020		Y	Minnesota Department of Labor and Industry (MN OSHA)	Safety Investigator
100399, 2016, Bachelors, University of Wisconsin, (P Raynor, Division of Environmental Health Sciences)		Evaluation of Real- Time Low-Cost Sensors in a Controlled Environment	MS	08/2018		Y	3M Company	EHS Field Engineer
100400, 2016, Bachelors, Saint Catherine University, (S Arnold, Division of Environmental Health Sciences)		Antineoplastic Drugs in Clinical Healthcare Settings: Understanding Potential Exposure Pathways to Healthcare Professionals	MS	11/2018		Y	University of Minnesota	Doctoral Student
100401, 2016, Bachelors, University of Minnesota, (P Raynor, Division of Environmental Health Sciences)		Working title: Applicability of Self- reported Noise Questionnaires for Noise Exposure Assessment in Electrical Generator Manufacturing Lines	MS					
100402, 2016, Bachelors, University of Minnesota, (S Arnold, Division of Environmental Health Sciences)		Fast vs. Slow Dosimetry in an Indoor Shooting Range Environment	MS	02/2020		Y	Jabil	Sr. EHS Engineer

100403, 2016, Bachelors, University of California, (S Arnold, Division of Environmental Health Sciences) (URM)		Effects of Flooring Type and Production Stage on Air Contaminants Present in Swine Facilities during Winter	MPH	03/2019		Y	Bureau Veritas	Associate Consultant I
100404, 2016, Bachelors, Saint Cloud State University, (S Arnold, Division of Environmental Health Sciences)		Working title: Assessing Fugitive Nitrous Oxide Emissions Associated with Mask Fit during Pediatric Anaesthesia	MPH					
100411, 2017, Masters, University of Washington, (P Raynor, Division of Environmental Health Sciences)		Working title: Midwest Consortium Instructors' Study	PhD					
100412, 2017, Bachelors, College of Medicine - City of Lagos, (P Raynor, Division of Environmental Health Sciences) (URM)		<i>Discontinued</i>	MPH					
100331, 2018, Masters, University of Minnesota, (S Arnold, Division of Environmental Health Sciences)		The effects of various control measures upon laboratory concentrations of airborne lab animal allergens	PhD					
100418, 2018, Bachelors, University of Michigan, (K Anderson, Division of Environmental Health Sciences)		Working title: 'Evaluation of the Effectiveness of a Smoke Extraction System at Reducing Veterinarian Exposures to Surgical Smoke during Electrocautery	MS					
100400, 2018, Masters, University of Minnesota, (S Arnold, Division of		<i>Discontinued</i>	PhD					

Environmental Health Sciences)								
100421, 2018, Bachelors, Macalester College, (P Raynor, Division of Environmental Health Sciences) (URM)		Working title: Association between Aerosol Exposure Levels and the Use of Different Bedding Materials in Dairy Farm Facilities	MS					
100422, 2018, Masters, University of Arizona, (K Anderson, Division of Environmental Health Sciences)		Working title: Characterization of Exposures during Metal Additive Manufacturing	PhD					
100423, 2018, Bachelors, University of Minnesota, (K Anderson, Division of Environmental Health Sciences) (URM)		Evaluation of Area Noise During Intercollegiate Basketball and Hockey Games	MS					
100417, 2019, Masters, George Washington University, (P Raynor, Division of Environmental Health Sciences) (URM)		Working title: Evaluating a Pandemic's Impact on Gig-Workers: How Is Their Mental Health Affected by COVID-19?	PhD					
100420, 2019, Bachelors, University of North Carolina - Chapel Hill, (S Arnold, Division of Environmental Health Sciences)		Working title: Associations of Surface Touch Frequency and Antineoplastic Drug Contamination in Cancer Clinics	MS					
100424, 2019, Bachelors, University of Minnesota, (P Raynor, Division of Environmental Health Sciences) (URM)		Working title: Evaluation of Personable Inhalable Exposures to Domestic Cleaning Sprays	MS					
100442, 2019, Bachelors, Saint Catherine University, (S			MS					

Arnold, Division of Environmental Health Sciences) (URM)								
100443, 2019, Bachelors, Gustavus Adolphus College, (S Arnold, Division of Environmental Health Sciences)			MS					
100444, 2019, Bachelors, University of Minnesota, (P Raynor, Division of Environmental Health Sciences)			MS					
100445, 2019, Bachelors, Cuttington University College, (P Raynor, Division of Environmental Health Sciences) (URM)			MS					
100449, 2019, Masters, Saint Louis University, (P Raynor, Division of Environmental Health Sciences)			PhD					
100450, 2019, Masters, Purdue University, (S Arnold, Division of Environmental Health Sciences)			PhD					
100446, 2020, Bachelors, Saint Catherine University, (P Raynor, Division of Environmental Health Sciences)			MS					

¹ List all NIOSH supported trainees and graduates by year of entry. Reporting period for renewals is from start date of prior competing award. New applicants should report last five years.

OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSING (OEHN)
ACADEMIC TRAINING PROGRAM

Patricia M. McGovern, PhD, MPH, RN – Director
Carolyn M. Porta, PhD, MPH, RN – Co-Director

OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSING

1. Background

Rationale, History, and Need. Our Occupational and Environmental Health Nursing (OEHN) Program has provided interdisciplinary education in Occupational Health and Safety (OHS) for nurses for more than 40 years. It is one of nine National Institute for Occupational Safety and Health (NIOSH) funded programs that prepare occupational health nurses (OHNs) at the graduate level in the U.S. and one of three based in a School of Public Health (SPH). Associate Professor Elaine Richard founded the program in 1978 to address an urgent need for OHNs to be prepared as master level leaders and practitioners to address the burden of illness and injury in the U.S. workforce within the region and nationwide. In 1989, the OEHN Program was transferred from the Public Health Nursing Program to the Division of Environmental Health Sciences (EnHS), where it became closely integrated with eight other specialty tracks. Dr. Pat McGovern has served as OHN Program Director since 1984 and has been joined by excellent faculty, including Debra Olson, MPH, RN, 1985-2008, and Nancy Nachreiner, PhD, MPH, RN, 2009-2013. OEHN PhD training was initiated in 1997. A successful dual degree (MS/MPH) with the School of Nursing (SON) was offered 2002–2009 until masters degrees were phased out in lieu of the Doctorate in Nursing Practice (DNP). Dr. Carolyn Porta, Associate Vice President for Clinical Affairs at University of Minnesota (UMN) and Professor in the Schools of Nursing and Public Health, joined the OEHN Program as Co-Director in July 2019.

Although significant strides have been made in the last four decades, workforce health has been threatened by persistent and new challenges that require an increasing number of highly qualified OEHN leaders in research and practice. Our OEHN Program is well positioned to make critical contributions to the field of OEHN and workforce safety and health. The OEHN Program is the only one of its kind in an expansive region that includes Minnesota (MN), Wisconsin (WI), North Dakota (ND), and South Dakota (SD), making it a unique regional resource to address the need for OEHNs. Consistent with the Midwest Center for Occupational Health and Safety's (MCOHS) mission, the OEHN Program prepares leaders in research, education, and practice. The program has provided rigorous interdisciplinary training in OHS to meet our objectives: 1) Recruit and retain qualified trainees, including enhancing efforts to enroll minority and underserved students; 2) Provide rigorous interdisciplinary training; 3) Conduct innovative, high-quality OEHN and interdisciplinary research; 4) Support graduates in job placement; 5) Disseminate research findings and engage in outreach; 6) Provide continuous improvement of the OEHN Program to ensure its sustainability and high impact; and 7) Partner with the Outreach and Continuing Education (CE) Program to create engaging online modules for OHS practitioners and individuals who may work in OHS but lack professional OHS training.

During the project period, 9 MPH students and two PhD students graduated. Five students were admitted for fall 2019. Graduates serve as administrative leaders, educators, and researchers for workers in business, industry, healthcare systems, workers' compensation management firms, and public agencies. Our graduates contribute to the safety, health, and well-being of the workforce not just in the region but nationwide.

Funding from the Centers for Disease Control (CDC)-NIOSH is essential for the program and the future of the profession. This T42 funding has been the only funding mechanism for producing qualified OEHN practitioners and researchers to contribute to worker safety and health and for growing the science of OEHN. Most of the funds, about 70%, were allocated to trainees (e.g., tuition, stipends, travel, and software). Faculty also support students through funded research and outreach. Key faculty dedicate 5-10% of their effort to create a rigorous curriculum, identify field experiences, facilitate student research and outreach, and support job placement.

The OEHN Program contributes its expertise to this interdisciplinary Education and Research Center (ERC). Faculty and students collaborate in research projects, coursework, and outreach activities. Participating programs have included Occupational and Environmental Medicine (OEM), Industrial Hygiene (IH), Occupational Injury Prevention (OIP), Occupational and Environmental Epidemiology (OEE), and Occupational Health Services Research & Policy (OHSRP).

Notable partnerships with other ERCs have included the exchange of students for learning opportunities at one another's CE programs. OEHN students have completed OHN professional certification review courses at Johns Hopkins University. One student participated in a weeklong intensive training in Total Worker Health® at

Harvard University SPH and now consults with their TWH Center on a project. Dr. Marjorie McCullough, OHN Program Director at University of Michigan Center for Occupational Health and Safety Engineering, is a valuable contributor to our OEHN Program Advisory Board. These relationships provide important networks that support ongoing program development and enrichment of our capacity for OEHN training.

2. Past Performance/Accomplishments July 1, 2015 - June 30, 2020

Highlights. The project period produced 11 OEHN graduates - two PhD and nine MPH students. Five of the 11 graduates (45%) were first-generation college students. Another MPH student graduated in September 2019, and five new students enrolled in fall 2019 for the PHCC Certificate Program. Thirty-three percent of certificate students are first-generation college students.

Our graduates are placed in leadership and practitioner positions in organizations serving the region, nation, and world. Kari Kilbride, MPH, COHN-S is Vice President for Health Transformation at Aon, a global professional services firm providing risk, retirement, and health solutions to companies. Dr. Joshua Gramling, COHN-S directs the Occupational Health, Jail Health, and Community Flu Vaccination Program at HennepinHealth. Rick Huewe, MPH worked as an injury prevention specialist, and in 2019, he started a nurse practitioner program at University of ND. Jessica Dorfsman, MPH is Branch Chief for the U.S. Customs and Border Protection Frontline Hiring and Medical Program. Dr. Catherine Graeve is Associate Professor of the SON at St. Catherine's University, and Julie Alcorn-Webb, MPH directs MCOHS CE and Outreach Programs. Ellen Simonson, MPH directs Infection Control and Prevention and internally consults with Employee Health at Centracare Health, St. Cloud, MN. Margaret Dake, MPH, COHN-S is OHN Program Coordinator for Allina Health, a healthcare system serving MN, WI, and ND. Jennifer Hansen, MPH, COHN-S is Supervisor at an OEM clinic, and Monique Kolb, MPH is Senior Workers' Compensation Case Manager at HealthPartners, a healthcare system serving MN and WI. Peter Mitchell, COHN-S, is an OHN Practitioner at Minneapolis Veterans Health Care Administration (VHA), which serves [the VA Midwest Health Care Network](#), including MN, ND, SD, WI, Iowa (IA), and Nebraska (NE).

The OEHN Program formalized a relationship with the SON in spring 2019, and Dr. Carolyn Porta, Associate Vice President for Clinical Affairs at UMN and Professor in the Schools of Nursing and Public Health, now serves as Co-Director of the OEHN Program. Below, we summarize our accomplishments by program objective given our goal of providing rigorous interdisciplinary education in occupational and environmental health for nurses with the aim of creating a cadre of OEHNs, who contribute to decreasing the burden of occupational injuries and illnesses and promoting worker safety, health, and well-being.

Objective 1. Recruit, enroll, and retain qualified MPH and PhD students into the MCOHS OEHN Program. Trainees are recruited from OEHN alumni networks, the MCOHS website, and outreach presentations to practicing OHNs and nursing students. In fall 2019, we increased admissions with enrollment of five Certificate students, who upon successful completion of the Certificate Program will seek admission to for an MPH Program focused in OEHN. Three additional nurses are pursuing admission for fall 2020. Ongoing enrollment at this level will create a sustainably sized program. Among 12 students enrolled during the current period, only one student left the program, transferring after one semester. Our retention goal was 100%; we achieved 92%.

Objective 2. Provide rigorous interdisciplinary training for masters and doctoral level students. We provide an academic curriculum that emphasizes interdisciplinary elements of OEHN while maintaining a strong emphasis on practical applications and relevance to the field. The OHS workforce requires that interdisciplinary teams of researchers and practitioners be comfortable working and learning *from* each other rather than working and learning *by* each other. Both core public health and OHS specialty classes provide opportunities for interdisciplinary learning. The curriculum includes: 1) Public health core courses in epidemiology, biostatistics, public health foundations, social and behavioral sciences, environmental and occupational health, management of health services, and public health ethics; 2) OHS core courses and seminars apply science to practice and address interdisciplinary OHS and OEHN-specific professional competencies; 3) Experiential learning occurs in field experiences, on faculty research projects, and through

students' final projects, papers, and dissertations; and 4) Interdisciplinary activities such as research seminars and professional development sessions to prepare all students to be part of the OHS workforce.

Objective 3. Support graduates in job placement. Students have access to career development and job placement support through the SPH's Career and Professional Development Center Services, which provides assistance with resumes, curriculum vitae, and cover letters and workshops on informational interviews and job searches. OEHN graduates have found positions or were promoted within 6-12 months of graduation.

Objective 4. Conduct rigorous OEHN and interdisciplinary research. Drs. Graeve and Gramling graduated with PhD degrees in Environmental Health (EH) in 2016-2017. They completed interdisciplinary dissertation research, presented at local and national meetings, and published three papers each during their training. They also received MCOHS pilot project grants, and were awarded membership in Delta Omega, the Public Health Honor Society. After graduation, Dr. Gramling was promoted to Director of the Occupational Health, Jail Health, and Community Flu Vaccination Program at HennepinHealth. Dr. Graeve accepted a faculty position in public health nursing where she integrates OEHN content into her classes at St. Catherine's University SON.

Objective 5. Disseminate research findings and engage in outreach to stakeholders. Faculty and students disseminate research findings in the research-to-practice (r2p) brochure that the Center distributes through the MCOHS website and during presentations at professional conferences and community-based outreach events. For example, Dr. Graeve engaged representatives of the MN legislature and MN OSHA and other key stakeholders to research, update, and disseminate chemosafety information to healthcare institutions and providers throughout the state.

Objective 6. Provide continuous improvement of the OEHN Program to ensure its sustainability and high impact. Dr. McGovern annually reviews program accomplishments and challenges in relation to the Center's strategic plan and the OEHN logic model. The MCOHS Alumni Survey, which surveyed 32 OEHN graduates from 2007 to 2017 and had a 72% response rate, showed encouraging results. Before enrollment, 45% of graduates worked in OHS-related employment, on average, four years. Alumni worked in settings that included corporate/industrial (23%), healthcare systems (23%), academia (23%), government agencies (18%), and free-standing clinics/hospitals (9%). At the time of the 2017 survey, 55% were working in OEHN, 83% reported using OEHN research in their jobs, and 100% were able to use the knowledge and skills from the OEHN Program in their current jobs. Satisfaction levels with their graduate education was high; 91 percent of respondents reporting being very satisfied and 9% were somewhat satisfied. The responses to an open-ended question about the rationale behind their response included: "broad range of courses," "excellent instructors or great teachers," "interesting classes," great access to seminars and other researchers' topics to keep students engaged," "excellent program that prepared me for my roles after graduation," and "I liked the curriculum and appreciated all the interdisciplinary group work." Dr. McGovern consults with MCOHS Program Evaluator, Melissa Heinen, and Dr. Marizen Ramirez for feedback and solicits input on issues of recruitment, curriculum, and strategic planning from Advisory Board members, OEHN affiliate faculty, and students at board meetings and informally throughout the year.

Objective 7. Partner with the CE Program to create OEHN and OHS CE online modules. Dr. McGovern collaborated with Alcorn-Webb, CE Program Director, to identify key content from OHS courses that would assist CE staff in maintaining high-quality and timely online courses. Working with instructional designer Krista Johansen Dederich, MS, and in response to learner assessments, nine new CE online modules were created in 2018-2019.

3. Program Deliverables

Following the OEHN logic model, we summarize key program outputs and outcomes as deliverables below. (See OEHN Appendices: A. Publications, B. Presentations, and C. Outreach)

Objective and Components	Program Outputs and Outcomes
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<p><i>Recruitment, retention and graduation, and recruitment to underserved and underrepresented minority groups (URMs)</i></p>	<ul style="list-style-type: none"> • 2 PhD student recruited, enrolled, and retained. • 9 MPH students recruited, enrolled, and retained. • 11 graduates in program period • 5 students enrolled and retained in new certificate program • 42% of graduates were first-generation college students. • New outreach to MN Black Nurses Association for student recruitment.
<p><i>Provide rigorous interdisciplinary training</i></p>	<ul style="list-style-type: none"> • OHS courses were enhanced by IH faculty (Arnold and Anderson) with applications of interdisciplinary practice skills in team-based field applications (PubH 6150) and research and evaluation of occupational exposure limits (PubH 6170). • An ergonomics lecture by an OSHA ergonomist was added to PubH 6170. • PhD students participated in a division-wide research seminar, Occupational and Environmental Health and Safety Research Seminar (PubH 8120), for 4 semesters to assist in developing and implementing their dissertation research. • 100% of graduates participated in Community Grand Rounds in OEM organized by HealthPartners OEM Residency Program for 10 times during MPH program. • 91% of graduates were very satisfied with their OEHN graduate education, according to the Alumni Survey.
<p><i>Support graduates in job placement and career development</i></p>	<ul style="list-style-type: none"> • 10 graduates from this program period were working in OEHN leadership roles in healthcare systems, federal agencies, risk management positions, continuing professional education, and schools of nursing. Also, 1 graduate works in a related specialty (infection control) and provides internal OEHN consultation to their employer. Six graduates are Certified Occupational Health Nurses-Specialist (COHN-S). • Job opportunities are identified by OHN professional organizations and other sources; Dr. McGovern regularly emails job opportunities to students. • 3 of 11 graduates earned professional certification while in the MPH program (COHN-S); 1 also became a Certified Occupational Health Hearing Conservationist.
<p><i>Conduct innovative, high-quality OEHN and interdisciplinary research</i></p>	<ul style="list-style-type: none"> • Both PhD students this period were awarded MCOHS pilot project research grants. • PhD student, Dr. Graeve, also received a prestigious UMN Dissertation Fellowship. • Dr. McGovern collaborated with Jean Bey, MPH, OEHN alumna, 2 OHSRP PhD students and Dr. Kim, Occupational & Environmental Epidemiology (OEE) on a pilot project testing the impact of a physical activity intervention on direct care workers' blood pressure, weight, and job satisfaction, partnering with a nonprofit assisted living organization with communities located in MN and IA. We were awarded a MCOHS pilot project grant and have presented findings at national and local presentations and a paper is in progress. • Dr. McGovern collaborated with OHSRP supporting faculty, Dr. McAlpine, and PhD student Jennifer Saunders to conduct a qualitative study investigating stress, coping, and resilience among farmers, farm workers, and veterinarians involved in MN's Avian Flu 2015 outbreak, and we were awarded a MCOHS pilot project grant and given national and local presentations on the findings and a paper is in progress.
<p><i>Disseminate research findings</i></p>	<ul style="list-style-type: none"> • 2 PhD students and 1 MPH student contributed a total of 7 peer-reviewed publications during their education. Dr. McGovern has published 23 and Dr. Porta has published 27 papers in peer-reviewed journals since 2015. • PhD students made research presentations at University venues and state and national professional conferences. • Dr. Graeve used research findings to develop a stakeholder workgroup through the state legislature and MN OSHA to research regulations and guidance documents on hazardous drug handling and develop recommendations for healthcare settings. MN OSHA uses the product of this work as guidance for healthcare organizations. • Dr. McGovern and an OEHN alumna, Ms. Alcorn-Webb, collaborated with the MN Breastfeeding Coalition to conduct employer outreach on policies and programs to support breastfeeding in the workplace. • Dr. Gramling collaborated with CE Program Director Alcorn-Webb and the MN Association of OHNs for the past 3 years to develop the Annual Professional Development Conference, which draws 35–40 OEHNs per year from MN and WI.

Appendix A

OEHN and Other ERC Student and Faculty Publications

Student and alumni names are underscored.

MCOHS Faculty and Advisory Board Members are in **bold font**.

2020

Rosebush C, Zaidman BA, **Schofield K**, Erickson DJ, **Ramirez M**, Tschida B, **McGovern P**: [In press] An evaluation of the Minnesota Safe Patient Handling Act: trends in workers' compensation indemnity claims in nursing home workers before and after enactment of the law. *Occupational and Environmental Medicine*. [Student author is a trainee in the OHSRP Training Program. Dr. Schofield is faculty with the Master of Environmental Health and Safety Program at the University of Minnesota, Duluth; Dr. Ramirez is faculty with the OIRPT Program and Dr. McGovern is faculty with the OEHN and OHSRP Programs.]

Rosebush C, Zaidman BA, **Schofield K**, Erickson DJ, **Ramirez M**, Tschida B, **McGovern**: [2020]. Occupational differences in workers' compensation indemnity claims among direct care workers in Minnesota nursing homes, 2005-2016. *American Journal of Industrial Medicine* 63: 517-526. [Student author is a trainee in the OHSRP Training Program. Dr. Schofield is faculty with the Master of Environmental Health and Safety Program at the University of Minnesota, Duluth; Dr. Ramirez is faculty with the OIRPT Program and Dr. McGovern is faculty with the OEHN and OHSRP Programs.]

2019

Green D, **Gerberich SG**, **Kim H**, **Ryan AD**, **McGovern PM**, **Church TR**, Schwartz A, Arauz RF: [2019] Knowledge of work-related injury reporting and perceived barriers among janitors. *Journal of Safety Research* 69:1-10. [Student authors are trainees in the OIR Training Program and faculty (other than Dr. McGovern) are with the OIRPT Program; Dr. McGovern is with the OEHN Program; RFA is a PhD graduate in Occupational and Environmental Epidemiology.]

Green D, **Gerberich SG**, **Kim H**, **Ryan AD**, **McGovern PM**, **Church TR**, Schwartz A, Arauz RF: [2019] Janitor workload and occupational injuries. *American Journal of Industrial Medicine* 62:222-232. DOI: 10.1002/ajim.22940. [Student authors are trainees in the OIR Training Program and faculty (other than Dr. McGovern) are with the OIRPT faculty; Dr. McGovern is with the OEHN Program; RFA is a PhD graduate in Occupational and Environmental Epidemiology.]

Riester SM, Leniek KL, Niece AD, **Montoya-Barthelemy A**, **Wilson W**, **Sellman J**, **Anderson PJ**, Bannister EL, **Bovard RS**, Kilbride KA, et. al. Occupational medicine clinical practice data reveal increased injury rates among Hispanic workers. *Am J Ind Med*. 2019 62:309-316. <https://doi.org/10.1002/ajim.22949> [This paper is a product of an OEM resident (Reister), OEM faculty and alumni and OEHN alumna and affiliate faculty, **Ms. Kilbride** and is based on clinical data at HealthPartners clinics where they work.]

Schwartz A, **Gerberich S**, **Kim H**, **Ryan A**, **Church TR**, Albin T, **McGovern PM**, Erdman A, Green D, Arauz RF: [2019] Janitor Ergonomics and Injuries in the Safe Workload Ergonomic Exposure Project (SWEEP) Study. *Applied Ergonomics* 81:102874. doi: 10.1016/j.apergo.2019.102874. Epub 2019 Jun 25. [Student authors are trainees in the OIPRT Program and faculty (other than Dr. McGovern) are with the OIRPT Program; Dr. McGovern is OEHN Program faculty; RFA is a PhD graduate in Occupational and Environmental Epidemiology.]

Sadr Dadres G, Whitaker KM, Haapala JL, Foster L, Smith KD, Teague AM, Jacobs DR Jr, Kharbanda EO, **McGovern PM**, Schoenfuss TC, Le LJ, Harnack L, Fields DA, Demerath EW. [2019] Relationship of Maternal Weight Status Before, During, and After Pregnancy with Breast Milk Hormone Concentrations. *Obesity* 27(4):621-628. doi: 10.1002/oby.22409. [Dr. McGovern is OEHN Program faculty.]

Tahir MJ, Haapala JL, Foster LP, Duncan KM, Teague AM, Kharbanda EO, **McGovern PM**, Whitaker KM, Rasmussen KM, Fields DA, Harnack LJ, Jacobs DR Jr, Demerath EW. [2019] Association of Full Breastfeeding Duration with Postpartum Weight Retention in a Cohort of Predominantly Breastfeeding Women. *Nutrients* 11(4): pii: E938. doi: 10.3390/nu11040938. [Dr. McGovern is OEHN Program faculty.]

Tahir MJ, Haapala JL, Foster LP, Duncan KM, Teague AM, Kharbanda EO, **McGovern PM**, Whitaker KM, Rasmussen KM, Fields DA, Jacobs DR Jr, Harnack LJ, Demerath EW. Higher Maternal Diet Quality during Pregnancy and Lactation Is Associated with Lower Infant Weight-For-Length, Body Fat Percent, and Fat Mass in Early Postnatal Life. *Nutrients* 11(3) pii: E632. doi: 10.3390/nu11030632. [Dr. McGovern is OEHN Program Director.]

2018

Porta CM, Johnson E+, Finn C: [2018] Male Help-Seeking after Sexual Assault: A Series of Case Studies Informing SANE Practice. *Journal of Forensic Nursing* 14 (2):106-111.[Dr. Porta is OEHN Program Co-Director.]

Cigan S, **McGovern P**, Choudhary K, Miller N, Georgieff M, Rao R, Stepanov I: [2018] Toenail manganese as a potential biomarker for *in utero* and early childhood exposure studies. *Scientific Reports* 19; 8(1):17034. doi: 10.1038/s41598-018-35112-0. [Student author is a trainee in the Occupational and Environmental Epidemiology Program; Dr. McGovern [OEHN] was the PI of the research grant; Dr. Stepanov designed and supervised the biomarker development and testing.]

Eisenberg ME, Mehus CJ, Saewyc EM, Corliss HL, Gower AL, Sullivan R, **Porta CM**: [2018] Helping young people stay afloat: A qualitative study of community resources and supports for LGBTQ adolescents in the U.S. and Canada. *Journal of Homosexuality* 65(8):969-989. [Faculty research involving a non-trainee student with Dr. Porta, OEHN Program Co-Director.]

Fish JN, Watson RJ, Gahagan J, **Porta CM**, Beaulieu-Prévost D, & Russell ST (2018). Smoking behaviors among heterosexual and sexual minority youth? Findings from 15 years of provincially- representative data. *Drug and Alcohol Review* 38(1):101-110. [Faculty research by Dr. Porta, OEHN Program Co-Director and colleagues.]

Jou J, **Kozhimannil KB**, **Abraham JM**, **Blewett LA**, **McGovern PM**: [2018] Paid Maternity Leave in the United States: Associations with maternal and infant health. *Maternal and Child Health Journal* 22(2):216-225. [Non-trainee student, HPM supporting faculty for the OHSRP Program. and OEHN faculty, Dr. McGovern.]

Gramling JJ, **McGovern PM**, **Church TR**, **Nachreiner NM**, Gaugler JE: [2018] Effectiveness of Conducted Electrical Weapons to Prevent Violence-related Injuries in the Hospital. *Journal of Emergency Nursing* 44: 249-7. Available online 28 July 2017 0099-1767. [This paper was a product of Dr. Gramling's OEHN PhD dissertation research. Dr. McGovern was his research advisor. Dr. Tim Church and Dr. Nancy Nachreiner are OEHN Program supporting faculty.]

Drake SA, Koetting C, Thimsen K, Downing D, **Porta CM**, Hardy P, Valentine JL, Finn C: [2018] Forensic Nursing State of the Science: Research and Practice Gaps and Opportunities. *Journal of Forensic Nursing* 14(1): 3-10. [Dr. Porta is OEHN Program Co-Director.]

Porta CM, Bloomquist ML, Garcia-Huidobro D, Gutiérrez R, Vega L, Cooper, D, Balch R+, Yu X: [2018]. Expanding an Evidence-Based Model for Prevention of Conduct Problems to Mexican Migrant Youth: Cross-Validation of Cultural Adaptations Made in Mexico with Latino Parents and Providers in the US. *Cultural Diversity and Ethnic Minority Psychology* 24(2): 231-241. [Dr. Porta is OEHN Program Co-Director and two non-trainee students are coauthors.]

Porta CM, Mathiason MA, Lust K, Eisenberg ME. (2017). Sexual and Non-Sexual Relationship Violence among College Students: An Examination of Individual- and Institutional-Level Factors associated with Perpetration. *Journal of Forensic Nursing* 13(3):109-117. [Faculty research by Dr. Porta, OEHN Program Co-Director and colleagues.]

Porta CM, Watson R, Doull M, Eisenberg M, Grumdahl N, Saewyc E. (2018). Trend disparities in emotional distress and suicidality among sexual minority and heterosexual Minnesota adolescents from 1998 to 2010.

Journal of School Health, 88(8), 605-614. [Faculty research by Dr. Porta, OEHN Program Co-Director, colleagues, and non-trainee students.]

Watson R, Goodenow C, **Porta CM**, Adjei J, Saewyc E. (2018). Substance Use among Sexual Minorities: Has it actually gotten better? *Substance Use and Misuse*, 53(7), 1221-1228. [Faculty research including Dr. Porta, OEHN Program Co-Director and colleagues.]

Wolowic J, Sullivan R, **Porta CM**, Eisenberg M: [2018] "Come with me": Linking LGBTQ youth to supportive resources. *International Journal of Child, Youth and Family Studies* 9 (3):1-20. [Dr. Porta is OEHN Program Co-Director.]

2017

Eisenberg ME, Lust K, Mathiason MA, **Porta CM**: [2017] Sexual Assault, Sexual Orientation, and Reporting Among College Students. *Journal of Interpersonal Violence*. Aug 1:886260517726414. doi: 10.1177/0886260517726414. [Epub ahead of print] [Faculty research with Dr. Porta, OEHN Program Co-Director.]

Graeve C, **McGovern P**, **Alexander B**, **Church T**, **Ryan A**, Polovich M: [2017] Occupational Exposure to Antineoplastic Agents: An Analysis of Healthcare Workers and Their Environments. *Workplace Health and Safety and Health*. 65(1):9-20. doi: 10.1177/2165079916662660. Epub 2016 Oct 7. [This paper is a product of Dr. Graeve's dissertation research. She was an OEHN PhD trainee; Dr. McGovern was her OEHN research advisor; Dr. Alexander and Dr. Church are supporting faculty for the OEHN Training Program and Mr. Ryan is Senior Research Fellow with MCOHS.]

Graeve C, **McGovern P**, **Arnold S**, Polovich M: [2017] Testing a Quality Improvement Intervention to Decrease Healthcare Workers' Exposure to Antineoplastic Agents. *Oncology Nursing Forum* 1; 44(1):E10-E19. [This paper is a product of Dr. Graeve's dissertation research. She was an OEHN PhD trainee; Dr. McGovern was her OEHN research advisor; Dr. Arnold is IH faculty and a committee member who assisted with surface sampling of antineoplastic residue.]

Fish J, Watson R, **Porta C**, Russell S, Saewyc E. (2017). Are alcohol-related disparities between sexual minority and heterosexual youth decreasing? *Addiction* 112(11):1931-1941. *10.1111/add.13896*

Living as an LGBTQ adolescent and a parent's child: Overlapping or separate experiences. *Journal of Family Nursing*. DOI: 10.1177/1074840717696924 [Non-trainee student and faculty research with Dr. Porta, Co-Director of the OEHN Program]

Porta CM, Corliss H, Wolowic J, Johnson A, Fogel K, Gower A, Saewyc E & Eisenberg M. (2017). Go-along interviewing with LGBTQ youth in Canada and the U.S. *Journal of LGBT Youth* 14(1):1-15.

Porta CM, Mathiason MA, Lust K, Eisenberg ME. (2017) Sexual and Non-Sexual Relationship Violence among College Students: An Examination of Individual- and Institutional-Level Factors associated with Perpetration. *Journal of Forensic Nursing* 13(3):109-117. [Dr. Porta, OEHN Program Co-Director and faculty research]

Porta CM, Singer E, Mehus C, Gower A, Saewyc EM, Fredcove W, Eisenberg ME: [2017] LGBTQ Youth's Views on Gay-Straight Alliances: Building Community, Providing Gateways, and Representing Safety and Support. *Journal of School Health* (87):489-497. [Dr. Porta, OEHN Program Co-Director, faculty and non-trainee student and faculty research]

2016

Coetzee DJ, **McGovern PM**, Rao R, Harnack LJ, Georgieff MK, Stepanov I: [2016] Measuring the impact of manganese exposure on children's neurodevelopment: advances and research gaps in biomarker-based approaches. *Environmental Health* 15(1):91. doi: 10.1186/s12940-016-0174-4. [Ms. Coetzee was a non-trainee student and Dr. McGovern, OEHN Program Director, was the PI of the grant funding the study and Ms. Coetzee's research advisor.]

Dagher RK, **McGovern PM**, Schold JD, Randall XJ. Determinants of breastfeeding initiation and cessation among employed mothers: a prospective cohort study. *BMC Pregnancy Childbirth*. 2016;

16(1):194. doi: 10.1186/s12884-016-0965-1.[OHSRP alumni (international student/ non-trainee) Dr. McGovern, OEHN Program Director, was PI of the study funding the research and Dr. Dagher's dissertation co-advisor.]

Eisenberg ME, Lust KA, Hannan PJ, **Porta CM**: [2016] Campus sexual violence resources and emotional health of college women who have experienced sexual assault. *Violence and Victims* 31(2): 274-84. [Faculty research]

Jou J, **Kozhimannil KB**, **Blewett LA**, **McGovern PM**, **Abraham JM**. Workplace accommodations for pregnant employees: associations with women's access to health insurance coverage after childbirth. *Journal of Occupational and Environmental Medicine* 2016 58(6):561-6. [Ms. Jou is a non-trainee student and HPM supporting faculty for the OHSRP Program and OEHN Program Director, Dr. McGovern.]

Kozhimannil KB, Jou J, Gjerdingen DK, **McGovern PM**: [2016] Access to workplace accommodations to support breastfeeding, after the affordable care act. *Women's Health Issues* 26(1)3-16. Press coverage: Forbes magazine, Huffington Post, US News and World Report, Minneapolis Star Tribune, Minnesota Public Radio, KSTP TV (Minneapolis ABC Affiliate), Marketplace, MinnPost. [OHSRP supporting faculty, (non-trainee) student and Dr. McGovern, OEHN Program Director.]

Landsteiner A, **Nyman J**, Lindgren P, **McGovern P**, **Alexander B**, **Williams A**: [2016] The Economic impact for farm injury in Minnesota, 2004-2010. *Journal of Agromedicine*, 21(2):171-7. doi: 10.1080/1059924X.2016.1143904. [OHSRP trainee dissertation product, Dr. McGovern was dissertation advisor, Dr. Nyman, Dr. Alexander and Dr. Williams are OHSRP supporting faculty.]

McGovern PM, Nachreiner NM, Holl JL, Halfon N, Dabelea D, Caulfield L, Cauley JA, Innocenti MS, Amsden L, Markovic N, Riddles M, Adams S. The National Children's Study (NCS): early recruitment outcomes using the direct outreach approach. *Pediatrics* 2016; 137 Suppl. 4:S231-8. doi: 10.1542/peds.2015-4410D. [Dr. McGovern, OEHN Program Director with the PI for the NCS Ramsey County Study Center.]

Porta CM, Allen M, Hurtado A, Padilla M, Arboleda M, Svetaz M, Balch R, and Sieving R. (2016). Honoring Roots in Multiple Worlds: Professionals' Perspectives on Healthy Development of Latino Youth. *Health Promotion Practice*, 17+ (2):186-198. DOI: 10.1177/1524839915606647 PubMed PMID: 26429993. [Faculty research with Dr. Porta, OEHN Program Co- Director.]

Wolowic JM, Heston LV, Saewyc EM, **Porta CM**, Eisenberg ME: [2016] Chasing the Rainbow: LGBTQ Youth and Symbolic Navigation. *Journal of Culture, Health & Sexuality* 19(5): 557-571. PMID: 27829321. [Non-trainee student and faculty research with Dr. Porta, OEHN Program Co- Director.]

2015

Landsteiner A, **Williams A**, Lindgren P, **McGovern P**, **Alexander B**: [2015] Rates and trends of injury related to agriculture in Minnesota, 2000 – 2011. *Journal of Agromedicine* 20(4): 419-426. [OHSRP trainee, dissertation product, Dr. McGovern was Research Advisor, and other faculty are OHSRP supporting faculty.]

Appendix B

OEHN Student and Faculty Presentations

Student and alumni names are underscored.

MCOHS Faculty and Advisory Board Members are in **bold font**.

2019

- Saunders J, **McGovern P**, **Arnold S**, and Landsteiner A. Occupational Hazards and Stress among Minnesota Cosmetologists, Estheticians and Nail Technicians." Poster presented at Work, Stress, and Health; November 2019; Philadelphia, PA. [Ms. Saunders is an OHSRP trainee, Dr. McGovern, is OEHN and OHSRP Program Director and Dr. Arnold is Industrial Hygiene faculty].
- Babcanec C, **McGovern P**. and **Schofield K**. Injuries, Costs, and Quality of Life in Home Healthcare Workers: A Decision Analysis. Poster presented at the International Conference on Emerging Challenges to Environmental and Occupational Health & Sustainability; January 2019; New Delhi, India. [Ms. Babcanec is an OHSRP and military trainee, Dr. McGovern, OEHN Program Director and Dr. Schofield is an assistant professor Occupational Safety Program Director]
- Cossi DA**, **McGovern PM**. Sexual Harassment Law and Implications for Nurses. Invited presentation. Master of Nursing Student Council, School of Nursing, University of Minnesota; March 2019; Minneapolis, MN. [Mr. Cossi is Environmental Health Sciences Affiliate faculty and Dr. McGovern is OEHN Program Director.]
- McGovern PM**. Health Disparities, Health Equity and Occupational Health. Invited Guest Lecture, PubH 6130, Occupational Medicine: Principles and Practice March 2019. School of Public Health University of Minnesota; Minneapolis, Minnesota. [OEHN faculty presentation.]
- McGovern PM**. Leadership. (Invited Presentation). Minnesota Occupational Health Nurses Association; University of Minnesota; May 2019; Minneapolis, MN. [OEHN faculty presentation.]
- Peternelj-Taylor C. with Colbert A, Neil K, Lewis-O'Connor A, **CM Porta**. Tips for Writing a CaseReport for the Journal of Forensic Nursing; International Association of Forensic Nursing Annual Conference. October 2019; New Orleans, Louisiana. [Faculty presentation, Dr. Porta, Co-Director, OEHN Program.]
- Porta C** with Schorr E. SMART, Wearable, and in Real-Time: Using the best design and data collection strategies to advance nursing science. 4th International Conference on Prevention and Management of Chronic Conditions; February 2019; Bangkok, Thailand. [Faculty presentation, Dr. Porta, Co-Director, OEHN Program.]
- Porta CM** with Nejabi MB, Amiri R, Avery M, Conway-Klaassen J, Mann E, Mwikarago I, O'Bryan M, Olejniczak M, Radhakrishnan R, Weinkauff J, Wiesner S. University partnership for the advancement of the healthcare workforce in Afghanistan; February 2019; iCOMOS. Chiang Mai, Thailand. [Faculty presentation, Dr. Porta, Co-Director, OEHN Program.]
- Saunders J, **McGovern P**, **Arnold S**, and **Landsteiner A**. Occupational Hazards and Stress among Minnesota Cosmetologists, Estheticians and Nail Technicians. Poster presented at Work, Stress, and Health; November 2019; Philadelphia, PA. [OHSRP PhD, student and Dr. McGovern is her dissertation advisor; Dr. Arnold (IH faculty and committee member, Dr. Landsteiner is OHSRP affiliate faculty and dissertation committee member.)]

2018

- McGovern PM**. Health Disparities, Health Equity and Occupational Health. (Invited Guest Lecture). PubH 6130, Occupational Medicine: Principles and Practice University of Minnesota School of Public Health; April 2018; Minneapolis, MN. [OEHN faculty presentation.]
- Porta C**. Mixed Methods Research. Manipal University, January 2018; Manipal, India; [OEHN faculty presentation.]

- Porta C.** (Invited presentation). Building the Evidence for Stopping Sexual Assault on College Campuses Using Common and Not-so-common yet Data Sources. Panel participant for University of Minnesota Diversity Data Deep Dive; November 2018, Minneapolis, Minnesota. [OEHN faculty presentation.]
- Saunders J, McGovern PM.** (Invited Oral Presentation). What Did We Learn from Focus Groups with Cosmetologists? Minnesota Board of Cosmetologists; February 2018; St. Paul, MN. [OHSRP PhD student and OHSRP/OEHN faculty presentation. Dr. McGovern is Ms. Sander's dissertation research advisor.]
- Saunders J, McGovern P, and Arnold S.** Understanding the Relationship between Work and Health: Occupational Health and Safety Knowledge and Behaviors among Cosmetologists in Minnesota. Poster presented at the Society for Chemical Hazard Communication Spring Meeting; Orlando, FL; April, 2018. [OHSRP PhD student and faculty presentation, Dr. McGovern, OHSRP/OEHN Program Director and Dr. Arnold, IH faculty.]
- Saunders J, McGovern P, and Arnold S.** Understanding the Relationship between Work and Health: Occupational Health and Safety Knowledge and Behaviors among Cosmetologists in Minnesota. Poster presented at the National Occupational Research Agenda (NORA) Symposium; Minneapolis, MN; May, 2019. [OHSRP PhD student and faculty presentation, Dr. McGovern, OHSRP/OEHN Program Director and Dr. Arnold, IH faculty.]
- Scher D and **McGovern PM.** Manganese: an Overlooked Drinking Water Containment and the Potential for Child Development Risks. Invited presentation for the **Minnesota Environmental Health Association; Rochester, MN; October, 2018.** [OEHN faculty presentation.]

2017

- Babcanec C, Rosebush C, McGovern P, Bey J, and Kim H.** Caring for care-givers: Testing the impact of a management-driven health interventions on job satisfaction and retention of elder-care employees. Poster presented at 26th International Epidemiology in Occupational Health Conference; August 2017; Edinburgh, Scotland. [Ms. Babcanec (military trainee) and Ms. Rosebush (OHSRP trainee), Dr. McGovern, their dissertation advisor, Ms. Bey, OEHN Program Advisory Board Member and community contact for study, and Dr. Kim, OEE and OIP faculty.]
- McGovern P.** (Invited presentation) Nursing Leadership: Professional Practice in Complex Systems NURS 4707, speakers for two panel presentations on leadership and career development to > 100 BSN seniors each class session (fall 2016 and spring 2017)
- McGovern P, Bey J, French S, Kim H.** Improving Working Conditions for Care Workers: Testing the Impact of a Pilot Worksite Health Improvement Intervention," Presentation at the Global Carework Summit, University of Massachusetts, June 2017; Lowell, MA. [OEHN faculty research with Dr. McGovern (PI) Ms. Bey, OEHN Program Advisory Board Member and community contact for the study, and Dr. Kim, OEE and OIP faculty].
- McGovern P, Saunders J, and McAlpine D.** The Environmental Impact of Highly Pathogenic Avian Influenza on Health, Coping, and Resilience in Farmers. Presented at Work, Stress, and Health: The 12th International Conference on Occupational Stress and Health; June 2017; Minneapolis, MN. [OHSRP key and supporting faculty and OHSRP PhD trainee presentation from a pilot project funded through the Upper Midwest Center for Occupational Health and Safety (UMASH).]
- McGovern P, Saunders J, and McAlpine D.** Stress and Resilience: The Impact of the 2015 Outbreak of Highly Pathogenic Avian Influenza on Minnesota Poultry Growers, Farm Workers and Industry Stakeholders. Poster presented at the National Occupational Research Agenda (NORA) Symposium; Minneapolis, MN; May 2017. [OHSRP key and supporting faculty and OHSRP trainee presentation from a pilot project funded through the Upper Midwest Center for Occupational Health and Safety (UMASH).]
- Porta C.** (Invited presentation). Preventing sexual violence on campus through screening: Can ACEs help identify potential perpetrators? University of Minnesota Boynton Health CME Lecture; Minneapolis, Minnesota; February 2017. [OEHN faculty presentation.]

Porta C. (Invited presenter) with Peterson B, Lust K, Eisenberg M. Nursing Students' Use of Fitbits to Encourage Healthy Activity & Sleep: A Pilot Study. University of Minnesota School of Nursing Research Day, April 2017; Minneapolis, Minnesota. [OEHN faculty presentation.]

Porta C. Global Health Case Competition: How to be an excellent faculty coach. University of Minnesota, Center for Global Health and Social Responsibility, Case Competition Faculty Training Workshop. Minneapolis, Minnesota, January 2017. [OEHN faculty presentation]

2016

Graeve C. Necessary Drugs, Unnecessary Consequences: An Intervention to Protect Healthcare Workers from Exposure to Chemotherapy. American Nurses Association Annual Conference. March 2016; Orlando, FL. [OEHN PhD student presentation from her dissertation; Dr. McGovern was Ms. Graeve's Dissertation Advisor.]

McGovern PM. PubH 6130 Occupational Medicine (Invited guest lecture). Occupational Health Disparities. School of Public Health, University of Minnesota; April 2016; Minneapolis MN. [OEHN Faculty presentation and facilitated discussion.]

McGovern PM. (Invited presentation) Paid Family and Medical Leave: What's Health Got to Do with It? Colorado Center for Health, Work and Environment, Colorado School of Public Health; October, 2016; Aurora, Colorado.

McGovern PM and **Mandel J.** (Invited guest lecture). Occupational Health and Safety Policies and a Case Study of Taconite Miners and Investigation of Exposures to Elongated Mineral Particles. Presented in PubH 8801 Health Services Policy Analysis Theory; October 2016; Minneapolis, Minnesota.

McGovern PM and Stepanov, I. (Invited presentation) Manganese: Biomarkers of Exposure and Infant Brain Development. Minnesota Department of Health, Non Community Public Water Supply and MDH Planners; October 2016; Rochester, MN.

Porta (Garcia) (Invited presenter). Commonalities among chickens, university students, and big (and little) ponds. Interdisciplinary Global Health hosted by the Center for Global Health and Social Responsibility. March 2016. St. Paul, Minnesota. [OEHN faculty presentation]

Porta C (Invited presenter). Effective interviewing techniques in the field with infectious disease prevention stakeholders and community members. University of Rwanda One Health Student Club Field Attachment Training; August 2016; Nyagatare, Rwanda. [OEHN faculty presentation]

Klein R, Abraham J, Dowd B, Gerberich S, Mandel J, and McGovern P. *Evaluating Paid Sick Leave in American Workers: Health and Work-Absence Effects.* Poster presented at the Population Association of America Conference; March 2016; Washington D.C. [OHSRP trainee dissertation-related presentation. Dr. McGovern was Mr. Klein's dissertation advisor and OHSRP/OEHN faculty. Other faculty included Drs. Abraham and Dowd (OHSRP faculty) and Drs. Gerberich (OIP faculty) and Dr. Mandel (former OEM Program Director) were Mr. Klein's dissertation committee members.]

2015

Porta (Garcia) C. (Invited presentation) with L Zhang, B Peterson. TXT U L8R: Teens' Texts on Moods, Sleep and **Parents!** University of Minnesota, School of Nursing Research Day; April 2015; Minneapolis, Minnesota.

Graeve C. Necessary Drugs; Unnecessary Exposures an Intervention to Protect Oncology Healthcare Workers. University of Minnesota School of Public Health Research Day. March 2015. Minneapolis, MN.

McGovern PM. Occupational and Environmental Medicine Grand Rounds Seminar, Invited Guest Research Seminar (Total Worker Health for New Mothers), HealthPartners Occupational and Environmental Medicine Residency Program; October 2015; St. Paul, Minnesota.

Appendix C

Selected Outreach and Continuing Education Activities

OEHN student and alumni names are underscored.
OEHN Key and supporting faculty, alumni and staff names are in **bold** font.

Educational Development

1. Annual NORA symposium

Faculty and staff from the MCOHS and the Upper Midwest Center for Agricultural Safety and Health (UMASH) annually collaborate to produce to facilitate the *Annual NORA Symposium*. Audiences (n ~ 50-150) representing center program students, faculty staff, advisory board members, and numerous community and regional partners. Included, in this event, is a poster session involving 20-40 student/faculty contributions associated with their research efforts. **Dr. McGovern** has worked closely with **Dr. Ramirez**, **Dr. Gerberich**, MCOHS Director and **Dr. Alexander**, UMASH Director, and **Julie Alcorn-Webb**, MPH, Continuing Education Program Director and Centers for Public Health Education and Outreach staff to develop and host programs as noted below. The NORA symposium is also available as an online video. (See: <http://www.mcohs.umn.edu/nora-symposium/>).

“Productive Aging and Work: Creating an Age-Friendly Workplace,” featuring James Grosch, PhD – Senior Research Psychologist and Co-Director of the Center for Productive Aging and Work at the National Institute for Occupational Safety and Health (NIOSH). **April 20, 2020. Dr. McGovern** was the session moderator.

“Stressed Out from Work: An Occupational Hazard,” featuring a panel presentation including: Doris Mold, President of Sunrise Agricultural Associates, LLC and Sunrise Farm primary; Dr. Stacy Holzbauer, a veterinarian and currently a Commander in the U.S. Public Health Services and serves as a CDC Career Epidemiology Field Officer assigned to the Minnesota Department of Health; and Joe Meuwissen, Fire Peer and Mental Health Professional, Metro Critical Incident Stress Management Team, **May 2, 2019. Dr. McGovern** was a discussant for this panel.

“Workplace Harassment: Ensuring Respect, Combating Harassment, and Improving Organizational Performance.” Featured speaker and international expert: Fran Sepler, President, Sepler & Associates, May 3, 2018.

“Prescription Opioid Use in Occupational Health Care: Reducing Risk and Improving Safety.” Featured speaker: Thomas Wickizer, PhD, Chair and Stephen F. Loeb Professor, The Ohio State University College of Public Health, **May 5, 2017.**

“Critical Challenges Facing Occupational Health and Safety – Today and Tomorrow.” Featured speaker: John Howard, MD, MPH, JD, LLM, Director of the National Institute for Occupational Safety and Health (NIOSH), **May 4, 2016.**

“Total Worker Health: Why You Should Build a Program in Total Worker Health and How to Do It.” Featured speaker: W. Kent Anger, PhD, Senior Scientist, Associate Director for Applied Research and Professor, Oregon Health & Science University (OHSU), **May 6, 2015.**

2. Online modules

Dr. McGovern has partnered with Instructional Designer and Consultant, **Krista Johansen Diederich, MS** to create online modules for blended learning in academic classes such as the interdisciplinary “Introduction to Occupational Health and Safety Class,” (PubH 6170), “Topics in Environmental Health: Science, Politics and Policy,” (PubH 6100) and “Environmental and Occupational Health Policy” (PubH 6105). We are also collaborating with **CE and Outreach Program Director, Julie Alcorn Webb, MPH**, to adapt these modules for Continuing Education. Modules that have been created include the following:

2019-2020

- “Hazard Recognition,” by **Kim Anderson, PhD**, Assistant Professor, Industrial Hygiene Program, Division of Environmental Health Sciences, School of Public Health, University of Minnesota.
- “Occupational Exposure Limits,” by **Susan Arnold, PhD, CIH**, Associate Professor, Industrial Hygiene Program, Division of Environmental Health Sciences, School of Public Health, University of Minnesota.
- “Minnesota OSHA Consultation and Ergonomics in the Workplace,” by Breca Tschida, MS, CIH, CPE, MNOSHA Workplace Safety Consultation.

2018-2019

- “Sleepers: The Complex Relationship American Truck Drivers have with Sleep,” by Sarah Moon, MPH
- “Business Skills for Occupational Professionals,” by **Lucy Carlson RN, MPH/MS, COHN-S/CM**, Occupational Health Manager, 3M Medical Department
- “Occupational Health in the Veterans Administration,” by **Steven Kirkhorn, MD, MPH**, MCOHS Academic Program Director, OEM Residency Program.
- “The Americans with Disabilities Act: How Do You Determine If An Individual Has A Disability as Defined By The ADA,” **David Cossi, JD, MS**, Affiliate Faculty, Environmental Health Sciences, School of Public Health.
- “Integrated Approaches Supporting Healthy Work: Total Worker Health,” by **Tamara Schult, PhD, MPH**, OHSRP Alumna and Research Data Analyst, VHA Employee Health and Well-being Program
- “Workers’ Compensation,” and “Opioids and Occupational Health Providers,” by Beth Baker, MD, MPH, Medical Consultant, Specialists in OEM, St. Paul, MN.

2017-2018

- “Policy and the Judicial Process: The American’s with Disabilities Act,” by **David Cossi, JD**, Adjunct Assistant Professor, Division of Environmental Health Sciences, School of Public Health, University of Minnesota, Minneapolis MN.
- “An Introduction to One Health,” by **Dr. Bruce Alexander**, Professor (Co-Director, OEI and former Division Head, Environmental Health Sciences and 3) “Zika Virus: Uncertain Actions and Policies,” by Richard Danila, PhD, MPH, Epidemiology Program Manager, and Deputy State Epidemiologist, Minnesota Department of Health.
- “Zika Virus: Uncertain Actions and Policies,” by Richard Danila, PhD, MPH, Epidemiology Program Manager, and Deputy State Epidemiologist, Minnesota Department of Health

2016-2017

- “Nanotechnology and Chemicals in the Workplace---A Perspective on Oversight,” by **Gurumurthy Ramachandran, PhD**, former Professor and Director of Industrial Hygiene, MCOHS.
- “Family and Medical Leave Policies and the Political Process,” by **Pat McGovern, PhD**, Professor Program Director of OEHN and OHSRP Training Programs.
- “Ensuring Safe Drinking Water and Promoting Environmental Health Literacy,” co-taught by Tannie Eshenaur, MPH, Planning Director, Drinking Water Protection and Deanna Scher, PhD from the Environmental Surveillance and Assessment Unit; Minnesota Department of Health.

2015-2016

- “Health Policy and Challenges Regarding Ebola that included issues of healthcare worker protection,” by Richard Danila, PhD, MPH, Epidemiology Program Manager, Minnesota Department of Health.
- “Risk Communication,” that featured Tannie Eshenaur, MPH, Planner, Minnesota Department of Health, St. Paul, Minnesota.

3. Curriculum Development and Outreach

Dr. McGovern collaborated with Dr. Betsy Wattenberg (risk assessment and toxicology) from the Division of Environmental Health Sciences to design and implement a two-day faculty development workshop, “Developing a Strategic Communications Plan in Public Health,” for approximately 55 interdisciplinary faculty

from throughout India at Jamia Millia Islamia (JMI) University in Delhi, India in January 2019. The faculty used this platform for teaching case examples from occupational and environmental health. They adapted the workshop content for use in environmental health classes initially in Environmental Health Science, Politics and Policy (PubH 6109), and in the online version of issues in Environmental and Occupational Health (PubH 6102) which is required for all students in the School of Public Health. Associated with this event, Dr. McGovern provided mentoring to a junior faculty member related to research and career development and her application for a tenured faculty position. The curriculum from the two day workshop was adapted and integrated in the online version of PubH 6102, Environmental and Occupational Health Issues (2 credits) which is required for all MPH students in the School of Public Health and is taught by Dr. Elizabeth Wattenberg, Associate Dean for Education, School of Public Health, University of Minnesota.

4. Presentations/Lectures/Awareness Seminars

- **McGovern PM.** Health Disparities, Health Equity and Occupational Health. (Invited Guest Lecture). Occupational Medicine: Principles and Practice, PubH 6130, University of Minnesota School of Public Health, Minneapolis, Minnesota, April 2020, March 2019, April 2018.
- **Cossi DA, McGovern PM, Porta C.** (Invited Panel Presentation) Sexual Harassment Law and Implications for Nurses. Invited presentation. Master of Nursing Student Council, School of Nursing, University of Minnesota. Minneapolis, Minnesota, March 2019.
- **McGovern PM** provides an invited guest lecture, "Introduction to Occupational and Environmental Health Nursing," in undergraduate nursing classes at St. Catherine's University School of Nursing and Metropolitan State University School of Nursing at least annually. She developed an online module, "Introduction to Occupational and Environmental Health Nursing." for distribution to interested Schools of Nursing and the MCOHS Continuing Education Program, 2018.
- Scher D and **McGovern PM.** (Invited presentation). Manganese: an Overlooked Drinking Water Containmentment and the Potential for Child Development Risks. Minnesota Environmental Health Association, Rochester, Minnesota, October, 2018.
- **McGovern PM,** Stepanov I. Manganese, Biomarkers of Exposure and Infant Brain Development (Invited Presentation). Minnesota Department of Health, Environmental Health Tracking and Biomonitoring Program. St. Paul, Minnesota, October 2017.
- **McGovern PM.** "Results from the Minnesota Department of Health Environmental Tracking and Biomonitoring Program and Proposed Priorities for 2017." (Invited presentation) Minnesota Legislative Hearing, St. Paul, Minnesota, March 2016.
- **McGovern PM.** Total Worker Health for New Mothers. Occupational and Environmental Medicine Grand Rounds, HealthPartners Clinic, St. Paul, Minnesota, October, 2015.

5. Consultations

- **Dr. McGovern** consulted with Northwestern University and the Social, Emotional and Behavioral Domain Team and the Health Measurement Network, to develop measures of parental and child health for the National Institute for Child Health and Human Development, Bethesda, Maryland, May 2013-2015.

6.a Other: Partnerships for Research to Practice and Outreach

Minnesota Department of Health and the Minnesota Board of Cosmetology

MCOHS faculty (OEHN and OHSRP Program Director, **Dr. McGovern**, Industrial Hygiene Program Faculty, **Dr. Arnold** and **Dr. Anderson**) and OHSRP PhD student, Jennifer Saunders are collaborating with the MN Department of Health Industrial Hygienist, Kathy Norlien, MS and the Minnesota Board of Cosmetology on a various research projects investigating: risk factors for health and safety, exposure assessment, precarious employment, engineering controls and use of and use of personal protective equipment among licensed cosmetologists, nail technicians and estheticians. Study findings will contribute to the scientific literature and inform recommendations to the MN Board of Cosmetology regarding the content of continuing education

designed to increase awareness of risk factors for occupational injury and illness and protective strategies. This information will be developed into curriculum and classes that will be required for renewal of workers' professional licenses in a population of ~35,000 members.

Minnesota Department of Health

MCOHS faculty (OHSRP Program Director, Dr. McGovern and OHSRP PhD student, **Jennifer Saunders** are also collaborating with the MN Department of Health Industrial Hygienist, Kathy Norlien, MS and using data from the Behavioral and Risk Factor Surveillance System dataset to examine the association between the occupation of salon professionals and unmet health care needs.

Minnesota Department of Labor and Industry (MN DLI):

Dr. McGovern (PI) and **Dr. Ramirez** (Co-PI, **Andy Ryan**, Senior Research Fellow, MCOHS and Dr. Katie **Schofield**, Assistant Professor, University of Minnesota, Duluth, and Mr. David Cossi, JD, Affiliate Faculty, Division of Environmental Health Sciences, and OSHRP PhD student, Adam Moskowitz, worked with the MN Department of Labor and Industry (MNDLI) to develop a study to address a state legislative inquiry about the safety of lowering the minimum age in construction from 18 to 16 years. We investigated national and state fatal and nonfatal injuries in construction in association with demographics and other factors. Federal and state child labor laws were analyzed and applied to the policy question. Study findings were integrated into a final report for the state legislature in January 2020 that was written by the Commissioner and the Director of Legislative Affairs, MN Department of Labor and Industry.

6.b Other: Professional Services

- **Dr. McGovern** participates in the NIOSH's Healthy Work Design and Well-Being Cross-Sector Council and assisted with the efforts to define priorities for the next decade of NORA, 2017-current
- **Dr. McGovern** serves on the Nominating Committee for the Minnesota Association of Occupational Health Nurses (MAOHN). In this role she assists in identifying practicing OHNs who might benefit from professional development opportunities and serve the organization's members in a variety leadership roles, 2017-current.
- **Dr. McGovern** served as a peer reviewer for the NIOSH Competing Continuing ERC Applications, February 2018.
- **Dr. McGovern** served as Chair, Advisory Panel, Environmental Health Tracking and Biomonitoring Program, Minnesota Department of Health, 2013-2018.
- **Dr. McGovern** participated as a member of the Interdisciplinary Advisory Committee, NIH Building Interdisciplinary Research Careers in Women's Health (BIRCWH) K12 training grant, University of Minnesota, 2014-2016.
- **Dr. McGovern** served as a member of the Scientific Advisory Board for the Deborah E. Powell Center for Women's Health, University of Minnesota Medical School, Minneapolis, Minnesota, 2013-2016.

**Table 1. Academic Training Report July 1, 2015 – June 30, 2020¹
 Occupational and Environmental Health Nursing**

Degree Awarded	How Does Degree Read?	Total # Applicants to Degree Program	Total # Applicants Admitted to Degree Program	Total # Under Represented Minority Applicants Admitted	# Full-Time Students Enrolled²	# Full-Time NIOSH-Supported Trainees	# Part-Time Students Enrolled²	# Part-Time NIOSH-Supported Trainees	# Trainees Graduated During Reporting Period
Master's degree ³									
	Master of Public Health	8	8	0	2	2	13	10	9
	Master of Science	1	0	0	0	0	0	0	0
Doctorate degree									
	Doctor of Philosophy in Environmental Health	3	0	0	1	1	1	1	2
Post-doctoral									
Certificate Program									

¹ Reporting period for renewals is from the start date of prior competing award. New applicants should report past five years.

² Full-time and part-time students should include all students in approved programs, regardless of source of support.

³ OM residents may be double-counted under Masters degree training and post-doctoral training.

Table 2. Trainees and Graduates Supported July 1, 2015 – June 30, 2020¹
Occupational and Environmental Health Nursing

Trainees				Graduates				
Trainee ID, Year of Entry, Prior Degree & Institution, (Current Academic Advisor or Mentor and Department). Identify Under Represented Minority with (URM).	OM Trainees: Previous Residency Training Specialty	Title of Research Project or Research Topic	Degree Program (MS, MPH, PhD, DrPH, etc.)	Date Degree or Certificate Awarded (mm/yyyy)	Date of Certificate for OM (mm/yyyy)	Employed in OSH Field or in OSH Advanced Study (Y/N)	Current Employer	Current Position
100206, 2002, Bachelors, Concordia College, (P McGovern, Division of Environmental Health Sciences)		Culminating Experience: A Career Portfolio	MPH	10/2016		N	Centracare Health, St. Cloud, MN	Director, Infection Prevention and Control; Occupational Health and Safety Consultant
100313, 2010, Masters, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		Protecting the Protectors: Violence-Related Injuries to Hospital Security Personnel and the Use of Conducted Electrical Weapons	PhD	04/2017		Y	Hennepin Health, Minneapolis, MN	Director, Occupational Health, Jail Health Services and Community Flu Vaccination Program
100342, 2012, Bachelors, University of Nevada, (P McGovern, Division of Environmental Health Sciences)		Association of Employment and Quality of Life among Hemodialysis Patients	MPH	05/2017		N	University of North Dakota, Grand Forks, ND	Graduate Student in Family Nurse Practitioner Program
100349, 2012, Bachelors, Saint		An Evaluation of the Customs and Border	MPH	05/2019		Y	US Customs and Border Protection,	Lead Chief Operating

Catherine University, (P McGovern, Division of Environmental Health Sciences)		Protection Patrol Frontline Medical Program					Front Line Medical Program	Officer Initiative
100286, 2012, Masters, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		Necessary Drugs, Unnecessary Exposures: An Intervention to Protect Oncology Healthcare Workers	PhD	06/2016		Y	St. Catherine's University, School of Nursing, St. Paul, MN	Associate Professor
100367, 2013, Bachelors, Minnesota State University - Mankato, (P McGovern, Division of Environmental Health Sciences)		Career and Education Portfolio and successful completion of the American Board for Occupational Health Nurses (ABOHN) Certification Exam (COHN-S)	MPH	08/2017		Y	New Ulm Medical Center, Allina Health, New Ulm, MN	Employee /Occupational Health Nurse Coordinator
100368, 2014, Bachelors, Saint Olaf College, (P McGovern, Division of Environmental Health Sciences)		Career and Education Portfolio and successful completion of the ABOHN Certification Exam (COHN-S)	MPH	05/2017		Y	Health Partners, Occupational & Environmental Medicine Division, St. Paul, MN	Senior Manager
100369, 2014, Bachelors, Metropolitan State University, (P McGovern, Division of Environmental Health Sciences)		<i>Discontinued after one semester</i>	MPH					
100380, 2015, Masters, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		Occupational and Environmental Health Nursing: Career and Education Portfolio	MPH	12/2017		Y	University of Minnesota, School of Public Health, Minneapolis, MN	Education Program Specialist 3, Director of Continuing Education
100389, 2015, Bachelors, Bethel University, (P		Career and Education Portfolio	MPH	07/2018		Y	Health Partners, Occupational & Environmental	Clinic Manager

McGovern, Division of Environmental Health Sciences)		and successful completion of the American Board for Occupational Health Nurses, Inc., (ABOHN) Certification Exam (COHN-S)					Medicine Division, St. Paul, MN	
100408, 2016, Bachelors, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		Acceptability of a New Questionnaire for VHA VISN 23 Occupational Health's Hazardous Drugs Medical Surveillance: Pilot Study Findings	MPH	08/2019		Y	Minneapolis Veterans Administration Healthcare System	Occupational Health Nurse Practitioner
100415, 2017, Bachelors, Metropolitan State University, (P McGovern, Division of Environmental Health Sciences)		Graduate Occupational Health Nurses Self-Perception in Relation to Core Competencies: Results of an Alumni Survey	MPH	07/2019		Y	Health Partners, St. Paul, MN	Senior Workers Compensation Case Manager
100435, 2019, Bachelors, College of Saint Scholastica, (P McGovern, Division of Environmental Health Sciences)		To be determined	MPH					
100436, 2019, Bachelors, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		To be determined	MPH					
100437, 2019, Bachelors, Minnesota State University, (P McGovern, Division of		To be determined	MPH					

Environmental Health Sciences)								
100438, 2019, Bachelors, Iowa State University, (P McGovern, Division of Environmental Health Sciences)		To be determined	MPH					
100439, 2019, Bachelors, Minnesota State University, (P McGovern, Division of Environmental Health Sciences)		To be determined	MPH					

¹ List all NIOSH supported trainees and graduates by year of entry. Reporting period for renewals is from start date of prior competing award. New applicants should report last five years.

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE (OEM)
ACADEMIC TRAINING AND RESIDENCY PROGRAM

Academic Program Director: Steven Kirkhorn, MD, MPH
Residency Director: Ralph Bovard, MD, MPH

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE RESIDENCY (OEMR)

1. Background

Rationale, history, objectives: The Occupational and Environmental Medicine Residency Program (OEM) is one of the oldest continually certified residency programs in the country, with a distinguished history in the field of occupational, environmental and preventive medicine. OEM is a core program of the Midwest Center for Occupational Health and Safety (MCOHS), situated in the Division of Environmental Health Sciences (EnHS), School of Public Health (SPH), University of Minnesota (UMN) School, and is an integral component of interdisciplinary training. Initially accredited in 1978, OEM has graduated 94 residents, many of whom have followed illustrious careers in academics, industry, and clinical practice. OEM is fully accredited through the HealthPartners Institute and currently certified by American Council of Graduate Medical Accreditation (ACGME) through 2025. The innovative partnership between HealthPartners Medical Group and the UMN SPH is a collaboration that provides rigorous academic training in an accredited school of public health and outstanding clinical training through a community-based health care institute. The purpose of the OEM is to prepare the future workforce of OEM physicians for the region and nationwide.

The OEM academic program, housed administratively within the UMN SPH, provides a robust scholarly experience for residents and staff. Students are trained in public health science applied to occupational illnesses and injuries through a suite of courses that include basic public health core courses, and specialty curriculum in Occupational Safety and Health (OSH). In addition, during the academic year, OEM residents interact regularly through classroom work and field projects with students and faculty from the other MCOHS programs, including Occupational and Environmental Health Nursing (OEHN), Industrial Hygiene (IH), Occupational and Environmental Epidemiology (OEE), Occupational Health Services Research and Policy (OHSRP), and Occupational Injury Prevention (OIP) program students. The residency training provides rotations and mentoring in clinical Occupational and Environmental Medicine (OEM) for the OEHN nurses. They also contribute to discussions of the clinical implications from work exposures during interdisciplinary classes and field work such as *Introduction to Occupational Health and Safety* (PubH 6170) and *Interdisciplinary Evaluation of Occupational Health and Safety Field Problems* (PubH 6150). These complementary experiences are crucial in providing an interdisciplinary approach to occupational health and safety knowledge and skills and to provide appropriate training for clinicians to improve worker health and safety. Residents complete an MPH academic program during the academic year and complete a high-quality written paper to be submitted for publication in a peer-reviewed journal.

With the recent closing of the University of Iowa OEM program, the MCOHS OEM is the only training site for OEM residents in the upper Midwest, which includes our designated service region of Minnesota, North Dakota, South Dakota, and Wisconsin. There are only three remaining OEMR programs in the Midwest: Minnesota, Illinois, and Ohio. National estimates suggest preventive / OEM deficits in the range of 3100-5500 physicians, nationally. Yet, existing programs throughout the U.S. supply around 120 graduates annually. The OEM program is accredited for two residents a year. The CDC-NIOSH funding in combination with the HealthPartners funding currently allows for training two residents per year which has been stable since the beginning of the OEM.

The present job market is vigorous with greater demand for occupational medicine physicians than there are available graduates. Over the lifespan of the program, OEM residents have: acquired OEM positions in Minnesota and throughout the United States; served in academic roles; provided medical directorships to Fortune 500 and smaller companies; and provided multi-faceted leadership roles in addressing the OHS needs. CDC-NIOSH funding is critical in continuing to meet the regional and national deficit.

This program seeks residents to fulfill a broad vision of the role of the modern OEM physician in America and the international public health arena. OEM embraces the Quadruple Aim¹ mission of working to improve the health of the population, enhance the experience and outcomes of the patient, enhance healthcare to provide wellness, and reduce the cost of care for the benefit of our community. Many of the residents come to Occupational Medicine from other subspecialties to address a desire to have a greater influence in primary prevention and population health. The opportunity to work in corporate, government, academic, and clinical

practice as a medical executive and healthcare innovator allows the OEM physicians to influence the direction of occupational and environmental medical practice. The OEM mission is to provide residents with a rigorous educational experience that prepares them to be thought leaders, physician educators, and medical directors in the fields of occupational, environmental, and preventive medicine.

2. Past Performance / Accomplishments from July 1, 2015 – June 30, 2020

Highlights. Graduation rates in the program have been exemplary. Of 14 residents supported by the grant during this reporting period, 12 have completed the program and two have entered the PGY3 year. Both Dr. Briggs and Dr. Rushing, each of who began the program July 2019, completed their master's completion projects and all course work successfully and graduated with their MPH this summer. Of the two OEM residents who just completed their PGY-3 year, both have accepted Occupational Health staff positions in the Twin Cities. Dr. Starchook-Moore completed her master's project in Quality control of DOT exams in a large multi-state company and will be submitting the paper for publication. Dr. Doss did not need to complete a MPH due to having completed two previously completed master's degrees but finished all course work required to sit for the Occupational Medicine boards. Of those graduating, ten residents have taken positions in OEM specialty practice. Dr. Gitnacht completed boards in OEM, then completed a sleep medicine fellowship, focusing in that specialty, and now intends to be a resource for obstructive sleep apnea in commercial truck drivers. Dr. Ciagne has elected to resume an outpatient surgical specialty after several years in an OHS position. Dr. Sellman has taken the position of both Clinical Medical Director of HealthPartners Occupational and Environmental Medicine and Regions Medical Center Employee Health Medical Director. Dr. Reister combines an Occupational Medicine Practice with the Mayo Clinic in two southern Minnesota communities with a research position with Mayo Clinic in Rochester. Dr. McKinney has assumed the Clinical Research Director position of the OEM residency in the HealthPartners Institute and has received funding for clinical research; he has assumed the position of Editor of Minnesota Medicine, the official publication of the Minnesota Medical Association and is President-elect of CSOEMA. The diversity selection of OEM residents has been successful and achieved 40% (4/10) of Under Represented Minority (URM) applicants, and 33% (4/12) admitted females. Dr. Nakhasi, an incoming PGY-2 OEM resident represents both URM and female categories. The OEM graduates have achieved a 100% pass rate among those who have taken the ABPM Occupational Medicine Boards. Since July 2015, 43 peer-reviewed papers have been published (Appendix C). Of note is a publication on large agricultural machinery related injuries in the MCOHS region (Journal of Occupational and Environmental Medicine in 2016) generated from an OEM resident's thesis in collaboration with Drs. Mandel (OEE) and Gerberich (OIP) that assessing.² During the same time period, over 250 presentations by OEM Program faculty and residents have been made within the residency program, at professional conferences, and at other Educational Research Centers (Appendix C). Faculty have also conducted outreach activities including professional service and leadership contributions to professional and community organizations, media communications on occupational and environmental topics, and health impact assessments (Appendix C).

The OEMR received a \$50,000 Regions RED (Research Education Development) grant to study ethnic inequality and health disparities in the OEMR clinical population. This resulted in several posters, research awards, and a major departmental publication.³ The activity involved faculty and residents and demonstrates the scholarly activity that can arise from clinical experience with opportunities to address significant minority OHS challenges.

3. Program Deliverables

The OEM program successfully achieved ACGME accreditation in 2015 for ten years. It has also met the goal of graduating occupational medicine physicians who have successfully become occupational and health safety professionals. All the residents have completed the program except the two current residents who began the PGY2 year in July 2019. Of those OEM residents who completed in the program, since 2015, eleven have successfully defended their MPH theses and completed the program. The two residents completing their PGY-2 year have both successfully defended their theses just before entering their PGY-3 year. The remaining OEM resident did not require a MPH due to completing other master's degrees but did successfully complete the program. The last twenty residents who sat for the ABPM Occupational Medicine Boards had a 100% pass rate.

Of the twelve residents who graduated in the last cycle, ten (83%) acquired positions in occupational medicine in outstate Minnesota and the Twin Cities metropolitan and suburban areas and provide OHS services to a diverse occupational workforce. The program has consistently filled the four positions that are funded for the two-year program. The OEMR residency has also successfully trained and recruited occupational medicine residents who have been promoted to faculty and leadership roles (Drs. Zeke McKinney, Andre Montoya-Barthelemy, and Jonathon Sellman). The program has also worked to diversify and has consistently met at least a 40% diversity enrollment for OEMR residents of female status and of color registration.

OEMR residents have represented MCOHS in national (ACOH) and regional (CSOEMA) conferences by presenting results of clinical work and grants. Recruitment of high-quality OEM residents has been accomplished in outreach through conferences and marketing by educational conferences. This has been successful in recruiting residents from other training programs, such as surgery and anesthesiology, as well as boarded specialists in other medical specialties (infectious disease). Other outreach has been directed towards medical students by offering presentations and short rotations. Emergency Preparedness training for OEM

APPENDIX A
OCCUPATIONAL MEDICINE RESIDENCY PROGRAM
Selected Multidisciplinary Publications
July 15, 2015-June 30, 2020

(Student names are underscored and faculty names are in bold font).

2020

Montoya-Barthelmy AG, Lee CD, Cundliff DR, Smith EB. COVID-19 and the correctional environment: the American prison as a focal point for occupational health. *Am J Prev Med.*2020; 58(6):888-91. PMID 32387174

2019

Kirkhorn S. Industry Specific Pearls, Agriculture. In: *Occupational Medicine, A Basic Guide*. Lee LP and DW Martin. Ed., American College of Occupational Medicine and Environmental Medicine.

2019. <https://ohguides.acoem.org/08-industry-specific-pearls-agriculture/>

Montoya-Barthelemy, A. [Feb 2019] The Occupational Health of Prison Inmates: An Ignored Population and an Opportunity. *J Occup Environ Med.* 2019; 61(2):e74-e76 .PMID 30730505

Riester SM, Leniek KL, Niece AD, Montoya-Barthelemy A, Wilson W, Sellman J, **Anderson P**, **Bannister E**, **Bovard R**, Kilbride K, **Koos K**, Kim H, McKinney Z, **Abarr A**. Occupational medicine clinical practice data reveal increased injury rates among Hispanic workers. *Am J Ind Med.* 2019; 62(4):309-316. doi:10.1002/ajim.22949. PMID 30697792

2018

Ludka-Gaulke T, Ghera P, Waring SC, ... **Kirkhorn, S**. Farm exposure in early childhood is associated with a lower risk of severe respiratory illnesses. *J Allergy Clin Immunol.* 2018; 141(1):454-456.e4. doi:10.1016/j.jaci.2017.07.032. PMID 28870458

2017

Anderson PJ, **Bovard RS**, Murad MH, Beebe TJ, Wang Z. Health status and health behaviors among citizen endurance Nordic skiers in the United States. *BMC Res Notes.* 2017; 10(1):305. Published 2017 Jul 24. doi: 10.1186/s13104-017-2619-4. PMCID: PMC5525345; PMID: 28738884

Eaton JL, Mohammad A, Mohr DC, Brustein DJ, **Kirkhorn SR**. Occupational medicine specialist referral triggers: Mixed-methods analysis of teleconsult cases. *Occup Med (Lond).* 2017; 67(9):718-721. doi:10.1093/occmed/kqx158

Feigenson M, Shull LC, Taylor EL, et al. Histone Deacetylase 3 Deletion in Mesenchymal Progenitor Cells Hinders Long Bone Development. *J Bone Miner Res.* 2017; 32(12):2453-2465. doi:10.1002/jbmr.3236. PubMed PMID: 28782836

Mamo T, Mladek AC, Shogren KL, ... Riester SM et al. Inhibiting DNA-PK_{CS} radiosensitizes human osteosarcoma cells. *Biochem Biophys Res Commun.* 2017;486(2):307-313. doi:10.1016/j.bbrc.2017.03.033. PubMed PMID: 28300555; PubMed Central PMCID: PMC5489116

Hwang J, **Ramachandran G**, **Raynor PC**, **Alexander BH**, **Mandel JH**. A comprehensive assessment of exposures to respirable dust and silica in the taconite mining industry. *J Occup Environ Hyg.* 2017; 14(5):377-388. doi:10.1080/15459624.2016.1263392. PMID: 28388309

McKinney ZJ. The merits of MIIC. *Minn Med*. 2017; 100(3): 20-22. PMID: 30452133

McKinney, Z., Ciagne, M., Swan, J., Parker, D. Initially Missed Diagnosis of Quadriceps Partial Tendon Tear (Case Report); *JUCM*. 2017; 11; 4.

Morrey ME, Abdel MP, Riester SM, et al. Molecular landscape of arthrofibrosis: Microarray and bioinformatic analysis of the temporal expression of 380 genes during contracture genesis. *Gene*. 2017; 610:15-23. doi:10.1016/j.gene.2017.01.025. PubMed PMID: 28167142

Riester SM, Denbeigh JM, Lin Y, et al. Safety studies for use of adipose tissue-derived mesenchymal stromal/stem cells in a rabbit model for osteoarthritis to support a Phase I Clinical Trial. *Stem Cells Transl Med*. 2017; 6(3):910-922. doi:10.5966/sctm.2016-0097. PubMed PMID: 27798372

Swan J, **Bovard RS**, McKinney ZJ. An Uncommon Mechanism of Work-Related Partial-Thickness Triceps Tear. *JUCM*. March 2017 (Case Report). Accessed 09/03/2020 at: <https://www.jucm.com/uncommon-mechanism-work-related-partial-thickness-triceps-tear/>

Shi C, Qiu S, Riester SM, Das V, Zhu B, Wallace AA, van Wijnen AJ, Mwale F, Iatridis JC, Sakai D, Votta-Velis G, Yuan W, Im HJ.[Sep 2017]. Animal models for studying the etiology and treatment of low back pain. *J Orthop Res*. doi: 10.1002/jor.23741. [Epub ahead of print] Review. PubMed PMID: 28921656

Swan JR, Baker R, McKinney ZJ. An Uncommon Mechanism for Work-Related Total Achilles Tendon Rupture. *JUCM*. 2017; Apr.(Case Report). Accessed on 09/03/2020 at <https://www.jucm.com/uncommon-mechanism-work-related-total-achilles-tendon-rupture/>

Vega OA, Lucero CMJ, Araya HF, Riester SM, et al. Wnt/ β -Catenin signaling activates expression of the bone-related transcription factor RUNX2 in select human osteosarcoma cell types. *J Cell Biochem*. 2017;118(11):3662-3674. doi:10.1002/jcb.26011. PubMed PMID: 28370561

2016

Anderson P, Bovard R, Murad M, Beebe T, Wang Z. [Jun 2016] A Survey of Social Support for Exercise and its Relationship to Health Behaviors and Health Status among Endurance Nordic Skiers. *British Medical Journal (BMJ)* 6 (6:e010259 doi: 10.1186/s13104-017-2619-4.

Anderson PJ, Bovard RS, Wang Z, Beebe TJ, Murad MH. A survey of social support for exercise and its relationship to health behaviors and health status among endurance Nordic skiers. *BMJ Open*. 2016; 6(6):e010259. Published 2016 Jun 23. doi: 10.1136/bmjopen-2015-010259. PMID: 27338876

Baltzer HL, Riester S, Moran SL. Bilateral Legg-Calve-Perthes Disease and Kienbock's Disease in a Child with Factor V Leiden Thrombophilia: A Case Report. *Hand (N Y)*. 2016; 11(3):NP16-NP19. Doi: 10.1177/1558944715627274. PubMed PMID: 27698645

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Camille ET, Gustafson MP, Dudakovic A, Riester SM, et al. Identification and validation of multiple cell surface markers of clinical-grade adipose-derived mesenchymal stromal cells as novel release criteria for good manufacturing practice-compliant production. *Stem Cell Res Ther*. 2016; 7(1):107. doi: 10.1186/s13287-016-0370-8. PubMed PMID: 27515308

Campo RA, **Leniek KL**, Gaylord-Scott N, et al. Weathering the seasons of cancer survivorship: mind-body therapy use and reported reasons and outcomes by stages of cancer survivorship. *Support Care Cancer*. 2016; 24(9):3783-3791. doi: 10.1007/s00520-016-3200-8. PMID: 27048456

Dudakovic A, Camilleri ET, Riester SM, et al. Enhancer of Zeste Homolog 2 Inhibition Stimulates Bone Formation and Mitigates Bone Loss Caused by Ovariectomy in Skeletally Mature Mice. *J Biol Chem*. 2016; 291(47):24594-24606. doi:10.1074/jbc.M116.740571. PubMed PMID: 27758858; PubMed Central PMCID: PMC5114411

Harrison MF, **Anderson PJ**, Johnson JB, Richert M, Miller AD, Johnson BD. [Acute Mountain Sickness Symptom Severity at the South Pole: The Influence of Self- Selected Prophylaxis with Acetazolamide.](#) *PLoS One.* 2016 11(2):e0148206. doi: 10.1371/journal.pone.0148206. PMID: 26848757

McKinney ZJ, Alley EM, Weinhaus AJ. Remarkable case of uncorrected type IC tricuspid atresia with adaptive pulmonary trunk dilatation to allow prolonged survival: Case report and CT fly-through. *Translational Research in Anatomy*, 2017; 7: 5-11.

Lambert CS, **Alexander BH**, **Ramachandran G**, et al. A case-control study of mesothelioma in Minnesota iron ore (taconite) miners. *Occup Environ Med.* 2016; 73(2):103-109. doi:10.1136/oemed-2015-103105. PMID 26655961

Lin Y, Lewallen EA, Camilleri ET, ... **Riester SM**, Krych AJ. RNA-seq analysis of clinical-grade osteochondral allografts reveals activation of early response genes. *J Orthop Res.* 2016;34(11):1950-1959. doi:10.1002/jor.23209. PubMed PMID: 26909883; PubMed Central PMCID: PMC4993686

Mandel JH, **Ramachandran G**, **Alexander BH**. Increased Lung Cancer Mortality in Taconite Mining: The Potential for Disease from Elongate Mineral Particle Exposure. *Chem Res Toxicol.* 2016; 29(2):136-141. doi:10.1021/acs.chemrestox.5b00472 PMID 26756500.

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Reiner AM, **Gerberich SG**, Ryan AD, **Mandel J**. Large Machinery-Related Agricultural Injuries Across a Five-State Region in the Midwest. *J Occup Environ Med.* 2016; 58(2):154-161. doi:10.1097/JOM.0000000000000584. PMID: 26849259

Switzer J, **Bovard RS**, Quinn RA. Wilderness orthopedics in: Auerbach P., ed. *Wilderness Medicine 7th ed.* Elsevier; 2016.

Westendorf JJ, Im HJ, van Wijnen AJ, **Riester SM**, Krych AJ. RNA-seq analysis of clinical-grade osteochondral allografts reveals activation of early response genes. *J Orthop Res.* 2016; 34(11):1950-1959. doi: 10.1002/jor.23209. PubMed PMID: 26909883

2015

Allen EM, **Alexander BH**, **MacLehose RF**, et al. Occupational exposures and lung cancer risk among Minnesota taconite mining workers. *Occup Environ Med.* 2015; 72(9):633-639. doi:10.1136/oemed-2015-102825. PMID 2597745

Allen EM, **Alexander BH**, **MacLehose RF**, Nelson HH, **Ramachandran G**, **Mandel JH**. Cancer incidence among Minnesota taconite mining industry workers. *Ann Epidemiol.* 2015; 25(11):811-815. doi:10.1016/j.annepidem.2015.08.003. PMID 26381550

Eaton JL, Mohr DC, Mohammad A, **Kirkhorn S**, et al. Implementation of a novel occupational and environmental medicine specialty teleconsultation service: the VHA experience. *J Occup Environ Med.* 2015; 57(2):173-177. doi:10.1097/JOM.0000000000000330. PMID 25654518

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Mandel JH, Wendt C, Lo C, Zhou G, Hertz M, **Ramachandran G**. Ambient air pollution and lung disease in China: health effects, study design approaches and future research. *Front Med.* 2015; 9(3):392-400. doi: 10.1007/s11684-015-0397-8. PMID 26089192

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Walters MS, Sreenivasan N, Shew M, Wheeler D, Hall J, Bogdanow L, **Leniek K**, Person B & Rao A. A Qualitative inquiry about Pruno, an illicit alcoholic beverage linked to botulism outbreaks in U.S. prisons. *Am J Public Health.* 2015; 105(11):2256-61. PMID 26378846

APPENDIX B
OCCUPATIONAL MEDICINE RESIDENCY PROGRAM
Selected Presentations
July 15, 2015-June 30, 2019

FACULTY

Fozia Abrar, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents:

2015

October - Chronic Disease Prevention and Health Promotion

2016

January - Department Head Responsibilities

April - Foodborne Illness/Investigation of Epidemics

May - Shift Work and Fatigue

July - Disability Management

October - Public Health Law and Health Service Management

2017

January - OSHA, MSHA, NIOSH (OSHA Workplace Standards) including regulatory agencies and toxic exposure levels

February - Part II: OSHA, MSHA, NIOSH (OSHA Workplace Standards) including regulatory agencies and toxic exposure levels

March - Bridging the Gap: Somali Culture and American Health Care Experience

September - Injury Epidemiology

2018

January - Workplace Violence

June - Employee Health Infectious Disease Management

August - Shift Work and Fatigue

2019

January - Contracts and Negotiations

March - Foodborne Illness/Investigation of Epidemics

April - Part I - OSHA, MSHA, NIOSH (OSHA Workplace Standards) including regulatory agencies and toxic exposure levels

April - Part II: OSHA, MSHA, NIOSH (OSHA Workplace Standards) including regulatory agencies and toxic exposure levels

May - Chronic Disease Prevention and Health Promotion

June - Framework for Rebuilding Public Health Systems in Somalia

September - Part II - Disability Management

Other Presentations:

2015

August – Presentation on health promotion presented to health care providers in Somalia.

2018

January - Disability Management of a Welder who presented with a Cold Finger, HP Occupational Medicine Residency Grand Rounds presentation

Paul Anderson, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2016

June - Mental Health in Fitness for Duty, presented to the Occupational Medicine Residents

September - A comprehensive review of the USPSTF recommendations

2017

March - Health Behavior Change

2018

April - Part II: A Comprehensive Review of the USPSTF Recommendations

2019

May - Cardiovascular Risk Reduction in Firefighters
July - Mental Health in Fitness for Duty

Other Presentations:

2018

January - An Introduction to Health Impact Assessment, PubH 6130, University of Minnesota, School of Public Health

Emily Bannister, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2016

February - Emergency Management and Public Health
August – Working with Interpreters

Other Presentations:

2015

December - Why I chose the specialty of Occupational Medicine, University of Minnesota, Pre-Med Society

2016

September – Risk Communication, HealthPartners Occupational Medicine Grand Rounds
November - Risk Communication, University of Illinois at Chicago Occupational Medicine residents and faculty

2017

August - Occupational Health and Migrant Farm Workers, University of Minnesota Internal Medicine and Global Health departments' migrant farm worker elective
November - Risks for Lab Workers, University of Illinois at Chicago Occupational Medicine residents and faculty

2018

March - Risks for Lab Workers, presented to the HealthPartners Occupational Medicine Residents
April - Chronic Pain Management and the Opioid Epidemic; University of Minnesota School of Public Health, PubH 6130

June - Environmental Disasters/Biological and Chemical Terrorism, HealthPartners Occupational Medicine Grand Rounds

September - The Opioid Crisis and the Public Health Response, Central States Occupational and Environmental Medical Association (CSOEMA) Fall Conference, Milwaukee, WI

2019

April: Designing a Successful Demographic Form, Niece, A., Leniek K., Madeleine Jean, M., Wilhelm, J., y Bannister, E., AOHC 2019 Conference, Poster Presentation
April - Unconscious Gender Bias In Occupational Medicine, AOHC 2019 Conference

Ralph Bovard, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2015

August - Medical Imaging in Clinical Practice
July - Departmental Practice Guidelines and Clinical Protocols

2016

January - Upper Extremity
April - Fitness for Duty
May - Two Shoulder Cases
June - Baromedicine
July - Clinic Visit Procedure and OEM Clinic Operations
August - **Eye Exam**
September - Acute and Chronic Neck Pain

December - Obesity Related Knee Arthritis, Apportioned Risk and Causation in the Workplace

2017

January - Lower Extremity Injuries – Foot and Ankle

February - Ionizing and Nonionizing Radiation

March - Body Composition – How Do We Measure Obesity and What Does It Mean?

July - Clinic Visit Procedures and Documentation and Taking an Occupational and Environmental History and OEM Clinic Operations

August - Joint Injections and Suturing

August - What Is a Normal Course of Healing?

October - Upper Extremity

November - Medical Imaging

December - Tropical Medicine in Papua New Guinea

2018

January - Baromedicine

April - FFD

July - PGY2 and PGY3 year

August - Sessions on Joint Injections and Suturing

August - Lower Extremity Injuries

August - Clinic Visit Procedures and Taking an Occupational and Environmental History and Occupational and Environmental Clinic Operations

September - Two Shoulder Cases

September - Elbow Exam and Diagnosis

October - Upper Extremity

November - Acute and Chronic Neck Pain

December - Obesity Related Knee Arthritis and Apportioned Risk and Causation in the Workplace

2019

January - Medical Imaging Reviews

February - Morbidity and Disability Case

April - Eye Exam

May - Injections and Aspirations

June - Ionizing and Nonionizing Radiation

July - Sessions on Joint Injections and Suturing

July - Clinic Visit Procedures and Documentation and Occupational and Environmental History and Occupational and Environmental Clinic Operations

Other Presentations:

2015

February - Fitness Assessment and the Exercise Prescription. School of Public Health, University of Minnesota. Minneapolis, MN.

July - Teaching & Assessing the ACGME Clinical Core Competencies: “Systems Based Practice” presented at Faculty Committee Meeting, HealthPartners Occupational Medicine

July - Evaluation & Treatment of Elbow Injuries

August – Suturing and Joint Injections

October – Knee

December - Practice Based Learning and Improvement: Teaching and Assessing the ACGME Clinical Core Competencies, HealthPartners Occupational & Environmental Medicine Faculty Meeting

2016

February – Low Back Pain, Keeping Injured Workers at Work, University of Minnesota, PubH 6130

February - Moderator - Well @ Work, American College of Preventive Medicine ACPM Annual Meeting, Washington DC

March - Fitness and the Aging Worker, University of Minnesota, PubH 6130

May - Progressive Inflammatory Neuropathy, Occupational/Toxicology Case Journal Discussion – Minnesota Department of Health

June - Patient Care Milestones, HealthPartners Occupational and Environmental Medicine Faculty Committee Meeting

July - Joint Injections and Suturing

July - Obesity and Clinical Implications for Physical Therapy – Novacare, Coon Rapids, Minnesota

October - Fitness and the Exercise Prescription. American College of Lifestyle Medicine, Naples, Florida

November - The Enigma of Prion Disease: Acquired, Inherited, & Sporadic, Minnesota Department of Health

December - Tropical Medicine in Papua New Guinea, HealthPartners Occupational Medicine Grand Rounds

2017

January - Interpersonal and Communication Skills Milestones, HealthPartners Occupational and Environmental Medicine Faculty Committee Meeting

February – Low Back Pain, Keeping the Injured Workers at Work, University of Minnesota, PubH 6130

March - Fitness and the Aging Worker, University of Minnesota, PubH 6130

April - Public Safety Medicine Update 2017: The Cutting Edge – Spinal Issues in Public Safety Medicine, AOHC 2017, Denver, Colorado

May - Movement as Medicine; ACPM Preventive Medicine Conference, Portland, OR

August – Envenomizations, Occupational /Toxicology Case/Journal Discussion, Minnesota Department of Health

2018

January – Professionalism Core Competency Training, HealthPartners Occupational and Environmental Medicine Faculty Committee Meeting

February – Aging Populace and Impact on Working Populations, University of Minnesota, School of Public Health, PubH 6130

February - Fitness/Obesity in the Workplace, University of Minnesota, School of Public Health PubH 6130

April - Evaluations of Public Service Professionals, University of Minnesota, School of Public Health, PubH 6130

September - Personal and Occupational Risk Factors in the Workplace. Central States Occupational & Environmental Medicine (CSOEMA) Fall Meeting. Milwaukee, Wisconsin

October - Moderating Risk: How Far Will You Go? 10th Annual Advanced Strategic Improvement Practices Conference. Minnesota Landscape Arboretum, Chaska, Minnesota

October - The Importance of Fitness in the Workplace. Impairment without Disability (IWD) Conference. St. Paul, MN.

2019

February - Aging Populace and Impact on Working Populations, University of Minnesota School of Public Health, PubH 6130

February - Fitness/Obesity in the Workplace, University of Minnesota School of Public Health, PubH 6130

April - Musculoskeletal Injuries in Occupational Medicine; Management Protocols. TRIA Orthopedic Conference for the Primary Care Provider, Minneapolis, Minnesota

April - Faculty Meeting – Core Competency Training on Practice Based Learning & Improvement

April - Update on Law Enforcement Officer Injury: Return to Work after Spine Surgery - LEO Task Force. American Occupational Health Society (AOHC). Anaheim, CA

May - The Aging Athlete: How Behaviors, Biomarkers & Physical Activity Affect Health Over a Lifetime. Exercise is Medicine. American College of Sports Medicine (ACSM). Orlando, FL

Demian Gitnacht, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2016

November – Occupational Sleep Apnea

Steven Kirkhorn, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2015

September - Emergency Management for OEM-The VA Experience.

2016

October - Adult Immunizations

2019

January - Agricultural Respiratory Hazards and Diseases

January - Agricultural Medicine Update, HealthPartners Occupational Medicine Residency

Community Grand Rounds

March - Fitness for Duty/Reasonable Suspicion Evaluations

Other Presentations:

2016

February - Musculoskeletal Disorders in Primary Care: Focus on Upper Extremity, Minneapolis Veterans Administration Medical Center Internal Medicine Resident Training Sessions.

June - Lab Safety Medical Surveillance Veterans Health Administration Occupational Health Grand Rounds Series

August - Current Issues in Medical Clearance of Drivers in the VHA-revisited, VA National Tele-Grand Rounds

2017

March - Current Issues in Medical Clearance of Drivers in the VHA, Veterans Health Administration NP/PA Mini residency. Minneapolis, Minnesota

March - Health Care Personnel Immunizations and TB Screening, Veterans Health Administration NP/PA Mini residency. Minneapolis, Minnesota

August - Occupational and Environmental Medicine Overview, Minneapolis Veterans Administration Medical Center Internal Medicine Resident Training Sessions

October - Hazardous Drugs in Health Care Facilities, Update-USP Criteria, Veterans Health Administration Occupational Health Grand Rounds Series

2018

May - USP 800 and Hazardous Drug Medical Surveillance, American Occupational Health Conference New Orleans, Louisiana

May - Occupational Respiratory Disease and Prevention, Veterans Health Administration Employee Occupational Health National Tele-Grand Rounds

September - Occupational Health in the Veteran's Administration, University of Minnesota School of Public Health, PubH 6170.

2019

May - Faculty, Veterans Health Administration Employee Occupational Health Mini-residency, Orlando Virginia Medical Center

May - Infectious Disease Management Presentation Veterans Hospital Administration Employee Occupational Health Mini-residency, Orlando VA Medical Center

June - Hazardous Drug Medical Surveillance, Minneapolis Veterans Administration Health Care System Internal Medicine Grand Rounds Series

September - Overview of Occupational Health in the Veteran's Administration, University of Minnesota, School of Public Health, PubH 6170

2020

FY 2020-Veterans Administration Employee Occupational Health Development National Teleconference Grand Rounds

February - Respirators: Medical Evaluation and Clearance, Veterans Health Administration Employee Occupational Health National Tele-Grand Rounds

April - An Employee Health Occupational approach to COVID-19. University of Minnesota, School of Public Health, PubH 8120

Kirsten Koos, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2015

August - PPD Ratings

2016

February – Professionalism

April - System Based Practice Case Studies

July - Systems Based Practice Case Study

September – Professionalism

2017

April - Practical Aspects of Workers Compensation Insurance and Case Management: Benefits, Responsibilities and Resources

August – Professionalism

2018

March - Federal Employees Disability Evaluations with 6th Ed of the AMA Guides to the Evaluation of Permanent Impairment

2019

March - Professionalism

May - Permanent Partial Disability and Impairment Ratings

Other Presentations:

2015

October - Overcoming Barriers to Recovery: Nurse Case Manager Role in Decreasing Opioid Use; Nursing Continuing Education Credit Webinar –State Auto Insurance Companies: RTW Inc.

2016

February – Medical Services Update- Continuing Education Nursing and Claims Adjuster Continuing Education Credit Webinar –State Auto Insurance Companies: RTW Inc.

April - DOT Requirements Before and After Injury - State Auto Insurance Company, RTW, Inc., Bloomington, MN, Continuing Education Credit

July - U.S. Opioid Epidemic and Medical Services Opioid Management Program, Senior Leadership State Auto Insurance Companies

November - Department of Transportation Requirements for Commercial Drivers Before and After Injury – Nursing Continuing Education Credit Webinar – State Auto Insurance Companies: RTW Inc.

2018

January - Impact and Opportunity: Women in Occupational Environmental Health; University of Minnesota School of Public Health, PubH 6130

2019

January - Impact and Opportunities: Women in Occupational Environmental Health and Safety, University of Minnesota, School of Public Health, PubH 6130

June - Understanding Advanced Medical Imaging Reports; Webinar to State Auto Insurance Company Nurse Case Managers and Claims Adjustors

Karyn Leniek, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2015

July - Role of Physician and Employer in Early and Safe Return to Work

2016

November – Bloodborne Pathogens and MN Statute Workers Compensation Treatment Parameters

2018

January - Lessons Learned on Practice Building and What Type of a Practice is the Best Fit for You

March - FMCSA, presented to the Occupational and Environmental Medicine Residents

May – Spirometry

2019

March – Personal Protective Equipment/MN DOC

June - MN Statute Workers Compensation Treatment Parameters

Other Presentations:

2015

July - Role of Physician and Employer in Early and Safe Return to Work, Lakes Area Human Resources Association Monthly Meeting, Brainerd, Minnesota

August - Role of Physician and Employer in Early and Safe Return to work, Central Minnesota Human Resource Administrators Cooperative Monthly Meeting, Monticello, Minnesota

December - OSHA Respirator Medical Evaluation: Questionnaire Review and Office Visits, Greater Lakes Area Safety & Health Monthly Meeting, Alexandria, Minnesota

2016

January - Promoting Healthier Lifestyles among Truck Drivers, Women in Trucking Event, Eagan, Minnesota

February - Prevention of Back Injuries through Pre-employment Physical Exams, HealthPartners Central Minnesota Clinic & NovaCare Back Injuries in the Workplace Seminar, Sartell, Minnesota

February - Injured Worker Case Study: Treatment of Work-Related Back Injuries, HealthPartners Central

2018

April - Considerations of safety-sensitive positions; University of Minnesota, School of Public Health, PubH 6130

2019

April - Designing a Successful Demographic Form, Niece, A., Leniek K., Madeleine Jean, M., Wilhelm, J., Bannister, E., AOHC 2019 Conference, Poster Presentation

Zeke McKinney, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2015

December - An Introduction to Biostatistics and Epidemiology

2016

January - Part II, Biostatistics and Epidemiology

February – Part III, Biostatistics and Epidemiology

March – Part IV, Biostatistics and Epidemiology

August - Occupational Medicine Approach to Latent TB

October - Occupational and Environmental Medicine and Psychiatric Concerns

2017

January - An Introduction to Biostatistics and Epidemiology

January - Cardiovascular Toxicology

February Part II, Biostatistics and Epidemiology

March – Part III, Biostatistics and Epidemiology

May – Part IV, Biostatistics and Epidemiology

June - Occupational Asthma

July - Pesticide Toxicity

September - DOT Cases

2018

January- An Introduction to Biostatistics and Epidemiology

February - Part II, Biostatistics and Epidemiology

March - Part III, Biostatistics and Epidemiology

April – Part IV, Biostatistics and Epidemiology

August - Occupational Medicine Approach to Latent TB

September - Occupational and Environmental Medicine and Psychiatric Concerns

October - Cardiovascular Toxicology and Cardiac Conditions

2019

January - An Introduction to Biostatistics and Epidemiology

February - Pesticide Toxicity

March - Part II: Biostatistics and Epidemiology

March - Part III: Biostatistics and Epidemiology

April - Part IV: Biostatistics and Epidemiology
June - Occupational Asthma
July - Complex DOT Cases

Other Presentations:

2015

October - Race Relations in the Exam Room: It's Not All Black and White, Hamm Clinic, St. Paul, MN.

2016

March - What is "Informatics?" Integrating Data into Occupational Medicine Practice, CSOEMA
March - What is "Informatics?" Integrating Data into Occupational Medicine Practice, HealthPartners
Occupational Medicine Grand Rounds
September - History of Occupational Health, Overview of Occupational and Environmental Medicine,
University of Minnesota, School of Public Health, PubH 6170

October - Occupational Medicine for Union Construction Workers, Construction Workers' Compensation
Program, Contractor Training Event, Bloomington, Minnesota

2017

January - Occupational Medicine for Union Construction Workers, presented to the Union Construction
Workers' Compensation Program
April - The Composition of a Contemporary Occupational Medicine Practice, AOHC 2017, Poster
Presentation
April - Occupational Medicine for Union Construction Workers, Construction Workers' Compensation
Program, Contractor Training Event, Bloomington, Minnesota
April - BSL-3 Medical Surveillance, BSL-3 Seminar Series, Eagleson Institute, Minnesota Department of
Health, St. Paul, Minnesota
May - Analytic Evaluation of Immunization Overutilization Rates in Minnesota, Preventive Medicine 2017,
American College of Preventive Medicine, Portland, Oregon, Poster Presentation
September - History of Occupational Health, Overview of Occupational and Environmental Medicine;
University of Minnesota, School of Public Health, PUBH 6170
October - Management of Acute Work-Related Injury for Urgent Care Clinicians, Urgent Care: An Old
Concept in the New Millennium, HealthPartners Institute, St. Louis Park, Minnesota

2018

January - The Public Health Impact of Preventive Services; University of Minnesota, School of Public Health,
PubH 6130
February - Biosafety and Occupational Health with Known and Unknown Influenza Strains;
15th CDC International Symposium on Biosafety: Biosafety in the Era of One Health, Atlanta, Georgia
February – Occupational Medicine for Union Construction Workers; Union Construction Workers
Compensation Program, Bloomington, Minnesota
April - Introduction to Occupational and Environmental Medicine, University of Minnesota – Duluth, Medical
School, Duluth, Minnesota
April - Occupational and Environmental Medicine for Non-Clinical Safety Specialists,
University of Minnesota – Duluth, Risk Management and Workers' Compensation (SAFE 6012), Duluth,
Minnesota
April - OEM and Psychiatric Concerns; University of Minnesota, School of Public Health, PubH 6130
April - Occupational, Environmental, and Public Health Informatics, University of Minnesota, School of Public
Health, PubH 6130
April - OEM-based Electronic Health Records: Applying the Theory, American Occupational Health
Conference, 2018, New Orleans, Louisiana.
April - Functional Impairment: We Have Met the Enemy and He is Us, American Occupational Health
Conference, 2018, New Orleans, Louisiana
August - Identifying Immunization Overutilization Populations in Minnesota, American Immunization Registry
Association (AIRA) National Meeting, Utah

September - Anatomy Radiology Workshop, University of Minnesota Medical School Program in Human Anatomy, Minneapolis, Minnesota
September - Contemporary Occupational Asthma Diagnosis and Management; Central States Occupational and Environmental Medicine Association 2018 Fall Seminar, Milwaukee, Wisconsin
September - Sick Building? Causation Determination in Challenging Environmental Intolerance Evaluations; Michigan Occupational Health Conference, Grand Rapids, Michigan
October - Firefighter Sweat Biomarker Pilot Study Overview; City of St. Paul and St. Paul Fire Department Administration, St. Paul, Minnesota
December - Sick Building: Causation Determination in Challenging Environmental Intolerance Evaluations; Presented at the HP Occupational Medicine Grand Rounds

2019

April - Introduction to Occupational and Environmental Medicine; University of Minnesota – Duluth, Medical School, Duluth, Minnesota
April - Occupational and Environmental Medicine for Non-Clinical Safety Specialists; University of Minnesota – Duluth, Risk Management and Workers' Compensation (SAFE 6012), Duluth, Minnesota

Andre Montoya-Barthelemy, MD, MPH

Presentations to HealthPartners Occupational and Environmental Medicine Residents

2018

December - How to create a world class PPT presentation

2019

February – Personal Protective Equipment

Other Presentations:

2017

April - The Occupational Safety of Inmate Workers, AOHC 2017, Denver, Colorado
April - The Occupational Safety of Inmate Workers, University of Minnesota, School of Public Health Research Day, Poster Presentation
October - What is Occupational Medicine? University of Minnesota PGY 1 and 2 Medical Students

2018

March - Conceptualizing Labor Rights, Health, and the Role for Occupational Medicine, CSOEMA
March - Working Conditions for Incarcerated Populations; University of Minnesota, PubH 6130
April - The Occupational Safety of Inmate Workers, American Occupational Health Conference 2018, New Orleans, Poster Presentation

2019

March - MAROEM Webinar Series: Labor Rights, Incarcerated Workers and Public Health, Johns Hopkins Education and Research Center for Occupational Safety and Health

Other Presentations:

Current Residents

Maria Starchook-Moore

Other Presentations:

2019

March - Initial Phase Results of Firefighter Cardiorespiratory Fitness Pilot Study, Spring 2019 CSOEMA Seminar
April - Initial Phase Results of Firefighter Cardiorespiratory Fitness Pilot Study, American Occupational Health Conference 2019, Poster and Oral Presentation
May - Initial Phase Results of Firefighter Cardiorespiratory Fitness Pilot Study, University of Minnesota School of Public Health NORA Symposium Poster Presentation

May - Initial Phase Results of Firefighter Cardiorespiratory Fitness Pilot Study. MMCGME 7th Annual Resident & Fellow Quality Forum poster presentation

Alumni

Jon Sellman

Other Presentations:

2018

April - Breaking Down Silos: The 5x5 Initiative to Bridge Human Health, Environmental, and Animal Research, Windmuller-Campione, M., Holton, N., Potter, .T, Schreiner, P. Sellman, J. The 3rd International Conference on One Medicine/One Science, Poster Presentation

September - Occupational Infectious Disease, CSOEMA Fall 2018 Seminar

November - Occupational What? An Introduction to Occupational and Environmental Medicine, Regions Hospital Internal Medicine Grand Rounds

2019

March - Occupational and Environmental Medicine at the Human-Animal Environmental Interface, CSOEMA Spring 2019 Seminar

April - Compassion Fatigue; Boston Scientific-St. Paul

May - Bitewounds: When Animals Attack, University of Minnesota's Global Health Course

Scott Riester

Other Presentations:

2017

April - Incidence of Rheumatoid Arthritis Among World Trade Center Responders, AOHC 2017 Conference, Denver, Colorado, Poster Presentation

May - The Composition of a Contemporary Occupational Medicine Practice, University of Minnesota, School of Public Health, NORA Symposium, Poster Presentation

May -The Composition of a Contemporary Occupational Medicine Practice, 5th Annual Resident and Fellow Quality Forum 2017, Minneapolis, Minnesota, Poster Presentation

2018

March - Obesity: a Risk Factor for Musculoskeletal Injury, CSOEMA 2018 Spring Seminar

April - Injury Rates among Minority Workers in Minnesota, AOHC 2018 Conference, New Orleans; Poster Presentation

Sarah Bronner

Other Presentations:

2017

April - Residency Website Redesign Using Quality Improvement Methodologies, AOHC Conference, Poster Presentation

Isabel Pereira

Other Presentations:

2017

March - Brewery Safety & Hazards, March CSOEMA Annual Spring Seminar, Lisle, Illinois

April - Residency Website Redesign Using Quality Improvement Methodologies, AOHC 2017 Conference, Poster Presentation

Elizabeth Alm

Other Presentations:

2016

April -The Odzi Project: Developing an Employee Health Protocol in a Rural Zimbabwe Hospital, AOHC Conference, Poster Presentation

Mark Ciagne

Other Presentations:

2016

April - MN Fire Department Health and Fitness Practices and Medical Survey, AOHC Conference, Poster Presentation

APPENDIX C
OCCUPATIONAL MEDICINE RESIDENCY PROGRAM
SELECTED OUTREACH ACTIVITIES
July 15, 2015 - June 30, 2020

FACULTY

Emily Bannister, MD, MPH

2015

- January-December- Faculty Member, Occupational and Environmental Residency Program, HealthPartners Institute for Education and Research, St. Paul, MN
- January-December- Member, Alpha Phi Omega National Service Fraternity
- January-December- Chapter Advisor, University of Minnesota Alpha Phi Omega Service Fraternity - Twin Cities, Minneapolis
- January-December- Trainer and Presenter, APO LEADS leadership development courses: Servant leadership, Conflict management, Project management

2016

- January-December- Primary Medical Liaison, University of Minnesota Department of University Health and Safety, Minneapolis, MN
- January-December- Faculty Member, Occupational and Environmental Residency Program, HealthPartners Institute for Education and Research, St. Paul, MN
- January-December- Member, Alpha Phi Omega National Service Fraternity
- January-December- Chapter Advisor, University of Minnesota Alpha Phi Omega Service Fraternity - Twin Cities, Minneapolis
- January-December- Trainer and Presenter, APO LEADS leadership development courses: Servant leadership, Conflict management, Project management

2017

- January-December- Member, Institutional Biosafety Committee, University of Minnesota, Minneapolis, MN
- January-December- Primary Medical Liaison, University of Minnesota Department of University Health and Safety, Minneapolis, MN
- January-December- Faculty Member, Occupational and Environmental Residency Program, HealthPartners Institute for Education and Research, St. Paul, MN
- January-December- Member, Alpha Phi Omega National Service Fraternity
- January-December- Chapter Advisor, University of Minnesota Alpha Phi Omega Service Fraternity - Twin Cities, Minneapolis
- January-December- Trainer and Presenter, APO LEADS leadership development courses: Servant leadership, Conflict management, Project management
- January-December- Physician Volunteer, Twin Cities Medical Society, Tobacco 21 Initiative

2018

- January-December- Advisory Member, Council on Educational and Academic Affairs, American College of Occupational and Environmental Medicine
- January-December- Co-chair, Central States Occupational and Environmental Medicine Association Fall Conference, Milwaukee, WI
- January-December- Co-chair, Medical Practice and Quality Improvement Committee, HealthPartners Occupational Medicine Department, St. Paul, MN
- January-December- Member, Institutional Biosafety Committee, University of Minnesota, Minneapolis, MN
- May- Co-Author, ACOEM work group for a large project on occupational health in research and educational institutions (REI).
- January-December- Primary Medical Liaison, University of Minnesota Department of University Health and Safety, Minneapolis, MN
- January-December- Faculty Member, Occupational and Environmental Residency Program, HealthPartners Institute for Education and Research, St. Paul, MN
- January-December- Member, Alpha Phi Omega National Service Fraternity

January-December- Chapter Advisor, University of Minnesota Alpha Phi Omega Service Fraternity - Twin Cities, Minneapolis
January-December- Trainer and Presenter, APO LEADS leadership development courses: Servant leadership, Conflict management, Project management
January-December- Physician Volunteer, Twin Cities Medical Society, Tobacco 21 Initiative

2019

January-December- Advisory Member, Council on Educational and Academic Affairs, American College of Occupational and Environmental Medicine
January-December- Member, Institutional Biosafety Committee, University of Minnesota, Minneapolis, MN
January-December- Primary Medical Liaison, University of Minnesota Department of University Health and Safety, Minneapolis, MN
January-December- Faculty Member, Occupational and Environmental Residency Program, HealthPartners Institute for Education and Research, St. Paul, MN
January-December- Member, Alpha Phi Omega National Service Fraternity
January-December- Chapter Advisor, University of Minnesota Alpha Phi Omega Service Fraternity - Twin Cities, Minneapolis
January-December- Trainer and Presenter, APO LEADS leadership development courses: Servant leadership, Conflict management, Project management
January-December- Physician Volunteer, Twin Cities Medical Society, Tobacco 21 Initiative

2020

January-December- Advisory Member, Council on Educational and Academic Affairs, American College of Occupational and Environmental Medicine
January-December- Member, Institutional Biosafety Committee, University of Minnesota, Minneapolis, MN
January-December- Primary Medical Liaison, University of Minnesota Department of University Health and Safety, Minneapolis, MN
January-December- Faculty Member, Occupational and Environmental Residency Program, HealthPartners Institute for Education and Research, St. Paul, MN
January-December- Member, Alpha Phi Omega National Service Fraternity
January-December- Chapter Advisor, University of Minnesota Alpha Phi Omega Service Fraternity - Twin Cities, Minneapolis
January-December- Trainer and Presenter, APO LEADS leadership development courses: Servant leadership, Conflict management, Project management
January-December- Physician Volunteer, Twin Cities Medical Society, Tobacco 21 Initiative

Ralph Bovard, MD, MPH

2015

January-December- Planning Committee Member, Impairment without Disability Annual Conference
January-December- St. Paul Fire Department Firefighter Health and Wellness Task Force
January-December- Member, Graduate Medical Education Committee (GMEC)-Regions Hospital
January-December- Planning Committee, Clinical Preventive Medicine/Lifestyle Medicine Track (ACPM)
January-December- Committee Member, US Anti-Doping Agency (USADA) Therapeutic Use Exemption Committee

2016

January-December- Planning Committee Member, Impairment without Disability Annual Conference
January-December- St. Paul Fire Department Firefighter Health and Wellness Task Force
January-December- Member, Graduate Medical Education Committee (GMEC)-Regions Hospital
January-December- Planning Committee, Clinical Preventive Medicine/Lifestyle Medicine Track (ACPM)

2017

January-December- Planning Committee Member, Impairment without Disability Annual Conference
July-December- Physician Member, MnFIRE Provider Summit – Quarterly meetings with fire chiefs
January-December- St. Paul Fire Department Firefighter Health and Wellness Task Force
January-December- Board of Directors of the Minneapolis (Downtown) YMCA

January-December- Member, Graduate Medical Education Committee (GMEC)-Regions Hospital
2018

January-December- Planning Committee Member, Impairment without Disability Annual Conference

January-December- Physician Member, MnFIRE Provider Summit – Quarterly meetings with fire chiefs

January-April- Board of Directors of the Minneapolis (Downtown) YMCA

January-December- Member, Graduate Medical Education Committee (GMEC)-Regions Hospital

2019

January-December- Physician Member, MnFIRE Provider Summit – Quarterly meetings with fire chiefs

January-December- Member, Graduate Medical Education Committee (GMEC)-Regions Hospital

2020

January-December- Physician Member, MnFIRE Provider Summit – Quarterly meetings with fire chiefs

January-December- Member, Graduate Medical Education Committee (GMEC)-Regions Hospital

Steven Kirkhorn, MD, MPH

2015

January-December- Consultant, Veterans Health Administration Occupational and Environmental Medicine
(OEMed) National Tele-Consult Program

January-December- Member, Midwest Center Occupational Health and Safety Center (MCOHS) ERC External
Advisory Board

2016

January-December- Consultant, Veterans Health Administration Occupational and Environmental Medicine
(OEMed) National Tele-Consult Program

January-December- Member, Midwest Center Occupational Health and Safety Center (MCOHS) ERC External
Advisory Board

2017

January-December- Consultant, Veterans Health Administration Occupational and Environmental Medicine
(OEMed) National Tele-Consult Program

January-December- Member, Midwest Center Occupational Health and Safety Center (MCOHS) ERC External
Advisory Board

2018

January-December- Consultant, Veterans Health Administration Occupational and Environmental Medicine
(OEMed) National Tele-Consult Program

January-December- Member, Midwest Center Occupational Health and Safety Center (MCOHS) ERC External
Advisory Board

2019

January-December- Member, Veterans Health Administration Employee Occupational Health Change Advisory
Board, VISN 23 Representative

2020

January-December- Member, Veterans Health Administration Employee Occupational Health Change Advisory
Board, VISN 23 Representative

Kirsten Koos, MD, MPH

2015

January-December- Member, Workers Compensation Research Institute Minnesota Advisory Committee

2016

January-December- Member, Workers Compensation Research Institute Minnesota Advisory Committee

2017

January-December- Member, Workers Compensation Research Institute Minnesota Advisory Committee

2018

January-December- Member, Workers Compensation Research Institute Minnesota Advisory Committee

2019

January-December- Member, Workers Compensation Research Institute Minnesota Advisory Committee

2020

January-December- Member, Workers Compensation Research Institute Minnesota Advisory Committee

Zeke McKinney, MD, MPH

2015

January-December- CSOEMA Delegate, ACOEM House of Delegates

January-December- Advisory Committee Member, *Minnesota Medicine*

January-August- Resident Governor, CSOEMA Board of Governors

2016

September-December- Chair, CSOEMA Technology Committee

January-December- CSOEMA Delegate, ACOEM House of Delegates

January-December- Advisory Committee Member, *Minnesota Medicine*

March-December- Minnesota Governor, CSOEMA

December- Co-Chair, ACOEM Trends in OEM Task Force

September-December- Conference Co-Chair, CSOEMA Fall 2017 Seminar

2017

November- Participant, University of Minnesota Institute for Engineering in Medicine 3D Printing Core, Minneapolis, MN.

April-December- Member, ACOEM Council of Scientific Advisors

January-December- Chair, CSOEMA Technology Committee

January-December- CSOEMA Delegate, ACOEM House of Delegates

January-December- Advisory Committee Member, *Minnesota Medicine*

January-December- Minnesota Governor, CSOEMA

May-December- Newsletter Editor, ACPM Young Physician Section

January-December- Co-Chair, ACOEM Trends in OEM Task Force

January-December- Secretary, ACOEM Health Informatics Section

January-September- Conference Co-Chair, CSOEMA Fall 2017 Seminar

February- Media/Communication, INVISIBLE DANGER: Firefighters and cancer, 2/6/17 KMSP-TV, Twin Cities, Minnesota Occupational/preventive medicine commentary on contemporary knowledge of cancer risk factors in firefighters.

May- Media/Communication, INVESTIGATORS: Something in the air?, 5/15/17 KMSP-TV, Twin Cities, Minnesota, Environmental medicine lead pollution story in North Minneapolis, a medically and Socio-economically underserved area of the Twin Cities.

May- Media/Communication, INVISIBLE DANGER: Firefighters' hearts at risk, 5/4/17 KMSP-TV, Twin Cities, Minnesota, Occupational/preventive medicine commentary on contemporary knowledge of Cardio-respiratory risk factors in firefighters.

2018

January-December- Consulting Physician, University of Minnesota Institute for Engineering in Medicine 3D Printing Core, Minneapolis, MN.

November-December- Chief Medical Editor, *Minnesota Medicine*

May-December- ACOEM Liaison, ACPM Young Physician Section

April-December- Chair, ACOEM Health Informatics Section

January-December- Member, ACOEM Council of Scientific Advisors

January-December- Chair, CSOEMA Technology Committee

January-December- CSOEMA Delegate, ACOEM House of Delegates

January-December- Advisory Committee Member, *Minnesota Medicine*

August-December- Secretary/Treasurer, CSOEMA

January-August- Minnesota Governor, CSOEMA

January-May- Newsletter Editor, ACPM Young Physician Section

January- April- Co-Chair, ACOEM Trends in OEM Task Force

January-April- Secretary, ACOEM Health Informatics Section

2019

January-December- Consulting Physician, University of Minnesota Institute for Engineering in Medicine 3D
Printing Core, Minneapolis, MN.

April-December- Physician Contact, Region 5 Minnesota Physician Contact – PEHSU

April-December- Vice President, CSOEMA

January– April- Board Member, Twin Cities Medical Society

January-December- Chief Medical Editor, *Minnesota Medicine*

January-December- ACOEM Liaison, ACPM Young Physician Section

January-December- Chair, ACOEM Health Informatics Section

January-December- Member, ACOEM Council of Scientific Advisors

January-December- Chair, CSOEMA Technology Committee

January-December- CSOEMA Delegate, ACOEM House of Delegates

January-December- Advisory Committee Member, *Minnesota Medicine*

January-April- Secretary/Treasurer – CSOEMA

2020

January-December- Consulting Physician, University of Minnesota Institute for Engineering in Medicine 3D
Printing Core, Minneapolis, MN.

January-December- Physician Contact, Region 5 Minnesota Physician Contact – PEHSU

January-December- Vice President, CSOEMA

January-December- Chief Medical Editor, *Minnesota Medicine*

January-December- ACOEM Liaison, ACPM Young Physician Section

January-December- Chair, ACOEM Health Informatics Section

January-December- Member, ACOEM Council of Scientific Advisors

January-December- Chair, CSOEMA Technology Committee

January-December- CSOEMA Delegate, ACOEM House of Delegates

January-December- Advisory Committee Member, *Minnesota Medicine*

Andre Montoya-Barthelemy, MD, MPH

2017

January- St Paul, MN Clinic day at CVT - performing intake H&Ps for clients requesting asylum

February- Participant, St Paul, MN Legislative Action Event - Second Chance Day on the Hill

February- Presenter, Webinar: We are Not Disposable - The Toxic Impacts of Prisons and Jails, hosted by
CURB prison spending.org

February- Participant, MN Listening session at All My Relations Gallery regarding minimum wage legislation
pending for the City of Minneapolis

September- Client Services Volunteer, Center for Victims of Torture, St Paul, Minnesota

2018

January-December- Client Services Volunteer, Center for Victims of Torture, St Paul, Minnesota

2019

January-December- Client Services Volunteer, Center for Victims of Torture, St Paul, Minnesota

April-December- Working Group Chair, ACOEM Underserved Occupational Populations Section - Investigating
the occupational health of incarcerated workers

April-January- Delegate to ACOEM House of Delegates, Residents and Recent Graduates Section

2020

January-December- Client Services Volunteer, Center for Victims of Torture, St Paul, Minnesota

January-December- Working Group Chair, ACOEM Underserved Occupational Populations Section –
Investigating the occupational health of incarcerated workers

January-April- Delegate to ACOEM House of Delegates, Residents and Recent Graduates Section

OCCUPATIONAL MEDICINE RESIDENTS AND GRADUATES

Jonathan Sellman, MD

2016

December- MDH project: Minnesota One Health Antibiotic Stewardship Collaborative
2017

August-December- Committee Member, AIAMC National Initiative VI: Stimulating a Culture of Well-Being in the Clinical Learning Environment

January-December- MDH project: Minnesota One Health Antibiotic Stewardship Collaborative
2018

January-December- MDH project: Minnesota One Health Antibiotic Stewardship Collaborative
2019

March-December- Vice Chair, Human Health Work Group of the Collaborative, Minnesota One Health Antibiotic Stewardship Collaborative

January-December- MDH project: Minnesota One Health Antibiotic Stewardship Collaborative
2020

January-December- Vice Chair, Human Health Work Group of the Collaborative, Minnesota One Health Antibiotic Stewardship Collaborative

January-December- MDH project: Minnesota One Health Antibiotic Stewardship Collaborative

January-December- Media/Communications, Informational Video: Minnesota Fungal Diseases: What Providers Need to Know. Minnesota Department of Health:
<https://www.health.state.mn.us/diseases/blastomycosis/hcp.html>

Maria Starchook-Moore, MD

2019

October- Elected Alternate Delegate, Minnesota Medical Association (MMA) Resident and Fellow Section

Manoj Doss, DO

2020

January-December- Member, Society of Practitioners of Health Impact Assessments (SOPHIA)

January-December- Working Group Leader, Society of Practitioners of Health Impact Assessments (SOPHIA): Health Impact Assessment Advocacy, GIS applications and Story Mapping

January-December- Working Group Leader (pending appointment), Society of Practitioners of Health Impact Assessments (SOPHIA): Community Health Services Advisory Committee

January-December- Working Group Facilitator, Minnesota Cardiovascular and Diabetes 2030 Health Plan, Preventive Care working group

January-December- Working Group Facilitator, Minnesota Cardiovascular and Diabetes 2030 Health Plan, Disease Management working group

January-December- Working Group Facilitator, Minnesota Cardiovascular and Diabetes 2030 Health Plan,

January-December- Member, Minnesota Cardiovascular and Diabetes 2030 Health Plan, Acute Care working Group

Isabel Pereira, DO

2016-2017

January-December- Elected as Board of Governors voting Resident for CSOEMA

Table 1. Academic Training Report July 1, 2015 – June 30, 2020¹
Occupational and Environmental Medicine

Degree Awarded	How Does Degree Read?	Total # Applicants to Degree Program	Total # Applicants Admitted to Degree Program	Total # Under Represented Minority Applicants Admitted	# Full-Time Students Enrolled²	# Full-Time NIOSH-Supported Trainees	# Part-Time Students Enrolled²	# Part-Time NIOSH-Supported Trainees	# Trainees Graduated During Reporting Period
Master's degree ³									
Doctorate degree									
Post-doctoral									
	Master of Public Health	10	10	4	12	12	0	0	9
Certificate Program									

¹ Reporting period for renewals is from the start date of prior competing award. New applicants should report past five years.

² Full-time and part-time students should include all students in approved programs, regardless of source of support.

³ OM residents may be double-counted under Masters degree training and post-doctoral training.

Table 2. Trainees and Graduates Supported July 1, 2015 – June 30, 2020¹
Occupational and Environmental Medicine

Trainees				Graduates				
Trainee ID, Year of Entry, Prior Degree & Institution, (Current Academic Advisor or Mentor and Department). Identify Under Represented Minority with (URM).	OM Trainees: Previous Residency Training Specialty	Title of Research Project or Research Topic	Degree Program (MS, MPH, PhD, DrPH, etc.)	Date Degree or Certificate Awarded (mm/yyyy)	Date of Certificate for OM (mm/yyyy)	Employed in OSH Field or in OSH Advanced Study (Y/N)	Current Employer	Current Position
100373, 2014, Doctoral, Creighton University, (J Mandel, Division of Environmental Health Sciences)	Gen Surgery	Sudden Cardiac Death, Firefighter Fitness Standards & Surveillance in MN Fire Departments	MPH	06/2016	06/30/2016	N	Vein Clinics of America	Staff Physician
100374, 2014, Doctoral, University of Minnesota, (J Mandel, Division of Environmental Health Sciences) (URM)	Gen Surgery	The Odzi Project: Establishing an Employee Health Protocol in a Rural Zimbabwe Hospital	MPH	05/2016	04/30/2016	Y	HealthPartners Urgent Care	Staff Physician
100390, 2015, Doctoral, University of Iowa, (J Mandel, Division of Environmental Health Sciences)	Emergency Medicine	Minnesota Craft Distillery Workplace Safety	MPH	06/2019	06/30/2019	Y	Allina Health Employee Health	Medical Director
100391, 2015, Doctoral, Des Moines University, (J Mandel, Division of Environmental Health Sciences) (URM)	Anesthesiology	Occupational Injuries in the brewery industry	MPH	06/2017	06/30/2017	Y	Allina Health Occupational Medicine	Staff Physician
100405, 2016, Doctoral, Mayo Graduate School of Medicine, (J Mandel, Division of Environmental Health Sciences)	Orthopedic Surgery	Risk Factors for Work-Related Musculoskeletal Injuries	MPH	06/2018	06/30/2018	Y	Mayo Clinic Occupational Medicine	Staff Physician
100406, 2016, Doctoral, Tulane University, (J	Gen Surgery	Analysis of Employment	MPH	07/2018	06/30/2018	Y	HealthPartners Occupational	Staff Physician

Mandel, Division of Environmental Health Sciences) (URM)		Protections and Occupational Health of Inmate Workers					Medicine	
100413, 2017, Doctoral, University of Cincinnati, (S Kirkhorn, Division of Environmental Health Sciences)	Internal Medicine	Review of Hazardous Drug Exposure Risk for Various Occupations in Clinical Settings and its Relevance to Medical Surveillance	MPH	07/2019	08/01/2019	Y	Allina Occupational Medicine Clinic and Air Force Reserves	Staff Physician
100414, 2017, Doctoral, University of Minnesota, (S Kirkhorn, Division of Environmental Health Sciences)	Internal Medicine & Infectious Disease	A Call for OEM Physicians to Embrace One Health	MPH	07/2019	06/30/2019	Y	HealthPartners Occupational Medicine	Staff Physician , Medical Director Regions Employee Health
100425, 2018, Doctoral, Moldova State University, (S Kirkhorn/P McGovern, Division of Environmental Health Sciences)	Gen Surgery	One-year retrospective quality evaluation of corporate medical director review of department of transportation physical examinations	MPH	06/2020	06/30/2020	Y	Minnesota Occupational Health	Staff Physician
100426, 2018, Doctoral, Edward Via College of Osteopathic Medicine, University of Minnesota, (S Kirkhorn, Division of Environmental Health Sciences) (URM)	Internal Medicine & Anesthesiology	Not required, had previous Master's degree	MPH		06/30/2020	Y	HealthPartners Occupational Medicine Department	Staff Physician
100440, 2019, Doctoral, University of Kansas Medical Center, (S Kirkhorn, Division of Environmental Health Sciences) (URM)	Family Medicine	Evaluation of laboratory hazards via application of a worksite walkthrough tool	MPH					

100441, 2019, Doctoral, West Virginia School of Osteopathic Medicine, (S Kirkhorn, Division of Environmental Health Sciences)	Psychiatry	Operation freelance: empowering the military family through the strength of the digital freelance market	MPH					
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¹ List all NIOSH supported trainees and graduates by year of entry. Reporting period for renewals is from start date of prior competing award. New applicants should report last five years.

Table 3
Tracking Graduates-Academic Training Report1
Since Beginning of Project Period

Trainee ID	Identify NIOSH support with (N)	Identify Under Represented Minority with (URM)	Date Entered Program (mm/yy)	Date Degree Awarded (mm/yy)	Degree Awarded (MS, MPH, DrPH, PhD, etc.)	Specialty Area of Degree (IH, OHN, OS, etc.)	Date of Certificate of Completion (for Occ Med and other Certificate programs) (mm/yy)	Current Employment (Job Title/Employer/2 digit NAICS Code of Employer)	Employed in OS&H Field or Enrolled in OS&H Academic Program? Y/N
Year 1: July 1, 2010 to June 30, 2011									
100272	N		7/1/2007	8/31/2010	MPH	OEM	8/31/2010	Physician, St. Cloud VA Medical Center, St. Cloud, MN	Y
100314	N	URM	5/24/2010	Already had MPH		OEM	5/23/2011	Physician, Minneapolis VA Medical Center, Compensation and Pension	Y
100288	N		9/1/2008	8/31/2010	MPH	OEM	8/31/2010	Interim Director, Compensation and Pension, Minneapolis Veterans Administration Medical Center, Minneapolis, MN	Y
Year 2: July 1, 2011 to June 30, 2012									
100315		URM	9/1/2010	6/29/2012	MPH	OEM	7/6/2012	Staff Physician, Cheyenne Regional	Y

								Medical Center, Cheyenne, WY	
100316	N		9/1/2010	6/29/2012	MPH	OEM	7/6/2012	Physician, Minneapolis VA Medical Center, Compensation and Pension	Y
100326	N	URM	9/1/2010	5/31/2012	MPH	OEM	6/30/2012	Resident, Physical Medicine and Rehabilitation Residency Program, Eastern Virginia Medical School	N
Year 3: July 1, 2012 to June 30, 2013									
100335	N		7/1/2011	5/9/2013	MPH	OEM	6/30/2013	Staff Physician, HealthPartners Occupational and Environmental Medicine	Y
Year 4: July 1, 2013 to June 30, 2014									
100337	N	URM	11/1/2011	7/31/2013	MPH	OEM	9/25/2013	Staff Physician, HealthPartners Occupational and Environmental Medicine	Y
100352			7/1/2012	5/30/2014	MPH	OEM	4/30/2014	Medical Director, HealthForce, Occupational, Environmental and Preventive Medicine, Altoona Regional Health Systems, Altoona, PA	Y
100351	N		9/1/2012	6/6/2014	MPH	OEM	8/4/2014	Staff Physician, HealthPartners Occupational and Environmental	Y

								Medicine and Physician Consultant, State Fund	
100350	N		9/1/2012	6/2/2014	MPH	OEM	6/30/2014	Staff Physician, HealthPartners and Environmental Medicine	Y
100378		URM	7/1/2012	6/30/2014	Already had MPH	OEM	6/30/2014	Staff Physician, Kaiser Medical Group, Sacramento, CA	Y
Year 5: July 1, 2014 to June 30, 2015									
100371	N		9/1/2013	6/30/2015	MPH	OEM	6/30/2015	Sleep Medicine Fellow, Minnesota Regional Sleep Disorders Center	N
100372	N	URM	9/1/2013	5/29/2015	MPH	OEM	5/29/2015	Physician, HealthPartners Occupational and Environmental Medicine	Y

Refer to: Supplemental Instructions, pages 10 and 11. Provide Table 3 for each academic program.

¹ Graduate counts include all trainees graduated from the approved programs. Beginning of project period = start date of prior competing award.

OCCUPATIONAL HEALTH SERVICES RESEARCH AND POLICY (OHSRP)
ACADEMIC TRAINING PROGRAM

Patricia McGovern, PhD, MPH, RN, Director
Bryan Dowd, PhD, Co-Director

OCCUPATIONAL HEALTH SERVICES RESEARCH AND POLICY ACADEMIC TRAINING PROGRAM

1. Background

The Occupational Health Services Research and Policy (OHSRP) training program is an innovative collaboration between the [Division of Environmental Health Sciences](#) (EnHS) and the [Division of Health Policy and Management](#) (HPM) in the School of Public Health University of Minnesota. Seven PhD students (including six NIOSH trainees and one military trainee) were enrolled in the program during this five year period. Four students have graduated since July 2015. Among the three students continuing their studies, two have completed all coursework and are working on their dissertations and a third student is beginning his second year of studies. The program prepares researchers who will help meet the demand for more rigorous evaluation of workplace policies and programs to reduce the nation's burden of occupational illness and injury and promote the well-being of the workforce. Our program provides a Doctor of Philosophy (PhD) in Environmental Health (EH) or Health Services Research, Policy and Administration (HSRPA). The OHSRP alumni strongly support the program: they serve on the advisory board, recruit and mentor students, and provide guest lectures.

Consistent with the Center's overall mission, OHSRP has provided cutting-edge interdisciplinary occupational health and safety and health services research and policy training to prepare researchers, academics and leaders in the field by meeting the following objectives: 1) conducting high quality OHRSP research, 2) providing rigorous interdisciplinary training, 3) recruiting and retaining underserved minority trainees, 3) disseminating research findings and engaging in outreach, 4) supporting graduates in job placements, and 5) continuous improvement of OHSRP training to ensure its high impact. Graduates have taken research positions at nationwide healthcare systems (e.g., Mayo Clinic, Veterans Health Administration), the NIH, universities, research firms, state health departments and health innovation firms (e.g., Optum).

Although OHSRP has achieved numerous accomplishments, the program will be phased out in academic year 2021-2022. As part of centerwide strategic planning, there was recognition of a high regional demand for safety professionals and a need to increase their supply for a more immediate impact on occupational injuries and illnesses in the MCOHS region. Given limited resources, the center is proposing to reallocate resources to a new safety training program to address this need. Beginning July 2020, the center will integrate an option of an occupational health policy focus into the Occupational Injury Prevention (OIP) Program because 50% of current OHSRP students' dissertations focus on policies impacting occupational injuries, such as safe patient handling polices in long-term care and home health settings, and policies on child labor in construction. MCOHS will support continued training of "grandfathered" OHSRP students whose academic program plans extend into academic year 2021 and beyond. The OIP program also will explore recruiting future students with policy interests into the OIP Program working in collaboration with HPM faculty and students.

Funding from the CDC-NIOSH has been essential for the OHSRP Program and the development of the field. Limited funding exists for training health services researchers in occupational safety and health (OSH) and worker wellbeing. This T42 funding has historically been the only funding mechanism for producing qualified and skilled occupational health services and policy researchers. Key faculty have dedicated 5-10% of effort to this rigorous, interdisciplinary training program. The majority of funds (70%) are allocated to trainees (tuition, stipend, professional development travel) who would likely have chosen other courses of study if the support was not available.

The OHSRP Program works closely with other MCOHS programs. A key example includes Dr. McGovern and Jennifer Saunders (OHSRP) work with Industrial Hygiene faculty (Dr. Arnold and Dr. Anderson) in research, outreach and continuing education regarding the OSH needs of cosmetologists, nail technicians, and estheticians. There is also a close collaboration with the OIP program in research such as a 2019 Department of Labor and Industry contract to investigate national and state fatal and nonfatal injuries in construction to address a state legislative inquiry about the safety of lowering the minimum age in construction from 18 to 16 years. The OHSRP Program also works with other ERCs such as the Occupational Health Services Research (OHSR) Program at the Northwest Center for Occupational Health and Safety, University of Washington faculty, Dr. Jeanne Sears and students to co-host a biannual journal club.

2. Past Performance / Accomplishments from July 1, 2015 – June 30, 2020

Highlights. The OHSRP Program has achieved its benchmarks for meeting program goals during the 2015-2020 program period. Four students were admitted through June 30, 2019 and a fifth was admitted for fall 2019. Four students graduated; one each in 2016 and 2017 and two in 2020. One was from an under-represented minority group. Genelle Lamont, PhD, MPH is a methodologist with the state health department and has led training in health literacy for health professionals across the state. Ryan Kline, PhD, MPH, now a senior analyst at Abt Associates, supported OSHA's efforts to evaluate a proposed standard on workplace violence in the health care sector, and authored a report: "Environmental Justice Implications of Updates to EPA's Lead and Copper Rule." Christina Rosebush, PhD, MPH accepted a post-doctoral fellowship jointly supported by the Divisions of Environmental Health Sciences and Health Policy and Management in the School of Public Health. Kael Wherry, PhD, is a Senior Manager of Health Economics and Outcomes Research at Medtronic.

Continuing in the program are Lieutenant Cate Babcanec, MPH, Jennifer Saunders, MSW and Adam Moskowicz. Lt. Babcanec, a military scholarship recipient, will take her final oral exam August, 2020 and present her dissertation, "Helping Homecare: Evaluating Workplace Injury Outcomes in Homecare." She will resume military service upon graduation. Ms. Sanders has completed her coursework and written preliminary exams. She is conducting her dissertation research, "Understanding the Occupational Health and Safety Needs of Cosmetologists, Esthiologists, and Nail Technicians in Minnesota." She also works as a research assistant in the Medical School on studies related to pregnant women who are incarcerated. Adam Moskowicz completed his first year of coursework and was awarded a CREATE scholarship for summer 2020 that provides opportunities for graduate students to conduct community engaged research in environmental equity.

The program had a total of 65 publications: 21 were jointly written by faculty and students, 20 were job-related student or alumni publications, and 24 were faculty research. (See Appendix A) The program had a total of 41 presentations, 13 were developed jointly developed by students and faculty, 20 were student or alumni job-related and eight were given by faculty (See Appendix B). Dr. McGovern, Dr. Dowd, supporting faculty, and alumni were also active in outreach (See Appendix C).

A key benchmark for providing students a comprehensive skillset are student-reported competencies which are measured in our MCOHS alumni survey. The survey was administered in summer 2018 to 2019 MCOHS alumni who graduated between January 2007 and December 2017. Of seven OHSRP eligible alumni, all (100%) responded. Six domains of interdisciplinary competencies and skills were evaluated: recognition, evaluation, control, communication, behavior, and management. Self-reported proficiency was highest for skills in recognition (all alumni), evaluation (six of seven alumni), and control of occupational exposures (five of seven alumni for each domain). Proficiency in communication skills varied with five to seven alumni reporting proficiency across five items. Proficiency in management skills varied with six to seven alumni reporting proficiency on three of five items. By specific competencies, alumni reported high proficiency in understanding the relation between occupational exposures and health outcomes; designing and initiating research; gathering, managing and analyzing data; interpreting and applying scientific findings; writing clearly and effectively; and demonstrating respect and support for diversity in social and cultural beliefs. However, three to four of seven alumni reported low proficiency in managing financial and staff resources consistent with the overall center results. The MCOHS interdisciplinary courses will be enhanced with skill building and content in these weaker areas during the next cycle drawing on faculty and external advisors with relevant expertise.

Our program achieved the following goals:

Objective 1. Identify, recruit and retain students, especially students from diverse backgrounds. During the current period, one of 7 students in the program was from an underrepresented racial/ethnic group. On average, we admitted one student per year. We have retained 100% of students enrolled during the period.

Objective 2. Provide interdisciplinary training in occupational health and safety. All students participate in the interdisciplinary class, "Introduction to Occupational Health and Safety," (PubH 6170) which is required for all MCOHS core disciplines. All OHSRP students also take Occupational and Environmental Epidemiology. Over the past four years OHSRP students have also taken Occupational and Environmental Policy (PubH

6109). OSHRP students from EnHS are integrated into the Occupational Health and Safety (OHS) Research Seminar,” (PubH 8120) which provides an interdisciplinary venue for EnHS PhD students to discuss and refine their dissertation projects, learn innovative research methods, and attain career development skills.

Objective 3. Facilitate the distance-based journal club with the University of Washington’s Occupational Health Services Research Training Program. The journal club has continued to foster students’ professional identity, create community, and facilitate skills in critically reviews of the literature. The students meet biannually by conference call. Students organize and lead discussions of peer-reviewed papers on OHSRP issues such as Total Worker Health®, occupational disparities and health equity, and COVID-19 exposures, and health outcomes for healthcare workers.

Objective 4. Maintain an advisory board that meets at least once per year. We have an engaged advisory board including representatives of the manufacturing industry, state agencies, a health services innovation company, major healthcare systems, and a University of MN-Duluth faculty member who is a safety engineer and occupational injury prevention specialist (Dr. Katherine Schofield). Board members contribute to the program including mentoring students in research and providing guest lectures. For example, Dr. Schofield is dissertation Co-Advisor for Christy Rosebush (NIOSH trainee) and Cate Babanec (military trainee) on analyses of workers compensation claims. Dr. Landsteiner, a 2014 alumna of the OHSRP Program and an Advisory Board member, first engaged Dr. McGovern and Jennifer Saunders (NIOSH trainee) in research on cosmetologists when she was working at the Minnesota Department of Health.

Objective 5. Collaborate with other program directors and the MCOHS Continuing Education (CE) staff to develop and implement the annual National Occupational Research Agenda (NORA) seminar. Dr. McGovern has collaborated with MCOHS leadership and the Upper Midwest Agricultural Safety and Health (UMASH) faculty and staff to develop and facilitate the annual NORA event. This jointly sponsored event features a nationally renowned speaker that attracts professionals in the field, students and faculty, and engages participants in networking. MCOHS faculty, students and regional experts present findings on NORA and UMASH related research through poster sessions.

3. Program Deliverables. Following the OHSRP Logic Model we summarize key program outputs and outcomes. See also Appendices A-C.

Objectives and Components	
Student recruitment, enrollment and retention	Students learn about the program from alumni, faculty from other graduate institutions, and the website. Six students sought admission during the project period. 100% of enrolled students have been retained. Program materials have been continuously updated. The graduates hold OHSRP-related jobs at state health departments, research firms (e.g., Abt Associates) and research arms of private companies (e.g., Medtronic) and assume post-doctoral fellowships (University of Minnesota).
PhD Program Curriculum Provide a rigorous interdisciplinary professional and scientific educational environment Facilitate completion of PhD coursework, dissertation research and publications. Complete annual letter of progress Professional competency self-evaluation	The curriculum is dynamic based on the evolving field of occupational health services research and policy. Courses are regularly updated and new courses are developed every year. All faculty review student course evaluations annually with their division head to ensure students are provided high quality classes and address any deficiencies. Dr. McGovern meets at least monthly with 100% of her OHSRP advisees and biannually with all OHSRP students. Either Dr. McGovern or Dr. Dowd is a member of all OSHRP dissertation committees. 100% of students review a letter of progress at least annually with their academic advisor and receive guidance on progress and resources to support their success. 100% of OHSRP alumni from 2010-2017 participated in the 2018 Alumni Survey.

<p>Student and faculty professional career development for OHSRP</p>	<p>100% of students are exposed to career development activities such as presenting job talks and practicing interview skills, preparing a Curriculum Vitae, and cover letters in the PhD seminar (PubH 8100).</p> <p>100% of students attend at least one OSHRP journal club per year, 66% of students attend both OHSRP journal club sessions with University of Washington OHSR program each year.</p> <p>100% of students are introduced to the School of Public Health Mentoring Program. Students most frequently develop mentoring relationships with at least one faculty member on their dissertation committees or in their department.</p>
<p>Outreach and Public Service</p>	<p><u>MN Department of Health Environmental Tracking and Biomonitoring (EHTB) Program.</u> Dr. McGovern served as chair of the EHTB executive committee for the MDH for 5 years and engaged EHTB program staff in providing presentations and skill-building exercises analyzing online data from the Environmental Health Tracking Program. Dr. McGovern presented, “Results from the Minnesota Department of Health Environmental Tracking and Biomonitoring Program and Proposed Priorities for 2017. Minnesota Legislative Hearing, St. Paul, Minnesota, March 2016.</p> <p><u>NIOSH and National Occupational Research Agenda (NORA).</u> Dr. McGovern is a member of Healthy Work Design and Wellbeing Council for the Third Decade of NORA. She served as a coauthor of the report, and engaged students and alumni to comment on the draft priorities for the Third Decade of NORA.</p> <p><u>MN OSHA Consultation.</u> Dr. McGovern and Dr. Ramirez are collaborating with MN OSHA Consultation to develop research, education and outreach activities for employers and employees involving MCOHS faculty and students.</p> <p><u>Occupational and Environmental Medicine Grand Rounds</u> Invited presentation by Dr. McGovern, “Total Worker Health for New Mothers.” HealthPartners Clinic, St. Paul, Minnesota, October, 2015.</p> <p><u>Minnesota Association of Occupational Health Nurses.</u> Dr. McGovern serves on the Nominating Committee for the MAOHN leadership roles.</p> <p><u>MN. Department of Labor and Industry.</u> Drs. McGovern, Ramirez, Schofield and MCOHS Senior Research Fellow, Andy Ryan contributed to the development of a report to the 2020 MN Legislature, “Ensuring the safety of youth in skilled trades training programs” written by the Commissioner of Labor. The MCOHS team provided research on the risk of injury to young workers and the application of state and federal policy.</p>

Job Placement and Professional Contributions

Ryan Klein, PhD, MS is Senior Analyst, Abt Associates, Rockville, MD. Dr. Klein led the interdisciplinary team that supported OSHA’s efforts in evaluating the benefits of a proposed standard around workplace violence in the health care sector. He has received awards from his employer including: the Abt Associates Spot Bonus Award, January 2019, which recognizes exceptional work of staff whose contributions have gone above and beyond the call of duty and significantly exceeded expectations for their job level, and an Abt Associates Data Science Fellowship. His dissertation, “*Evaluating Health and Healthcare Use Effects of Changes in Paid Sick Leave Access for Workers in the United States*” was completed in 2016. His awards included selection for the Delta Omega Honorary Society in Public Health, 2016, and the Population Association of America Conference Poster Session Award, 2015. He delivered three student presentations.

Genelle Lamont, PhD, MPH is a methodologist with the MN Department of Health and she is in charge of the MDH health literacy trainings across the state. Her dissertation, “Cigarette Smoking, Social Support and Workplace Smoke-free Policies among an Urban American Indian Population,” was completed in 2017.

Christina Rosebush, MPH is a post-doctoral fellow at the University of Minnesota, School of Public Health. She successfully completed her final oral exam in June, 2020 and presented her dissertation, “Caring for our Caregivers: an Evaluation of the Minnesota Safe Patient Handling Act.” She was awarded a MCOHS Pilot Project Grant, 2019-2020 for her dissertation research and has published her study findings in one paper in the American Journal of Industrial Medicine and has a second paper in press with Occupational and Environmental Medicine. Christina also coauthored five peer-reviewed publications while a student in association with her work as a Project Manager and Researcher, Minneapolis V.A. Medical Center Evidence-based Synthesis Program, 2017-2018. Christina delivered three presentations associated with her PhD training.

Kael Wherry, MS, PhD candidate. Kael is a Senior Manager, Health Economics and Outcomes Research, Medtronic, Minneapolis, MN. She completed her final oral exam and presented her dissertation research, “The Long-Term Effectiveness of the Kidney Allocation System,” in June of 2020. Her dissertation research evaluates the long-term cost-effectiveness of the nation’s Kidney Allocation System focusing on the effects of disease management programs among individuals with late-stage Chronic Kidney Disease (CKD) and End-Stage Renal Disease (ESRD). She is evaluating issues of disparities and health equity in kidney transplant allocation and cost savings associated with reduced inpatient admissions, and the impact of delayed transition to ESRD on workplace productivity. She has had one paper accepted for publication and another is in review in association with her dissertation research. She was the Medtronic Star of Excellence Award winner, 2019, for execution of a study using Medicare administrative claims to measure clinical outcomes. Kael has one non-peer reviewed publication and has given 11 research presentations.

Cate Babcanec, MPH (Military Trainee). Her dissertation, “Helping Homecare: Investigating Injuries in Homecare Workers in MN,” was completed in August 2020. Cate has given two presentations involving her research, one of which was at an international environmental health conference in New Delhi, India.

Cynthia Kenyon, MPH, PhD student, is Supervisor, Vaccine Preventable Disease Surveillance Unit – Minnesota Department of Health (MDH). In the past year, she has played a leadership role in the MN Department of Health’s response to the corona virus pandemic. Her dissertation will evaluate the gaps in influenza vaccine uptake among MN’s long term care workers (taking into account coverage of vaccine, recent experience of influenza outbreaks in the facility, and various demographics), and health care facilities’ understanding of health care worker immunization recommendations and their ability to evaluate those recommendations during exposures and outbreaks. Cynthia has co-authored seven publications on occupational health and safety during her enrollment in the OHSRP Program. As Supervisor, Vaccine Preventable Disease Surveillance Unit at the MN Department of Health, she has 22 peer reviewed publications and five major conference presentations; only those completed during her PhD education are listed in the publications.

Jennifer Saunders, MSW, PhD student. Her dissertation will describe work-related exposures and protective behaviors among beauty professionals (e.g., cosmetologists, nail technicians) in a survey of ~ 30,000 licensed beauty professionals and Dr. McGovern is her research advisor. She has received two student investigator awards: a MCOHS pilot research (2018) and an award from the Society for Chemical Hazard Communications (2017) in addition to a Professional Development Grant Award from the School of Public Health Student Senate, March 2019, to cover a portion of conference travel expenses to present a poster at the *Work, Stress and Health* Conference. She is a research assistant in the Medical School on studies related to pregnant women who are incarcerated. Jennifer has coauthored two publications and given eight presentations associated with her education.

Adam Moskowitz, PhD student. Adam has completed his first year in the OHSRP Program. He was awarded a CREATE scholarship for summer 2020 that provides opportunities for graduates students to conduct community engaged research in environmental equity.

Appendix A
Occupational Health Services Research and Policy
Student and Faculty Publications

Student and alumni names are underscored.

MCOHS Faculty and Advisory Board Members are in **bold font**.

2020

Atherly A, Feldman RD, **Dowd B**, van den Broek-Altenburg E: [2020] Switching Costs in Medicare Advantage. Forum for Health Economics & Policy. 23(1). [Dr. Dowd is co-director of the OHSRP Training Program.]

Dowd BE, Laugesen MJ: [2020] Fee-for-service payment is not the (main) problem. Health Service Research 55(4):491-495. [Dr. Dowd is co-director of the OHSRP Training Program.]

Rosebush C, Zaidman BA, **Schofield K**, Erickson DJ, **Ramirez M**, Tschida B, **McGovern P**: [In press] An evaluation of the Minnesota Safe Patient Handling Act: trends in workers' compensation indemnity claims in nursing home workers before and after enactment of the law. Occupational and Environmental Medicine. [Student author is a trainee in the OHSRP Training Program. Dr. Schofield is faculty with the Master of Environmental Health and Safety Program at the University of Minnesota, Duluth; Dr. Ramirez is faculty with the OIRPT Program and Dr. McGovern is faculty with the OEHN and OHSRP Programs.]

Smith LB, Desai NR, **Dowd B**, Everhart A, Herrin J, Higuera L, Jeffery MM, Jena AB, Ross JS, Shah ND, Karaca-Mandic P. [Patient and provider-level factors associated with changes in utilization of treatments in response to evidence on ineffectiveness or harm](#). International Journal of Health Economics and Management. 2020 Apr 30. doi: 10.1007/s10754-020-09282-2. Online ahead of print. [Dr. Dowd is co-director of the OHSRP Training Program.]

Rosebush C, Zaidman BA, **Schofield K**, Erickson DJ, **Ramirez M**, Tschida B, **McGovern P**: [2020]. Occupational differences in workers' compensation indemnity claims among direct care workers in Minnesota nursing homes, 2005-2016. American Journal of Industrial Medicine 63: 517-526. [Student author is a trainee in the OHSRP Training Program. Dr. Schofield is faculty with the Master of Environmental Health and Safety Program at the University of Minnesota, Duluth; Dr. Ramirez is faculty with the OIRPT Program and Dr. McGovern is faculty with the OEHN and OHSRP Programs.]

Shlafer R, Hindt L, Saunders J: [2020] "No one has ever asked me if I'm a dad." Supporting families in the context of incarceration through community-university-corrections partnerships. Zero to Three Journal, 40(4). [Student author is a trainee in the OHSRP Training Program and the publication is from her research assistantship position.]

Pendleton V, Saunders J, Shlafer, R: [2020] Corrections officers' knowledge and perspectives of maternal and child health policies and programs for pregnant women in prison. Health & Justice, 8(1). [Student author is a trainee in the OHSRP Training Program and the publication is from her research assistantship position.]

2019

Ackland PE, Greer N, Sayer NA, Spont MR, Macdonald R, McKenzie L, Rosebush C, Wilt TJ.: [2019] Effectiveness and harms of mental health treatments in service members and veterans with deployment-related mild traumatic brain injury. Journal of Affective Disorders, 252: 493-501. [OHSRP trainee job-related research.]

Balk EM, Trikalinos TA, Mickle K, Cramer G, Chapman R, Khan S, Ollendorf DA, Pearson SD, Kuntz KM, Wherry K, Williamson I. [2018] Modulator Treatments for Cystic Fibrosis: Effectiveness and Value.

Retrieved from Institute for Clinical and Economic Review website: https://icer-review.org/wp-content/uploads/2017/10/CF_Final_Evidence_Report_06072018.pdf [Ms. Wherry is an OHSRP student].

- Dowd B, Nyman JA.** [2019] Cost-Effectiveness Analysis in the Context of US Commercial Health Insurance. *Pharmacoeconomics* 37(6):743-744. doi:10.1007/s40273-019-00780-x. [Drs. Dowd and Dr. Nyman are OHSRP key and supporting faculty, respectively.]
- Fink HA, MacDonald R, Forte ML, Rosebush C, Ensrud KE, et. al: [2019] Long-Term Drug Therapy and Drug Discontinuations and Holidays for Osteoporosis Fracture Prevention: A Systematic Review. *Annals of Internal Medicine*, 171(1):37-50. [OHSRP trainee job-related research.]
- Green D, **Gerberich SG, Kim H, Ryan AD, McGovern PM, Church TR, Schwartz A**, Arauz RF: [2019] Knowledge of work-related injury reporting and perceived barriers among janitors. *Journal of Safety Research* 69:1-10. [Student authors are trainees in the OIR Training Program and faculty (other than Dr. McGovern) are with the OIRPT Program; Dr. McGovern is with the OHSRP Program; RFA is a PhD graduate in Occupational and Environmental Epidemiology.]
- Green D, **Gerberich SG, Kim H, Ryan AD, McGovern PM, Church TR, Schwartz A**, Arauz RF:[2019] Janitor workload and occupational injuries. *American Journal of Industrial Medicine* 62:222-232. DOI: 10.1002/ajim.22940. [Student authors are trainees in the OIR Training Program and faculty (other than Dr. McGovern) are with the OIRPT faculty; Dr. McGovern is with the OHSRP Program; RFA is a PhD graduate in Occupational and Environmental Epidemiology.]
- Greer N, Sayer NA, Spont M, Taylor BC, Ackland PE, MacDonlad R, McKenzie L, Rosebush C, Wilt TJ: [2019] Prevalence and Severity of Psychiatric Disorders and Suicidal Behavior in Service Members and Veterans With and Without Traumatic Brain Injury: Systematic Review. *Journal of Head Trauma Rehabilitation*, Epub ahead of print. [OHSRP trainee job-related research.]
- Griffith J, Bozio CH, Poel AJ, Fitzpatrick K, DeBolt CA, Cassidy P, Kenyon C, ... and Acosta AM. [2019] Imported Toxin-Producing Cutaneous Diphtheria—Minnesota, Washington, and New Mexico, 2015– 2018. *Morbidity and Mortality Weekly Report*. 68(12): 281. [OHSRP trainee job-related research.]
- Moline H, Kalaskar A, Pomputius III, WF., Lopez A, Routh J, Kenyon C, and Griffith J. [2019]. Notes from the Field: Six Cases of Acute Flaccid Myelitis in Children—Minnesota, 2018. *Morbidity and Mortality Weekly Report* 68(15): 356. [OHSRP trainee job-related research.]
- Norton EC, **Dowd BE**, Maciejewski ML. [2019] Marginal Effects-Quantifying the Effect of Changes in Risk Factors in Logistic Regression Models. 321(13):1304-1305. doi: 10.1001/jama.2019.1954. [Dr. Dowd is OHSRP faculty.]
- Schwartz A, **Gerberich S, Kim H, Ryan A, Church TR**, Albin T, **McGovern PM**, Erdman A, Green D, Arauz RF. [2019] Janitor Ergonomics and Injuries in the Safe Workload Ergonomic Exposure Project (SWEEP) Study. *Applied Ergonomics* 81:102874. doi: 10.1016/j.apergo.2019.102874. Epub 2019 Jun 25. [Student authors are trainees in the OIPRT Program and faculty (other than Dr. McGovern) are with the OIRPT Program; Dr. McGovern is OHSRP Program faculty; RFA is a PhD graduate in Occupational and Environmental Epidemiology.]
- Sadr Dadres G, Whitaker KM, Haapala JL, Foster L, Smith KD, Teague AM, Jacobs DR Jr, Kharbanda EO, **McGovern PM**, Schoenfuss TC, Le LJ, Harnack L, Fields DA, Demerath EW. [2019] Relationship of Maternal Weight Status Before, During, and After Pregnancy with Breast Milk Hormone Concentrations. *Obesity* 27(4):621-628. doi: 10.1002/oby.22409. [Dr. McGovern is OHSRP Program faculty.]
- Tahir MJ, Haapala JL, Foster LP, Duncan KM, Teague AM, Kharbanda EO, **McGovern PM**, Whitaker KM, Rasmussen KM, Fields DA, Harnack LJ, Jacobs DR Jr, Demerath EW. [2019] Association of Full Breastfeeding Duration with Postpartum Weight Retention in a Cohort of Predominantly Breastfeeding Women. *Nutrients* 11(4): pii: E938. doi: 10.3390/nu11040938. [Dr. McGovern is OHSRP Program faculty.]

Tahir MJ, Haapala JL, Foster LP, Duncan KM, Teague AM, Kharbanda EO, **McGovern PM**, Whitaker KM, Rasmussen KM, Fields DA, Jacobs DR Jr, Harnack LJ, Demerath EW. Higher Maternal Diet Quality during Pregnancy and Lactation Is Associated with Lower Infant Weight-For-Length, Body Fat Percent, and Fat Mass in Early Postnatal Life. *Nutrients* 11(3) pii: E632. doi: 10.3390/nu11030632. [Dr. McGovern is OHSRP Program faculty.]

2018

Cigan S, **McGovern P**, Choudhary K, Miller N, Georgieff M, Rao R, Stepanov I: [2018] Toenail manganese as a potential biomarker for *in utero* and early childhood exposure studies. *Scientific Reports*.19; 8(1):17034. doi: 10.1038/s41598-018-35112-0. [Student author is a trainee in the Occupational and Environmental Epidemiology Program; Dr. McGovern was the PI of the research grant; Dr. Stepanov designed and supervised the biomarker development and testing.]

Duan-Porter W, Martinson BC, Greer N, Taylor BC, Ullman K, McKenzie L, Rosebush C, et .al. [2018]. Evidence Review- Social Determinants of Health for Veterans. *Journal of General Internal Medicine*, 33(10), 1785-1795. [OHSRP trainee job-related research]

Goldsmith ES, Taylor BC, Greer N, Murdoch M, MacDonald R, McKenzie L, Rosebush C, Wilt TJ. [2018] Focused Evidence Review: Psychometric Properties of Patient-Reported Outcome Measures for Chronic Musculoskeletal Pain. *Journal of General Internal Medicine*, 33 (Suppl. 1), 61-70. [OHSRP trainee job- related research]

Jeffery MM, **Dowd BE**, Wolfson, J, Meier, SK., Abraham, JM., and Kane RL: [2018] Healthcare Service Use among Elderly Seasonal Migrants. *Population Health Management* 21(5) 415-421. [OHSRP faculty research]

Jou J, **Kozhimannil KB**, **Abraham JM**, **Blewett LA**, **McGovern PM**: [2018] Paid Maternity Leave in the United States: Associations with maternal and infant health. *Maternal and Child Health Journal* 22(2):216-225. [Non-trainee student and OHSRP supporting and key faculty research]

Higuera L, Carlin CS, **Dowd BE**: [2018] Narrow Provider Networks and Willingness to Pay for Continuity of Care and Network Breadth. *Journal of Health Economics* 60: 90-97. [OHSRP faculty research]

Moline HL, Karachunski PI, Strain A, Griffith J, Kenyon C, Schleiss M: [2018] Acute Transverse Myelitis Caused by Echovirus 11 in a Pediatric Patient: Case Report and Review of the Current Literature. *Child Neurology Open* 5:1-4. [OHSRP trainee job-related research]

Norton E, **Dowd BE**. [2018] Log Odds and the Interpretation of Logit Models. *Health Services Research* 53(2):859-878. doi: 10.1111/1475-6773.12712. Epub 2017 May 30. [OHSRP faculty research.]

Norton E, **Dowd BE**, Maciejewski ML. [2018] Odds Ratios vs Risk Ratios-Reply. *JAMA* 320(19):2041-2042. doi:10.1001/jama.2018.14421. [OHSRP Program faculty and non-trainee alumni research.]

Norton E, **Dowd BE**, Maciejewski ML. [2018] Odds Ratios-Current Best Practice and Use. *JAMA* 320(1):84-85. doi:10.1001/jama.2018.6971. [OHSRP Program and non-trainee alumni research faculty research.]

Nyman J, Cagatay K, **Dowd BE**, McCreedy E, Trenz HM: [2018] Decomposition of Moral Hazard *Journal of Health Economics* 57:168-178. [OHSRP supporting and key faculty research]

Parashuram S, Seung K, **Dowd BE**: [2018] Inappropriate Utilization in Fee-for-Service Medicare and Medicare Advantage Plans. *American Journal of Medical Quality* 33(1):58-64. [OHSRP faculty research.]

Saunders J, Jarlenski M, Levy R, **Kozhimannil K**: [2018] Federal and state policy efforts to address maternal opioid misuse: Gaps and challenges. *Women's Health Issues*: 28(2):130-136. [OHSRP trainee and OHSRP supporting faculty research.]

Wholey D, LaVenture M, Rajamani S, Kreiger R, Hedberg C, and Kenyon C: [2018] Developing workforce capacity in public health informatics: Core competencies and curriculum design. *Frontiers in Public Health*. 6 (124):1-11. [Ms. Kenyon is an OHSRP trainee]

Yang YT, Saunders JB, Kozhimannil KB: [2017] Health Policy Brief: Workplace and Public Accommodations for Nursing Mothers. *Health Affairs* 10.1377/hblog20160318.054018 Accessed October 2019 at <https://www.healthaffairs.org/doi/10.1377/hblog20160318.054018/full/>. [Ms. Saunders is an OHSRP trainee and Dr. Kazhimannil is supporting OHSRP faculty.]

2017

Curtis CR, Baughman AL, DeBolt C, Goodykoont, S, Kenyon C, Watso, B... and Bisgard, K. M. [2017]. Risk Factors Associated With Bordetella pertussis Among Infants ≤ 4 Months of Age in the Pre-Tdap Era: United States, 2002–2005. *The Pediatric Infectious Disease Journal*. 36(8): 726-735.

Graeve C, McGovern P, Alexander B, Church T, Ryan A, Polovich M: [2017] Occupational Exposure to Antineoplastic Agents: An Analysis of Healthcare Workers and Their Environments. *Workplace Health and Safety and Health*. 65(1):9-20. doi: 10.1177/2165079916662660. Epub 2016 Oct 7. [This paper is a product of Dr. Graeve's dissertation research. She was an OEHN PhD trainee; Dr. McGovern was her OEHN research advisor; Dr. Alexander and Dr. Church are supporting faculty for the OEHN Training Program and Mr. Ryan is Senior Research Fellow with MCOHS.]

Graeve C, McGovern P, Arnold S, Polovich M: [2017] Testing a Quality Improvement Intervention to Decrease Healthcare Workers' Exposure to Antineoplastic Agents. *Oncology Nursing Forum* 1; 44(1):E10-E19. [This paper is a product of Dr. Graeve's dissertation research. She was an OEHN PhD trainee; Dr. McGovern was her OEHN research advisor; Dr. Arnold is IH faculty and a committee member who assisted with surface sampling of antineoplastic residue.]

Hall V, Banerjee E, Kenyon C, ... and Ehresmann, K. [2017]. Measles Outbreak—Minnesota April–May 2017. *MMWR. Morbidity and Mortality Weekly Report*, 66.

Lamont G. Cigarette smoking, social support, and workplace smoke-free policies among an urban American Indian population. [OHSRP Trainee Student's PhD Dissertation, Dr. McGovern was her PhD Advisor].

McNamara L A, Skoff T, Faulkner A, Miller L, Kudish K, Kenyon C, ... and Briere, E. [2017]. Reduced Severity of Pertussis in Persons with Age-Appropriate Pertussis Vaccination—United States, 2010–2012. *Clinical Infectious Diseases* 65, (5): 811–818. <https://doi.org/10.1093/cid/cix421>

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Yu J, Abraham JM, Dowd B, Higuera LF, Nyman JA. [2017] Impact of a workplace physical activity tracking program on biometric health outcomes. *Prev Med*. 105:135-141. doi: 10.1016/j.ypmed.2017.09.002. [OHSRP key and supporting faculty research.]

2016

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Carlin CS, Feldman R, Dowd BE: [2016] The Impact of hospital acquisition of physician practices on referral patterns. *Health Economics* 25(4): 439-454. [OHSRP faculty research]

Carlin CS, Fertig AR, **Dowd BE**. [2016] Affordable Care Act's Mandate Eliminating Contraceptive Cost Sharing Influenced Choices of Women With Employer Coverage. *Health Aff (Millwood)*. 35(9):1608-15. doi: 10.1377/hlthaff.2015.1457. [OHSRP faculty research]

Coetzee DJ, **McGovern PM**, Rao R, Harnack LJ, Georgieff MK, Stepanov I: [2016] Measuring the impact of manganese exposure on children's neurodevelopment: advances and research gaps in biomarker-based approaches. *Environmental Health* 15(1):91. doi: 10.1186/s12940-016-0174-4. [Ms. Coetzee was a non-trainee student and Dr. McGovern was the PI of the grant funding the study and Ms. Coetzee's research advisor.]

Dagher RK, **McGovern PM**, Schold JD, Randall XJ. Determinants of breastfeeding initiation and cessation among employed mothers: a prospective cohort study. *BMC Pregnancy Childbirth*. 2016;16(1):194. doi: 10.1186/s12884-016-0965-1.[OHSRP alumni (international student/ non-trainee) Dr. McGovern was PI of the study funding the research and Dr. Dagher's dissertation co- advisor.]

Hudak ML, Park CH, Annett RD, Hale DE, **McGovern PM**, McLaughlin TJ, Dole N, Kaar JL, Balsam MJ. The National Children's Study: an introduction and historical overview. *Pediatrics*. 2016; 137 Suppl. 4:S213-8. doi: 10.1542/peds.2015-4410B. [Dr. McGovern is with OHSRP faculty.]

Jou J, **Kozhimannil KB**, **Blewett LA**, **McGovern PM**, **Abraham JM**. Workplace accommodations for pregnant employees: associations with women's access to health insurance coverage after childbirth. *Journal of Occupational and Environmental Medicine* 2016 58(6):561-6. [Ms. Jou is a non-trainee student and the faculty are OHSRP supporting and key faculty.]

Klein, Ryan. Evaluating Health and Health Care Use Effects of Changes in Paid Sick Leave Access for Workers in the U.S. [OHSRP Trainee Student's PhD Dissertation, Dr. McGovern was PhD Advisor.]

Kozhimannil KB, Jou J, Gjerdingen DK, **McGovern PM**: [2016] Access to workplace accommodations to support breastfeeding, after the affordable care act. *Women's Health Issues* 26(1)3-16. Press coverage: Forbes magazine, Huffington Post, US News and World Report, Minneapolis Star Tribune, Minnesota Public Radio, KSTP TV (Minneapolis ABC Affiliate), Marketplace, MinnPost. [OHSRP supporting and key faculty, and (non-trainee) student research.]

Landsteiner A, **Nyman J**, Lindgren P, **McGovern P**, **Alexander B**, **Williams A**: [2016] The Economic impact for farm injury in Minnesota, 2004-2010. *Journal of Agromedicine*, 21(2):171-7. doi: 10.1080/1059924X.2016.1143904. [OHSRP trainee dissertation product, Dr. McGovern was dissertation advisor, Dr. Nyman, Dr. Alexander and Dr. Williams are OHSRP supporting faculty.]

Michaud TL, **Nyman JA**, Jutkowitz E, Su D, **Dowd B**, **Abraham JM**. [2016] Effect of Workplace Weight Management on Health Care Expenditures and Quality of Life. *J Occup Environ Med*. 58(11):1073-1078. [OHSRP supporting and key faculty research.]

McGovern PM, Nachreiner NM, Holl JL, Halfon N, Dabelea D, Caulfield L, Cauley JA, Innocenti MS, Amsden L, Markovic N, Riddles M, Adams S. The National Children's Study: early recruitment outcomes using the direct outreach approach. *Pediatrics* 2016; 137 Suppl. 4:S231-8. doi: 10.1542/peds.2015- 4410D. [Dr. McGovern is with OHSRP faculty.]

Nelson J, Edhlund B, Johnson J, Rosebush C, Holmquist Z, Swan S, and Nguyen R.: [2016] Assessing a New Method for Measuring Fetal Exposure to Mercury: Newborn Bloodspots. *International Journal of Environmental Research and Public Health*, 13(7), 692. [OHSRP trainee work-related research.]

Parsons HM, Schmidt S, Karnad A, Liang Y, Pugh MJ, Fox E: [2016] Association between the number of suppliers for critical antineoplastics and drug shortages: implications for future drug shortages and treatment. *Journal of Oncology Practice* 12(3):e289-98, 249-50. doi: 0.1200/JOP.2015.007237. Epub 2016 Feb 2. [OHSRP Alumna research]

Schult TM, Kelly Q, Schmunk SK, Awosika ER: [2016] From policy to practice: tobacco use cessation for employees in the Veterans Health Administration. *Journal of Occupational and Environmental Medicine*, 58(5):525-31. doi: 10.1097/JOM.0000000000000720. [OHSRP Alumna research]

Williams JAR, Schult TM, Nelson CC, Cabán-Martinez AJ, Katz JN, Wagner GR, Pronk NP, Sorensen G, McLellan D: [2016]. Validation and Dimensionality of the Integration of Health Protection and Health Promotion Score: Evidence from the PULSE small business and VA Medical Center Surveys. *Journal of Occupational and Environmental Medicine*, 58(5):499-504. doi: 10.1097/JOM.0000000000000732. [OHSRP Alumna research.]

Xu Yi W, **Dowd BE**, **Abraham J**: [2016] Lessons from state mandates of preventive cancer screenings, *European Journal of Health Economics* 17(2): 203-215. [Student (non-trainee) and OHSRP key and supporting faculty research]

2015

Kralewski J, **Dowd BE**, Knutson D, Tong J, Savage M: [2015] The relationships of physician practice characteristics to quality of care and costs, *Health Services Research* 50(3): 710-729. [OHSRP faculty research.]

Landsteiner A, **Williams A**, Lindgren P, **McGovern P**, **Alexander B**: [2015] Rates and trends of injury related to agriculture in Minnesota, 2000 – 2011. *Journal of Agromedicine* 20(4): 419-426. [OHSRP trainee, dissertation product, Dr. McGovern Advisor, other faculty are OHSRP supporting faculty.]

Parsons HM, Harlan LC, Schmidt S, Keegan THM, Lynch CF, Kent EE, Wu WC, Schwartz SM, Chu RL, Keel G, Smith AW: [2015]. Who treats adolescents and young adults with cancer? A report from the AYA HOPE Study. *Journal of Adolescent and Young Adult Oncology* 4(3):1-10. [OHSRP Alumna research]

Appendix B
Occupational Health Services Research and Policy
Student and Faculty Presentations

Student and alumni names are underscored.

MCOHS Faculty and Advisory Board Members are in **bold font**.

2020

McGovern PM. Health Disparities, Health Equity and Occupational Health. Invited Guest Lecture, PubH 6130, Occupational Medicine: Principles and Practice, School of Public Health University of Minnesota; Minneapolis, Minnesota; April 2020. [OHSRP faculty presentation.]

2019

Babcanec C, **McGovern P.** and **Schofield K.** Injuries, Costs, and Quality of Life in Home Healthcare Workers: A Decision Analysis. Poster presented at the International Conference on Emerging Challenges to Environmental and Occupational Health & Sustainability; January 2019; New Delhi, India.[OHSRP military trainee, OHSRP key and supporting faculty.]

Cossi DA, **McGovern PM.** Sexual Harassment Law and Implications for Nurses. Invited presentation. Master of Nursing Student Council, School of Nursing, University of Minnesota; March 2019; Minneapolis, MN. [OHSRP key and supporting faculty.]

Gaugler, J., Bustamante-Callejas, G., Rosebush, C., Birkeland R. The PorchLight Project. Presentation and training for study participants at Anoka Senior Center; June 2019; Coon Rapids, MN. [OHSRP trainee job-related presentation.]

Lamont, GRS. Patient-friendly Medication Schedule. Talk and mini-workshop presented at the Minnesota Health Literacy Best Practices Conference; August 2019; St. Paul, MN. [OHSRP alumna job-related presentation.]

McCarron H, Rosebush C, Birkeland R. A Conversation About Gentrification and Aging in North Minneapolis, Findings from a Report from the North Minneapolis Community Housing Forum .University of Minnesota School of Public Health, Harrison Neighborhood Association, Metropolitan Area Agency on Aging, and AARP Minnesota; July, 2019, Harrison Recreation Center in Minneapolis, MN. [OHSRP trainee job-related presentation.]

McGovern PM. Health Disparities, Health Equity and Occupational Health. Invited Guest Lecture, PubH 6130, Occupational Medicine: Principles and Practice, School of Public Health University of Minnesota; Minneapolis, Minnesota; March 2019. [OHSRP faculty presentation.]

McGovern PM. Leadership. (Invited Presentation). Minnesota Occupational Health Nurses Association; University of Minnesota; May 2019; Minneapolis, MN. [OEHN and OHSRP faculty presentation.]

Saunders J, **McGovern P**, **Arnold S**, and **Landsteiner A.** Occupational Hazards and Stress among Minnesota Cosmetologists, Estheticians and Nail Technicians. Poster presented at Work, Stress, and Health; November 2019; Philadelphia, PA. [OHSRP student and faculty presentation.]

Saunders J, Pendleton V, and Schlafer R. Corrections Officers' Experiences of Work-Related Stress and their Perspectives of Working with Women Who are Pregnant and Incarcerated. Poster presented at the National Occupational Research Agenda (NORA) Symposium; May, 2019; Minneapolis, MN. [OHSRP trainee job-related presentation.]

Saunders J, Pendleton V, and Shlafer R. Corrections Officers' Perspectives of Working with Women Who are Pregnant and Incarcerated. Poster presented at 12th Academic & Health Policy Conference on Correctional Health, March, 2019; Las Vegas, NV. [OHSRP trainee job-related presentation.]

Wherry (Haig) K, Williamson I, Chapman R, Kuntz K. Ivacaftor Treatment for G551D Cystic Fibrosis Patients is Not Cost-Effective in the US Health Care System Setting. Moderated poster session at the Society for Medical Decision Making Annual North American Meeting; October, 2019; Portland, OR. Nominee: Lee B. Lusted Student Prize. [OHSRP trainee job-related presentation.]

Wherry (Haig) K, Stromberg K, Bockstedt L, Hinnenthal J, El-Chami M. New Technology Assessment with Administrative Claims Data Vs. Clinic-Based Registry Data: A Comparison of Outcomes Ascertained from Two Real-World Data Sources. Poster session at the Academy Health Annual Research Meeting; June, 2019; Washington, DC. [OHSRP trainee job-related presentation.]

Zmora R, Statz TL, Birkeland R, McCarron H, Finlay JM, Rosebush C, Gaugler JE. Mechanisms and Impacts of Counseling on Family-Staff Relationships in Residential Long-Term Care. Poster presentation at American Psychological Association Annual Convention; August, 2019; Chicago, IL. [OHSRP trainee job-related presentation.]

2018

Dowd BE. Minnesota Health Care Roundtable: Consolidation in Health Care: Examining Cost and Quality Issues; November, 2018; Minneapolis, MN. [OHSRP faculty presentation.]

Lamont, GRS. Health Literacy 101 – Helping your patients understand. Talk presented at the Minnesota Health Literacy Best Practices Conference; July, 2018; Minnesota Humanities Center, St. Paul, MN. [OHSRP alumna job-related presentation.]

Lamont, GRS. Health Literacy Best Practices for Informed Consent Forms. Presentation at the Minnesota Department of Health; December, 2018; St. Paul, MN. [OHSRP alumna job-related presentation.]

McGovern PM. Health Disparities, Health Equity and Occupational Health. (Invited Guest Lecture). PubH 6130, Occupational Medicine: Principles and Practice University of Minnesota School of Public Health; Minneapolis, MN; April 2018. [OHSRP faculty presentation.]

Saunders J, McGovern PM. (Invited Oral Presentation). What Did We Learn from Focus Groups with Cosmetologists? Minnesota Board of Cosmetologists; St. Paul, MN; February 2018. [OHSRP student and faculty presentation.]

Saunders J, McGovern P, and Arnold S. Understanding the Relationship between Work and Health: Occupational Health and Safety Knowledge and Behaviors among Cosmetologists in Minnesota. Poster presented at the Society for Chemical Hazard Communication Spring Meeting; Orlando, FL; April, 2018. [OHSRP student and faculty presentation.]

Saunders J, McGovern P, and Arnold S. Understanding the Relationship between Work and Health: Occupational Health and Safety Knowledge and Behaviors among Cosmetologists in Minnesota. Poster presented at the National Occupational Research Agenda (NORA) Symposium; Minneapolis, MN; May, 2019. [OHSRP student and faculty presentation.]

Scher D and **McGovern PM.** Manganese: an Overlooked Drinking Water Containment and the Potential for Child Development Risks. Invited presentation for the Minnesota Environmental Health Association; Rochester, MN; October, 2018. [OHSRP faculty presentation.]

Shlafer R, Davis L, and Saunders J. Effectiveness of Doula Care for Pregnant Women who are Incarcerated. 11th Academic & Health Policy Conference on Correctional Health; Houston, TX; March, 2018. [OHSRP trainee job-related presentation.]

Wherry (Haig) K, Bockstedt L, Hinnenthal J, El-Chami M. Using real world evidence in coverage with evidence (CED): An innovative approach to new technology assessment. Poster presentation at the National Health Policy Conference; Washington, DC; February, 2018. [OHSRP trainee job-related presentation.]

2017

Babcanec C, Rosebush C, McGovern P, Bey J, and Kim H. Caring for care-givers: Testing the impact of a management-driven health interventions on job satisfaction and retention of elder-care employees. Poster presented at 26th International Epidemiology in Occupational Health Conference; August 2017; Edinburgh, Scotland. [Ms. Babcanec (military trainee) and Ms. Rosebush (OHSRP trainee), Dr. McGovern, their dissertation advisor, Ms. Bey, OEHN Program Advisory Board Membe and community contact for study, and Dr. Kim OHSRP supporting faculty.]

Chien A, (Wherry) Haig K, Bannister W, Plosser K, Ruyter M, Stankovic A. A comparison of time to dialysis among individuals with and without access to a nurse-facilitated disease management program. Poster session at the American Nephrology Nurses Association National Symposium; April, 2017; Washington, DC: [OHSRP trainee job-related presentation.]

Haig K, Chien A, Gray H, Bannister W. Impact of a specialized disease management program on medical cost and time to ESRD transition among patients with stage 4-5 CKD. Poster presented at the National Kidney Foundation Spring Clinical Meeting; April, 2017; Orlando, FL. [OHSRP trainee job-related presentation.]

McGovern P, Bey J, French S, Kim H. Improving Working Conditions for Care Workers: Testing the Impact of a Pilot Worksite Health Improvement Intervention,” Presentation at the Global Carework Summit, University of Massachusetts, June 2017; Lowell, MA. [OHSRP faculty research with OEHN advisory board member, Ms. Bey and OEHN supporting faculty, Dr. French, and OHSRP supporting faculty, Dr. Kim and conducted in part with a MCOHS pilot project grant.]

McGovern P, Saunders J, and McAlpine D. The Environmental Impact of Highly Pathogenic Avian Influenza on Health, Coping, and Resilience in Farmers. Presented at Work, Stress, and Health: The 12th International Conference on Occupational Stress and Health; Minneapolis, MN; June, 2017. [OHSRP key and supporting faculty and OHSRP PhD trainee presentation from a pilot project funded through the Upper Midwest Center for Occupational Health and Safety (UMASH).]

McGovern P, Saunders J, and McAlpine D. Stress and Resilience: The Impact of the 2015 Outbreak of Highly Pathogenic Avian Influenza on Minnesota Poultry Growers, Farm Workers and Industry Stakeholders. Poster presented at the National Occupational Research Agenda (NORA) Symposium; Minneapolis, MN; May, 2017. [OHSRP key and supporting faculty and OHSRP trainee presentation from a pilot project funded through the Upper Midwest Center for Occupational Health and Safety (UMASH).]

Wherry (Haig) K, Kuntz K. Cost-effectiveness of living versus deceased donor kidney transplant under the Kidney Allocation System. Poster presented at the Society for Medical Decision Making Annual North American Meeting; Pittsburgh, PA; October, 2017. [OHSRP trainee and supporting faculty presentation.]

2016

Gray H, (Wherry) Haig K, and Bannister W. *Cost and utilization related to sickle cell disease in a managed Medicaid program.* Poster presented at the Annual Sickle Cell Disease Research & Educational Symposium; August 2016; Fort Lauderdale, FL. [OHSRP trainee job-related presentation.]

Klein R, Abraham J, Dowd B, Gerberich S, Mandel J, and McGovern P. *Evaluating Paid Sick Leave in American Workers: Health and Work-Absence Effects.* Poster presented at the Population Association of America Conference; March 2016; Washington D.C. [OHSRP trainee dissertation-related presentation. Dr. McGovern was Mr. Klein’s dissertation advisor and OHSRP supporting faculty were dissertation committee members.]

Lamont GRS. Minnesota Action Plan to Address Health Literacy. Presentation at the Minnesota Department of Health, Communities of Practice in Evaluation; March, 2016; St. Paul, MN. [OHSRP alumna presentation.]

Lamont GRS. Collecting, Measuring and Reporting Health Disparities. Presentation at the Minnesota Department of Health, Communities of Practice in Evaluation; November, 2016; St. Paul, MN. [OHSRP alumna presentation.]

Lo M, (Wherry) Haig K, Bannister W. (2016). Outcomes associated with abdominal and vaginal hysterectomies: complication rates and post-surgical expenditures. Podium presentation at the Women's Health Annual Conference; New Orleans, LA; October, 2016. [OHSRP alumna presentation.]

Lo M, (Wherry) Haig K. (2016). Patterns in opioid prescription rates among back and neck pain episodes involving chiropractors and primary care physicians. Podium presentation at the American Public Health Association National Meeting; Denver, CO; October, 2016. [OHSRP alumna presentation.]

2015

Coursolle K, Vick B, and Klein R. *The 1960 Data Restoration Project*. Poster presented at the Population Association of America Conference, May, 2015; San Diego, California. [OHSRP trainee job-related presentation.]

Haig K and Bannister W. *Factors influencing probability of inpatient readmission after bariatric surgery*. Poster presented at Obesity Week; November, 2015; Los Angeles, CA. [OHSRP trainee job-related presentation.]

Klein R, Hillmer T, **Landsteiner A**, and **Williams A**. *Worker Health and Safety Training in Minnesota High Schools*. Poster presented at the National Occupational Research Agenda Symposium, Midwest Center for Occupational Health and Safety, School of Public Health May, University of Minnesota; May, 2015; Minneapolis, MN. [OHSRP trainee and OHSRP supporting faculty presentation.]

Lamont GRS. Health Numeracy for the Data Nerd. Presentation at the Minnesota Department of Health, Environmental Health Communicators Meeting; October, 2015; St. Paul, MN. [OHSRP alumna presentation.]

Appendix C
Occupational Health Services Research and Policy
Faculty, Student and Alumni Selected Outreach Activities
OHSRP student and alumni names are underscored.

OHSRP Key and supporting faculty, alumni and staff names are in **bold font**.

1. Educational Development

Annual NORA symposium

Faculty and staff from the MCOHS and the Upper Midwest Center for Agricultural Safety and Health (UMASH) annually collaborate to produce to facilitate the *Annual NORA Symposium*. Audiences (n ~ 50-150) representing center program students, faculty staff, advisory board members, and numerous community and regional partners. Included, in this event, is a poster session involving 20-40 student/faculty contributions associated with their research efforts. Dr. McGovern has worked closely with Drs. Gerberich (MCOHS), Ramirez (MCOHS), Alexander (UMASH) and Bender (UMASH), and Julie Alcorn-Webb, MPH (Continuing Education Program Director and Centers for Public Health Education and Outreach staff) to develop and host programs as noted below. The NORA symposium is also available as an online video. (See: <http://www.mcohs.umn.edu/nora-symposium/>).

- **“Productive Aging and Work: Creating an Age-Friendly Workplace,”** featured Speaker: James Grosch, PhD – Senior Research Psychologist and Co-Director of the Center for Productive Aging and Work at the National Institute for Occupational Safety and Health (NIOSH), April 30, 2020. Dr. McGovern was a moderator for the presentation.
- **“Stressed Out from Work: An Occupational Hazard,”** featuring a panel presentation including: Doris Mold, President of Sunrise Agricultural Associates, LLC and Sunrise Farm primary; Dr. Stacy Holzbauer, a veterinarian and currently a Commander in the U.S. Public Health Services and serves as a CDC Career Epidemiology Field Officer assigned to the Minnesota Department of Health; and Joe Meuwissen, Fire Peer and Mental Health Professional, Metro Critical Incident Stress Management Team, May 2, 2019. Dr. McGovern was a discussant for this panel.
- **“Workplace Harassment: Ensuring Respect, Combating Harassment, and Improving Organizational Performance.”** Featured speaker and international expert: Fran Sepler, President, Sepler & Associates, May 3, 2018.
- **“Prescription Opioid Use in Occupational Health Care: Reducing Risk and Improving Safety.”** Featured speaker: Thomas Wickizer, PhD, Chair and Stephen F. Loeb Professor, The Ohio State University College of Public Health, May 5, 2017.
- **“Critical Challenges Facing Occupational Health and Safety – Today and Tomorrow.”** Featured speaker: John Howard, MD, MPH, JD, LLM, Director of the National Institute for Occupational Safety and Health (NIOSH), May 4, 2016.
- **“Total Worker Health: Why You Should Build a Program in Total Worker Health and How to Do It.”** Featured speaker: W. Kent Anger, PhD, Senior Scientist, Associate Director for Applied Research and Professor, Oregon Health & Science University (OHSU), May 6, 2015.

Online Modules

Dr. McGovern has partnered with Instructional Designer and Consultant, **Krista Johansen Diederich, MS** to create online modules for blended learning in academic classes such as the interdisciplinary “Introduction to Occupational Health and Safety Class,” (PubH 6170), “Topics in Environmental Health: Science, Politics and Policy,” (PubH 6100) and “Environmental and Occupational Health Policy” (PubH

6105). We are also collaborating with **CE and Outreach Program Director, Julie Alcorn Webb, MPH**, to adapt these modules for Continuing Education. Modules that have been created include the following:

2019-2020

- “Occupational Exposures Limits,” by **Susan Arnold, PhD, CIH, FAIHA**
- “Hazard Recognition,” by **Kimberly Anderson, PhD**
- “Minnesota OSHA Consultation and Ergonomics in the Workplace,” by **Breca Tschida, MSPH, CIH, CPE**

2018-2019

- “Sleepers: The Complex Relationship American Truck Drivers have with Sleep,” by Sarah Moon, MPH
- “Business Skills for Occupational Professionals,” by **Lucy Carlson RN, MPH/MS, COHN-S/CM**, Occupational Health Manager, 3M Medical Department
- “Occupational Health in the Veterans Administration,” by **Steven Kirkhorn, MD, MPH**, MCOHS Academic Program Director, OEM Residency Program.
- “The Americans with Disabilities Act: How Do You Determine If An Individual Has A Disability as Defined By The ADA,” **David Cossi, JD, MS**, Affiliate Faculty, Environmental Health Sciences, School of Public Health.
- “Integrated Approaches Supporting Healthy Work: Total Worker Health,” by **Tamara Schult, PhD, MPH**, OHSRP Alumna and Research Data Analyst, VHA Employee Health and Well-being Program
- “Workers’ Compensation,” and “Opioids and Occupational Health Providers,” by Beth Baker, MD, MPH, Medical Consultant, Specialists in OEM, St. Paul, MN.

2017-2018

- “Policy and the Judicial Process: The American’s with Disabilities Act,” by **David Cossi, JD**, Adjunct Assistant Professor, Division of Environmental Health Sciences, School of Public Health, University of Minnesota
- “An Introduction to One Health,” by **Dr. Bruce Alexander**, Professor (Co-Director, OEI and Division Head, EH, and 3) “Zika Virus: Uncertain Actions and Policies,” by Richard Danila, PhD, MPH, Epidemiology Program Manager, and Deputy State Epidemiologist, Minnesota Department of Health.
- “Zika Virus: Uncertain Actions and Policies,” by Richard Danila, PhD, MPH, Epidemiology Program Manager, and Deputy State Epidemiologist, Minnesota Department of Health

2016-2017

- “Nanotechnology and Chemicals in the Workplace---A Perspective on Oversight,” by **Gurumurthy Ramachandran, PhD**, former Professor and Director of Industrial Hygiene, MCOHS.
- “Family and Medical Leave Policies and the Political Process,” by **Pat McGovern, PhD**, Professor Program Director of OEHN and OHSRP Training Programs.
- “Ensuring Safe Drinking Water and Promoting Environmental Health Literacy,” co-taught by Tannie Eshenaur, MPH, Planning Director, Drinking Water Protection and Deanna Scher, PhD from the Environmental Surveillance and Assessment Unit; Minnesota Department of Health.

2015-2016

- “Health Policy and Challenges Regarding Ebola that included issues of healthcare worker protection,” by Richard Danila, PhD, MPH, Epidemiology Program Manager, Minnesota Department of Health.
- “Risk Communication,” that featured Tannie Eshenaur, MPH, Planner, Minnesota Department of Health, St. Paul, Minnesota.

Curriculum Development and Outreach

Dr. McGovern collaborated with Dr. Betsy Wattenberg (risk assessment and toxicology) from the Division of Environmental Health Sciences to design and implement a two-day faculty development workshop, “Developing a Strategic Communications Plan in Public Health,” for approximately 55 interdisciplinary faculty from throughout India at Jamia Millia Islamia (JMI) University in Delhi, India in January 2019. The faculty used this platform for teaching case examples from occupational and environmental health. They adapted the workshop content for use in environmental health classes initially in Environmental Health Science, Politics and Policy (PubH 6109), and in the online version of issues in Environmental and Occupational Health (PubH 6102) which is required for all students in the School of Public Health. Associated with this event, Dr. McGovern provided mentoring to a junior faculty member related to research and career development and her application for a tenured faculty position.

2. Presentations/Lectures/Awareness Seminars

- **Cossi DA, McGovern PM, Porta C.** (Invited Panel Presentation) Sexual Harassment Law and Implications for Nurses. Invited presentation. Master of Nursing Student Council, School of Nursing, University of Minnesota. Minneapolis, Minnesota, March 2019.
- **McGovern PM** provides an invited guest lecture, “Introduction to Occupational and Environmental Health Nursing,” in undergraduate nursing classes at St. Catherine’s University School of Nursing and Metropolitan State University School of Nursing at least annually. She developed an online module, “Introduction to Occupational and Environmental Health Nursing.” for distribution to interested Schools of Nursing and the MCOHS Continuing Education Program, 2018.
- **McGovern PM.** Health Disparities, Health Equity and Occupational Health. (Invited Guest Lecture). Occupational Medicine: Principles and Practice, PubH 6130, University of Minnesota School of Public Health, Minneapolis, Minnesota, March 2019, April 2018.
- Scher D and **McGovern PM.** (Invited presentation). Manganese: an Overlooked Drinking Water Contaminant and the Potential for Child Development Risks. Minnesota Environmental Health Association, Rochester, Minnesota, October, 2018.
- **McGovern PM,** Stepanov I. Manganese, Biomarkers of Exposure and Infant Brain Development (Invited Presentation). Minnesota Department of Health, Environmental Health Tracking and Biomonitoring Program. St. Paul, Minnesota, October 2017.
- **McGovern PM.** “Results from the Minnesota Department of Health Environmental Tracking and Biomonitoring Program and Proposed Priorities for 2017.” (Invited presentation) Minnesota Legislative Hearing, St. Paul, Minnesota, March 2016.
- **McGovern PM.** Total Worker Health for New Mothers. Occupational and Environmental Medicine Grand Rounds, HealthPartners Clinic, St. Paul, Minnesota, October, 2015.

3. Consultations

Dr. McGovern consulted with Northwestern University and the Social, Emotional and Behavioral Domain Team and the Health Measurement Network, to develop measures of parental and child health for the National Institute for Child Health and Human Development, Bethesda, Maryland, May 2013-2015.

4. Other

Partnerships for Research to Practice and Outreach

Minnesota Department of Health and the Minnesota Board of Cosmetology

MCOHS faculty (OEHN and OHSRP Program Director, **Dr. McGovern**, Industrial Hygiene Program Faculty, **Dr. Arnold** and **Dr. Anderson**) and **OHSRP PhD student, Jennifer Saunders** are collaborating with the MN Department of Health Industrial Hygienist, Kathy Norlien, MS and the Minnesota Board of Cosmetology on a various research projects investigating: risk factors for health and safety, exposure assessment, precarious employment, engineering controls and use of and use of personal protective equipment among licensed cosmetologists, nail technicians and estheticians. Study findings will contribute to the scientific literature and inform recommendations to the MN Board of Cosmetology regarding the content of continuing education designed to increase awareness of risk factors for occupational injury and illness and protective strategies. This information will be developed into curriculum and classes that will be required for renewal of workers' professional licenses in a population of ~35,000 members.

Minnesota Department of Health

MCOHS faculty (OHSRP Program Director, Dr. McGovern and OHSRP PhD student, **Jennifer Saunders** are also collaborating with the MN Department of Health Industrial Hygienist, Kathy Norlien, MS and using data from the Behavioral and Risk Factor Surveillance System dataset to examine the association between the occupation of salon professionals and unmet health care needs.

Minnesota Department of Labor and Industry (MN DLI) Young Workers and Construction

Dr. McGovern (PI) and **Dr. Ramirez** (Co-PI, **Andy Ryan**, Senior Research Fellow, MCOHS are working with the MN Department of Labor and Industry (MNDLI) and two PhD students to investigate national and state fatal and nonfatal injuries in construction in association with demographics and other factors to address a state legislative inquiry about the safety of lowering the minimum age in construction from 18 to 16 years. The study will also review and summarize federal and state laws in relation to child labor. Study findings will be used in a final report that will be presented to the legislature in January 2020 by the commissioner and director of legislative affairs.

Professional Services

- **Dr. Dowd** chaired the October 2019 and February and June 2020 Healthcare Services Value Research study sections at the Agency for Healthcare Research and Quality (AHRQ)
- **Dr. McGovern** participates in the NIOSH's Healthy Work Design and Well-Being Cross-Sector Council and assisted with the efforts to define priorities for the next decade of NORA, 2017-current
- **Dr. McGovern** serves on the Nominating Committee for the Minnesota Association of Occupational Health Nurses (MAOHN). In this role she assists in identifying practicing OHNs who might benefit from professional development opportunities and serve the organization's members in a variety leadership roles, 2017-current.

- **Dr. McGovern** served as a peer reviewer for the NIOSH Competing Continuing ERC Applications, February 2018.
- **Dr. McGovern** served as Chair, Advisory Panel, Environmental Health Tracking and Biomonitoring Program, Minnesota Department of Health, 2013-2018.
- **Dr. McGovern** participated as a member of the Interdisciplinary Advisory Committee, NIH Building Interdisciplinary Research Careers in Women's Health (BIRCWH) K12 training grant, University of Minnesota, 2014-2016.
- **Dr. McGovern** served as a member of the Scientific Advisory Board for the Deborah E. Powell Center for Women's Health, University of Minnesota Medical School, Minneapolis, Minnesota, 2013-2016.

**Table 1. Academic Training Report July 1, 2015 – June 30, 2020¹
 Occupational Health Services Research and Policy**

Degree Awarded	How Does Degree Read?	Total # Applicants to Degree Program	Total # Applicants Admitted to Degree Program	Total # Under Represented Minority Applicants Admitted	# Full-Time Students Enrolled ²	# Full-Time NIOSH-Supported Trainees	# Part-Time Students Enrolled ²	# Part-Time NIOSH-Supported Trainees	# Trainees Graduated During Reporting Period
Master's degree ³									
Doctorate degree									
	Doctor of Philosophy in Environmental Health or Doctor of Philosophy in Health Services Research, Policy and Administration	6	5	0	7	6	1	0	4
Post-doctoral									
Certificate Program									

¹ Reporting period for renewals is from the start date of prior competing award. New applicants should report past five years.

² Full-time and part-time students should include all students in approved programs, regardless of source of support.

³ OM residents may be double-counted under Masters degree training and post-doctoral training.

Table 2. Trainees and Graduates Supported July 1, 2015 – June 30, 2020¹
Occupational Health Services Research and Policy

Trainees				Graduates				
Trainee ID, Year of Entry, Prior Degree & Institution, (Current Academic Advisor or Mentor and Department). Identify Under Represented Minority with (URM).	OM Trainees: Previous Residency Training Specialty	Title of Research Project or Research Topic	Degree Program (MS, MPH, PhD, DrPH, etc.)	Date Degree or Certificate Awarded (mm/yyyy)	Date of Certificate for OM (mm/yyyy)	Employed in OSH Field or in OSH Advanced Study (Y/N)	Current Employer	Current Position
100273, 2007, Masters, University of Minnesota, (P McGovern, Division of Environmental Health Sciences) (URM)		Cigarette Smoking, Social Support, and Workplace Smoke-free Policies among an Urban American Indian Population	PhD	12/2017		No	Minnesota Department of Health	Epidemiologist
100328, 2011, Masters, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		Evaluating Health and Healthcare Use Effects of Changes in Paid Sick Leave Access for Workers in the United States	PhD	10/2016		Yes	Abt Associates	Senior Analyst
100370, 2014, Masters, University of Iowa, (P McGovern/ K Kozhimannil, Division of Environmental Health Sciences/Division of Health Policy and Management)		Understanding the Health and Safety Needs of Cosmetologists	PhD	Pending				
100392, 2015, Masters, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		The Long-Term Effectiveness of the Kidney Allocation System	PhD	06/2020		Yes	Medtronic	Senior Manager, Health Economics and Outcomes Research

100393, 2016, Masters, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		Caring for Our Care-givers: An Evaluation of the Minnesota Safe Patient Handling Act	PhD	05/2020		Yes	University of Minnesota, School of Public Health	Post-doctoral Fellow
100396, 2016, Masters, St. Louis University, College of Public Health and Social Justice, (P McGovern, Division of Environmental Health Sciences) (Military Trainee in OHSRP Program)		Helping Homecare: Evaluating Workplace Injury Outcomes in Homecare	PhD	Pending				
100416, 2018, Masters, University of Minnesota, (P McGovern, Division of Environmental Health Sciences)		Factors associated with vaccine uptake: Beyond the count	PhD	Pending				
100434, 2019, Bachelors, Earlham College, (P McGovern, Division of Environmental Health Sciences)		To be determined	PhD					

¹ List all NIOSH supported trainees and graduates by year of entry. Reporting period for renewals is from start date of prior competing award. New applicants should report last five years.

² Note: Student 100396 is supported by the military but is a student in the OHSRP Program.

OCCUPATIONAL AND ENVIRONMENTAL EPIDEMIOLOGY (OEE)
ACADEMIC TRAINING PROGRAM

Richard F. MacLehose, PhD – Director
Hyun Kim, ScD – Co-Director

OCCUPATIONAL AND ENVIRONMENTAL EPIDEMIOLOGY ACADEMIC TRAINING PROGRAM

1. Background

The Occupational and Environmental Epidemiology (OEE) training program was a new allied program for the Midwest Center for Occupational Safety and Health (MCOHS) in 2011. This program provides needed support for training in the epidemiology of occupational diseases related to the working or natural environment. Doctoral training epidemiology at the School of Public Health (SPH) at University of Minnesota (UMN) can be acquired through two divisions: the Division of Environmental Health Sciences (EnHS) or the Division of Epidemiology and Community Health (EpiCH). Both programs emphasize training in advanced methods in epidemiology. To enhance recruitment of well-qualified students, the occupational epidemiology training program draws on the strengths of both divisions. The breadth of the experience and research of the faculty in the two divisions offers prospective students with varying backgrounds, goals, and interests the opportunity to be trained in a dynamic, interdisciplinary environment to address current and future environmental health needs.

The primary aim of the doctoral program in OEE is to produce future researchers and leaders in the field. The OEE training program allows students to enroll in either EnHS or EpiCH and meet the specific requirements for the doctoral program in their home division. A uniform curriculum for the OEE program includes rigorous training in epidemiologic methods, biostatistics, and specific coursework related to a prospective student's area of interest. Students may specialize in research relating to the etiology of occupational/environmental disease; biological markers of disease and exposure; genetic and genomic aspects of exposure disease relationships; interventions to reduce disease burden; and methodological issues in occupational and environmental epidemiology. Trainees admitted to the program will be expected to have basic epidemiologic training at the master's level or take that level of training in their first year. This interaction of students and faculty from both divisions will enhance the interdisciplinary nature of the training program and MCOHS.

The OEE program has evolved in this last funding cycle. The original version of the program included an option for recruiting MPH (Master of Public Health) level students from the EnHS. The MPH program was intended to be an alternate recruiting tool to draw students to the doctoral program. To date, the program has enjoyed a steady stream of applicants to the priority doctoral program to the extent that there are not enough resources to accommodate them. The OEE program is now specifically focusing on supporting doctoral students. Both divisions maintain steady enrollment in the MPH program, and in fact, multiple current trainees were recruited through the MPH program. Directing resources to the doctoral program will allow the program to accommodate more doctoral trainees, which are the priority of the program. A second change in this cycle is that OEE will no longer maintain a separate advisory board. The OEE program will utilize the overall MCOHS advisory board to guide priorities related to the regional needs in occupational health. The OEE leadership believed the past structure was duplicative and will alternatively seek ad hoc advice from colleagues in similar programs about the structure of the training program.

The resources provided to MCOHS for the OEE program have enabled this program that involves two divisions in the School of Public Health to grow and thrive. The support provided allows the OEE program to recruit high-quality trainees with diverse backgrounds. This also facilitates the interdisciplinary nature of the program and encourages engagement of faculty members who do not normally engage in research related to occupational health. The resources also help provide excellent learning and career development opportunities for the trainees, particularly with resources for attending and presenting at professional meetings. The resources for this program also allow the maintenance of a critical mass of doctoral trainees that, along with other MCOHS, EnHS, and EpiCH training programs, create a strong interdisciplinary learning community. Finally, the support for the faculty ensures sufficient time and resources are available for managing the program, mentoring students, and creating collaborations with other faculty and external partners with expertise that will benefit the trainees.

2. Program Objectives:

Provide an academic curriculum to develop a strong methodological foundation for epidemiologic research in working populations, including an understanding of modern epidemiologic theory, applied epidemiologic methods, and advanced statistical methods for analysis.

The curricula developed for this training program is robust and provides several didactic courses in advanced epidemiology as well as training in occupational health. There are a number of electives available to tailor the training needs to each student's interest. The advanced epidemiology and biostatistics courses are receiving very positive reviews from the trainees and other students. The faculty leading these courses continually update them in response to student reviews. One particular success is the continued development of the interdisciplinary seminar, PubH 8120 Occupational and Environmental Health and Safety Research Seminar, taught by Drs. Ramirez and Berman. This seminar includes doctoral students from across the Division of EnHS, which enriches the interdisciplinary training. The advanced epidemiologic methods series, including PubH 8341 Advanced Epidemiologic Methods: Concepts, PubH 8342 Advanced Epidemiologic Methods: Applications, and PubH 8343 Synthesis and Application of Methods in Epidemiologic Research, continues to be very well received by the students. The courses focused on skillsets more specific to occupational and environmental epidemiology, PubH 6140 Occupational and Environmental Epidemiology and PubH 6100 GIS and Spatial Analysis for Public Health, round out a strong curriculum in epidemiologic methods.

Provide a framework to integrate the fundamentals of the methods of epidemiology, both theoretical and applied, to the study of working populations and the work environment and to incorporate environmental systems concepts such as the exposome and metabolome into epidemiologic research.

The curriculum and opportunities to participate in research related to their dissertations as well as supplementary research gives the trainees the chance to translate the technical information gained in coursework into practice. This involves integrating knowledge and skills to answer scientific questions about the health of working populations. All trainees are working with program faculty to apply the theoretical methods to address novel hypotheses in their research programs.

Provide opportunities to develop scientific research capability, including hypothesis development, study design, data collection and analysis, interpretation, and communication.

Both EnHS and EpiCH divisions have several occupational cohorts that students have access to, including the ongoing studies of taconite miners in Minnesota and the United States Radiologic Technologists Cohort Study (USRT). These studies provide opportunities for research in occupational causes of cancer, lung disease, cardiovascular disease, and neurological diseases as well as the application of biological markers in research. Trainees interested in occupational infectious disease are collaborating with epidemiologists from the Upper Midwest Agriculture Safety and Health Center, Minnesota Department of Health, and the Marshfield Clinic to explore several areas of research.

Develop critical thinking skills and an understanding of the interdisciplinary nature of occupational and environmental epidemiology and the importance of incorporating other disciplines into their work.

The trainees develop a comprehensive proposal for their dissertation research that integrates epidemiologic methods with the scientific underpinnings pertinent to their research. The weekly Environmental and Occupational Health and Safety Research Seminar offers a venue to critique works in progress and other topics from the literature. The trainees get a variety of opportunities to interact with a multidisciplinary team. In addition to the regular interdisciplinary seminar series, the research activities that form the basis of these all involve multiple disciplines, including epidemiology, biostatistics, industrial hygiene, and occupational medicine. The trainees also interact with scientists outside UMN at the Minnesota Department of Health, the National Cancer Institute, and the Veterans' Administration.

Create a sustainable and diverse training program with mechanisms for continuous improvement.

As described above, the OEE program has been able to recruit and retain a diverse group of trainees who will become leaders in the field in the future. We continue to explore other areas of discovery with the involvement of a broader range of faculty.

3. Academic Training Program Leadership

Dr. Richard F. MacLehose, OEE Director. Dr. MacLehose is a tenured Associate Professor and Director of Graduate Studies in the Division of EpiCH and was a founding Co-Director of the OEE training program with Dr. Bruce H. Alexander and Dr. Jeffery Mandel. Dr. MacLehose holds a PhD in epidemiology from University of North Carolina and completed postdoctoral work in epidemiology and biostatistics at the National Institute of Environmental Health Sciences. Dr. MacLehose's scholarly focus relates to the development, application, and evaluation of novel epidemiologic and biostatistical methods with a particular focus on environmental and occupational epidemiology. His methodologic research focuses primarily on causal inference through the use of Bayesian analysis and bias adjustments, and he has developed novel Bayesian semi-parametric methods for use with highly correlated data, commonly found in environmental and occupational epidemiology; the methods were implemented in the Agricultural Health Study to examine the effect of pesticide exposure on macular degeneration. A related avenue of research is the adjustment of biases such as misclassification, uncontrolled confounding, or selection bias in various epidemiologic study designs. Dr. MacLehose teaches PubH 8341 Advanced Epidemiologic Methods: Concepts and PubH 8343 Synthesis and Application of Methods in Epidemiologic Research. Dr. MacLehose is recognized nationally and internationally for his ability to teach complex methods in epidemiology. Dr. MacLehose has extensive experience in occupational and environmental epidemiology research and has been highly engaged with trainees in OEE and other MCOHS training programs. He mentored one OEE trainee who has graduated (Meyer), is currently mentoring another (Richter), and co-mentored another (Bustamante) on research using data from the U.S. Radiologic Technologists Study. He was a primary collaborator on the Taconite Worker Health Study, in which he co-mentored four OEE trainees (Allen, Lambert, Odo, and Arauz) and two IH trainees (Hwang and Shao). He collaborated with investigators with the Upper Midwest Agricultural Safety and Health Center, co-mentored an OEE trainee (Sorley) in a study of campylobacteriosis among poultry workers, and co-mentored an Occupational Injury Prevention Training Program trainee (Schofield) in a study utilizing worker compensation data. Additionally, Dr. MacLehose has been primary advisor to four and co-advisor to three doctoral students in EpiCH, who were not affiliated with the OEE program. Dr. MacLehose transitioned to Director of the OEE program in 2019. Dr. Alexander, the previous Director, has taken a position at Colorado State University but will retain an Adjunct Professor appointment at UMN.

Dr. Hyun Kim, OEE Co-Director. Dr. Hyun Kim is an epidemiologist with specific expertise in occupational epidemiology and epidemiologic methods. Dr. Kim holds a ScD from University of Massachusetts, Lowell, and prior to his appointment at UMN, was on faculty at the Zucker School of Medicine at Hofstra. Dr. Kim has extensive experience in occupational epidemiology and has led and collaborated on research related to occupational disease and injury. He has a particular interest in disaster epidemiology and conducted research on the impacts on first responders, including impacts of the World Trade Center attacks and Hurricane Sandy. Dr. Kim has active research on a related area - work-related post-traumatic stress disorder (PTSD) in firefighters in Minnesota, in which he developed a strong partnership with Minnesota firefighters across the state. Dr. Kim is also recognized as an expert in occupational injury prevention and is also the Co-Director of the Occupational Injury Prevention Program of MCOHS. He has mentored and co-mentored seven PhD students in the OIP program. Dr. Kim also serves as an advisor to the Occupational and Environmental Medicine Residency and has mentored two occupational health residents. Dr. Kim teaches the OEE core course PubH 6140 Occupational and Environmental Epidemiology and PubH 6120 Injury Prevention in the Workplace, Community, and Home. Dr. Kim also brings considerable experience in multidisciplinary and cross-sectoral approaches to public health. He is actively engaged with the World Health Organization in developing protocols for responding to the impacts of climate change in Southeast and Eastern Asia. This broad systems-

thinking experience brings an important component to the OEE training program. Dr. Kim transitioned to OEE Co-Director in 2019, following the retirement of Dr. Mandel.

4. Past Performance/Accomplishments

4.1. Overview

The OEE program has enjoyed excellent success in recruiting, retaining, and graduating trainees in the recent funding cycle. The OEE program faculty have been resourceful in obtaining sponsored research funding and fellowships for the OEE trainees, allowing NIOSH funds to be used to recruit new students. In July 2015, there were four doctoral trainees (Odo, Scott, Meyer, and Sorley) enrolled in the program and one MPH student (Bell). All of these trainees finished their training, graduated, and found employment utilizing the skills they gained in this program. Dr. Nnaemeka Odo is currently a Senior Scientist for Exponent. Dr. Laura Scott is an Epidemiologist and Biostatistician at the U.S. Army Institute of Surgical Research. Dr. Craig Meyer is an Epidemiologist/Data Scientist at Genentech, and Dr. Evan Sorley is an Epidemiologist at Blue Cross Blue Shield of Minnesota. Mr. Austin Bell is an Epidemiologist in the Emerging Infections unit at the Minnesota Department of Health. Since July 2015, the OEE program has recruited 10 doctoral trainees, of which four have completed their degrees. Dr. Rony F. Arauz is a Postdoctoral Research Fellow studying lung cancer at the National Cancer Institute. One trainee, Dr. Maria Sundarum, who joined in 2014 ultimately completed a dissertation in infectious disease. She is a Postdoctoral Fellow in infectious disease epidemiology at Emory University and maintains significant interest in occupational and environmental health.

OEE trainees have conducted novel and challenging research that addresses a number of persistent and emerging challenges in occupational and environmental epidemiology. The research has included analyses of data from the Taconite Worker Health Study (Allen, Lambert, Odo, Arauz, and Hernandez), which has past and future relevance to the Upper Midwest. Mining and other extractive industries have been expanding, and there are long-held questions related to the potential harmful effects of exposures from taconite mining. Trainees Meyer and Bustamante took novel approaches to evaluating health and occupational ionizing radiation exposure in the medical field with the nationwide U.S. Radiologic Technologists (USRT) study. Both of these studies involved collaboration with the National Cancer Institute. Craig Meyer demonstrated that the healthy worker survivor bias is a critical issue in this cohort and impacts assessments of risk of cataract from ionizing radiation exposure. Evan Sorley formed a collaboration with investigators in the Upper Midwest Agricultural Safety and Health Center (UMASH) and Minnesota Department of Health to examine the risk of campylobacteriosis in poultry workers. Animal agriculture is an expanding industry in the Upper Midwest that now hires a large portion of the labor force.

The OEE program has had good success in recruiting a diverse pool of trainees. Of the 14 trainees supported to date in this funding cycle, five were either Black or African American, Latino, or Asian.

4.2. Career Development and Advancement

Graduates of the OEE training program have gone on to successful careers. There have been a total of 11 trainees graduated with a PhD from the OEE program, and one with an MPH. Four OEE graduates have advanced in academia and research, including one who is currently faculty - Elizabeth Allen, PhD, 2014, Assistant Professor, Program in Public Health, St. Catherine's University. Four OEE graduates have advanced toward postdoctoral fellowships - Rony Aruz, PhD, 2018, National Cancer Institute; Maria Sundaram, PhD, Infectious Diseases, Emory University Division; Shannon S. Cigan, PhD, 2019, cancer research, UMN School of Medicine; and Gabriela Bustamante, PhD, 2019, cancer disparities, UMN. Two graduates have taken jobs in the public sector - Austin Bell, MPH, 2015, Emerging Infectious Diseases, Minnesota Department of Health, and Laura F. Scott, PhD, 2018, Epidemiologist for the U.S. Army Institute of Surgical Research. One OEE graduate (Christine Lambert, PhD/MD, 2013/2015) is currently completing a Pulmonary and Critical Care fellowship in the School of Medicine at UMN. Three graduates landed in the private sector - Naemeka Odo,

Kaiser Permanente and then as a Senior Scientist for Exponent; Craig Meyer, PhD, 2016, Genentech; and Evan Sorley, PhD, 2018, is an analyst for Blue Cross/Blue Shield of Minnesota. All graduates are applying the skills and knowledge in environmental and occupational epidemiology in situations where understanding the work-related health is important.

5. Current Performance, June 2019 – June 2020

Two trainees received their PhD in the last academic year, Dr. Shannon S. Cigan and Dr. Gabriela Bustamante. Dr. Cigan examined how race, ethnicity, and genetics may influence the impact of occupational cadmium exposure in a cohort of smokers from the Multi-Ethnic Cohort. Dr. Bustamante linked the data from the USRT to census data to determine if neighborhood socioeconomic status was either a confounder or effect modifier when evaluating risk of circulatory disease from ionizing radiation exposure. The use of ionizing radiation in the medical field is rapidly increasing, and understanding the potential effects of long-term, low-dose ionizing radiation is a critical question. Dr. Cigan is currently a Postdoctoral Fellow in cancer research at the UMN Medical School. Dr. Bustamante is a Postdoctoral Fellow in the Cancer Disparities Group at UMN. Both are commencing their search for academic positions. Five other trainees were active during the previous year but did not graduate. One of the trainees (Tecca) withdrew from the program and has decided to pursue a career in the private sector rather than complete her PhD. Dr. MacLehose had multiple conversations with Ms. Tecca and her advisor before she left the program. Despite Dr. MacLehose's attempts to keep Ms. Tecca in the program, she did not feel that she needed a PhD and left the program in Spring 2020. She was supported by the training grant for two years and is the first doctoral student on the training grant who was not retained in the program.

The remaining four trainees, including two who joined in 2019, are interested in a wide range of health concerns of working people, including occupational particulate exposure and cardiovascular disease (Hernandez), infectious disease risks to health care workers (Balius and Rasmussen), and methodologic challenges in occupational and environmental epidemiology (Richter). Ms. Hernandez is nearing completion of her dissertation under the guidance of Dr. Alexander. Mr. Balius is defining his dissertation focus with an emphasis on COVID-19 among health care workers. Mr. Richter has completed his first year of coursework and is taking qualifying exams while also working on a master's degree in biostatistics. Ms. Rasmussen has completed her first year of coursework.

The trainees or primary faculty (MacLehose and Kim) have authored or co-authored a total of 33 peer reviewed publications. Of these, 5 papers involved trainees in the program and have presented their findings at national and international meetings, including ISEE, and participated in local events that highlight the research such as the SPH Research Day and MCOHS-sponsored NORA symposium.

Appendix A
Occupational and Environmental Epidemiology
Selected Publications by Core Trainees and Faculty
(Faculty/staff identified with bold font; Students identified with underline)

2015

- Allen EM, **Alexander BH**, **MacLehose RF**, **Nelson HH**, **Ramachandran G**, **Mandel JH**. [2015] Cancer incidence among Minnesota taconite mining industry workers. *Ann Epidemiol* 25:811-5.
- Allen EM, **Alexander BH**, **MacLehose RF**, **Nelson HH**, Ryan AD, **Ramachandran G**, **Mandel JH**. [2015] Occupational exposures and lung cancer risk among Minnesota taconite mining workers. *Occup Environ Med* 72:633-9.
- Alonso A**, **MacLehose RF**, Lutsey PL, Konety S, Chen LY. [2015] Association of amiodarone use with acute pancreatitis in patients with atrial fibrillation: a nested case-control study. *JAMA Intern Med* 175:449-50.
- Alonso A**, **MacLehose RF**. [2016] Commentary: Weight Loss and Coronary Heart Disease: Uncontrolled Confounding by Undiagnosed Disease May Not Be All It's Cracked up to Be. *Epidemiology* 27:299-301.
- Appiah D, Schreiner PJ, **MacLehose RF**, Folsom AR. [2015] Association of Plasma gamma' Fibrinogen With Incident Cardiovascular Disease: The Atherosclerosis Risk in Communities (ARIC) Study. *Arterioscler Thromb Vasc Biol* 35:2700-6.
- Belongia EA, Simpson MD, King JP, Sundaram ME, Kelley NS, **Osterholm MT**, McLean HQ. Variable influenza vaccine effectiveness by subtype: a meta-analysis of test-negative design studies. *Currently under review at Lancet Infectious Diseases*.
- Berge JM, Meyer C, **MacLehose RF**, Crichlow R, Neumark-Sztainer D. [2015] All in the family: correlations between parents' and adolescent siblings' weight and weight-related behaviors. *Obesity (Silver Spring)* 23:833-9.
- Berge JM, Meyer C, **MacLehose RF**, Loth K, Neumark-Sztainer D. [2015] Do Parents Treat Siblings Similarly or Differently with Regard to Feeding Practices, Weight-Related Conversations, and Support for Physical Activity? An Exploratory Analysis. *Child Obes*.
- Cahoon EK, Kitahara CM, Ntowe E, Bowen EM, Doody MM, **Alexander BH**, Lee T, Little MP, Linet MS, Freedman DM [2015] Female Estrogen-Related Factors and Incidence of Basal Cell Carcinoma in a Nationwide US Cohort. *J Clin Oncol* 33:4058-65.
- Cahoon EK, Pfeiffer RM, Wheeler DC, Arhancet J, Lin SW, **Alexander BH**, Linet MS, Freedman DM. [2015] Relationship between ambient ultraviolet radiation and non-Hodgkin lymphoma subtypes: a U.S. population-based study of racial and ethnic groups. *Int J Cancer* 136:E432-41.
- Choi JY, Baumgartner J, Harnden S, **Alexander BH**, Town RJ, D'Souza G, **Ramachandran G**. [2015] Increased risk of respiratory illness associated with kerosene fuel use among women and children in urban Bangalore, India. *Occup Environ Med* 72:114-22.
- Finnegan J, **Mandel JH** [2016] Health of the iron range should always be a focus. Editorial *Mesabi Daily News* Feb. 10, 2016
- Folsom AF, Tang W, George K, Heckbert S, **MacLehose RF**, Cushman M, Pankow J. [2016] Prospective study of gamma prime fibrinogen and incident venous thromboembolism: the longitudinal investigation of thromboembolism etiology (LITE). Accepted, *Thrombosis Research*
- Goldschmidt AB, Loth KA, **MacLehose RF**, Pisetsky EM, Berge JM, Neumark-Sztainer D. [2015] Overeating with and without loss of control: Associations with weight status, weight-related characteristics, and psychosocial health. *Int J Eat Disord* 48:1150-7.

- Hardy ST, Loehr LR, Butler KR, Chakladar S, Chang PP, Folsom AR, Heiss G, **MacLehose RF**, Matsushita K, Avery CL [2015] Reducing the Blood Pressure-Related Burden of Cardiovascular Disease: Impact of Achievable Improvements in Blood Pressure Prevention and Control. *J Am Heart Assoc* 4:e002276.
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Wolf TM, Singer RS, Lonsdorf EV, **MacLehose RF**, Gillespie TR, Lipende I, Raphael J, Rerio K, Murray C, Pusey A, Hahn BH, Kamenya S, Deus M, Travis DA. [2019] Syndromic surveillance of respiratory disease in free-living chimpanzees. Accepted, *Ecohealth*.

2019

Ahern TP, **MacLehose RF**, Haines L, Cronin-Fenton DP, Damkier P, Collin LJ, Lash TL. Improving the transparency of meta-analyses with interactive web applications. *BMJ Evid Based Med*. 2020 Mar 27;bmjebm-2019-111308. doi:10.1136/bmjebm-2019-111308. Epub ahead of print. PMID: 32220861. [Faculty Research]

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Collin LJ, Riis AH, **MacLehose RF**, Ahern TP, Erichsen R, Thorlacius-Ussing O, Lash TL. Application of the Adaptive Validation Substudy Design to Colorectal Cancer Recurrence. *Clin Epidemiol*. 2020 Feb 3;12:113-121. doi:10.2147/CLEP.S230314. PMID: 32099477; PMCID: PMC7007499. [Student Research]

Drake C*, **Hernandez AM***, Liu Y, Schwartz AH, Sundaram ME. Evidence of Background Checks in an Online Firearms Marketplace. *American Journal of Preventive Medicine*. 2019 Sep. [Trainee Research – co first author]

- Green DR, Gerberich SG, **Kim H**, Ryan AD, McGovern PM, Church TR, Schwartz A, Arauz RF. Janitor workload and occupational injuries. *Am J Ind Med*. 2020 Jan;63(1):101-102. doi: 10.1002/ajim.23059. Epub 2019 Nov 6. [Student Research]
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- Henning-Smith C, **Hernandez AM**, Neprash H, Lahr M. Differences by Rurality in Satisfaction with Care Among Medicare Beneficiaries. *The Journal of Rural Health*. May 2020. [Faculty Research]
- Henning-Smith C, **Hernandez AM**, Hardeman RR, Ramirez MR, Kozhimannil KB. Rural Counties with Majority Black or Indigenous Populations Suffer the Highest Rates of Premature Death in the US. *Health Affairs*. 2019 Dec. [Faculty Research]
- Horvath KJ, Lammert S, **MacLehose RF**, Danh T, Baker JV, Carrico AW. A Pilot Study of a Mobile App to Support HIV Antiretroviral Therapy Adherence Among Men Who Have Sex with Men Who Use Stimulants. *AIDS Behav*. 2019 Nov;23(11):3184-3198. doi: 10.1007/s10461-019-02597-3. PMID: 31309348; PMCID: PMC6803067. [Faculty Research]
- Horvath KJ, **MacLehose RF**, Martinka A, DeWitt J, Hightow-Weidman L, Sullivan P, Amico KR. Connecting Youth and Young Adults to Optimize Antiretroviral Therapy Adherence (YouTHrive): Protocol for a Randomized Controlled Trial. *JMIR Res Protoc*. 2019 Jul 30;8(7):e11502. doi: 10.2196/11502. PMID: 31364601; PMCID: PMC6691670. [Faculty Research]
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- Kawazu EC, **Kim H**. Mass fainting in Cambodian garment factories. *Global Epidemiology*, 2019. Nov 1;1:100008. [Faculty Research]
- Lifson AR, Workneh S, Hailemichael A, **MacLehose RF**, Horvath KJ, Hilk R, Sites A, Shenie T. Disclosure of HIV status among patients new to HIV care in Southern Ethiopia: role of perceived social support and other factors. *AIDS Care*. 2020 Jul 2:1-6. doi: 10.1080/09540121.2020.1785999. Epub ahead of print. PMID: 32613851.[Faculty Research]
- Lutsey PL, Norby FL, Ensrud KE, **MacLehose RF**, Diem SJ, Chen LY, Alonso A. Association of Anticoagulant Therapy With Risk of Fracture Among Patients With Atrial Fibrillation. *JAMA Intern Med*. 2019 Nov 25;180(2):245–53. doi:10.1001/jamainternmed.2019.5679. Epub ahead of print. PMID: 31764956; PMCID: PMC6902159. [Faculty Research]
- Lutsey PL, Walker RF, **MacLehose RF**, Alonso A, Adam TJ, Zakai NA. Direct oral anticoagulants and warfarin for venous thromboembolism treatment: Trends from 2012 to 2017. *Res Pract Thromb Haemost*. 2019 Jun 9;3(4):668-673. doi: 10.1002/rth2.12222. PMID: 31624786; PMCID: PMC6782014. [Faculty Research]
- Lutsey PL, Zakai NA, **MacLehose RF**, Norby FL, Walker RF, Roetker NS, Adam TJ, Alonso A. Risk of hospitalised bleeding in comparisons of oral anticoagulant options for the primary treatment of venous thromboembolism. *Br J Haematol*. 2019 Jun;185(5):903-911. doi: 10.1111/bjh.15857. Epub 2019 Mar 28. PMID: 30919942; PMCID: PMC6536346. [Faculty Research]

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- Muller CJ, Noonan CJ, **MacLehose RF**, Stoner JA, Lee ET, Best LG, Calhoun D, Jolly SE, Devereux RB, Howard BV. Trends in Cardiovascular Disease Morbidity and Mortality in American Indians Over 25 Years: The Strong Heart Study. *J Am Heart Assoc*. 2019 Nov 5;8(21):e012289. doi: 10.1161/JAHA.119.012289. Epub 2019 Oct 25. PMID: 31648583; PMCID: PMC6898852. [Student Research]
- Muller CJ, Alonso A, Forster J, Vock DM, Zhang Y, Gottesman RF, Rosamond W, Longstreth WT Jr, **MacLehose RF**. Stroke Incidence and Survival in American Indians, Blacks, and Whites: The Strong Heart Study and Atherosclerosis Risk in Communities Study. *J Am Heart Assoc*. 2019 Jun 18;8(12):e010229. doi: 10.1161/JAHA.118.010229. Epub 2019 Jun 13. PMID: 31189396; PMCID: PMC6645631. [Student Research]
- Odo NU**, Mandel JH, **Alexander BH**, Perlman DM, MacLehose RF, Ramachandran G, Ryan AD, **Shao Y**. The impact of different approaches to exposure assessment on understanding non-malignant respiratory disease risk in taconite miners. *Int Arch Occup Environ Health*. 2020 Jan;93(1):77-85. doi: 10.1007/s00420-019-01465-w. Epub 2019 Aug 1. PMID: 31372718. [Trainee Research]
- O'Neal WT, Alam AB, Sandesara PB, Claxton JS, **MacLehose RF**, Chen LY, Bengtson LGS, Chamberlain AM, Norby FL, Lutsey PL, Alonso A. Sex and racial differences in cardiovascular disease risk in patients with atrial fibrillation. *PLoS One*. 2019 Sep 4;14(9):e0222147. doi: 10.1371/journal.pone.0222147. PMID: 31483839; PMCID: PMC6726240. [Student Research]
- Ogilvie RP, **MacLehose RF**, Alonso A, Norby FL, Lakshminarayan K, Iber C, Chen LY, Lutsey PL. Diagnosed Sleep Apnea and Cardiovascular Disease in Atrial Fibrillation Patients: The Role of Measurement Error from Administrative Data. *Epidemiology*. 2019 Nov;30(6):885-892. doi: 10.1097/EDE.0000000000001049. PMID:31205284. [Student Research]
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- Schwartz A, Gerberich SG, Albin T, **Kim H**, Ryan AD, Church TR, Green DR, McGovern PM, Erdman AG, Arauz RF. The association between janitor physical workload, mental workload, and stress: The SWEEP study. *Work*. 2020;65(4):837-846. doi: 10.3233/WOR-203135. [Faculty Research]
- Schwartz A, Gerberich SG, **Kim H**, Ryan AD, Church TR, Albin TJ, , McGovern P, Erdman AE, Arauz, RF. Janitor ergonomics and injuries in the safe workload ergonomic exposure project (SWEEP) study. *Applied Ergonomics*. 81 (2019): 102874. [Faculty Research]
- Shao Y**, **Hwang J**, **Alexander BH**, Mandel JH, **MacLehose RF**, Ramachandran G. Reconstructing historical exposures to elongate mineral particles (EMPs) in the taconite mining industry for 1955-2010. *J Occup Environ Hyg*. 2019 Dec;16(12):817-826. doi: 10.1080/15459624.2019.1676431. Epub 2019 Oct 24. PMID: 31647751. [Trainee Research]
- Walker RF, Zakai NA, **MacLehose RF**, Cowan LT, Adam TJ, Alonso A, Lutsey PL. Association of Testosterone Therapy With Risk of Venous Thromboembolism Among Men With and Without Hypogonadism. *JAMA Intern Med*. 2019 Nov 11;180(2):190-7. doi: 10.1001/jamainternmed.2019.5135. Epub ahead of print. PMID: 31710339; PMCID: PMC6865248. [Student Research]
- Wang Z, Lin L, Hodges JS, **MacLehose R**, Chu H. A variance shrinkage method improves arm-based Bayesian network meta-analysis. *Stat Methods Med Res*. 2020 Aug 5;962280220945731. doi: 10.1177/0962280220945731. Epub ahead of print. PMID: 32757707. [Student Research]

Wolf TM, Singer RS, Lonsdorf EV, **Maclehose R**, Gillespie TR, Lipende I, Raphael J, Terio K, Murray C, Pusey A, Hahn BH, Kamenya S, Mjungu D, Travis DA. Syndromic Surveillance of Respiratory Disease in Free-Living Chimpanzees. *Ecohealth*. 2019 Jun;16(2):275-286. doi: 10.1007/s10393-019-01400-y. Epub 2019 Mar 5. PMID: 30838479; PMCID: PMC6684380. [Faculty Research]

Appendix B
Occupational and Environmental Epidemiology
Selected Presentations by Trainees and Core Faculty
(Faculty/staff identified with bold font; Students identified with underline)

2015

- Alexander BH.** Cancer Incidence in Ammonium Perfluorooctanoate Production Workers. Fluoros 2015. Golden, CO July 15, 2015
- Alexander BH.** Taconite Worker Health Study. Asbestos-like Mineral Fibers in the Upper Midwest: Implications for Mining and Health Workshop. Duluth Minnesota. October 7, 2015
- Kim H,** Camacho M, Kriebel, Baron S, Moline J. Socioeconomic Status and Asthma among WTC Responders. Society for Epidemiologic Research, Denver, USA, 2015.
- Kim H,** Liu B, Smith F, Baron S, Moline J. Health Effects of the WTC Disaster among Responders: 10 years assessment. International Congress on Occupational Health, Seoul, Korea, 2015.
- Kim H.** Occupational Surveillance for injury epidemiology, Pusan National University, School of Medicine, Busan, South Korea, 2015.
- MacLehose RF.** Hierarchical Semi-Bayes Methods for Misclassification of Maternal Pregnancy BMI. Society for Epidemiologic Research meeting. Denver, Co. 2015.
- Mandel JH.** Air Pollution Epidemiology. Joint Meeting of University of Minnesota Schools of Engineering, Medicine and Public Health, and Chinese Academy of Sciences, 3M Center, St. Paul, MN October 7, 2015
- Mandel JH.** Fiber-Related Lung Disease. Internal Medicine Grand Rounds. Minneapolis Veteran's Administration Hospital, October 30, 2015
- Odo NU, Mandel JH, MacLehose RF, Alexander BH, Ramachandran G, Ryan A, Perlman DM. Health Effects of Silica Dust Exposure in Taconite Mining: Understanding Mixed Dust Effects. Poster presentation at the Society for Epidemiologic Research (SER) Conference, June 2015, Denver, CO.

2016

- Alexander BH and Bender JB:** Participants: Addressing Anti-microbial Usage in Asia's Livestock Production Sector: Toward a Unified, One Health Approach to Preventing and Controlling Resistance, Side Meeting sponsored by USAID and FAO at Prince Mahidol Award Conference, Bangkok Thailand, January 27, 2016.
- Alexander BH and Bender JB:** Participants and lecturers: Defining One Health Workforce Needs. Workshop sponsored by Vietnam One Health University Network. Hanoi, Vietnam, January 29-30, 2016.
- Alexander BH.** Injuries and illness in Swine Workers and Veterinarians. American Association of Swine Veterinarians Annual Meeting, New Orleans, LA, February 28, 2016.
- Alexander BH.** Injury Prevention in Animal Agriculture. Veterinary Public Health Residency, University of Minnesota College of Veterinary Medicine, April 1, 2016.
- Alexander BH:** Assessing Injuries in Pork Production Facilities. National Pork Board Committee on Public Health and Worker Safety. July 27, 2016
- Alexander BH:** Grant Writing Workshops. Malaysia One Health University Network, April 21-23, 2016. Kuala Lumpur Malaysia
- Alexander BH:** Grant Writing Workshops. Thailand One Health University Network, April 25-29, 2016 Pattaya Thailand

- Alexander BH.** Lectures on Risk Assessment, Risk Communication, and Migration and Urbanization. Thailand One Health University Network Environmental Learning Institute. Kanchanaburi Thailand. June 7-14, 2016
- Kim H.** Disasters Surveillance and Epidemiology: World Trade Center and Hurricane Sandy, Minnesota Department of Health, MN, 2016.
- Kim H.** Disasters, Role of Occupational Health Professionals, Local AIHA Chapter The Upper Midwest Section, MN, USA, 2016.
- Kim H, Baron S, Cifuentes M, Jurek A, Maldonado G, Kriebel D.** World Trade Center Disaster and the Health of Responders: Surveillance, Epidemiology, and Biases. The 25th International Conference on Epidemiology in Occupational Health, Barcelona, Spain, 2016.
- Allen EM, Call KT, Beebe T, McAlpine DD, Johnson PJ. *Barriers to Care and Healthcare Utilization among Medicaid Enrollees.* Academy Health Annual Research Meeting. Boston, MA May 2016 *Selected as featured poster in the Coverage, Access and Medicaid theme poster walk.
- Allen EM, Call KT, Beebe T, McAlpine DD, Johnson PJ. (May, 2016) *Barriers to Care and Healthcare Utilization among Medicaid Enrollees.* University of Minnesota Promoting Health Equity Conference. Minneapolis, MN. May 2016
- Allen EM, Call KT, Pintor JK.) *Impact of Insurance Based Discrimination on Healthcare Utilization.* University of Minnesota Promoting Health Equity Conference. Minneapolis, MN. May 2016
- Allen EM. *Barriers to Healthcare Access among the Publicly Insured.* University of Minnesota Department of Family Medicine and Community Health Research Seminar, Minneapolis. March, 2016.
- Allen EM. *Health of Minnesota Taconite Mining Workers: Lessons Learned and Future Community-Engaged Research.* University of Minnesota Center for Health Equity Works in Progress, Minneapolis MN. Jan, 2016.
- Bustamante G, Yershova K, Jensen J, Hatsukami D, Stepanov I. Investigation of Endogenous Nitrosation in E-cigarette Users School of Public Health Research Day. April 7, 2016 Minneapolis, MN.
- Liu Y, Sundaram ME, Convertino M. A transfer entropy model for the inference of influenza dispersion networks. Presentation at International Society for Environmental Epidemiology, 2016.
- Liu Y, Sundaram ME, Convertino M. Reverse-engineering the information network of influenza transmission in US using MIDER. Poster at International Conference on One Medicine One Science, 2016
- Miller R, Tawfik P, Lambert C, Nordstrom E. Improving Lung Cancer Screening with Low-dose Helical CT in High Risk Patients Using a Nursing-Driven Protocol. American College of Physicians Minnesota Chapter – Internal Medicine Meeting, Minneapolis October 2016
- Shao Y, Ramachandran G, Mandel J, Alexander B, MacLehose R, Arauz R. (2016). O05-1 Occupational Iron Exposures and Pleural Disease among Minnesota Taconite Mining Workers. 25th EPICOH 2017 Barcelona Spain, September 5-8, 2017.
- Sorley EJ, Sundaram ME, Kao S-Y, Alarid-Escudero F. Comparative effectiveness of inactivated and live-attenuated influenza vaccine in children: a decision-analytic model. Poster at Society for Medical Decision Making, 2016.
- Sullivan, S., McGovern, P., Choudary, K., Miller, N., Raghavendo, R., Georgieff, M., and **Stepanov, I.** Biomarkers to Assess Neurodevelopmental Toxicity of Manganese: A Pilot Study. APHA 2016 Annual Meeting and Expo. October 29-November 2, 2016. Denver, CO.
- Sullivan, S., McGovern, P., Choudary, K., Miller, N., Raghavendo, R., Georgieff, M., and **Stepanov, I.** Biomarkers to Assess Neurodevelopmental Toxicity of Manganese: A Pilot Study. School of Public Health Research Day. April 7, 2016 Minneapolis, MN.

Sundaram ME, Ali H, Mehra S, Shamim AA, Ullah B, Rashid M, Shaikh S, Christian P, Klemm RDW, West KP, Labrique AB. Milk and honey: Breastfeeding delays and early newborn ritual foods in rural Bangladesh. Poster at University of Minnesota Global Health Day, 2016.

2017

Alexander BH, Bender JB, Murphy D. Adapting the Haddon Matrix to Incorporate One Health in Occupational Health in Animal Agriculture. 25th EPICOH 2017 Barcelona Spain, September 5-8, 2017.

Arauz RE, **Mandel JH**, B Ma, Lindgren B, **Stepanov I**. (2017). 0279 Occupational exposure to dust components and alterations in immune/inflammation markers among taconite workers in Minnesota. The 26th International Symposium on Epidemiology in Occupational Health. Aug 28-31, 2017. Edinburgh, Scotland, UK

Hernandez AM, **Church TR**, **Mandel JS**, **Alexander BH**. (2017). Indirect Parent-Mediated Pathways of Child Exposure to 2,4-dichlorophenoxyacetic acid (2,4-D) and Chlorpyrifos in Farm Families. 26th International Epidemiology in Occupational Health (EPICOH) Conference, Edinburgh United Kingdom, September 2017

Sullivan SM, Ma B., **Alexander BH**, **Mandel JH**, **Stepanov I**. (2017) Relationship between extracellular iron and circulating inflammation markers in plasma of Minnesota taconite workers. 26th EPICOH, Edinburgh, Scotland, August 2017.

Sullivan SM., Park SL, **Stepanov, I**. (2018) Cadmium Exposure and Lung Cancer Risk in Smokers. Research Day, Minneapolis, Minnesota, April 2018.

Sorley E, Klumb C, Scheftel J, Alexander BH, Bender J, Smith K. (2017). Poultry Worker Tasks and Safety Practices Associated with Campylobacteriosis in Minnesota. 26th EPICOH, Edinburgh Scotland, August 2017.

2018

Alexander BH. Mesothelioma and Taconite Mining Exposures: A Persistent Question. 20th Annual Whiteside Memorial Lecture, University of Minnesota Duluth Medical School, November 8, 2018

Alexander BH. One Health and Occupational Health. 1st Annual Forum on Environmental and Occupational Health, University of Philippines, Manila, November 28, 2018

Balius P, Bye M, Smith K, Holzbauer S. Comparison of Community-Associated Clostridium difficile Infections with other Reportable Enteric Pathogens, Minnesota, 2016. IDWEEK, Washington, DC October 2-6 2018

Bustamante G, Andrade MS, Mikesell C, Cullen C, Endara P, Ponce P, Avila S, Grunauer M: [2018]. Evaluation of an educational program for self-protection against child sexual abuse in Ecuador. 2018 SER, Baltimore, MD, June 2018

Cigan, Shannon S. "Urinary Cadmium and Lung Cancer Risk in Smokers from the Multiethnic Cohort Study". National Institute of Environmental Health Sciences (NIEHS). November 5, 2018.

Kim H. Climate change, displacement, and Health. (Keynote speaker). The first National Environmental and Occupational Health Forum, Manila, the Philippines, 2018.

Kim H. Climate Change and Emergency Workers. (Keynote speaker). The 5th International Conference for Occupational and Environmental Health. Hanoi, Vietnam, 2018.

Kim H. Water and Sanitation for the Sustainable Development in the Western Pacific Region. Application of Rainwater Harvesting. (Keynote speaker). The 5th International Conference for Occupational and Environmental Health. Hanoi, Vietnam, 2018.

Sullivan, S., Park, S.L., **Stepanov, I.** “Cadmium Exposure and Lung Cancer Risk in Smokers”. Masonic Cancer Center 8th Annual Cancer Research Symposium, University of Minnesota March 29, 2018

Sullivan, Shannon. “Cadmium Exposure and Lung Cancer Risk in Smokers”. School of Public Health Research Day Lightning Round Presenter. April 18, 2018.

2019

Alexander BH. Working and Living: The Environment and One Health. 4th International Conference on One Medicine One Science Chiang Mai, Thailand, February 11-14, 2019

Hernandez AM, Zhou Y, Chen W, **Mandel JH.** Ambient and Personal PM2.5 Measurements: What’s the Difference When Determining Associations of Individual Health Effects? International Society for Environmental Epidemiology (ISEE). Utrecht, Netherlands. March 2019.

Hernandez AM, **Mandel JH,** **Alexander BH.** Multiple Cause of Death Analysis of Chronic Obstructive Pulmonary Disease (COPD) and Ischemic Heart Disease (IHD) in a Cohort of Iron Miners. International Society for Environmental Epidemiology (ISEE). Utrecht, Netherlands. March 2019.

Drake C, Hernandez AM, Liu Y, Schwartz AH, Sundaram ME. Prevalence of “Responsible Selling” Tendencies in an Online Firearms Marketplace. Society for Epidemiologic Research (SER). Minneapolis, MN. January 2019.

Arauz RF. Airborne Particulates Exposure Assessments and Potential Impact on Inflammatory Markers and Health Outcomes in Taconite Workers in Minnesota. Pulmonary Citywide Conference, Department of Medicine, University of Minnesota Medical School. Jun. 05, 2018. Minneapolis, MN.

Cigan, Shannon S., Jenson, Joni., Murphy, Sharon E., Hatsukami, Dorothy, **Stepanov, Irina.** “Differences in urinary cadmium levels in African American and White smokers”. Society for Research on Nicotine and Tobacco 25th Annual Meeting, February 2019.

Cigan, Shannon S., **Alexander, Bruce H.,** Park, Lani S., **Stepanov, I.** “Relationship between urinary cadmium and occupation in smokers from the Multiethnic Cohort Study. International Conference on Emerging Challenges to Environmental and Occupational Health Sustainability”. Jamia Millia Islamia (A Central University), New Delhi, India. January 17, 2019

Bustamante, G., **MacLehose, R.,** Osypuk, T., Kitahara, C., Ramirez, M., Linet, M., **Alexander, B.** *Effect of neighborhood socioeconomic status on the association between ionizing radiation and circulatory diseases.* Abstract submitted for review for the 2019 meeting of the Society of Epidemiologic Research (SER), Minneapolis, MN.

2019

Hernandez AM. Uncovering Racial and Ethnic Disparities in Health and Health Care Among Rural Residents. Lightning Round Talk, School of Public Health Research Day. May 2020.

Hernandez AM. Rural Disparities in Health and Health Care by Race and Ethnicity. Rural Health Research Gateway Webinar. Jan 2020.

Hernandez AM. The Relationship between Bullying Incidents and Anti-Bullying Policies in Maine School Districts. International Bullying Prevention Association (IBPA) Conference. November 2019.

Hernandez AM. Evidence of Background Checks in an Online Firearms Marketplace. Society for Epidemiologic Research (SER) Conference. Minneapolis, Minnesota. June 2019.

MacLehose RF. Get off of my lawn: a manifesto. Seminar, Division of Epidemiology, University of Minnesota. Sept, 2019

Hernandez AM, Henning-Smith C. Disparities in health, Preventive Care Services, and health Care Access Among Rural Residents by Race and Ethnicity [Poster Session Canceled]. Academy Health. July 2020.

Hernandez AM, Zhou Y, Chen W, **Mandel JH**. Ambient and Personal PM2.5 Measurements: What's the Difference when Determining Associations with Individual Health Effects? International Society for Environmental Epidemiology (ISEE) Conference. August 2019.

Henning-Smith C, Hernandez AM, Ramirez M, Hardeman R, Kozhimannil K. Dying Too Soon: County-level Disparities in Premature Death by Rurality, Race, and Ethnicity. Academy Health Annual Research Meeting. Washington, D.C. June 2019.

Appendix C
Occupational and Environmental Epidemiology
Selected Other Engagement and Awards by Trainees and Core Faculty
(Faculty/staff identified with bold font; Students identified with underline)

Bruce H Alexander:

- Member. Advisory Committee to the Minnesota Department of Health Biomonitoring and Environmental Health Tracking Program
- Member, Birth Defects Work Group Advisory Panel. Minnesota Department of Health
- Member, DVM/MPH Program Advisory Committee, School of Public Health/College of Veterinary Medicine University of Minnesota, 2018-Present
- Advisor. National Pork Board Producer, Public Health and Workplace Safety Committee 2018-Present
- International One Medicine One Science Meeting Planning Committee, 2017-present

Hyun Kim:

- Associate Editor, *Archives of Environmental and Occupational Health* (2018-)
- Contributing Editor, *American Journal of Industrial Medicine* (2010-)
- Board Member and Scientific Advisor, Minnesota Korean Service Center, Minnesota and Korean Adoptee Ministry, USA
- Consulted on patient-handling related injuries among hospital workers and first responders with Minnesota Occupational Safety and Health Administration, MN
- Consulted on violence against nurses with Minnesota Department of Health, MN
- Provided scientific advice to Minnesota Korean Service Center in submitting a program grant, "Eliminating Health Disparities Initiative" by Minnesota Department of Health, MN
- Grant reviewer, NIOSH/CDC Special Emphasis Panel for Occupational Safety and Health Training Project Grants (T03), 2015-2017.

Richard F. MacLehose

- Faculty mentor for SER student workshop, Society for Epidemiologic Research Boston
- Member, Editorial Board, *Epidemiology*
- Associate Editor, *BMC Medical Research Methodology*
-

Jeffrey H. Mandel:

- Coordinator/Member, management team for Occupational and Environmental Medicine Residency, including Admissions Committee
- Member, HealthPartners Occupational and Environmental Medicine Residency Advisory Committee
- 2007-present
- Committee Chair, External Advisory Committee for Taconite Workers Health Studies
- Consulted with attorneys in Cleveland, Ohio on non-pulmonary cancers associated with asbestos exposure
- Consulted with attorneys in Tampa, FL in law suit against cigarette manufacturer

Rony Arauz

- William Randolph Hearst Endowed Scholarship 2016-2018)
- NIH/NHLBI Pulmonary and Critical Care Training Grant Fellowship (2017)
- Garífuna Health and Education Support Institute (New York, NY). Serves as Director of Education and Health Affairs, Other activities: Organizes collection of basic medical supplies in support of the First Garífuna Hospital in Honduras
- Translation Services in English to Spanish (University of Minnesota School of Public Health)
- MCOHS-ERC Pilot grant
- Title: Air Pollutants, Categories of Biomarkers and Health Outcomes in Taconite Workers in Minnesota

- Funding Source: CDC/NIOSH (MCOHS-ERC Pilot grant)
- Role: Principal Investigator
- Project Duration: *Jun 1, 2017-May 31, 2018*

Gabriela Bustamante

- School of Public Health Research Day - 1st place award for the PhD Category
- School of Public Health Research Day - Public Health Impact Award
- 2016 University of Minnesota Graduate School Summer Research Internship Award
- Teaching Assistant Issues in Global Health and the Environment Fall 2015-18

Ashley Hernandez

- Dinnaken Fellowship, University of Minnesota, 2017-2018
- MCOHS) Pilot Project Grants
- Role: Principal investigator
Funding Source: Midwest Center for Occupational Safety and Health (Title: The Association between Particulate Matter 2.5 with Cardiovascular Disease and Chronic Obstructive Pulmonary Disease Mortality in Minnesota Taconite Workers)
- Dates: 01/2018-01/2019
- Amount: \$20,000
- Teaching Assistant Issues in Environmental and Occupational Health PubH 6102 Fall 2017, Spring 2018

Craig Meyer:

- Society of Epidemiologic Research Student & Postdoc Committee, Past-President 2015-2016.

Maria Sundarum:

- Environmental Health Sciences representative to the University of Minnesota Council of Graduate Students, 2015-2016.
- Frieda Martha Kunze Fellowship, University of Minnesota Graduate School
- Infectious Diseases Society of America Interest Group Grant (To support student ID journal club)
- Alumni Society Scholarship, University of Minnesota School of Public Health

Shannon Sullivan Cigan

- Division of Environmental Health, Herbert M. Bosch Award 2017
- Service presentations:
- Blake High School Lab tour. University of Minnesota. December 18, 2018.
- The School of Biology – exploring careers in health sciences – lab tour. University of Minnesota. December 4, 2018.
- SCRUBS Camp Minneapolis Public Schools - exploring careers in the health sciences – tour. Masonic Cancer Center. Presentation “Are E-Cigarettes Safer Than a Cigarette?” July 26, 2018.
- Cancer and the Human Body exhibit presented by Masonic Cancer Center and Science Museum of Minnesota. March 5, 2018.
- Society for Research on Nicotine and Tobacco Research 25th Annual Meeting Travel Awardee (\$800) based on submitted abstract, February 2019
- School of Public Health Student Senate
- Professional Development Grant Awardee (\$200), March 2018
- Eliminating Health Disparities Initiative (EHDI) grant review note taker, Minnesota Department of Health
- Public Health Review Journal, University of Minnesota
- Centers for Disease Control and Prevention (CDC) Grant Reviewer
- Society for Nicotine on Research and Tobacco (SRNT) Global Research Network Education Subcommittee

- Society for Nicotine on Research and Tobacco (SRNT) Knowledge Center Subcommittee
- University of Minnesota Council of Graduate Students Grants Committee
- School of Public Health Ambassador, University of Minnesota, Minneapolis MN
- Tobacco Youth Program – Development of Content for Peer Educators– Community Outreach with Masonic Cancer Center. Ongoing.
- Cancer and the Human Body exhibit presented by Masonic Cancer Center at the Science Museum of Minnesota. March 2018.

Table 1. Academic Training Report July 1, 2015 – June 30, 2020¹
Occupational and Environmental Epidemiology

Degree Awarded	How Does Degree Read?	Total # Applicants to Degree Program	Total # Applicants Admitted to Degree Program	Total # Under Represented Minority Applicants Admitted	# Full-Time Students Enrolled ²	# Full-Time NIOSH-Supported Trainees	# Part-Time Students Enrolled ²	# Part-Time NIOSH-Supported Trainees	# Trainees Graduated During Reporting Period
Master's degree ³									
	Master of Science	0	0	0	1	1	0	0	1
Doctorate degree									
	Doctor of Philosophy in Environmental Health	7	7	1	13	12	0	0	8
Post-doctoral									
Certificate Program									

¹ Reporting period for renewals is from the start date of prior competing award. New applicants should report past five years.

² Full-time and part-time students should include all students in approved programs, regardless of source of support.

³ OM residents may be double-counted under Masters degree training and post-doctoral training.

Table 2. Trainees and Graduates Supported July 1, 2015 – June 30, 2020¹
Occupational and Environmental Epidemiology

Trainees				Graduates				
Trainee ID, Year of Entry, Prior Degree & Institution, (Current Academic Advisor or Mentor and Department). Identify Under Represented Minority with (URM).	OM Trainees: Previous Residency Training Specialty	Title of Research Project or Research Topic	Degree Program (MS, MPH, PhD, DrPH, etc.)	Date Degree or Certificate Awarded (mm/yyyy)	Date of Certificate for OM (mm/yyyy)	Employed in OSH Field or in OSH Advanced Study (Y/N)	Current Employer	Current Position
100334, 2011, Masters, University of Minnesota, (J Mandel, Division of Environmental Health Sciences) (URM)		Nonmalignant respiratory disease in taconite workers	PhD	01/2016		N	Exponent Company	Senior Scientist
100340, 2011, Masters, University of Michigan, (G Maldonado, Division of Environmental Health Sciences)		Application of uncertainty analysis and meta-analysis to estimate a causal measure of effect for ischemic heart disease among chemical production workers occupationally exposed to tcdd-contaminated chlorophenols and phenoxy herbicides	PhD	12/2018		Y	Department of Defense	Epidemiologist and Statistician
100354, 2012, Masters, University of Minnesota, (B Alexander, Division of Environmental Health Sciences)		The risk of cataracts from occupational ionizing radiation exposure in the U.S.	PhD	02/2016		Y	Technical Institute, Evidence for Access, U.S. Medical Affairs Genentech	Data Scientist

100375, 2013, Bachelors, University of Iowa, (B Alexander, Division of Environmental Health Sciences) (URM)		Ebola Risks and Laboratory Safety	MS	09/2015			Minnesota Department of Health	
100376, 2014, Masters, University of Illinois, (B Alexander/J Bender, Division of Environmental Health Sciences)		Campylobacteriosis in Poultry and Livestock Workers in Minnesota, 2012-2016	PhD	12/2018		N	Blue Cross/Blue Shield of Minnesota	Analyst
100383, 2014, Masters, Johns Hopkins University, (M Osterholm, Division of Environmental Health Sciences) (URM)		Neisseria Meningitidis, Meningococcal Vaccines and Nutrition in Children in the African Meningitis Belt	PhD	05/2018		Y	Rollins School of Public Health at Emory University	Postdoctoral Fellow
100382, 2015, Masters, Georgia State University, (I Stepanov, Division of Environmental Health Sciences)		Urinary cadmium and lung cancer risk in smokers from the Multiethnic Cohort Study	PhD	08/2019		N	Division of Epidemiology and Clinical Research, Department of Pediatrics, University of Minnesota	Postdoctoral Associate
100394, 2015, Masters, University of Michigan, (B Alexander, Division of Environmental Health Sciences)		Airborne particulates exposure assessments and potential impact on inflammatory markers and health outcomes in taconite workers in Minnesota	PhD	10/2018		Y	National Cancer Institute	Post-Doctoral Research Fellow

100395, 2015, Masters, Columbia University in the city of New York, (B Alexander, Division of Environmental Health Sciences) (URM)		Circulatory Disease Risk from Occupational Ionizing Radiation Exposure and Socioeconomic Status	PhD	08/2019			N	Cancer Disparities, University of Minnesota	Postdoctoral Fellow
100407, 2016, Masters, University of Texas, (B Alexander, Division of Environmental Health Sciences)		Cardiovascular Disease and COPD Mortality in the Taconite Worker Health Study	PhD						
100431, 2018, Masters, University of Minnesota, (J Bender, Division of Environmental Health Sciences)		Occupational infectious disease	PhD						
100432, 2018, Masters, Indiana University, (D Lazovich, Division of Epidemiology and Community Health)		<i>To be determined</i>	PhD						
100447, 2019, Masters, University of North Dakota, (R Maclehose, Division of Epidemiology and Community Health)		<i>To be determined</i>	PhD						
100448, 2019, Master of Public Health, University of Minnesota, (advisor to be determined)		<i>To be determined</i>	PhD						

¹ List all NIOSH supported trainees and graduates by year of entry. Reporting period for renewals is from start date of prior competing award. New applicants should report last five years.

OCCUPATIONAL INJURY PREVENTION RESEARCH TRAINING PROGRAM (OIPRTP)
ACADEMIC TRAINING PROGRAM

Marizen R. Ramirez, PhD – Director
Hyun Kim, ScD – Co-Director

OCCUPATIONAL INJURY PREVENTION RESEARCH TRAINING PROGRAM (OIPRTP)

1. Background

Rationale, History, and Objectives. For almost two decades, the Occupational Injury Prevention Research Program (OIPR) has existed as a National Institute for Occupational Safety and Health (NIOSH)-funded program to train PhD-level occupational injury professionals in the United States. Occupational injury prevention training was started in the early 1980s by **Dr. Susan Gerberich**, Emeritus Director of OIP and the Midwest Center for Occupational Health and Safety (MCOHS) and key advisor to the Center, to address a critical need for trained academicians and leaders to conduct multidisciplinary research in occupational injury prevention. In 2016, **Dr. Marizen Ramirez** was recruited from the University of Iowa (UI) and appointed Co-Director of OIP and now serves as OIP Director. She is joined by **Dr. Hyun Kim**, Co-Director, who was recruited from Zucker School of Medicine (Hofstra/Northwell, New York City). Consistent with the Center's overall mission, OIPR has provided cutting-edge interdisciplinary occupational safety training to prepare leaders and practitioners in the field of occupational injury prevention and control by meeting the following objectives: 1) Conduct high-quality occupational injury prevention research; 2) Provide rigorous multidisciplinary training; 3) Recruit and retain, especially underserved minority trainees; 4) Disseminate research findings and engage in outreach; 5) Support graduates in job placement; and 6) Continue improvement of OIP to ensure its sustainability and high impact. Since its existence, OIP has trained 34 graduates who have been employed in academic institutions, state and federal public health agencies, industries, and nonprofit organizations.

Funding from the Centers for Disease Control (CDC)-NIOSH has been essential to OIPR and the future of the occupational injury prevention profession. Very limited federal research funding is dedicated to occupational injury research (and the injury field in general), and no other source exists for training in occupational injury. Thus, this T42 funding has historically served as the only federal funding mechanism for producing qualified and skilled occupational injury professionals for prevention and control of occupational injuries. Key faculty dedicated extensive efforts to create dynamic curriculum and research experiences in occupational injury prevention. The majority of funds (~70%) are allocated to the trainees (tuition, stipends, travel, books, software), who would potentially select other programs of study if funding was unavailable.

OIPR has served as a resource for industry, labor, federal, state, and local agencies as well as nonprofit organizations from the Upper Midwest states of Minnesota (MN), Wisconsin (WI), North Dakota (ND), and South Dakota (SD) through continuing education, community-engaged research, and outreach. This four-state service region was determined originally by NIOSH, although the scope of activities has not been limited to this geographic area. Notable partnerships include: a currently funded Training Program Grant housed at the University of Wisconsin (UW); other NIOSH-funded centers and Education and Research Centers (ERCs) (e.g., the Upper Midwest Center for Agricultural Safety and Health, Great Plains Center for Agricultural Health, Healthier Workforce Center of Excellence, and Heartland Center ERC at the University of Iowa (UI); and the Maine State Department of Education.

2. Past Performance/Accomplishments July 1, 2015 – June 30, 2020

LEADERSHIP. The leadership of OIPR has grown in its diversity and breadth in research with the recruitment of two accomplished injury epidemiologists. Dr. Ramirez (University of California, Los Angeles) was recruited from UI in 2016, and Dr. Kim (University of Massachusetts, Lowell) was recruited from Zucker School of Medicine in 2015. Both came with excellent track records of federally funded research, and Dr. Ramirez held previous leadership positions with the UI Heartland Center for Occupational Safety and Health and UI Injury Prevention Research Center. Dr. Ramirez currently serves as OIP Director while Dr. Kim serves as Co-Director. Both have been mentored closely by Dr. Gerberich (Emeritus Director), current advisor to OIP.

STUDENT TRAINEES. During the 2015-2020 program period, 10 PhD students matriculated into OIP, exceeding the targeted six identified in the prior competitive renewal. Three have graduated, one is a PhD candidate, and six are currently completing coursework and preparing for their oral preliminary examinations. Five students also competed successfully for MCOHS pilot grants. Four are racially underrepresented minority

students and come from diverse academic backgrounds of nursing, engineering, psychology, anthropology, biology, chemistry, and sociology. With the OIP strong emphasis on epidemiology, several students completed minors in that field and have received awards.

Graduates. OIPR: Three graduates completed their degrees within five years and have been placed in competitive positions in academia, government, and industry. All three received numerous awards while enrolled in the program and each published three or more peer-reviewed papers.

- **Navneet Baidwan, MPH, PhD**, has a background in nursing. Her dissertation was on occupational injuries to older adults. She graduated in 2018 and is now a *Post-Doctoral Scholar at University of Alabama's School of Health Professionals*. She has published seven publications, of which four are first-authored.
- **Deirdre Green, MS, PhD**, has a background in industrial hygiene. Her research focused on injuries to janitorial service employees. She graduated in 2018, and secured a Postdoctoral Fellowship, followed by an *Epidemiologist* position with *NIOSH's Surveillance Division*. In 2020, she became a Research Scientist at the Occupational Safety and Health Agency's Directorate of Standards and Guidance. In May 2020, she was drafted to work as a special assistant on the Assistant Secretary's Team for COVID-19. She has published seven papers, of which four were first-authored papers from her dissertation.
- **Adam Schwartz, MS, PhD**, has a background in psychology and human factors/ergonomics. His dissertation focused on ergonomic workload among janitors. He is a *researcher with the Human Centered Design Institute of Emerson Electronic Company*, a Fortune 500 company. Adam has published nine papers, of which four are first authored and was awarded the International Ergonomics Association (IEA) K.U. Smith Student Award for his dissertation-based paper at the 20th Congress of the IEA in Florence, Italy in 2018.

Current Trainees.

- **Disi Tian, MS**, a doctoral candidate, has a background in Mechanical Engineering and is studying transportation crashes in rural intersections and their impact on occupational safety. She will defend her dissertation in summer 2020. Ms. Tian received a travel award from the Transportation Research Board in 2017, and the American Public Health Association's Injury Control and Emergency Health Services President's Roadway Safety Scholarship in 2019. She has published four papers, of which three are first authored.
- **Douglas DeMoulin, MS**, is a third-year doctoral student with an MS in Occupational Safety and Health. His dissertation is on moral injury among firefighters, for which he was awarded a MCOHS pilot project research training program grant. At the International Association of Fire Chief's Annual Fire-Rescue conference, he received the top award for his poster entitled Posttraumatic Stress Disorder Assessment in Minnesota Firefighters. He has one publication, to date, and another one in review.
- **Yoon-Sung Nam, MPH**, is a third-year doctoral student with a background in biology and an MPH in Environmental Health Sciences (EnHS). His dissertation is on injuries and stress to law enforcement and was recently awarded a MCOHS pilot project research training program grant. From his research assistantship with Dr. Ramirez, he has presented research on bullying at several conferences this year (e.g., Society for the Advancement of Violence and Injury Research, the Society for Adolescent Health and Medicine, and the International Bullying Prevention Association). He received the Mary Lauren Olson Scholarship award.
- **Samuel Jacobs, BS**, has a background in microbiology and is a second-year PhD student. He completed a MPH degree (Epidemiology) project on bone fractures in retired astronauts.
- **Mathew McFalls, MPH**, is a second-year PhD student with a background in biology and an MPH in Epidemiology. He is developing a dissertation topic on injuries in the aging workforce using two national databases, the Health Retirement Survey and the Medicare Database. He has worked on several studies (farm equipment crashes, bullying and adverse child experiences), and presented at the Society for the Advancement of Violence and Injury Research.
- **Nathan Wright, MPH**, is a first-year PhD student with a background in psychology and an MPH in Epidemiology. He is the lead epidemiologist for MN Department of Health's drug overdose and substance use program. He will focus on opioids in the workplace as his dissertation topic. He has a manuscript focused on opioids use among adolescents in review.

- **Alyson Harding, MPH**, is a first-year PhD student with a background in chemistry, anthropology, and epidemiology. Her dissertation topic is focused on work-related climate change and disaster preparedness. Ms. Harding received the 2020 Northwest Chapter American Society of Safety Professionals Student Scholarship.

In addition, two master's students, who were not recipients of MCOHS funds, were trained, following our proposed MS curriculum. Both were underrepresented minority students of color. Yihe Shi developed a thesis on sleepiness and depression in firefighters and recently accepted a job as a research assistant at the University of Wisconsin Institute for Sleep and Consciousness. Linzi Zhu is completing a master's project on child abuse and sex trafficking with the MN Department of Health. During this spring 2020, the OIPR program also successfully recruited incoming PhD student, Alexis Grimes Trotter, who is completing an ORISE fellowship at NIOSH and has a BA in Biology and an MPH in Epidemiology. She is interested in the intersection between health policy, occupational injury prevention and health equity. Seven students were from racially underrepresented backgrounds.

COMPETENCIES AND TRAINING ENHANCEMENTS

One objective is to provide trainees with knowledge and skills to apply the Public Health Model to occupational injury prevention. This includes designing data collection and surveillance systems and implementing and evaluating injury control measures. The 2018 alumni survey, which was conducted with all 11 OIPR graduates since 2008, reported being proficient in all 10 OIP competencies (Table 2). Graduates were highly proficient in critiquing literature/proposals/manuscripts, accessing injury prevention resources, presenting scientific information, utilizing epidemiologic methods, and understanding the research process (design to analysis to interpretation). Graduates reported moderate to high proficiency in implementing and evaluating interventions.

Course Improvements. Based on these results, OIPR enhanced its curriculum with additional rigor and innovation: 1) The Injury and Violence courses were infused with intervention design and evaluation content, adding exercises on developing logic models and implementing violence prevention programs in diverse communities; 2) Because the OIPR curriculum has been firmly grounded in epidemiologic methods as the basis for injury prevention science, the most advanced Epidemiologic Methods series (PubH 8341/2/3) was added as a PhD requirement to provide further exposure to advanced topics; 3) Under the leadership of Dr. Ramirez, the violence prevention class became a required course and was revitalized with web-based lectures featuring experts from other parts of the country (e.g., Dr. Garen Wintemute from the Violence Prevention Program at University of California, Davis, and Dr. Rachel Young from UI School of Journalism, who taught students to write opinion-editorials) and interactive online tools (e.g., www.polleverywhere.com); and 4) OIPR specialty courses were enhanced with skills-based exercises on using surveillance data (e.g., WISQARS), analysis of datasets using STATA, developing r2p products (e.g., policy briefs), and writing for academic journals.

DISSEMINATION OF RESEARCH FINDINGS

OIPR students and faculty presented 87 posters and oral presentations at professional conferences and published 116 peer-reviewed papers. Trainee Schwartz received the K.U. Smith Student Award at the International Ergonomics Society for developing a measurement tool for his research on injuries to janitors. Trainee Baidwan was a finalist for her oral presentation on injuries to older workers at the American Public Health Association's 2017 meeting. Dr. Ramirez received a research paper award from the International Society for Agricultural Safety and Health in 2017. Trainee DeMoulin received a first-place award for his poster at the International Association of Fire Chiefs in 2019.

OUTREACH

Julie Alcorn-Webb, Director of Continuing Education (CE) and Outreach, regularly consulted with OIPR faculty for injury prevention content in CE and outreach trainings. During the past performance period, about 17,000 safety practitioners were trained through the CE course offerings. OIPR faculty were also heavily involved in the planning of the recent National Occupational Research Agenda (NORA) symposia, which featured

occupational injury topics (e.g., 2017 - opioids in the workplace; 2018 - workplace harassment; 2019 - stress and suicide; 2020 – the aging workplace). Furthermore, OIPR students and faculty research has involved strong community and industry engagement (e.g., janitors study, firefighter study, and bullying studies). MCOHS’s partnership with Service Industry Employee Union led to two dissertations on janitor health. OIPR and Occupational and Environmental Health Services and Policy students completed MN Department of Labor and Industry contract to evaluate the impacts of a new policy allowing 16- and 17-year-olds to work on construction sites. A strong relationship has been built with the fire service in Minnesota; a survey to assess PTSD and other mental health risks was conducted (over 1,000 responses) and led to one doctoral dissertation.

RECRUITMENT AND RETENTION

Recruitment. A new center brochure with professional consultation on the design was developed for marketing through various venues and networks, including professional conferences, CE sessions, professional associations, alumni, and colleagues. The OIPR website, <http://www.mcohs.umn.edu/occupational-injury-prevention-research-training-oiprt/>, which contains personalized stories of trainees, including a video featuring OIPR graduate Deirdre Green, has drawn traffic and subsequent applications to the program.

Retention. OIP retained 100% of students, including those from underrepresented backgrounds through targeted activities: 1) The weekly Research Seminar (PubH 8120) facilitates networking to connect trainees from all six MCOHS training programs with faculty, stakeholders, and alumni; 2) A webpage on MCOHS is dedicated to providing diversity resources (e.g., cultural centers, policies on diversity, and disability resources); 3) Student-staff-faculty brown bag lunches are held monthly to discuss topics of interest driven by students; and 4) Through annual required progress reviews, students are mentored closely. 5) During COVID-19, OIPR faculty have held weekly Zoom office hours for OIPR student thesis research discussions.

SUSTAINABILITY

During the past performance period, OIPR continuously monitored benchmarks for success and identified areas for enhancement. Evaluation data came from regional injury data, course evaluations, alumni surveys, exit interviews, discussions with trainees during monthly brown bag lunches or individual meetings, annual external advisory board meetings (representing industry, safety, healthcare, academia, labor, all key faculty, leadership, and current students), and executive committee meetings, which involved directors of other MCOHS training programs and key staff. Research training areas have been expanded to include a stronger focus on intervention, implementation, and evaluation (including policy), disaster preparedness, and occupational disparities. Because of a national trend of reduced PhD matriculation in schools of public health, OIPR is also strategically adding a MS/MPH OIP training option to fill the ranks of injury prevention professionals in the workforce. Finally, OIPR has and will continue to leverage additional funding through grants, scholarships, and fellowships to support trainees beyond the three NIOSH/ERC funded slots per year (<http://www.mcohs.umn.edu/financial-aid/>). Looking forward, OIPR has great promise for continuing rigorous training, research, and outreach and building on its long history of success.

3. Program Deliverables

Table 1. Program Outputs and Outcomes

Objectives	Program Outputs and Outcomes
Recruitment, enrollment, and retention with a focus on diversity	<ul style="list-style-type: none"> • 8 PhD students recruited; 11 total enrolled and retained (5 minority students) • 2 MS students recruited, enrolled, and retained (all minority students) • 3 graduated and placed in academic, industry, and federal government • Diversity resources offered to students • Recruitment strategies employed to reach diverse student pools
Apply public health and epidemiologic model and provide high-quality curriculum	<ul style="list-style-type: none"> • Coursework enhanced with practical skills and professional development • 5 students developed R01-style proposals for PhD degree • Experiential learning through research assistantships with OIP faculty • Violence Course updated and is now a required core course

Provide opportunities for research projects and theses	<ul style="list-style-type: none"> • 6 PhD students were awarded MCOHS pilot grants • 1 PhD student received the prestigious University of Minnesota (UMN) Dissertation award • All students engage in research with OIP faculty; some secured research assistant positions on federally funded grants or contracts • 2 MS students developed theses • Dr. Kim awarded pilot grant and two contracts from the World Health Organization (WHO); OIP students included on the team
Disseminate research findings	<ul style="list-style-type: none"> • 116 peer-reviewed publications (33 involved students); journals include Journal of Safety Research, American Journal Industrial Medicine, and Injury Epidemiology • 87 professional presentations (49 involved students) at venues such as the American Public Health Association Conference and the Society for the Advancement of Violence and Injury Research
Enhance OIP development	<ul style="list-style-type: none"> • 7 OIP students received awards and fellowships related to their MCOHS training and research activities (e.g., UMN Dissertation Fellowships) • 3 OIP students received fellowships to ensure adequate funding. • MS/MPH injury and violence programs were developed. • Injury and Violence courses were enhanced • 2 new OIP faculty were recruited into leadership roles
Promote job opportunities	<ul style="list-style-type: none"> • All graduates were placed immediately upon graduation • Job opportunities are marketed through the website • OIP faculty accessed professional networks to identify job opportunities
Provide CE and outreach	<ul style="list-style-type: none"> • NORA symposia featured occupational injury topics (opioids in the workplace, workplace harassment, and stress/suicide) • Research-to-practice dissertation and research topics pursued
Interdisciplinary training activities seen in coursework	<ul style="list-style-type: none"> • 2 MCOHS Core Courses (Introduction to OSH and Field Problems) • 5 NORA symposia (one each spring) • Research Seminar; and other interactions with staff/faculty across disciplines

Appendix A
Occupational Injury Prevention Research Program (OIPR)
Selected Multidisciplinary Publications, 2015-2020

(OIPRTP faculty/staff identified with **bold font**; OIPR students identified with underline
(publications, n = 116; OIPR students (33) contributing = 28%;)

2020

1. Bolenbaugh M, Foley-Nicpon M, Young R, Tully M, **Ramirez MR**, Grunewald N. Parental perceptions of gender differences in child technology use and cyberbullying. *Psychology in Schools* (in press). [MRR is on PhD committee of BM, Faculty research]
2. Baidwan NK, **Gerberich SG**, **Kim H**, **Ryan AD**, **Church T**, Capistrant B. A marginal structural model approach to analyse work-related injuries: an example using data from the health and retirement study. *Inj Prev*. 2020 Jun;26(3):248-253. doi: 10.1136/injuryprev-2018-043124. Epub 2019 Apr 24. PMID: 31018941. [**SGG: PhD Thesis Advisor for NKB**, NIOSH T42 Pilot Project funding Faculty/Student Research]
3. Jang SB, Ekyalongo Y, **Kim H**. Systematic Review of Displacement and Health Impact from Natural Disasters in Southeast Asia, *Disaster Medicine and Public Health Preparedness*, 2020;1-10. doi:10.1017/dmp.2019.125 [Faculty Research]
4. **Kim H**, Kriebel D, Cifentes M, Baidwan N, Baron S: [2020] Qualitative bias assessment in World Trade Center responders and workers' studies, In review.
5. Rexing CJ, Hohl BC, Johnson RM, **Ramirez MR**, Carlson KF, Garrettson M, Cruz TH: [2020] We must do better science: addressing racism to improve health and safety for all people. *Injury Prevention* (in press). [MR is member of professional organization, SAVIR, leading this publication.]
6. Rosebush CE, Zaidman B, Schofield KE, Erickson DJ, **Ramirez M**, Tschida B, McGovern PM. Occupational differences in workers' compensation indemnity claims among direct care workers in Minnesota nursing homes, 2005-2016. *American Journal of Industrial Medicine*. 2020 Jun;63(6):517-26. [PM is advisor of RCE, MRR is committee member-Faculty/Student Research]
7. Rosebush CE, Zaidman B, Schofield KE, Erickson DJ, Tschida B, **Ramirez M**, McGovern PM An evaluation of the Minnesota Safe Patient Handling Act: trends in workers' compensation indemnity claims in nursing home workers before and after enactment of the law. *Occupational and Environmental Medicine* (in press). [PM is advisor of RCE, MRR is committee member- Faculty/Student Research]
8. Schofield KE, **Alexander BH**, **Gerberich SG**, MacLehose RF, Ryan AD: [2020] Safety and health professional consultation and risk of lost-time injury in construction companies. In preparation [**BHA: Research Advisor for KES; SGG: PhD Committee Member**] [Faculty/Student Research]
9. Schofield KE, Alexander BH, **Gerberich SG**, MacLehose RF, Ryan AD: [2020] Minor injury experience and risk of subsequent lost-time injury in construction companies. In preparation [**BHA: Research Advisor for KES; SGG: PhD Committee Member**] [Faculty/Student Research]
10. Schofield KE, **Alexander BH**, **Gerberich SG**, MacLehose RF, Ryan AD: [2020] Safety and health professional consultation and risk of lost-time injury in construction companies. In preparation [**BHA: Research Advisor for KES; SGG: PhD Committee Member**] [Faculty/Student Research]
11. Schwartz A, **Gerberich SG**, Albin T, **Kim H**, **Ryan AD**, **Church TR**, Green DR, **McGovern PM**, Erdman AG, Arauz RF. The association between janitor physical workload, mental workload, and stress: The SWEEP study. *Work*. 2020;65(4):837-846. doi: 10.3233/WOR-203135. PMID: 32310213. [**SGG: PhD Thesis Advisor for AS**] NIOSH T42 Pilot Project funding - [Faculty/Student Research]
12. Smith K, Casteel C, McGehee D, Rohlman D, **Ramirez M**, Peek-Asa C: [2020] Examination of realism in a high-fidelity tractor driving simulator. Examining the association between age and tractor driving performance measures using a high-fidelity tractor driving simulator. *Journal of Agricultural Safety and Health* (in press). [MRR is on PhD committee of KS Faculty Research]

2019

1. **Baidwan NK, Gerberich SG, Kim H, Ryan AD, Church TR**, Capistrant B: [2019] A longitudinal study of work-related psychosocial factors and injuries: Implications for the aging United States workforce. *American Journal of Industrial Medicine* 2019;1-10. DOI: 10.1002/ajim.22945 [SGG and HK: PhD Thesis Co-Advisors for NKB] NIOSH T42 Pilot Project funding. [Faculty/Student Research]
2. **Drucker C, Gerberich SG**, Manser MP, **Church TR, Alexander BH**, Becic E, **Ryan AD**: [2019] Driver support systems for the detection of in-use and in-transport emergency vehicles, In review. [**SGG: PhD Thesis Advisor for CD**] [Faculty/Student Research; Funding: Pilot Projects, MCOHS ERC through NIOSH]
13. **Feda DM, Gerberich SG, Ryan AD**, Nachreiner NM, **McGovern PM**: [2019] Presence of assault deterrents and educators' risk of physical assault. In review. [SGG: PhD Thesis Advisor for DMF] [Faculty/Student Research; NIOSH RO1 funding]
14. **Gerberich SG**: [2019] Verbal abuse against home care aides: Another shot across the bow in violence against health care and other workers. Invited Commentary, *Occupational and Environmental Medicine* 76(9):593-594. doi: 10.1136/oemed-2019-105925. [Faculty Research]
15. **Green D, Gerberich SG, Kim H, Ryan A, McGovern P, Church T, Schwartz A, [Arauz RF]**: [2019] Knowledge of work-related injury incidence, severity, and associated risk factors. *Journal of Occupational and Environmental Medicine* 61(2):153-161. [RFA is a PhD graduate in Occupational and Environmental Epidemiology.] [SGG: PhD Thesis Advisor for DG] NIOSH T42 Pilot Project funding [Faculty/Student Research]
16. **Green D, Gerberich SG, Kim H, Ryan AD, McGovern PM, Church TR, Schwartz A, [Arauz RF]**: [2019] Knowledge of work-related injury reporting and perceived barriers among janitors. *Journal of Safety Research* 69:1-10. [RFA is a PhD graduate in Occupational and Environmental Epidemiology.] [SGG: PhD Thesis Advisor for DG] NIOSH T42 Pilot Project funding. [Faculty/Student Research]
17. **Green D, Gerberich SG, Kim H, Ryan AD, McGovern PM, Church TR, Schwartz A, [Arauz RF]**: [2019] Janitor workload and occupational injuries. *American Journal of Industrial Medicine* 62:222-232. DOI: 10.1002/ajim.22940. [RFA is a PhD graduate in Occupational and Environmental Epidemiology.] [SGG: PhD Thesis Advisor for DG, NIOSH T42 Pilot Project funding]
18. Immerfall S, **Ramirez MR**: [2019] Link for Schools: A System to Prevent Trauma and Its Adverse Impacts. *NASN School Nurse* 34(1):21-24. doi: 10.1177/1942602X18785010
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22. **Ryan AD**, **Gerberich SG**, **Alexander BH**, Renier CM: [2015] Animal-related activities as risk factors for injuries among youth on agricultural operations. *Journal of Agromedicine* 20:188-194. [Faculty Research]

23. Schofield KE, **Alexander BH**, **Gerberich SG**, **Ryan AD**: [2015] Management commitment to safety and risk of injury- A Workers' Compensation Insurance Perspective. *Journal of Safety Health and Environmental Research (JSHER)* 11(1);186-195. [**BHA: Research Advisor for KES; SGG: PhD Committee Member**] [Faculty/Student Research]
24. Scott LL, **Maldonado G**: [2105] Quantifying and adjusting for disease misclassification due to loss to follow-up in historical cohort mortality studies. *International Journal of Environmental Research in Public Health*. 15;12(10):12834-12846. doi: 10.3390/ijerph121012834. PMID:26501295. [Faculty/Student Research]
25. Shaukat A, **Church TR**, Shanley R, Kauff ND, O'Brien MJ, Mills GM, Jordan PA, Allen JA, Kim A, Feld AD, Zauber AG, Winawer SJ: [2015] Development and validation of a clinical score for predicting risk of adenoma at screening colonoscopy. *Cancer Epidemiology Biomarkers Prevention* 24(6):913-20. doi: 10.1158/1055-9965.EPI-14-1321. Epub 2015 Mar 23. PMID:25800242. [Faculty Research]
26. Shaukat A, Rector TS, **Church TR**, Lederle FA, Kim AS, Rank JM, Allen JI: [2015] Longer withdrawal time is associated with a reduced incidence of interval cancer after screening colonoscopy. *Gastroenterology*. 49(4):952-957. doi10.1053/j.gastro.2015.06.044. Epub 2015 Jul 9. PMID:26164494. [Faculty Research]

Appendix B
Occupational Injury Prevention Research Program
Selected Multidisciplinary Presentations, 2015-2020

(OIPRTP faculty/staff identified with **bold font**; students identified with underline)
(presentations, n = 87; OIPR students (49) contributing = 56%;)

2020:

- Nam Y, Hatzenbuehler M, McFalls M, Calvert C, Hernandez A, Adkins S, Iwan A, **Ryan AD, Ramirez, M.** *The Impact of Anti-Bullying Policies at the School Level: A Mixed-Method Analysis of Implementation Practices* Society for Advancement of Violence and Injury Research, SAVIR Annual (Virtual) Conference, 2020.
- Gower A, Brown C, **Ramirez M**, Nam Y, Eisenberg M. *Youth Perspective on Bias-Based Bullying: Opportunities for Screening and Support*, Society for Adolescent Health and Medicine (SAHM) Annual Meeting, San Diego, CA, 2020.
- Nam Y, Hernandez A, Adkins S, Ramirez M. *The Qualitative Narrative of the Impact of Anti-Bullying Policies on Youth Violence* International Bullying Prevention Association (IBPA) Annual Meeting, Chicago, IL, 2019.
- McFalls M, Peek-Asa C, Harland K., Zhu M, Morris NL, **Ramirez MR**. Farm equipment crashes on public roads: Results from a survey of 184idwest farms. Society for the Advancement of Violence and Injury Research, SAVIR Annual (Virtual) Conference, 2020. *Injury Prevention*, 26(Suppl 1), A53–A53. <https://doi.org/10.1136/injuryprev-2020-savir.135>

2019:

- Alexander BH**. Working and Living: The Environment and One Health. 4th International Conference on One Medicine One Science Chiang Mai, Thailand, February 11-14, 2019.
- DeMoulin D, **Kim H**, Jacobs S. Posttraumatic Stress Disorder Assessment in Minnesota Firefighters. Minnesota State Fire Chief Association Conference—Annual Board Meeting. Duluth, MN, 2019.
- DeMoulin D, **Kim H**, Jacobs S. Posttraumatic Stress Disorder Assessment in Minnesota Firefighters. International Association of Fire Chief's Annual Fire-Rescue Med. Henderson, NV, 2019.
- DeMoulin D, Abulhassan Y. Locating Firefighters in Immediately Dangerous to Life or Health Environments. National Occupational Research Agenda (NORA) Symposium. University of Minnesota, Minneapolis, MN, 2019.
- Gerberich SG**. (Invited Guest Lecture). Course Introduction/Overview: Historical Perspective; Basic Theory, Epidemiological Approach; Injuries: A National Perspective. PubH 6120, Injury Prevention in the Workplace, Community, and Home, Minnesota School of Public Health, Minneapolis, Minnesota, 2019.
- Green DR, **Gerberich SG**, **Kim H**, **Ryan AD**, **McGovern PM**, **Church TR**, Schwartz A, Arauz RF. Occupational Injuries among Janitors in a Major Metropolitan Area. *American Public Health Association, Occupational Health section*, Philadelphia, Pennsylvania, 2019.
- Tian D, **Gerberich SG**, Morris NL, **Ryan AD**, **Kim H**, Easterlund P, Erickson DJ. Safety Benefits and Potential Risks Associated with Using a Conflict Warning Intervention System at High-risk Rural Intersections: a Randomized Trial on a Driving Simulator. *American Public Health Association, Occupational Health section*, Philadelphia, Pennsylvania, 2019.
- Tian D, **Gerberich S**, **Kim H**, Morris N, **Ryan A**. Analysis of Risk Factors for Intersection-Related Crash Rates by Injury Severity Using the Total Annual Average Daily Traffic Volume as a Denominator, *American Public Health Association, Injury Control and Emergency Health Services section*, Philadelphia, Pennsylvania, 2019.

2018:

- Alexander BH**. One Health and Occupational Health. 1st Annual Forum on Environmental and Occupational Health, University of Philippines, Manila, November 28, 2018.

- Baidwin N, Casteel C, Gerr F, **Ramirez MR**. Farm related injuries: cost and risk estimates by type of injury claims. National Occupational Injury Research Symposium, Morgantown, 2018.
- Green DR, **Gerberich SG**, **Kim H**, **Ryan AD**. Determining Physical Workload among Janitorial Service Employees, Injury Control and Emergency Health Services, American Public Health Association, San Diego, California, November 2018.
- Green DR, **Gerberich SG**, **Kim H**, **McGovern P**, **Ryan A**, Schwartz A, Arauz R. Health and Injury Study of Janitorial Service Employees, *Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium*, Minneapolis, Minnesota, 2018.
- Hernandez A, **Ramirez MR**, Young R, Nam Y-S, Tilley M, The effect of parent-child communication on responses to electronic aggression among parent-child dyads. American Public Health Association Annual Meeting and Exposition, San Diego, 2018.
- Kim H**. Climate change, displacement, and Health. (Keynote speaker). The first National Environmental and Occupational Health Forum, Manila, the Philippines, 2018.
- Kim H**. Climate Change and Emergency Workers. (Keynote speaker). The 5th International Conference for Occupational and Environmental Health. Hanoi, Vietnam, 2018.
- Kim H**. Water and Sanitation for the Sustainable Development in the Western Pacific Region. Application of Rainwater Harvesting. (Keynote speaker). The 5th International Conference for Occupational and Environmental Health. Hanoi, Vietnam, 2018.
- McGovern PM**. Health Disparities, Health Equity and Occupational Health. (Invited Guest Lecture). PubH 6130, Occupational Medicine: Principles and Practice University of Minnesota School of Public Health, Minneapolis, Minnesota, 2018.
- Ramirez MR**, Srinivasan P, Campo S, Heimer K, Peek-Asa C, Chipara O, Paik A. Content and language of cyberaggression: a mixed methods study. American Public Health Association Annual Meeting and Exposition, San Diego, 2018.
- Ramirez MR**. Contents and Contexts of Cyberaggression: an epidemiologic study using electronic detection and social networks analysis. (Invited Speaker) Federal Panel on Cyberbullying, Rockville, Maryland, 2018.
- Saunders J, **McGovern PM**. (Invited Oral Presentation). What did we learn from focus groups with cosmetologists? Minnesota Board of Cosmetologists, St. Paul, Minnesota, 2018.
- Schwartz A, **Gerberich SG**, **Ryan A**, **Kim H**, Albin T, **McGovern P**, Green D. The Safe Workload Ergonomic Exposure Project (SWEEP), *Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium*, Minneapolis, Minnesota, 2018.
- Schwartz A, Albin T, **Gerberich SG**. Intra-rater and inter-rater reliability of the Rapid Entire Body Assessment (REBA) tool, International Ergonomics Association, AS presented with award for Student Paper Competition, Florence, Italy, August 2018.
- Tian D, **Gerberich S**, **Kim H**, **Ryan A**, **Morris N**. Intersection-Relevant Risk Factors for Crashes of Various Severities Incurred at Minnesota Rural Intersections, *Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium*, Minneapolis, Minnesota, May 2018.
- Tian D, and **Morris NL**. Comparing Novice Teenage Drivers to Experienced Middle Aged Drivers: Trust, Mental Workload and Driving Behavior towards a Rural Intersection Collision Warning System, Poster Presentation, Transportation Research Board 97th Annual Meeting, Washington, DC, 2018.
- Young R, Hernandez A, Tully M, Nam Y-S, **Ramirez MR**. Association between parental monitoring and electronic violence perpetration and victimization among children. American Public Health Association Meeting and Exposition. San Diego, 2018.
- 2017:**
- Abulhassan Y, DeMoulin D. Locating firefighters in immediately dangerous to life or health environments. Human Factors and Ergonomics Society (HFES). International Annual Meeting, Austin, TX.

- Babcanec C, Rosebush C, presenter, **McGovern P**, Bey J, French S, Bovard R, and **Kim H**: [2017] Caring for Caregivers: Testing the Impact of Management Driven Health Interventions on Job Satisfaction and Retention of Elder-care Employees, Poster presentation. EPICOH (Scientific Committee on Epidemiology in Occupational Health). Edinburgh, Scotland, August 2017.
- Baidwan, NK, Gerberich SG, Kim H, Ryan A. Work-Related Psychosocial Exposures and the Occurrence of Work-Related Injuries among the Aging United States Workforce, *Work, Stress, and Health Conference*, American Psychological Association and the National Institute for Occupational Safety and Health, Minneapolis, MN, June 2017.
- Baidwan N, Gerberich SG, Hyun K, Ryan AD. Work-Related Psychosocial Exposures and the Occurrence of Work-Related Injuries among the Aging United States Workforce, *Work, Stress and Health: 12th International Conference on Occupational Stress and Health*, Minneapolis, MN, June 2017.
- Baidwan, NK, Gerberich SG, Kim H, Ryan A. Analysis of Injuries Using a Marginal Structural Model Approach: An Example Using Data from the Health and Retirement Study (HRS), American Public Health Association Annual Meeting, Injury Control and Emergency Services Section, Atlanta, Georgia, 2017.
- Drucker C, Gerberich SG, Ryan AD. Detecting Emergency Vehicles: The Use of In-Vehicle Driver Support Systems to Improve Transportation Safety, NIOSH State of the Science Conference, Denver, Colorado, 2017.
- Gerberich SG, Ryan AD, Alexander BH**, Renier CM. Health Utilities Index-3 Outcomes of Injuries Occurring to Youth Living on Agricultural Operations in the Midwest United States: Regional Rural Injury Study – III, Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium, Minneapolis, Minnesota, 2017.
- Gerberich SG, Ryan AD, Alexander BH**, Renier CM. Injury Effects on Short-and Long-Term Lost-Work Outcomes among Youth and Other Agricultural Operation Household Members in the Midwest United States, Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium, Minneapolis, Minnesota, 2017.
- Green DR, Gerberich SG, Ryan AD, Schwartz A. Health and Injury Study of Janitorial Service Employees, Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium, Minneapolis, Minnesota, 2017.
- Maertens L, Dator R, **Ryan AD, Gerberich SG**, Balbo S. Acetaldehyde-Derived DNA Adducts for the Investigation of Alcohol Hangover, Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, *Annual National Occupational Research Agenda (NORA) Symposium*, Minneapolis, Minnesota, 2017.
- McGovern PM**, Stepanov I. Manganese, Biomarkers of Exposure and Infant Brain Development (Invited Presentation). Minnesota Department of Health, Environmental Health Tracking and Biomonitoring Program. St. Paul, Minnesota, 2017.
- Schofield K, Ryan AD**, Dauner KN. Am J Ind Med. 2019 Sep;62(9):755-765. Doi: 10.1002/ajim.23017. Epub 2019 Jul 12. PMID: 31298426
- Ryan AD, Gerberich SG, Schofield K, Drucker C**. Small Equipment-Related Injuries Incurred by Agricultural Operation Household Members in the Upper Midwest United States: A Neglected Problem, Midwest Center for Occupational Health and Safety (MCOHS) Education And Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium, Minneapolis, Minnesota, 2017.
- Schwartz A, Gerberich SG, Kim H, Ryan AD, Albin T, **McGovern PM**, Green D, Arauz R. Workload Factors and Stress in a Population of Janitors, *Work, Stress and Health: 12th International Conference on Occupational Stress and Health*, Minneapolis, MN, 2017.
- Schwartz A, Gerberich SG, Ryan AD, Albin T, Kim H, Ryan AD, **McGovern PM**, Green D, Arauz R. Occupation of Janitors at Risk: The Safe Workload Ergonomic Exposure Project (SWEEP) Study, American Public Health Association Annual Meeting, Injury Control and Emergency Services Section, Atlanta, Georgia, 2017.

Schwartz A, Gerberich SG, Ryan AD, Albin T, Kim H, Ryan AD, McGovern PM, Green D, Arauz R. Stress Outcomes in the Safe Worker Ergonomic Exposure Project (SWEEP) Study, Midwest Center for Occupational Health and Safety (MCOHS) Education And Research Center (ERC) and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium, Minneapolis, Minnesota, 2017.

Tian D. The Effectiveness of the RICWS System in Promoting Drivers' Gap Acceptance and Safety at Rural Thru-Stop Controlled Intersections, Presenter at 28th Annual CTS Transportation Research Conference, University of Minnesota, 2017.

2016:

Alexander BH, Bender JB, Murphy D. Adapting the Haddon Matrix to Incorporate One Health in Occupational Health in Animal Agriculture. 25th EPICOH 2017 Barcelona Spain, September 2016.

Baidwan N. Analyses of Occupational Injuries among Aging Workers, Canadian Society for Epidemiology and Biostatistics (CSEB) oral presentation, Student Conference, University of Manitoba, Winnipeg, Manitoba, June 2016.

Baidwan N, **Gerberich SG**, **Kim H**, **Ryan A**. Analysis of the Association between Personal and Work-Related Exposures and the Occurrence of Occupational Injuries in an Aging American Working Population, *Midwest Center for Occupational Health and Safety and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium*, Minneapolis, Minnesota, 2016. **Gerberich SG**, **Ryan AD**, **Alexander BH**, Renier CM. Health Utilities Index-3 Outcomes of Injuries Occurring to Youth Living on Agricultural Operations in the Midwest United States: Regional Rural Injury Study – III, Epidemiology in Occupational Health Conference (EPICOH), Barcelona, Spain, September 2016.

Gerberich SG, **Ryan AD**, **Alexander BH**, Renier CM. Injury Effects on Short-and Long-Term Lost-Work Outcomes among Youth and Other Agricultural Operation Household Members in the Midwest United States, Epidemiology in Occupational Health Conference (EPICOH), Barcelona, Spain, September 2016.

Ryan AD, **Gerberich SG**, Schofield K, Drucker C. Small Equipment-Related Injuries Incurred by Agricultural Operation Household Members in the Upper Midwest United States: A Neglected Problem, Epidemiology in Occupational Health Conference (EPICOH), Barcelona, Spain, September 2016.

Gerberich SG, Renier CM, **Ryan AD**, **Alexander BH**. Consequences of Injuries – Health Status among Agricultural Operation Adult Household Members: Regional Rural Injury Study-III, Society for Epidemiologic Research, Congress of the Americas, Miami, FL, June 2016.

Gerberich SG, **Ryan AD**, **Alexander BH**, Renier CM. Cost and Severity of Injuries to Youth and Adult Agricultural Operation Household Members: RRIS III, Society for Epidemiologic Research, Congress of the Americas, Miami, FL, June 2016.

Gerberich SG, **McGovern PM**, **Alexander BH**, MacLehose RF, Ramachandran G, Raynor PC, Mandel JH, O'Neal J, Dowd B, Alcorn-Webb J, Ryan. Midwest Center for Occupational Health and Safety (MCOHS) Education And Research Center (ERC), *Midwest Center for Occupational Health and Safety and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium*, Minneapolis, Minnesota, 2016.

Green D: Analyses of Incidence and Risk Factors of Injuries among a Population of Janitors, Canadian Society for Epidemiology and Biostatistics (CSEB) oral presentation, Student Conference, University of Manitoba, Winnipeg, Manitoba, June 2016.

Jurek A, Mongin S, Kriebel D, Cifuentes M, Baron S, **Kim H**. Epidemiologic Biases in Asthma Studies of the 9/11 World Trade Center Attack: Disaster Epidemiology Needed. Society for Epidemiologic Research, Miami, USA, June 2016.

Kim H. Disasters Surveillance and Epidemiology: World Trade Center and Hurricane Sandy, Minnesota Department of Health, MN, 2016.

Kim H. Disasters, Role of Occupational Health Professionals, Local AIHA Chapter The Upper Midwest Section, MN, USA, 2016.

- Kim H**, Baron S, Cifuentes M, Jurek A, Maldonado G, Kriebel D. World Trade Center Disaster and the Health of Responders: Surveillance, Epidemiology, and Biases. The 25th International Conference on Epidemiology in Occupational Health, Barcelona, Spain, 2016.
- Mongin S, Baron S, Jurek A, Taioli E, **Kim H**. Detecting Susceptible Subgroups in Disasters: An Example From 2012 Hurricane Sandy and Emergency Department (ED) Use In Long Island, New York. American Public Health Association, USA, 2016
- Ramirez MR**. Bullying: Efforts in Prevention. Lecture for Health Equity Work Group. University of Minnesota. November 2016.
- Ramirez MR**. Experiences in Obtaining Funding from the Patient-Centered Outcomes Research Institute (PCORI). Cancer Epidemiology and Population Science Luncheon. University of Iowa. June 2016.
- Ramirez MR**. How Does Trauma Impact Health in Children and Adults in the Context of Resiliency? Resiliency Triumphs Over Trauma: Working with the Whole Person. University of Iowa. May 2016.
- Roth L, **Ramirez MR**. A Comparative Effectiveness Study of Two Parent Programs Designed to Support Children after Traumatic Injury: A Patient Engaged Approach in Four Children's Hospitals in the Midwestern United States. Injury Free Coalition for Kids Annual Conference. Ft. Lauderdale. November 2016.
- Shao Y, Ramachandran G, Mandel J, **Alexander B**, MacLehose R, Arauz R. Occupational Iron Exposures and Pleural Disease among Minnesota Taconite Mining Workers. 25th EPICOH Barcelona Spain, September 2016.
- Schwartz A, **Gerberich S**. Janitors' Workload, Health and Injury Study; An Overview. Presentation to the Labor Management Board between SEIU L26 and Management. Minneapolis, MN. 2016
- Schwartz A, Albin T. Non-repetitive Activity Ergonomic Risk Assessment. Poster Presentation For the Occupational Health Section at the 2016 American Public Health Association Conference. Denver CO. 2016.
- Schwartz A, Anderson N. Best Practices in Occupational Ergonomics for the Food Industry. Presented at the 2016 US Food Industry Safety and Health Advisory Council. St. Paul, MN. 2016
- Schwartz A. Janitor Ergonomics: Theory and Practice. Presented at the University of Minnesota mixed Environmental Health Science Occupational Safety and Health Research Seminar and the Veterinary Resident's Seminar. Minneapolis, MN, 2016.
- Schwartz A, Session Chair, with Y.K. Ng. Modelling and Systems in Occupational Ergonomics. Applied Human Factors and Ergonomics Conference. Orlando FL. 2016.
- Schwartz A, Albin T. Non-repetitive activity risk assessment. Presented at the 2016 Applied Human Factors and Ergonomics Conference. Orlando FL, 2016.
- Schwartz A, Albin T. Occupational Ergonomic Sampling Techniques. Presented at the 2016 National Occupational Research Agenda Symposium, University of Minnesota, Minneapolis, MN. 2016
- Schwartz A. Potential Long-Haul Truck Driver Crash and Injury Risk Factors. Presented to American Society of Safety Engineers Northwest Chapter. Roseville, MN. 2016.
- Schwartz A, Albin T. Ergonomic Sampling Techniques. Presented at University of Minnesota Research Day. Minneapolis, MN, 2016.
- Schwartz A. Occupational Ergonomics. Presented to University of Minnesota IE5513 Industrial Engineering Safety. Minneapolis, MN, 2016
- Tian D. Oral Presentation, Rural Intersection Collision Warning System (RICWS) Evaluation and Design Investigation, 27th Annual CTS Transportation Research Conference, University of Minnesota, Minneapolis, Minnesota, November 2016.
- Tian D, Raynor PC, Murphy D, Engelman S, Ramachandran G, Bender JB, **Alexander BH**. Poster Presentation: Assessment of the Temporal and Spatial Variances of the Airborne Contaminant Concentrations in a Swine Facility, The 2016 National Occupational Research Agenda (NORA) Symposium, University of Minnesota, Minneapolis, Minnesota, May 2016.

2015:

- Gerberich SG**. *Invited Presentation*. Identification of Workplace Violence Risk Factors and Management Practices in Healthcare Settings, *Hospital Authority Convention*, 2015, Hong Kong, HK, May 2015.

- Gerberich SG.** *Invited Presentation.* Prevention of Injury at Work: Promoting Staff Health and Psychological Well-Being, *Hospital Authority Convention*, 2015, Hong Kong, HK, May 2015.
- Gerberich SG,** McGovern PM, Alexander BH, MacLehose RF, Ramachandran G, Raynor PC, Mandel JH, O'Neal J, Dowd B, Alcorn-Webb J, Ryan A. Midwest Center For Occupational Health And Safety (MCOHS) Education and Research Center (ERC). *Midwest Center for Occupational Health and Safety and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium*, Minneapolis, Minnesota, 2015.
- Green D. and Anthony TR. (2015) The Din of Dining Out: Noise Exposures of Restaurant Employees. National Occupational Research Agenda (NORA) Symposium, Minneapolis, Minnesota, May 6th, 2015.
- Kim H,** Camacho M, Kriebel, Baron S, Moline J. Socioeconomic Status and Asthma among WTC Responders. Society for Epidemiologic Research, Denver, USA, 2015.
- Kim H,** Liu B, Smith F, Baron S, Moline J. Health Effects of the WTC Disaster among Responders: 10 years assessment. International Congress on Occupational Health, Seoul, Korea, 2015.
- Klein R, Hillmer T, Landsteiner A, **Williams A.** Worker Health and Safety Training in Minnesota High Schools. Poster Presentation, NORA Symposium, University of Minnesota, May 2015.
- Landsteiner A, Lindgren P, **Williams A.** Elevated Blood Lead Levels in Minnesota Adults. Poster Presentation, NORA Symposium, University of Minnesota, May 2015.
- Kim H.** Occupational Surveillance for injury epidemiology, Pusan National University, School of Medicine, Busan, South Korea, 2015.
- Ryan AD, Gerberich SG,** Renier CM, **Alexander BH.** Consequences of injuries among household members on agricultural operations: RRIS-III. Midwest Center For Occupational Health And Safety (MCOHS) Education And Research Center (ERC). *Midwest Center for Occupational Health and Safety and Upper Midwest Agricultural Safety and Health Center, Annual National Occupational Research Agenda (NORA) Symposium*, Minneapolis, Minnesota, 2015.

Appendix C Occupational Injury Prevention Research Program Selected Outreach Activities, 2015-2020

1. Educational Development/Outreach

Dr. Alexander continues to offer the Global Health Seminar (PubH 6133), which explores issues in global public health with an emphasis on current problems, using cross-disciplinary approaches to solve relevant problems, and Global Public Health and the Environment (PubH 3107) which is part of the undergraduate minor in Public Health. He has also continued work in the international arena with the development of One Health Curriculum.

Drs. Kim, Mandel, Church, and Alexander contributed to teaching of PubH 6140, Environmental and Occupational Epidemiology, involving multiple disciplines.

Drs. Gerberich and Alexander with Drs. McGovern, Mandel, Raynor, Kim, and Mr. Ryan collaborate weekly throughout the year with students in the **PubH 8120** Interdisciplinary occupational and environmental health and safety research seminar, to critique various students-led research efforts that facilitate timely completion of their thesis efforts.

Each year, MCOHS and the Upper Midwest Agricultural Safety and Health Center co-sponsor the *Annual NORA Symposia*. See archived keynote presentations (<http://www.mcohs.umn.edu/nora-symposium/>). In 2020, the symposium, titled “Productive Aging and Work: Creating an Age-Friendly Workspace” featuring Dr. James Grosch, the Senior Research Psychologist and Co-Director of the Center for Productive Aging and Work at the National Institute for Occupational Safety and Health. Two of the past MCOHS symposia featured injury topics, specifically “Prescription Opioid Use in Occupational Health Care” in 2017, “Workplace Harassment” in 2018, and “Stressed Out from Work” in 2019.

Dr. McGovern integrated the 2018 video and a related assignment into her 2018 interdisciplinary course, “Introduction to Occupational Health and Safety” and students found it to be extremely meaningful and relevant to their workplaces and future roles.

Together, with a consultant, **Dr. McGovern** developed modules for the fall 2018 class required for all NIOSH trainees (PubH 6170), Introduction to Occupational Health and Safety

- “Business Skills for Occupational Professionals,” by Lucy Carlson RN, MPH/MS, COHN-S/CM, Occupational Health Manager, 3M Medical Department.
- “The Americans with Disabilities Act: How Do You Determine If An Individual Has A Disability As Defined By The ADA,” David Cossi, JD, MS, Affiliate Faculty, Environmental Health Sciences, School of Public Health.
- “Integrated Approaches Supporting Healthy Work: Total Worker Health®,” by Tamara Schult, PhD, MPH, OHSRP Alumna and Research Data Analyst, VHA Employee Health and Well-being Program.
- “Workers’ Compensation,” and “Opioids and Occupational Health Providers,” by Beth Baker, MD, MPH, Medical Consultant, Specialists in OEM, St. Paul, MN.
- “Occupational Health in the Veterans Administration,” by Steven Kirkhorn, MD, MPH, MCOHS Academic Program Director, OEM Residency Program.

Dr. Kim revised PubH 6140, Environmental and Occupational Epidemiology in 2018; He also initiated a weekly seminar on climate change-induced disasters and health effects on first responders. In addition, Dr. Kim provided occupational health training for physicians, nurses, and safety engineers in Mongolia as well as a lecture series on occupational and environmental epidemiology in the College of Public Health, University of the Philippines Manila.

Dr. Maldonado offers courses, critical to methodological research issues, involving many programs.

Dr. Ramirez is now the primary instructor of the Violence Prevention and Control: Theory, Research, and Application Course (PubH 6123, 2 credits) which focuses on the epidemiologic approach to studying and preventing violence. The course engages students in dynamic discussions and problem-solving skills across a variety of topics from youth violence, work-related violence, suicide, violent extremism and child abuse. Students are also taught to develop logic models and to write an Opinion-Editorial and Policy Briefs which are key dissemination avenues for translating research into practice. Dr. Ramirez also gives a lecture on pediatric injury and violence prevention in PUBH 6630: Foundation of Maternal and Child Health Leadership.

The following continuing education courses were provided on Safety/Injury (total 658) through the Continuing Education and Outreach Program, directed by Julie Alcorn-Webb – American Society of Safety Professionals Northern Plains Section: The Opioid Epidemic (15); American Society of Safety Engineers Northwest Chapter (ASSE NWC): Minnesota OSHA Update (40); ASSE NWC October (60); ASSE NWC November (30); Northern Region Association of Safety Professionals Annual Safety and Health Conference (85); ASSE NWC: Annual Professional Development Conference (220); ASSE NWC March (68); ASSE NWC April (54); Chemical Hazards for Public Health Workers (Online) (32); Radiological Hazards for Public Health Workers (Online) (20); Best Management Practices for Animal Research Worker Safety (Online) (34).

2. Presentations - Lectures - Awareness Seminars (Refer, also, to Attachment 2, Presentations)

Faculty and students gave numerous presentations to national and international audiences (**noted above**) **Peer-reviewed publications, involving students and faculty are also identified above.**

Dr. Alexander: Occupational Health Course, International MPH program Hanoi Medical School September 2017.

Dr. Alexander: Environmental Health Course, International MPH program Hanoi Medical School January 2018.

Dr. Alexander: Environmental Health Course, International MPH program Hanoi Medical School January 2018.

Dr. Alexander and Bender: Participants: Addressing Anti-microbial Usage in Asia's Livestock Production Sector: Toward a Unified, One Health Approach to Preventing and Controlling Resistance, Side Meeting sponsored by USAID and FAO at Prince Mahidol Award Conference, Bangkok Thailand, January 2016.

Dr. Alexander and Bender: Participants and lecturers: Defining One Health Workforce Needs. Workshop sponsored by Vietnam One Health University Network. Hanoi, Vietnam, January

Dr. Kim was involved in several media releases:

[Asthma Leading to Job Status Changes for 9/11 First-Responders, 2016](#)

Puerto Rico: How power outages can affect mental health (*Time*), 2016

Why Harvey will be a mental health disaster, too (*Fortune*), 2106

Dr. Kim: provided lectures internationally: 1) Occupational and Environmental Epidemiology: New Disaster Epidemiology”, University of the Philippines Manila, College of Public Health, Philippines, Invited lecturer for three courses, 2018; 2) Emergency responders and climate change”, Hanoi Medical University, Vietnam Invited Speaker, 2018; 3) Basic Occupational Health Service (BOHS) training for trainers, WHO consultant and instructor, Mongolia, 2018.

Dr. McGovern was an invited panelist to discuss careers in occupational and environmental health nursing as part of a program, Careers in Public Health Nursing (Nurs 4321) for 57 students from the School of Nursing, University of Minnesota, Minneapolis, Minnesota, December 2015.

Dr. Ramirez was an invited panellist/keynote speaker for the following:

A workshop on gun violence prevention (Panelist), Minnesota Medical Association, 2019

Public Health Approach to Violence (Keynote Speaker), Hennepin County Violence Prevention Summit, 2019

Occupational Injury (Invited Speaker). Midwest Injury Prevention Alliance Summit, Bloomington, MN, 2017.

Careers in Injury Prevention (Panelist), Society for the Advancement of Violence and Injury Research, 2019.

Contents and Contexts of Cyberbullying (Invited Speaker), Federal Panel on Cyberbullying, Rockville, MD, 2018.

3. Consultations (Identified for faculty)

Faculty are involved in numerous consultation activities, primarily unpaid efforts:

Dr. Gerberich: NIOSH; Centers for Disease Control and Prevention (CDCP); United States Department of Agriculture; Minnesota Department of Health; Multiple law firms relevant to product/equipment-related injuries, occupational injuries; numerous educational institutions; Minnesota Occupational Safety and Health

Administration; Continuing Education; National Children's Center for Rural and Agricultural Health and Safety Scientific Board of Advisors (2008-); Review of University of Utah Division of Occupational and Environmental Health, in which their Education and Research Center is located (2019).

Dr. Kim served as a scientific consultant at WHO for occupational and environmental health and climate change and developed five country-wide climate change mitigation and adaptation proposals to the United Nations' climate change funding agency, Green Climate Fund. Dr. Kim was newly appointed as a board member of Korean American Association in Minnesota and continued as Scientific Advisor and Board Member of Minnesota Korean Service Center and Korean Adoptee Ministry studying mental health and suicide prevention; Member, Advisory Committee of the HealthPartners/University of Minnesota Occupational Medicine Residency Program.

Dr. Ramirez is a key collaborator of K-12 schools in the Midwestern Region to address trauma in schools, continuing a long line of research in the area of school injuries and violence. She recently began partnerships in the area of school health and safety with the Minnesota Department of Education and the Minnesota Department of Health's State School Nurse Health Consultant, and also the Maine Department of Education. Dr. Ramirez, an Adjunct Associate Professor at the University of Iowa, also continues to serve as a committee member for several student trainees from the Heartland Center for Occupational Health and Safety, the sister Education Research Center (ERC) at the University of Iowa.

Dr. Alexander and Ramirez were consulted by the MN State Attorney General to provide input on the value of OSHA Forms 300 and 301 to research in occupational health and safety.

4. Other

Alexander: Member, Advisory Committee to the Minnesota Department of Health Biomonitoring Program. 2007-present. **Member**, Advisory Committee to the Minnesota Department of Health Birth Defects Monitoring Program, Appointed 2006-present **Advisor**: Producer, Public Health, and Worker Safety Committee, National Pork Board; **Member**, Masonic Cancer Center.

Church: Editorial Boards, Journal of the National Cancer Institute (1999-) and Epidemiologic Perspectives and Innovations (2003-); **Co-chair**, Publications, Presentations, and Ancillary Studies Subcommittee, National Lung Screening Trial (2003-); **Reviewer**: Journal of the National Cancer Institute (Ad hoc); **Member**: Data Monitoring Committee, Medtronic, Inc., DellVery for Pulmonary Arterial Hypertension (PAH) Patient Population Study (2011-); Data Monitoring Committees, Medtronic, Inc., Cardiac Rhythm Disease Management Business, Post-MI Remodeling Prevention Therapy (PRomPT) and Determining the Feasibility of Spinal Cord Neuromodulation for the Treatment of Chronic Heart Failure (Defeat-HF) Studies (2011-); Data and Safety Monitoring Board, "S-ICD System Clinical Study Investigation," Cameron Health, Inc., San Clemente, California (2010-); Medical Advisory Board, SAGE Scopes Program, Minnesota Department of Health (2009-); Data Monitoring Committee, Department of Veterans Affairs, Cooperative Studies Program (CSP) #563, "Prazosin and Combat Trauma PTSD [NB: Post-traumatic Stress Disorder] (PACT)," Mountain View, California, (2008-); Epidemiology Committee, Colorectal Cancer Family Registry (2002-); Executive Committee, National Lung Screening Trial (2002-); Clinical and Translational Science Award Clinical Integration Team, Clinical and Translational Science Institute (2011-); Cancer Prevention and Control Steering Committee, University of Minnesota Cancer Center (2005-); Population Sciences Program, Masonic Cancer Center, University of Minnesota (2005).

Gerberich: 2017 - Member: NIOSH NORA SECTOR – Traumatic Injury Prevention;

Assistant Editor, Injury Epidemiology (2013-); **Associate Editor**, Journal of Agromedicine (2016-); **Reviewer**: Injury Prevention; Journal of Accident Analysis and Prevention (1997-); Epidemiology (1996-); Journal of Agricultural Safety and Health (1991-); American Journal of Industrial Medicine; Annals of Epidemiology; American Journal of Epidemiology (1990-); American Journal of Public Health (1989-); Journal of the American Medical Association; Journal of Occupational and Environmental Medicine; Occupational and Environmental Medicine (2004-); Preventive Medicine (1985-) and others; **Faculty/Advisor**, Interdisciplinary Human Factors/Ergonomics program; University of Minnesota; Director, Center for Violence Prevention and Control (1994-), Co-Director (2007-); Director, Regional Injury Prevention Research Center (1986-), Co-Director (2007-); Diversity Equity Action Leadership Team, School of Public Health (2015 -); **Search Committee**, Development Officer, School of Public Health (2017-); **Research Grant Reviewer**: Ontario Ministry of Labour (2017-2018).

Green American Public Health Association, Injury Control and Emergency Health Services, Student Co-Chair, 2015-2018; Society of Epidemiologic Research (SER) Student and Postdoc Committee, *Media Chair*, 2016-2018.

Kim: Associate Editor, *Archives of Environmental and Occupational Health* (2018-); **Contributing Editor**, *American Journal of Industrial Medicine* (2010-); **Reviewer**: *American Journal of Public Health*; *Injury Epidemiology*; *American Journal of Industrial Medicine*; *Occupational Environmental Medicine*; *International Journal of Environmental Research and Public Health*; *Lung Cancer*; *American Journal of Epidemiology*.

Board Member and Scientific Advisor, Minnesota Korean Service Center, Minnesota and Korean Adoptee Ministry, USA; Initiated a study on workload and injury among 4,000 janitorial workers in Service Employees International Union (SEIU) Local 26. MN; Consulted on patient-handling related injuries among hospital workers and first responders with Minnesota Occupational Safety and Health Administration, MN; Consulted on violence against nurses with Minnesota Department of Health, MN; Provided scientific advice to Minnesota Korean Service Center in submitting a program grant, "Eliminating Health Disparities Initiative" by Minnesota Department of Health, MN; Grant reviewer, NIOSH/CDC Special Emphasis Panel for Occupational Safety and Health Training Project Grants (T03), 2015-2017.

Maldonado: Reviewer: American Chemical Society Press; *J Suicide and Life-Threatening Behavior* (1994-); *International Journal of Epidemiology*; *American Journal of Industrial Medicine*; *American Journal of Epidemiology* (1993-); *Journal of Occupational and Environmental Medicine* (1986-).

McGovern: Reviewer: *Health Services Research*; *Annals of Family Medicine*; *International Journal of Behavioral Medicine*, *Journal of Agromedicine*, *Journal of Epidemiology and Community Health*, *American Journal of Public Health*; *Scandinavian Journal of Psychology*; *Social Science and Medicine*; *Medical Care*; and *Women's Health*. **Chair**, Minnesota Advisory Panel for the Environmental Health Tracking and Biomonitoring Board for the Minnesota Department of Health, St. Paul, Minnesota.

Ramirez: Elected Board Member, Society for the Advancement of Violence and Injury Research (2015-2018); **Editorial Board**: *Injury Epidemiology* (2013-); **Reviewer**: *American Journal of Industrial Medicine*, *American Journal of Preventive Medicine*, *Disability and Health Journal*, *Journal of Rural Health*, *Journal of School Health*, *Annals of Epidemiology*, *Health Education and Behavior*, *Journal of Traumatic Stress*, *Public Health Nursing*, *Pediatrics*; **Grant Reviewer**: Scientific Review Special Emphasis Panel for Youth Violence Centers of Excellence, National Center for Injury Control and Prevention, Centers for Disease Control and Prevention (2016); WorkSafeBC Innovation at Work Grant Opportunity, British Columbia, Canada (2016-2017); USDA, National Institute of Food and Agriculture, Smith Lever Special Needs Competitive Grants Program (2016); National Institute for Occupational Safety and Health (2018); National Center for Injury Control and Prevention (2018); University of California Research Initiatives Biological, Life, and Health Sciences Panel (2018); University of Minnesota Grant-in-Aid (2018).

Examples of Research to Practice

1) Identification of risk factors for work-related physical assault against teachers/educators that are important in application of relevant interventions. Dissemination through peer-reviewed publications and presentations to key professional groups is integral to development of appropriate interventions.

2) Studies among agricultural household members on both agriculture and non-agriculture-related injuries, in five upper Midwest states, identified not only incidence and consequences of these injuries for all ages – but, also risk factors for agriculture-related injury among children; results serve as a basis for development of intervention efforts and dissemination to key professionals as well as the agricultural community.

3) Results of the Minnesota Nurses' Study (Violence against Nurses), including information on risk factors from the case-control study have been disseminated extensively through peer-reviewed publications and to key leaders and are being utilized in an online course developed in collaboration with NIOSH (Dr. Gerberich, Consultant) http://www.cdc.gov/niosh/topics/violence/training_nurses.html.

4) Farm Equipment Roadway Crash Study, a study led by new faculty, Dr. Ramirez, is focused on identifying risk factors for crashes and related injuries involving agricultural equipment on public roads and on evaluating

policies on lighting and marking of agricultural equipment. The project has resulted in several peer-reviewed publications and extensive media coverage across the Midwestern U.S.

5) Janitor Health and Wellness Studies. Two PhD students completed their dissertations on the topic of janitor wellness with the focus on preventing occupational injuries. The project involved collaborations with the Service Industry Employment Union and MCOHS OIP faculty and staff.

6) Youth in Construction Policy Studies. The Minnesota Department of Labor and Industry contracted Drs. McGovern, Ramirez and Schofield, and Mr. Andy Ryan to conduct a policy and injury study of a new policy being presented to MN's legislature to allow 16- and 17-year olds onto construction sites. The team worked with an OHSRP student, Adam Moskowitz, to conduct a series of studies, including a policy analyses of state laws, an analyses of FACE cases of youth construction deaths, and evaluation of workers' compensation data from Washington State (which permits 16- and 17-year olds on construction sites) and Minnesota (which currently prohibits it). A final report was completed in December 2019, and publications are currently being prepared in collaboration with the MN Department of Labor and Industry.

**Table 1. Academic Training Report July 1, 2015 – June 30, 2020¹
 Occupational Injury Prevention**

Degree Awarded	How Does Degree Read?	Total # Applicants to Degree Program	Total # Applicants Admitted to Degree Program	Total # Under Represented Minority Applicants Admitted	# Full-Time Students Enrolled ²	# Full-Time NIOSH-Supported Trainees	# Part-Time Students Enrolled ²	# Part-Time NIOSH-Supported Trainees	# Trainees Graduated During Reporting Period
Master's degree ³									
Doctorate degree									
	Doctor of Philosophy in Environmental Health	10	7	2	9	7	1	1	3
Post-doctoral									
Certificate Program									

¹ Reporting period for renewals is from the start date of prior competing award. New applicants should report past five years.

² Full-time and part-time students should include all students in approved programs, regardless of source of support.

³ OM residents may be double-counted under Masters degree training and post-doctoral training.

**Table 2. Trainees and Graduates Supported July 1, 2015 – June 30, 2020¹
Occupational Injury Prevention**

Trainees				Graduates				
Trainee ID, Year of Entry, Prior Degree & Institution, (Current Academic Advisor or Mentor and Department). Identify Under Represented Minority with (URM).	OM Trainees: Previous Residency Training Specialty	Title of Research Project or Research Topic	Degree Program (MS, MPH, PhD, DrPH, etc.)	Date Degree or Certificate Awarded (mm/yyyy)	Date of Certificate for OM (mm/yyyy)	Employed in OSH Field or in OSH Advanced Study (Y/N)	Current Employer	Current Position
100353, 2014, Masters, University of Minnesota, (S Gerberich, Division of Environmental Health Sciences) (URM)		Work-related exposures and injuries among the aging United States workforce	PhD	06/2018		N	School of Health Professions, University of Alabama	Post-doctoral Scholar
100364, 2014, Bachelors, University of Tennessee (S Gerberich, Division of Environmental Health Sciences)		Safe workload ergonomic exposure project	PhD	08/2018		Y	Emerson automation solutions company	Research Ergonomist
100365, 2014, Masters, University of Iowa, (S Gerberich, Division of Environmental Health Sciences) (URM)		Health and injury study of janitorial service employees	PhD	07/2018		Y	National Institute of Occupational Safety and Health, Division of Surveillance, Hazard Evaluations and Field Studies	Research Fellow/ Epidemiologist
100366, 2014, Masters, University of Minnesota, (S Gerberich, Division of Environmental Health Sciences) (URM)		Multidisciplinary investigation of rural intersection-related crashes and crash injuries: characteristics, risk factors and prevention	PhD					

100409, 2017, Masters, Murray State University, (H Kim, Division of Environmental Health Sciences)		Working Title: Moral injury in firefighters	PhD					
100410, 2017, Masters, University of Minnesota, (M Ramirez, Division of Environmental Health Sciences) (URM)		No project title yet	PhD					
100427, 2018, Masters, University of Minnesota, (M Ramirez, Division of Environmental Health Sciences)		No project title yet	PhD					
100428, 2018, Masters, University of Minnesota, (H Kim, Division of Environmental Health Sciences)		No project title yet	PhD					
100429, 2019, Masters, University of Minnesota, (M Ramirez, Division of Environmental Health Sciences)		No project title yet	PhD					
100433, 2019, Masters, University of Pittsburg, (H Kim, Division of Environmental Health Sciences)		No project title yet	PhD					

¹ List all NIOSH supported trainees and graduates by year of entry. Reporting period for renewals is from start date of prior competing award. New applicants should report last five years.

CONTINUING EDUCATION (CE) IN OCCUPATIONAL SAFETY AND HEALTH PROGRAM

Julie Alcorn-Webb MA, RN - Director

CONTINUING EDUCATION (CE) IN OCCUPATIONAL SAFETY AND HEALTH PROGRAM

1. Background

The Continuing Education (CE) Program (<http://www.mcohs.umn.edu/continuing-education>) has been an integral and dynamic component of the Midwest Center for Occupational Health and Safety (MCOHS) Education and Research Center (ERC) for more than 40 years. It is the only National Institute for Occupational Safety and Health (NIOSH) supported CE program serving Occupational Safety and Health (OSH) practitioners in the MCOHS-assigned region, which covers Minnesota (MN), Wisconsin (WI), and the Dakotas (SD, ND). The overall goal of the MCOHS CE Program is *to improve occupational and environmental health and safety through the transmission of knowledge, skill, and understanding to those responsible for workplace health and safety*. To meet this goal, the 2015-2020 objectives for CE were as follows:

- Conduct and evaluate multifaceted local, regional, and national needs assessments to determine CE training needs of OSH professionals
- Respond to the needs of broad-based OSH professional audiences by developing innovative courses
- Maintain high-quality course offerings as evidenced by ongoing course, instructor, and selected impact evaluations
- Maximize resources and knowledge bases by collaborating with internal and external individuals/groups
- Increase benefits/reach of face-to-face and online learning options with innovative technology

As a core vehicle of outreach, CE serves as a formal mechanism for training OSH professionals who need the most current information on best practices in workplace-related safety and health. This is particularly critical given that a significant proportion of OSH professionals currently practicing in the field are not graduate-level prepared (75% of occupational safety professionals, 75% of occupational nurses, and 41% of industrial hygienists). For OSH professionals with graduate training, including MCOHS alumni, CE also provides the newest information on best practices and a venue for refreshing OSH skills, as the field continues to mature. From 2015 to 2020, CE provided a total of **451 courses**, reaching **19,219 trainees**. Our CE audience included practitioners from Industrial Hygiene (IH), Occupational Safety (OS)/Injury Prevention Professionals, Occupational and Environmental Health Nursing (OEHN), and Occupational and Environmental Medicine (OEM).

Ms. Julie Alcorn-Webb, MPH, MA, RN, has served as CE Program Director since 2013 but has been associated with its programming efforts as early as 2010 as an education specialist at University of Minnesota (UMN) School of Public Health (SPH). Support is provided by **Ms. Christine Western**, a Program Specialist with over 35 years of experience in continuing education.

2. Performance/Accomplishments July 1, 2015 – June 30, 2020

TRAININGS

From July 1, 2015-June 30, 2020, our CE Program provided **451 courses** and trained **19,219 participants**, of which 26% were occupational safety practitioners, 23% were IHs, 22% were OEHNs, 8% were OEM participants, and 21% were from other disciplines (e.g., professionals in safety, human resources, workers compensation, loss-control specialists, etc.). A total of 322 were certified in NIOSH spirometry, and 525 were Council for Accreditation in Occupational Hearing Conservation certified. In order to provide just-in-time training on emerging issues in OSH, over half of the trainings offered during the last five-year grant cycle were new courses (e.g., MN Workers' Compensation, Occupational Asthma Management and Diagnosis, Agricultural Medicine, Carpal Tunnel Syndrome, and Ethics and Program Management). CE Instructors include Bill Stuart from MN OSHA; David Abrams, CIH, CSP, from our External Advisory Board; Steven Kirkhorn, MPH, MD (OEM Academic Program Director); Ted Madison, MA, from 3M; and Katherine Schofield, PhD, CSP (OS Program Director). (See Table 3 for a list of all courses.)

Within the Midwest, CE courses were offered onsite in ND, SD, WI, Michigan, and throughout MN (including rural parts of the state). One of our most significant accomplishments was an extension of training to international settings facilitated through our partnerships. The Council for Accreditation in Occupational Hearing Conservation (CAOHC) Hearing Certification Courses were offered in China to international

employees of MN-based 3M Corporation as well as four *international* Occupational Health Nursing conferences. Both resulted from ongoing partnership with stakeholders in an effort to decrease disparities in OSH CE training for international employees of U.S. companies. These collaborations provide a template for development of future CE courses that will benefit OHS professionals globally.

NEEDS ASSESSMENT

Two multi-state CE needs assessments were conducted. The first was a regional needs assessment conducted in coordination with MAP and Rocky Mountain Center for Occupational and Environmental Health in 2015-2016. The second was an ERC CE national needs assessment completed by all NIOSH-supported ERC CE programs in 2017-2018. We focus on the 2017-2018 results, as findings from both assessments were consistent. A convenience sample of 2,064 workers representing all 50 states responded to the survey; occupational safety professionals, occupational health nurses, industrial hygienists, occupational medicine physicians, and total worker health professionals were represented. Key highlights of this assessment were as follows: Half of all respondents preferred in-person courses, 36% preferred online or a hybrid, and yet, 79% participated in online or hybrid courses. About 80-90% of respondents indicated high interest in topics that included **legal issues, compliance with new standards, risk management, management issues, risk communication, and accident prevention**. This is based on workplace concerns about **safety culture, health promotion, injury prevention, occupational stress, and musculoskeletal injuries**.

MCOHS CE COURSES

In-person offerings. The preference of respondents for in-person/face-to-face training rather than online training has led to increasing the number of in-person trainings from 43 CE courses in 2015-2016 to 71 in-person CE courses in 2018-2019. Yet, given the logistical difficulties in attending in-person courses, we also offered over half of our in-person CE courses as mixed access (i.e., trainees can elect to attend trainings in-person or online). Online offerings increase access to trainings, particularly by rural workers in our region. Hands-on courses allow for more interactive collaboration with attendees and practice of skills. In-person learning formats include hands-on experiences with equipment used in the workplace and site visits with industry experts. We recognize the value and impact of face-to-face offerings, but with today's innovative technologies and response to logistical challenges, we provided both. Both in-person and online offerings integrate panel presentations, small and large group discussions, scenario-based exercises, and case studies.

Online and Mixed Format Courses. During the five-year grant cycle, CE reached **5,115 learners via online and mixed format courses**. Due to concerns about cost, time and travel constraints, especially among marginalized OSH workers, we have continued to offer free online modules. Our recent success in delivering online MCOHS CE courses was through the launch of a new Learning Management System (LMS) during this grant cycle. The new LMS allows trainees to easily access and track their online CE credits and to search for trainings based on specific competencies. Although LMS was an existing innovation in audiovisual online technology, we faced the challenge in keeping up with new technology as old technology is retired. During this cycle, Adobe software used for the initial creation of several online CE modules is phasing out. While plans called for the software to be discontinued in 2020, a gradual degradation of service led to modules losing functionality earlier than planned and needing to be discontinued. As a result, the number of online learners during the last years of this cycle has been lower than in previous years (NIOSH Table 3). In response to this challenge, the six modules using the software slated for discontinuation by Adobe were removed from our LMS. An additional five modules with declining usage are under review for updates. In order to meet the needs of our trainees despite the retirement of these courses, new courses were developed based on our needs assessments to expand CE topic offerings. New CE modules were developed to address interdisciplinary competencies in OSH in response to the needs of our diverse CE trainees. The CE program launched a suite of eight in-depth "just-in-time" OHS online training courses during 2019 and three additional modules in 2020 (CE Table 1) with plans to add new modules yearly to meet the ever-changing training needs of professionals. These modules will continue to feature topics directly responding to areas of high interest (i.e., risk management, legal issues, management, accident prevention, and safety culture) indicated by participants of our recent national CE assessment in 2017-2018. By offering a robust suite of free online modules that are

available on an ongoing basis, MCOHS CE further improves health equity for worker populations that may not have access to training courses scheduled during traditional working hours.

CE Table 1 New Online Modules

Launched 2019:

Integrated Approaches Supporting Healthy Work: Total Worker Health™
Opioids and Occupational Health Providers
Americans with Disabilities Act: Part I and II
Workers' Compensation and Injuries
Introduction to Occupational Health and Safety for Nurses
Business Acumen and Skills for Occupational and Environmental Health and Safety Professionals: Part 1)
Budgeting and Contracting; Part 2) Business Etiquette and Competencies
Sleeper: Truckers and Obstructive Sleep Apnea

Launched 2020:

Occupational Exposure Limits
Hazard Recognition
Minnesota OSHA Consultation and Ergonomics in the Workplace

Innovative and Flexible Learning Formats. Our learning platforms offer flexibility to support both in-person and easily accessible online training. The CE Program benefits from collaboration with technology professionals within UMN, including project managers/team leaders, instructional designers, multimedia producers, multimedia programmers, data analysts/programmers, distance education coordinators, and a webmaster. With the aim of reducing disparities in OSH CE, innovative design choices such as video segments containing case studies and real student questions, accompanied by faculty responses make these engaging modules appropriate for CE students with a wide range of educational backgrounds. All modules are formatted to meet the Americans with Disability Act accessibility standards.

With the advent of the global Covid-19 Pandemic, MCOHS CE was able to quickly increase the use of innovative online teaching methods to continue to meet the training needs of OSH professionals. Courses and events normally held in person were moved to online formats. For example, monthly Occupational Medicine Grand Rounds (OMGR) are usually held in person at the Health Partners Clinic, but were able to be transitioned to synchronous Zoom webinars starting immediately when the MN Governor issued a Stay-At-Home Order. Because this allowed for increased attendance by OSH professionals outside the Twin Cities Metro area, OMGR continues to take place online, even though in-person venues have opened back up. Further, with OMGR now being held online, approval was obtained to create asynchronous online recordings which will bring valuable OSH information to an even wider audience.

In addition to making existing educational events and courses more widely available during the pandemic, MCOHS CE has been able to provide valuable new information and training on pandemic-related topics. In some cases, these topics are reaching audiences previously not associated with MCOHS. For example, many of the highly-publicized outbreaks linked to meat processing took place in or near our service region (MN, WI, ND, SD). In response, a "just-in-time" course on controlling Covid-19 in the meat packing industry was offered, helping to establish new training relationships between our center and agricultural OSH professionals. Other examples of new courses developed to meet a variety of OSH professionals' needs during the pandemic include: Telehealth and Injury Prevention; Covid-19 Aerosol Transmission and Implications for Masks and Respirators; and How OSHA's New 2 ½ Minute Fit Test is Revolutionary for Respiratory Protection Programs.

The need to address systemic racism as a public health crisis became more evident in May 2020 when the killing of George Floyd sparked mass protests and then riots in our region (specifically Minneapolis) and

around the nation. The alignment of the MCOHS focus on health equity with the crisis in our region means that our center is well-positioned to help address training needs related to occupational exposures resulting from systemic racism. In partnership with 3M Corporation's Women's Leadership Institute and African American Network, an online event is being planned which will take place at the beginning of the next grant cycle. The event features award-winning author of "So You Want to Talk about Race", Ijeoma Oluo. Ms. Oluo will lead a discussion about racial justice and advocacy. This example shows that, by leveraging both internal and external partnerships, MCOHS CE has been able to quickly react to the increasingly urgent needs for OSH training related to racism.

Evaluation and Impact. In addition to ongoing post-course evaluations for every in-person and online course, MCOHS CE used pre- and post-course knowledge tests. As an example, all spirometry courses found gains in knowledge after trainings. External evaluation is also used; MCOHS CE recently completed an in-person audit of our spirometry course with NIOSH, which resulted in a five-year renewal of our status as a NIOSH-approved spirometry course provider.

While it can be difficult to measure direct long-term impact of CE courses due to the large number of students and relatively short length of each course, post-course evaluations are one way to assess the impact of our CE program. A small selection of comments from course evaluations below indicate the impact of MCOHS CE courses to students, their co-workers, and those they serve.

"Hands-on and repetition of important concepts and identification of errors as they would appear on individual studies will improve mine and my staff's testing proficiency."

-Spirometry Certification Student

"The information and resources are much appreciated and will be put to good use in my company's safety program."

-Hearing Loss Prevention Seminar Student

"Learning the purpose of testing and looking at examples of audiograms and what are some of the common causes of different patterns will be very helpful back in the workplace."

-Occupational Hearing Conservation Student

Additionally, trainees with widely varying levels of experience found the teaching methods and content of MCOHS CE courses to be beneficial to their learning.

"Very informative seminar, educational and increased my learning even after 20 years"

-Hearing Loss Prevention Seminar Student

"Understanding spirometry and being able to learn spirograms before having to do them in my clinic is wonderful."

-Spirometry Certification Student

"I learned a lot as a new (safety) HR position filling in for safety leader."

-Occupational Hearing Conservation Student

CE PARTNERSHIPS

Partnerships with professional organizations and businesses have proven successful in marketing and enrolling participants into CE courses. CE courses are often advertised through websites of professional organizations. Furthermore, Ms. Alcorn-Webb consults regularly with professional organizations to support their educational mission; this, in turn, serves to focus our CE courses on topics of high need and interest. Many CE courses are offered as workshops during professional conferences.

Professional Organizations. CE successfully collaborates with American Industrial Hygiene Association-Upper Midwest Section (AIHA-UMS), Northwest Chapter of the American Society of Safety Engineers (ASSE-NW), Minnesota Association of Occupational Health Nurses (MAOHN), Wisconsin State Association of Occupational

Health Nurses (WSAOHN), the Minnesota Safety Council, the Central States Occupational and Environmental Medicine Association (CSOEMA), and local occupational medicine physicians in partnership with the Mayo Clinic to deliver training and conferences. Community-based planning committees, particularly with our local OHS professional organizations (i.e., AIHA, ASSE, MAOHN, WSAOHN), help develop content, curriculum, format, and publicity strategies for CE courses. For example, after a joint needs assessment of MAOHN members, MCOHS CE and MAOHN developed a professional development conference (PDC), which better served the needs of members. CE credits over the course of one day rather than separate monthly one-hour trainings led to an increase in CE participation. After receiving the distinction of *Best One-Day Training* from the AAOHN, the PDC has developed into an annual conference during which CE programming is offered.

Websites for Marketing. Approximately 10-15 marketing strategies were launched annually to advertise CE courses. Most of these are online such as the ASSE-NW website, a LinkedIn professional group, the MAOHN website, and regional AIHA chapter websites.

Collaborations with Corporate, Industry, and Healthcare. As mentioned above, collaborations with MN-based 3M Corporation have resulted in a *national* series of 10 yearly hearing conservation trainings, three CAOHC Hearing Certification Courses held in *China*, and four *international* occupational health nurse conferences. A partnership with Proctor and Gamble Paper Products Division (Kimberly Clark) reaches OSH professionals for regular CE trainings. CE courses are also offered to occupational medicine physicians in close collaboration with HealthPartners Occupational Medicine Residency Program, Mayo and Essentia Health Systems.

Outreach Exhibits. CE Outreach exhibits yearly at the following: Impairment Without Disability OEM Conference, Midwest Regional Occupational Health Conference, AIHA-UMS Professional Development Conference, ASSE-NW Professional Development Conference, and the National Occupational Research Agenda Symposium (our annual conferences co-sponsored by the MCOHS and the Upper Midwest Center for Agricultural Safety and Health).

C. Program Deliverables

Following the CE Outreach Program Logic Model, key program outputs and outcomes are summarized in CE Table 2. Additional detailed participant and course data are in NIOSH Table 3.

CE Table 2
Key Program Components/Activities and Program Outputs and Outcomes

<i>Objective Components</i>	<i>Program Outputs and Outcomes</i>
<ul style="list-style-type: none"> •In-person classes •Enrollment target/annual •Accessibility, safety, security assurance •High dose 	<ul style="list-style-type: none"> •451 courses offered. •19,219 individuals registered, participated to completion: 4,484 Industrial Hygienist participants, 4,970 Occupational Safety participants, 4,142 Occupational and Environmental Health Nursing participants, 1,495 Occupational and Environmental Medicine participants, and 4,128 participants in other disciplines. •322 certified in NIOSH-approved spirometry. •525 certified in CAOHC-approved hearing conservation. •Contract courses offered onsite in ND, SD, WI, Michigan, and rural MN. •3 CAOHC-approved hearing conservation courses offered in China to international employees of MN-based 3M Corporation.
<ul style="list-style-type: none"> •Distance learning modules •Online learning/training 	<ul style="list-style-type: none"> •5,115 individuals participated online or mixed-format courses. •11 new online modules created.
<ul style="list-style-type: none"> •Program marketing, recruitment, & outreach strategies •Recruitment 	<ul style="list-style-type: none"> • 10-15 marketing strategies launched in collaborations with professional organizations, businesses, and governmental agencies.
<ul style="list-style-type: none"> •Partnerships •Strategy for engagement, •Develop educational content for professional conferences •Conference planning and support 	<ul style="list-style-type: none"> •Primary Professional Association Partners: MAOHN, WSAOHN, AIHA, ASSE, South Eastern Wisconsin Association of OHN, and Impairment Without Disability Collaboration. •Primary Corporate, Industry and Healthcare Partners (See Attachment D for complete list): 3M Corporation, Mayo Clinic, HealthPartners OEM Clinics, Proctor and Gamble, Kimberly Clark Corporation, Allina Health System, and Essentia Health System. •Primary Government Partners: Minnesota Department of Health, MN OSHA, and Minnesota Safety Council.

The CE Program is a vital component of MCOHS with the mission to train those OSH practicing professionals who need continuing education. An impactful CE Program produces competent professionals in the field well-equipped to address current and emerging threats to the nation's health and safety. The region served by the CE Program contains a wide variety of industries, occupations, workers, and OHS practitioners, resulting in the need for diverse training to prevent workplace injury, illness, and fatality. Over the last decade, approximately 40,000 workers have been trained in OSH content by MCOHS from industries throughout the globe. We plan to continue this level of impact by growing our CE Program in terms of its content, methods of delivery, and reach.

**Table 3. Continuing Education Offerings by Program Area
July 1, 2015 - Jun 30, 2020**

Course Title ¹	# Participants / Course	Contact Hours / Course	Person-Hours / Course	# Participants by Profession						# Participants by Employer					
				IH	OHN	OM	OS	Other	Total	Private Industry	Federal State Local Gov.	Academic	Non-Profit	Other	Total
Industrial Hygiene Totals	4484	376	25,963	2901	139	66	1161	217	4484	3275	657	277	20	255	4484
Annual HAZWOPER Training for MN OSHA: 09/11/18	15	8.0	120.0	12	0	0	3	0	15	0	15	0	0	0	15
Upper Midwest Section of the American Industrial Hygiene Association (UMS AIHA) Program: How Are Innovative Technologies Affecting Your Culture? 8/7/18	4	2.0	8.0	4	0	0	0	0	4	4	0	0	0	0	4
UMS AIHA in conjunction with IOHA: Global Community Conference for Occupational Hygienists: 9/24/18	5	18.0	90.0	5	0	0	0	0	5	4	1	0	0	0	5
Hearing Loss Prevention-Detroit: 9/27/18	61	8.0	488.0	38	0	0	23	0	61	50	6	4	0	1	61
Hearing Loss Prevention-Philadelphia: 10/10/18	85	8.0	680.0	40	2	3	40	0	85	80	5	0	0	0	85
UMS AIHA Monthly Program: Evaluation of Local Exhaust Ventilation for Nail Salons: 10/18/18	21	2.0	42.0	21	0	0	0	0	21	14	4	3	0	0	21
UMS AIHA: Annual Professional Development Conference: 11/15/18	102	8.0	680.0	100	1	0	1	0	102	92	8	2	0	0	102
Hearing Loss Prevention-Kansas City: 2/13/18	127	8.0	1016.0	60	10	5	34	18	127	89	30	8	0	0	127

UMS AIHA Monthly Program: The World Wide Web of Free Learning Opportunities for EHS Professionals-2/21/19	40	2.0	80.0	38	0	0	2	0	40	35	2	3	0	0	40
Hearing Loss Prevention-Pleasanton CA: 4/23/19	63	8.0	504.0	40	5	0	18	0	63	49	8	6	0	0	63
Hearing Loss Prevention-Indianapolis: 5/21/19	111	8.0	888.0	47	8	2	44	10	111	81	20	10	0	0	111
UMS AIHA Monthly Program: Industrial Hygiene Panel 09/15/17	27	2.0	54.0	27	0	0	0	0	27	21	3	3	0	0	27
UMS AIHA Program: New Silica Regulations with Emphasis on Construction: 10/20/17	26	2.0	52.0	26	0	0	0	0	26	17	7	2	0	0	26
Hearing Loss Prevention Seattle, WA: 10/25/17	66	8.0	528.0	16	5	2	43	0	66	38	25	3	0	0	66
Hearing Loss Prevention, Boston, MA: 11/16/17	144	8.0	1152.0	46	8	3	65	22	144	100	30	14	0	0	144
UMS AIHA: Annual Professional Development Conference: 11/17/17	121	8.0	968.0	100	1	0	11	9	121	102	11	8	0	0	121
Hearing Loss Prevention, Tampa, FL: 02/09/18	75	8.0	600.0	24	6	0	45	0	75	60	11	4	0	0	75
UMS AIHA Program: The EPA Worker Protection Standard: 02/23/18	22	2.0	44.0	21	0	0	1	0	22	15	5	2	0	0	22
UMS AIHA Program: Federal OSHA Presentation on the Silica Regulations Update: 3/8/18	181	2.5	452.5	65	4	2	80	30	181	150	20	9	2	0	181
Hearing Loss Prevention, San Antonio, TX: 03/16/18	75	8.0	600.0	30	3	2	40	0	75	52	10	4	0	9	75
UMS-AIHA Program: Student Presentations - 4/20/18	40	2.0	80.0	40	0	0	0	0	40	29	7	4	0	0	40

Hearing Loss Prevention, Oakland, CA: 04/26/18	121	8.0	968.0	62	0	0	58	1	121	97	16	8	0	0	121
Hearing Loss Prevention, Chicago, IL: 5/26/18	56	8.0	448.0	22	4	2	28	0	56	44	7	5	0	0	56
Annual HAZWOPER Training for MN OSHA: 9/11/17	15	8.0	120.0	12	0	0	3	0	15	0	15	0	0	0	15
UMS AIHA Program: 9/7/17	22	2.0	44.0	22	0	0	0	0	22	0	0	0	0	22	22
UMS AIHA Monthly Program: October 10/5/17	34	2.0	68.0	34	0	0	0	0	34	0	0	0	0	34	34
UMS AIHA: Annual Professional Development Conference: 11/15/17	102	8.0	816.0	100	1	0	1	0	102	92	8	2	0	0	102
UMS AIHA January Program: Update on Silica Regulation-01/16/18	54	2.0	108.0	24	2	0	28	0	54	45	5	4	0	0	54
UMS AIHA Program: How Changing Technology Affects the Workplace/TSI Technical Tour: 02/22/18	22	2.0	44.0	22	0	0	0	0	22	15	4	3	0	0	22
UMS-AIHA Program: Student Presentations - 4/19/18	45	2.0	90.0	40	0	0	5	0	45	35	4	6	0	0	45
Annual HAZWOPER Training for MN OSHA: 9/11/17	15	8.0	120.0	12	0	0	3	0	15	0	15	0	0	0	15
(UMS AIHA Program: 9/7/17	22	2.0	44.0	22	0	0	0	0	22	0	0	0	0	22	22
UMS AIHA Monthly Program: 10/5/17	34	2.0	68.0	34	0	0	0	0	34	0	0	0	0	34	34
UMS AIHA: Annual Professional Development Conference: 11/15/17	102	8.0	816.0	100	1	0	1	0	102	92	8	2	0	0	102
UMS AIHA January Program: Update on Silica Regulation-01/16/18	54	2.0	108.0	24	2	0	28	0	54	45	5	4	0	0	54

UMS AIHA Program: How Changing Technology Affects the Workplace/TSI Technical Tour: 02/22/18	22	2.0	44.0	22	0	0	0	0	22	15	4	3	0	0	22
UMS-AIHA Program: Student Presentations - 4/19/18	45	2.0	90.0	40	0	0	5	0	45	35	4	6	0	0	45
UMS AIHA Monthly Program: Measuring Custodial Cleaning Effectiveness: 9/18/14	22	2.0	44.0	22	0	0	0	0	22	16	4	0	0	2	22
UMS AIHA Webinar: Manganese in Welding Fume Sources and Controls: 10/1/14	34	2.0	68.0	34	0	0	0	0	34	0	0	0	0	34	34
UMS AIHA Monthly Program: Azide Aftershocks: 10/16/14	29	2.0	58.0	29	0	0	0	0	29	26	3	0	0	0	29
UMS AIHA Webinar: There's an App (and Hack) for That: 11/14/14	33	2.0	66.0	33	0	0	0	0	33	30	1	1	1	0	33
UMS AIHA Professional Development Conference: 11/2014	133	8.0	1064.0	120	0	0	13	0	133	111	8	6	0	8	133
UMS AIHA Webinar: Work Toward Global Harmonization of Respiratory Protection Standards: 12/3/14	34	2.0	68.0	34	0	0	0	0	34	0	0	0	0	34	34
UMS AIHA Webinar: Challenging Incident Investigation Paradigms: 1/22/15	11	2.0	22.0	11	0	0	0	0	11	11	0	0	0	0	11
UMS AIHA Monthly Program: Noise Exposure to Police at Hockey Games: 2/19/15	28	2.0	56.0	28	0	0	0	0	28	24	2	2	0	0	28
UMS AIHA Webinar: Developing Respirator	16	2.0	32.0	16	0	0	0	0	16	16	0	0	0	0	16

Cartridge Change Schedules: 3/10/15															
UMS AIHA Webinar: Developing Respirator Cartridge Change Schedules: 3/10/15	16	2.0	32.0	16	0	0	0	0	16	16	0	0	0	0	16
UMS AIHA Webinar: Turning Numbers Into Knowledge: Sensors for Safety, Health, Wellbeing and Productivity: 4/24/15	28	2.0	56.0	28	0	0	0	0	28	24	4	0	0	0	28
UMS AIHA Webinar: Developing Respiration	16	2.0	32.0	16	0	0	0	0	16	16	0	0	0	0	16
UMS AIHA Webinar: Developing Respirator Cartridge Change Schedules: 3/10/15	16	2.0	32.0	16	0	0	0	0	16	16	0	0	0	0	16
UMS AIHA Program: Introduction to the Recognition, Evaluation and Control of Legionella in Building Water Systems-09/15/15	6	2.0	12.0	5	0	0	0	1	6	4	1	1	0	0	6
UMS AIHA Program: Occupational Safety and Health Indicators-09/17/15	26	2.0	52.0	26	0	0	0	0	26	17	7	2	0	0	26
UMS AIHA Program: Disasters and the Need for Good Exposure Assessment and Epidemiology-10/16/15	24	2.0	48.0	23	0	0	1	0	24	18	3	3	0	0	24
UMS AIHA: Ethics for the IH Professional-10/21/15	6	2.0	12.0	5	0	0	1	0	6	3	2	1	0	0	6
UMS AIHA: Annual Professional Development Conference: 11/20/15	118	8.0	944.0	104	0	2	12	0	118	100	10	8	0	0	118
UMS AIHA: A Practical Approach to World Class	8	2.0	16.0	7	0	0	1	0	8	8	0	0	0	0	8

EHS Leading Indicators-12/01/15															
UMS AIHA: Strategies for Effectively Communicating and Implementing IH and Safety Practices-02/18/16	26	2.0	52.0	26	0	0	0	0	26	19	5	2	0	0	26
UMS AIHA: How Long Do You Go?-02/24/16	10	2.0	20.0	9	0	0	1	0	10	9	0	1	0	0	10
UMS AIHA: Student Poster Presentations-04/21/16	22	1.0	22.0	22	0	0	0	0	22	16	4	2	0	0	22
Annual HAZWOPER Training for MN OSHA: 09/08/16	12	8.0	96.0	6	0	0	6	0	12	0	12	0	0	0	12
Hearing Loss Prevention: 9/14/16	80	8.0	640.0	41	3	2	34	0	80	56	18	6	0	0	80
UMS AIHA)Program: Industrial Hygiene Panel 09/15/16	27	2.0	54.0	27	0	0	0	0	27	21	3	3	0	0	27
UMS AIHA Program: New Silica Regulations with Emphasis on Construction: 10/20/16	26	2.0	52.0	26	0	0	0	0	26	17	7	2	0	0	26
Hearing Loss Prevention Seattle, WA: 10/25/16	66	8.0	528.0	16	5	2	43	0	66	38	25	3	0	0	66
Hearing Loss Prevention, Boston, MA: 11/16/16	144	8.0	1152.0	46	8	3	65	22	144	100	30	14	0	0	144
UMS AIHA: Annual Professional Development Conference: 11/17/16	121	8.0	968.0	100	1	0	11	9	121	102	11	8	0	0	121
Hearing Loss Prevention, Tampa, FL: 02/09/17	75	8.0	600.0	24	6	0	45	0	75	60	11	4	0	0	75
UMS AIHA Program: The EPA Worker Protection Standard: 02/23/17	22	2.0	44.0	21	0	0	1	0	22	15	5	2	0	0	22
UMS AIHA Program: Federal OSHA Presentation on the Silica Regulations Update: 3/8/17	181	2.5	452.5	65	4	2	80	30	181	150	20	9	2	0	181

Hearing Loss Prevention, San Antonio, TX: 03/16/17	75	8.0	600.0	30	3	2	40	0	75	52	10	4	0	9	75
UMS-AIHA Program: Student Presentations - 4/20//17	40	2.0	80.0	40	0	0	0	0	40	29	7	4	0	0	40
Hearing Loss Prevention, Oakland, CA: 04/26/17	121	8.0	968.0	62	0	0	58	1	121	97	16	8	0	0	121
Annual HAZWOPER Training for MN OSHA: 10/30/19	15	8.0	120.0	12	0	0	3	0	15	0	15	0	0	0	15
Hearing Loss Prevention: Houston: 9/17/19	99	8.0	792.0	40	19	25	15	0	99	40	32	12	15	0	99
Hearing Loss Prevention-Laurel, MD: 10/23/19	70	8.0	560.0	35	5	0	30	0	70	62	8	0	0	0	70
Upper Midwest Section of the American Industrial Hygiene Association (UMS AIHA) Program: Technical Tour of Orfield Labs: 9/19/19	18	2.0	36.0	15	1	2	0	0	18	15	1	2	0	0	18
MS AIHA Monthly Program: Evaluation of Local Exhaust Ventilation for Nail Salons: 10/18/19	21	2.0	42.0	21	0	0	0	0	21	14	4	3	0	0	21
UMS AIHA Annual Professional Development Conference: 11/14/19	116	8.0	944.0	109	3	0	4	0	116	101	6	9	0	0	116
Hearing Loss Prevention-Kansas City:11/12/19	127	8.0	1016.0	60	10	5	34	18	127	89	30	8	0	0	127
UMS AIHA Monthly Program: How OSHA's New 2 1/2 Minute Fit Test is Revolutionary for Respiratory Protection Programs: 2/20/20	48	2.0	96.0	43	3	0	2	0	48	40	4	4	0	0	48
Introducing 7-Elements of a Hearing Conservation Program: Regulatory Requirements and Best Practices Webinar-4/30/20	96	2.0	192.0	40	5	0	51	0	96	80	5	11	0	0	96
Occupational Exposure Limits (Online)	14			0	0	0	0	14	14	0	0	0	0	0	14

Hazard Recognition (Online)	20			0	0	0	0	20	20	0	0	0	0	0	20
Minnesota OSHA Consultation and Ergonomics in the Workplace (Online)	12			0	0	0	0	12	12	0	0	0	0	0	12
Occupational Health Nursing Totals	4142	920.0	22,149	18	2988	67	74	995	4142	2991	172	74	9	896	4142
Midwest Regional Occupational Health Nursing Conference: 9/18/18	43	12.0	516.0	0	43	0	0	0	43	39	2	2	0	0	43
Minnesota Association of Occupational Health Nurses (MAOHN) Fall Forum on Bloodborne Pathogens: 10/17/15	26	2.0	52.0	0	26	0	0	0	26	20	3	3	0	0	26
Northern Wisconsin Association of Occupational Health Nurses (NWAOHN) Monthly Program: People Like Them - The Opioid Crisis: 10/18/15	8	1.0	8.0	0	8	0	0	0	8	6	1	1	0	0	8
NIOSH-Approved Spirometry Training: 10/22/15	15	16.0	240.0	0	5	0	0	10	15	13	1	1	0	0	15
Occupational Hearing Conservation Training: 10/24/15	24	20.0	480.0	0	12	0	3	9	24	20	3	1	0	0	24
3M Occupational Health Nurses Conference: Ergonomics Prime: 11/1/18	60	1.0	60.0	0	60	0	0	0	60	60	0	0	0	0	60
Occupational Hearing Conservation Recertification: 11/13/18	12	8.0	96.0	0	8	0	4	0	12	11	1	0	0	0	12
NIOSH-Approved Spirometry Refresher: 11/14/18	4	8.0	32.0	0	1	0	3	0	4	4	0	0	0	0	4

NWAOHN Monthly Program: Keeping Your Head in the Game: Concussion Education: 11/15/18	18	1.0	18.0	0	18	0	0	0	18	18	0	0	0	0	18
HealthPartners Occupational Medicine Update: 12/4/18	23	2.0	46.0	0	23	0	0	0	23	23	0	0	0	0	23
Spirometry Training Duluth: 3/5/19	6	16.0	96.0	0	1	0	0	5	6	6	0	0	0	0	6
Occupational Hearing Conservation Training Shanghai China: 3/26/19	18	20.0	360.0	0	18	0	0	0	18	18	0	0	0	0	18
Occupational Hearing Conservation Recertification: 4/4/19	16	8.0	128.0	0	10	0	0	6	16	14	1	1	0	0	16
NIOSH-Approved Spirometry Refresher: 4/4/19	11	8.0	88.0	0	5	0	0	6	11	11	0	0	0	0	11
NIOSH-Approved Spirometry Training: 10/8/19	15	16.0	240.0	0	5	0	0	10	15	15	0	0	0	0	15
Occupational Hearing Conservation Training: 04/10/19	24	20.0	480.0	0	15	0	3	6	24	22	1	1	0	0	24
MAOHN Professional Development Conference: 5/21/19	55	8.0	440.0	0	0	49	6	0	55	49	4	2	0	0	55
Occupational Hearing Conservation Training: 06/03/19	24	20.0	480.0	1	11	2	4	6	24	20	2	2	0	0	24
A Nurse's Guide to Children's Agricultural Safety (Online)	6	1.0	6.0	0	6	0	0	0	6	6	0	0	0	0	6
Recognition/Assessment: Health Assessment and Employee Selection (Online)	8	1.0	8.0	0	8	0	0	0	8	8	0	0	0	0	8

Health Promotion and Adult Education (Online)	14	1.0	14.0	0	14	0	0	0	14	14	0	0	0	0	14
Theory and Practice of Occupational Health and Safety (Online)	18	1.0	18.0	0	18	0	0	0	18	18	0	0	0	0	18
A Glimpse Into Occupational Health and Safety (Online)	29	1.0	29.0	0	29	0	0	0	29	0	29	0	0	0	29
Issues and Trends in Occupational Health and Safety (Online)	33	1.0	33.0	0	33	0	0	0	33	0	33	0	0	0	33
Population Perspectives: Labor (Online)	9	1.0	9.0	0	9	0	0	0	9	9	0	0	0	0	9
A Nurse's Guide to Children's Agricultural Safety (Online)	56	1.0	56.0	0	56	0	0	0	56	0	0	0	0	56	56
Recognition/Assessment: Health Assessment and Employee Selection (Online)	74	1.0	74.0	0	0	0	0	74	74	0	0	0	0	74	74
Health Promotion and Adult Education (Online)	28	1.0	28.0	0	0	0	0	28	28	0	0	0	0	28	28
A Glimpse Into Occupational Health and Safety (Online)	59	1.0	59.0	0	0	0	0	59	59	0	0	0	0	59	59
Issues and Trends in Occupational Health and Safety (Online)	44	1.0	44.0	0	0	0	0	44	44	0	0	0	0	44	44
Population Perspectives: Labor (Online)	11	1.0	11.0	0	0	0	0	11	11	0	0	0	0	11	11
NIOSH-Approved Spirometry Training: 8/1/14	24	16.0	384.0	0	14	0	0	10	24	24	0	0	0	0	24
MAOHN Monthly Program: Antimicrobials - Does it Impact Human Health? 9/9/14	33	2.0	66.0	0	33	0	0	0	33	30	1	1	1	0	33

MROH Health and Safety Conference: 9/28/14	60	16.0	960.0	4	56	0	0	0	60	50	4	6	0	0	60
NIOSH-Approved Spirometry Training: 10/21/14	24	16.0	384.0	0	14	0	0	10	24	24	0	0	0	0	24
Occupational Hearing Conservation Training: 10/24/14	24	3.0	72.0	0	14	0	0	10	24	24	0	0	0	0	24
NIOSH-Approved Spirometry Refresher: 10/27/14	13	8.0	104.0	0	10	0	0	3	13	13	0	0	0	0	13
Occupational Hearing Conservation Refresher: 10/28/14	18	8.0	144.0	0	10	0	0	8	18	18	0	0	0	0	18
MAOHN Monthly Program: Lessons Learned From Workers Exposures to Manganese and the Emerging Concern for Infant Neurodevelopment: 11/11/14	26	2.1	54.3	4	22	0	0	0	26	20	3	3	0	0	26
MAOHN Monthly Program: Governmental Affairs -The Evolving Nurse Licensure Compact: 1/13/15	29	2.0	58.0	0	29	0	0	0	29	27	0	2	0	0	29
MAOHN Monthly Program: Resilience and Mindfulness at Work: 4/15/15	19	2.9	55.1	0	19	0	0	0	19	19	0	0	0	0	19
Occupational Hearing Conservation Refresher: 4/15/15	18	8.0	144.0	0	9	0	0	9	18	18	0	0	0	0	18
NIOSH-Approved Spirometry Refresher: 4/16/15	8	8.0	64.0	0	4	0	0	4	8	8	0	0	0	0	8
Occupational Hearing Conservation Training: 4/20/15	24	3.0	72.0	2	13	0	0	9	24	20	0	0	4	0	24

NIOSH-Approved Spirometry Training: 4/22/15	20	2.0	40.0	1	11	0	0	8	20	20	0	0	0	0	20
Midwest Regional Occupational Health Nursing Conference: 09/23/15	72	20.0	1440.0	0	72	0	0	0	72	65	6	1	0	0	72
Occupational Hearing Conservation Recertification:10/05/15	15	8.0	120.0	0	9	0	2	4	15	11	1	0	2	1	15
NIOSH-Approved Spirometry Refresher: 10/06/15	7	8.0	56.0	0	5	0	2	0	7	5	1	1	0	0	7
Occupational Hearing Conservation Training: 10/12/15	24	20.0	480.0	0	11	1	2	10	24	20	1	2	0	1	24
NIOSH-Approved Spirometry Training: 10/14/15	14	16.0	224.0	0	6	0	0	8	14	13	1	0	0	0	14
MAOHN November Program: Accommodating Work Restriction Injuries - 11/1/15	10	1.0	10.0	0	10	0	0	0	10	6	2	2	0	0	10
MAOHN January Program: EMS technical tour at U. S. Bank Stadium: - 01/25/16	18	1.0	18.0	0	18	0	0	0	18	12	4	2	0	0	18
Occupational Hearing Conservation: 12/16/15	15	8.0	120.0	0	11	1	0	3	15	6	7	2	0	0	15
NIOSH-Approved Spirometry Refresher: 2/08/16	7	8.0	56.0	0	3	0	0	4	7	7	0	0	0	0	7
NIOSH-Approved Spirometry Training: 2/10/16	7	16.0	112.0	0	4	0	0	3	7	7	0	0	0	0	7
NWAOHN Program: Respirator Medical Evaluation for the APNP, PA and Physician: 2/16/16	30	2.0	60.0	0	25	3	2	0	30	30	0	0	0	0	30

NWAOHN Program: The Secrets of Reducing Stress and Staying Positive at Work - 3/15/16	13	1.0	13.0	0	13	0	0	0	13	13	0	0	0	0	13
Occupational Hearing Conservation Training: 04/03/16	15	20.0	300.0	0	8	1	1	5	15	13	1	1	0	0	15
NIOSH-Approved Spirometry Training:04/06/16	10	16.0	160.0	0	8	0	2	0	10	10	0	0	0	0	10
Occupational Hearing Conservation Recertification:04/19/16	20	8.0	160.0	0	9	0	0	11	20	20	0	0	0	0	20
NIOSH-Approved Spirometry Refresher: 04/20/16	8	8.0	64.0	0	8	0	0	0	8	8	0	0	0	0	8
MAOHN Annual Professional Development Conference: 5/20/16	46	8.0	368.0	0	46	0	0	0	46	41	2	3	0	0	46
Medical Records Standard Training 3M: 5/18/16	41	1.0	41.0	0	41	0	0	0	41	41	0	0	0	0	41
Clinic Practice Update: Emerging Therapies for Diabetes Mellitus: 6/27/16	29	1.0	29.0	0	29	0	0	0	29	29	0	0	0	0	29
Global Occupational Health Skills and Competency: 05/13/16	16	1.0	16.0	0	16	0	0	0	16	16	0	0	0	0	16
A Nurse's Guide to Children's Agricultural Safety (Online)	15	1.0	15.0	0	15	0	0	0	15	15	0	0	0	0	15
Recognition/Assessment: Health Assessment and Employee Selection (Online)	44	1.0	44.0	0	44	0	0	0	44	44	0	0	0	0	44
Health Promotion and Adult Education (Online)	111	1.0	111.0	0	111	0	0	0	111	111	0	0	0	0	111
Theory and Practice of Occupational Health and Safety (Online)	60	1.0	60.0	0	60	0	0	0	60	60	0	0	0	0	60

A Glimpse Into Occupational Health and Safety (Online)	164	1.0	164.0	0	164	0	0	0	164	164	0	0	0	0	164
Issues and Trends in Occupational Health and Safety (Online)	68	1.0	68.0	0	68	0	0	0	68	68	0	0	0	0	68
Population Perspectives: Labor (Online)	24	1.0	24.0	0	24	0	0	0	24	24	0	0	0	0	24
Population Perspectives: Women in the Trades (Online)	31	1.0	31.0	0	31	0	0	0	31	31	0	0	0	0	31
Midwest Regional Occupational Health Nursing Conference: 09/23/16	72	20.0	1440.0	0	72	0	0	0	72	65	6	1	0	0	72
Occupational Hearing Conservation Recertification:10/05/16	15	8.0	120.0	0	9	0	2	4	15	11	1	0	2	1	15
NIOSH-Approved Spirometry Refresher: 10/06/16	7	8.0	56.0	0	5	0	2	0	7	5	1	1	0	0	7
Occupational Hearing Conservation Training: 10/12/16	24	20.0	480.0	0	11	1	2	10	24	20	1	2	0	1	24
NIOSH-Approved Spirometry Training: 10/14/16	14	16.0	224.0	0	6	0	0	8	14	13	1	0	0	0	14
MAOHN November Program: Accommodating Work Restriction Injuries - 11/1/16	10	1.0	10.0	0	10	0	0	0	10	6	2	2	0	0	10
MAOHN January Program: EMS technical tour at U. S. Bank Stadium: - 01/25/17	18	1.0	18.0	0	18	0	0	0	18	12	4	2	0	0	18
Occupational Hearing Conservation: 12/16/16	15	8.0	120.0	0	11	1	0	3	15	6	7	2	0	0	15
NIOSH-Approved Spirometry Refresher: 2/08/17	7	8.0	56.0	0	3	0	0	4	7	7	0	0	0	0	7

NIOSH-Approved Spirometry Training: 2/10/17	7	16.0	112.0	0	4	0	0	3	7	7	0	0	0	0	7
NWAOHN Program: Respirator Medical Evaluation for the APNP, PA and Physician: 2/16/17	30	2.0	60.0	0	25	3	2	0	30	30	0	0	0	0	30
NWAOHN Program: The Secrets of Reducing Stress and Staying Positive at Work - 3/15/17	13	1.0	13.0	0	13	0	0	0	13	13	0	0	0	0	13
Occupational Hearing Conservation Training: 04/03/17	15	20.0	300.0	0	8	1	1	5	15	13	1	1	0	0	15
NIOSH-Approved Spirometry Training: 04/06/17	10	16.0	160.0	0	8	0	2	0	10	10	0	0	0	0	10
Occupational Hearing Conservation Recertification: 04/19/17	20	8.0	160.0	0	9	0	0	11	20	20	0	0	0	0	20
NIOSH-Approved Spirometry Refresher: 04/20/17	8	8.0	64.0	0	8	0	0	0	8	8	0	0	0	0	8
MAOHN Annual Professional Development Conference: 5/19/17	46	8.0	368.0	0	46	0	0	0	46	41	2	3	0	0	46
Medical Records Standard Training 3M: 5/18/17	41	1.0	41.0	0	41	0	0	0	41	41	0	0	0	0	41
Clinic Practice Update: Emerging Therapies for Diabetes Mellitus: 6/27/17	29	1.0	29.0	0	29	0	0	0	29	29	0	0	0	0	29
Global Occupational Health Skills and Competency: 05/13/17	16	1.0	16.0	0	16	0	0	0	16	16	0	0	0	0	16
A Nurses' Guide to Children's Agricultural Safety (Online)	15	1.0	15.0	0	15	0	0	0	15	15	0	0	0	0	15

Recognition/Assessment: Health Assessment and Employee Selection (Online)	44	1.0	44.0	0	44	0	0	0	44	44	0	0	0	0	44
Health Promotion and Adult Education (Online)	111	1.0	111.0	0	111	0	0	0	111	111	0	0	0	0	111
Theory and Practice of Occupational Health and Safety (Online)	60	1.0	60.0	0	60	0	0	0	60	60	0	0	0	0	60
A Glimpse Into Occupational Health and Safety (Online)	164	1.0	164.0	0	164	0	0	0	164	164	0	0	0	0	164
Issues and Trends in Occupational Health and Safety (Online)	68	1.0	68.0	0	68	0	0	0	68	68	0	0	0	0	68
Population Perspectives: Labor (Online)	24	1.0	24.0	0	24	0	0	0	24	24	0	0	0	0	24
Population Perspectives: Women in the Trades (Online)	31	1.0	31.0	0	31	0	0	0	31	31	0	0	0	0	31
Midwest Regional Occupational Health Nursing Conference: 09/18/17	64	20.0	1280.0	0	64	0	0	0	64	0	0	0	0	64	64
Occupational Hearing Conservation Recertification:11/12/17	13	8.0	104.0	0	6	0	3	4	13	11	2	0	0	0	13
Occupational Hearing Conservation Training: 10/12/17	22	20.0	440.0	0	10	0	4	8	22	17	3	1	0	1	22
NIOSH-Approved Spirometry Training: 10/14/17	14	16.0	224.0	0	6	0	0	8	14	13	1	0	0	0	14
MAOHN November Program: 11/12/17	12	1.0	12.0	0	12	0	0	0	12	0	0	0	0	12	12
NWAOHN Monthly Program: The Feasible and Reasonable Function Physical Exam: Practical	18	2.0	36.0	0	18	0	0	0	18	18	0	0	0	0	18

Screening Exam Skills for the OHN-11/16/17															
MAOHN January Program: 1/18/18	22	1.0	22.0	0	22	0	0	0	22	0	0	0	0	22	22
NWAOHN Program: Creating a Wellness Culture in a Plant Environment: 3/15/18	17	1.0	17.0	0	17	0	0	0	17	10	3	4	0	0	17
NWAOHN Program: The Opioid Epidemic:5/17/18	12	1.0	12.0	0	12	0	0	0	12	10	1	1	0	0	12
Occupational Hearing Conservation Training China: 3/15/18	26	20.0	520.0	0	26	0	0	0	26	26	0	0	0	0	26
Occupational Hearing Conservation Training: 4/18/18	23	20.0	460.0	1	11	1	6	4	23	19	2	2	0	0	23
NIOSH-Approved Spirometry Training:4/16/18	24	16.0	384.0	0	16	2	3	3	24	21	0	3	0	0	24
Occupational Hearing Conservation Recertification:4/10/18	16	8.0	128.0	3	8	0	2	3	16	16	0	0	0	0	16
NIOSH-Approved Spirometry Refresher: 4/11/18	13	8.0	104.0	0	10	0	0	3	13	12	0	1	0	0	13
MAOHN Annual Professional Development Conference: 5/22/18	47	6.0	282.0	0	47	0	0	0	47	37	5	5	0	0	47
Occupational Hearing Conservation Training: 5/30/18	18	20.0	360.0	0	10	1	4	3	18	15	2	1	0	0	18
Occupational Hearing Conservation Recertification:5/31/18	5	8.0	40.0	1	4	0	0	0	5	5	0	0	0	0	5
A Nurse's Guide to Children's Agricultural Safety (Online)	6	1.0	6.0	0	0	0	0	6	6	0	0	0	0	6	6

Recognition/Assessment: Health Assessment and Employee Selection (Online)	8	1.0	8.0	0	0	0	0	8	8	0	0	0	0	8	8
Health Promotion and Adult Education (Online)	14	1.0	14.0	0	0	0	0	14	14	0	0	0	0	14	14
Theory and Practice of Occupational Health and Safety (Online)	18	1.0	18.0	0	0	0	0	18	18	0	0	0	0	18	18
A Glimpse Into Occupational Health and Safety (Online)	29	1.0	29.0	0	0	0	0	29	29	0	0	0	0	29	29
Issues and Trends in Occupational Health and Safety (Online)	33	1.0	33.0	0	0	0	0	33	33	0	0	0	0	33	33
Population Perspectives: Labor (Online)	9	1.0	9.0	0	0	0	0	9	9	0	0	0	0	9	9
Population Perspectives: Women in the Trades (Online)	8	1.0	8.0	0	0	0	0	8	8	0	0	0	0	8	8
Issues and Trends in Occupational Health and Safety (Online)	33	1.0	33.0	0	0	0	0	33	33	0	0	0	0	33	33
Midwest Regional Occupational Health Nursing Conference: 09/18/19	55	12	660.0	0	55	0	0	0	55	51	4	0	0	0	55
Northern Wisconsin Association of Occupational Health Nurses (NWAOHN) Monthly Program: Cost Effective Radiology: 10/10/19	10	1.0	10.0	0	10	0	0	0	10	8	2	0	0	0	10
NIOSH-Approved Spirometry Training: 10/22/19	15	16	240.0	0	5	0	0	10	15	13	1	1	0	0	15
Occupational Hearing Conservation Training: 10/25/19	19	20	380.0	0	12	0	4	3	19	17	1	1	0	0	19
3M Occupational Health Program: When OSHA Knocks on Your Door: What to do and Lessons Learned: 10/22/19	38	2	76.0	0	38	0	0	0	38	38	0	0	0	0	38

Occupational Hearing Conservation Recertification:10/29/19	10	8	80.0	0	8	0	2	0	10	8	2	0	0	0	10
NIOSH-Approved Spirometry Refresher: 10/30/19	10	8	80.0	1	4	0	1	4	10	8	2	0	0	0	10
MAOHN Winter 2020 Site Visit: Surly Brewery: 3/6/20	20	1	20	0	20	0	0	0	20	0	0	0	0	20	20
3M Occupational Health Program: Coping With Anxiety and Supporting Well Being During COVID 19 - 5/4/20	61	1.0	61.0	0	61	0	0	0	61	61	0	0	0	0	61
3M Occupational Health Program: Navigating Candid Conversations During COVID-19: 6/10/20	38	1.0	38.0	0	38	0	0	0	38	38	0	0	0	0	38
MN OSHA Consultation Ergonomics in the Workplace On Line	11	1.0	11.0	0	0	0	0	11	11	0	0	0	0	11	11
Americans With Disabilities Act Part I On Line	55	1.0	55.0	0	0	0	0	55	55	0	0	0	0	55	55
Americans With Disabilities Act Part II On Line	60	1.0	60.0	0	0	0	0	60	60	0	0	0	0	60	60
Sleepers: Truckers and Sleep Apnea On Line	38	1.0	38.0	0	0	0	0	38	38	0	0	0	0	38	38
Hazard Recognition On Line	17	1.0	17.0	0	0	0	0	17	17	0	0	0	0	17	17
Business Skills for OEHS Professionals I On Line	60	1.0	60.0	0	0	0	0	60	60	0	0	0	0	60	60
Business Skills for OEHS Professionals II On Line	47	1.0	47.0	0	0	0	0	47	47	0	0	0	0	47	47
Americans With Disabilities Act Part I On Line	55	1.0	55.0	0	0	0	0	55	55	0	0	0	0	55	55
Occupational Medicine Totals	1495	115.0	5455	0	94	1146	0	77	1495	797	6	191	2	322	1495
Issues and Trends in Occupational Health and Safety (Online)	33	1.0	33.0	0	0	0	0	33	33	0	0	0	0	33	33

Occupational Medicine Grand Rounds (OMGR): Radon and Lung Cancer - What Physicians Need to Know: 07/15/15	11	1.0	11.0	0	0	11	0	0	11	0	0	11	0	0	11
OMGR: Infectious Disease Diagnostics and What You Need to Know 08/19/15	9	1.0	9.0	0	9	0	0	0	9	0	0	9	0	0	9
OMGR: Forensic Engineering and Occupational Injuries: 09/16/15	11	1.0	11.0	0	0	11	0	0	11	0	0	11	0	0	11
OMGR: Family and Medical Leave As Total Worker Health for New Mothers: 10/21/15	10	1.0	10.0	0	1	9	0	0	10	1	0	9	0	0	10
OMGR: The Odzi Project Developing an Employee Health Protocol in a Rural Zimbabwe Hospital: 11/18/15	8	1.0	8.0	0	0	8	0	0	8	0	0	8	0	0	8
OMGR: Protecting Those Who Protect - Public Safety Health and Wellness: 12/6/15	13	1.0	13.0	0	2	11	0	0	13	2	0	11	0	0	13
OMGR: Organizational Coherence and Medicine's Hidden Curriculum: Biospying the Residency Learning Environment: 01/20/16	12	1.0	12.0	0	2	10	0	0	12	2	0	10	0	0	12
OMGR: Health Implications of the Changing American Diet: 02/17/16	13	1.0	13.0	0	1	11	0	1	13	2	0	11	0	0	13
OMGR: What is Informatics? Integrating Data into Occupational Medicine Practice: 03/16/16	11	1.0	11.0	0	1	8	0	2	11	3	0	8	0	0	11

OMGR: The Art and Science of Concussion Management: 04/20/16	22	1.0	22.0	0	8	12	0	2	22	10	0	12	0	0	22
OMGR: Minnesota Fire Department Health and Fitness Practices and Medical Surveillance: 05/18/16	13	1.0	13.0	0	3	9	0	1	13	4	0	9	0	0	13
OMGR: Audiology for the Occupational Physician: 06/15/16	9	1.0	9.0	0	0	9	0	0	9	0	0	9	0	0	9
Skin Disease in Returning Travelers	9	1.0	9.0	0	0	9	0	0	9	9	0	0	0	0	9
World Trade Center Disaster and Health Impacts	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
Risk Communication	14	1.0	14.0	1	0	13	0	0	14	14	0	0	0	0	14
Population Well-being Strategy	15	1.0	15.0	0	0	15	0	0	15	15	0	0	0	0	15
Health Trends and a Mission that Matters	15	1.0	15.0	0	2	11	0	2	15	15	0	0	0	0	15
Impairment Without Disability OM Conference	112	10.0	1120.0	0	10	99	0	3	112	96	2	8	1	5	112
Tropical Medicine in Papua New Guinea	10	1.0	10.0	0	0	10	0	0	10	10	0	0	0	0	10
Global Water Risk	6	1.0	6.0	0	0	6	0	0	6	6	0	0	0	0	6
Ramsey County-St. Paul Public Health Overview	11	1.0	11.0	0	1	9	0	1	11	11	0	0	0	0	11
Integration of Worker Health Protection and Promotion: Past, Present, and Future	21	1.0	21.0	0	1	17	0	3	21	21	0	0	0	0	21
An Overview of Health Informatics	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
The Evolution of Oil Transportation Preparedness 2014-2017: A	11	1.0	11.0	0	1	9	0	1	11	11	0	0	0	0	11

Whole Community Partnership															
Minnesota Craft Brewery Injury and Safety Survey	11	1.0	11.0	0	1	10	0	0	11	11	0	0	0	0	11
OMGR: Descriptive Analysis of Blood and Body Fluid Exposures at a Major Healthcare System	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: Child Labor A Public Health Perspective	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
Impairment Without Disability OM Conference	112	10.0	1120.0		10	99		3	112	96	2	8	1	5	112
OMGR: Evidence Based Indications for Chiropractic Referral for Neck and Low Back Pain	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: The Affordable Care Act, Healthcare Reform and Occupational Health	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: Hospitals and MN OSHA	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: 1/2/15	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: 2/18/15	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: 3/18/15	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: 4/15/15	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: 5/20/15	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: 6/17/15	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR: Health Implications of the Changing American Diet: 02/17/15	13	1.0	13.0	0	1	11	0	1	13	2	0	11	0	0	13
OMGR: What is Informatics? Integrating Data into Occupational Medicine Practice: 03/16/15	11	1.0	11.0	0	1	8	0	2	11	3	0	8	0	0	11

OMGR: The Art and Science of Concussion Management: 04/20/15	22	1.0	22.0	0	8	12	0	2	22	10	0	12	0	0	22
OMGR: Minnesota Fire Department Health and Fitness Practices and Medical Surveillance: 05/18/15	13	1.0	13.0	0	3	9	0	1	13	4	0	9	0	0	13
OMGR:Audiology for the Occupational Physician: 06/15/15	9	1.0	9.0	0	0	9	0	0	9	0	0	9	0	0	9
Impairment Without Disability Conference	112	10.0	1120.0	0	9	98	0	5	112	0	0	0	0	112	112
OM Grand Rounds (June) 2017	17	1.0	17.0	0	2	15	0	0	17	0	0	0	0	17	17
OM Grand Rounds (July) 2017	10	1.0	10.0	0	1	9	0	0	10	0	0	0	0	10	10
OM Grand Rounds (August)2017	8	1.0	8.0	0	0	8	0	0	8	0	0	0	0	8	8
OM Grand Rounds (September) 2017	12	1.0	12.0	0	2	10	0	0	12	0	0	0	0	12	12
OM Grand Rounds (October) 2017	11	1.0	11.0	0	1	10	0	0	11	0	0	0	0	11	11
OM Grand Rounds (November) 2017	15	1.0	15.0	0	2	13	0	0	15	0	0	0	0	15	15
OM Grand Rounds (December) 2017	11	1.0	11.0	0	1	10	0	0	11	0	0	0	0	11	11
OM Grand Rounds (January) 2018	13	1.0	13.0	0	0	10	0	3	13	0	0	0	0	13	13
OM Grand Rounds (February) 2018	14	1.0	14.0	0	1	11	0	2	14	0	0	0	0	14	14
OM Grand Rounds (March) 2018	9	1.0	9.0	0	1	7	0	1	9	0	0	0	0	9	9
OM Grand Rounds (April) 2018	14	1.0	14.0	0	1	12	0	1	14	0	0	0	0	14	14
OM Grand Rounds (April, II) 2018	19	1.0	19.0	0	1	17	0	1	19	0	0	0	0	19	19

OM Grand Rounds (May) 2018	14	1.0	14.0	0	0	11	0	3	14	0	0	0	0	14	14
Occupational and Environmental Medicine Grand Rounds (OMGR): July, 2018	18	1.0	18.0	0	0	18	0	0	18	18	0	0	0	0	18
OMCG September, 2018	20	1.0	20.0	0	0	20	0	0	20	20	0	0	0	0	20
OMGR October, 2018	18	1.0	18.0	0	0	18	0	0	18	18	0	0	0	0	18
OMGR November, 2018	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR December 2018	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
OMGR January 2019: Agricultural Medicine	15	1.0	15.0	0	0	15	0	0	15	15	0	0	0	0	15
OMGR February, 2019	20	1.0	20.0	0	0	20	0	0	20	20	0	0	0	0	20
OMGR March 2019	18	1.0	18.0	0	0	18	0	0	18	18	0	0	0	0	18
OMGR April 2019	18	1.0	18.0	0	0	18	0	0	18	18	0	0	0	0	18
OMGR May 2019	16	1.0	16.0	0	0	16	0	0	16	16	0	0	0	0	16
OMGR June 2019	12	1.0	12.0	0	0	12	0	0	12	12	0	0	0	0	12
Impairment Without Disability Conference 2019	104	10.0	1040.0	0	6	95	0	3	104	94	2	8	0	0	104
OMGR July 17, 2019: Injuries Among Minority Workers in MN, An Update	17	1.0	17	0	0	17	0	0	17	17	0	0	0	0	17
OMGR August 21, 2019: Building Systems to Connect Learning, Knowing, and Doing at HealthPartners; The Case of Workplace Well-Being	15	1.0	15	0	0	15	0	0	17	15	0	0	0	0	17
OMGR September 18, 2019: Health Impact Assessment	15	1.0	15	0	0	15	0	0	15	15	0	0	0	0	15
OMGR October 16, 2019: Nietzsche was Right: Revisiting What Happens after Exposure to Trauma	35	1.0	35	0	0	35	0	0	35	35	0	0	0	0	35
OMGR November 20, 2019: Bold Women of Medicine	14	1.0	14	0	0	14	0	0	14	14	0	0	0	0	14

OMGR December 18, 2019: Physicians Guide to Workers' Compensation	19	1.0	19	0	0	19	0	0	19	19	0	0	0	0	19
OMGR January 15, 2020: Permanent Partial Disability and Impairment Ratings	22	1.0	22	0	0	22	0	0	22	22	0	0	0	0	22
OMGR April 15, 2020: Orbital and Ocular Trauma	12	1.0	12	0	0	12	0	0	12	12	0	0	0	0	12
OMGR May 15, 2020: One-Year Retrospective Quality Evaluation of Corporate Medical Director Review of Department of Transportation Examinations	17	1.0	17	0	0	17	0	0	17	17	0	0	0	0	17
OMGR June 18, 2020: Controlling Covid-19 in the Meat Packing Industry	21	1.0	21	0	0	21	0	0	21	21	0	0	0	0	21
Occupational Safety Totals	4970	307	28426	425	281	99	3431	586	4970	2510	380	350	3	282	4970
American Society of Safety Professionals Northern Plains Section: The Opioid Epidemic-7/18/17	15	1.0	15.0	0	0	0	15	0	15	10	5	0	0	0	15
American Society of Safety Professionals Northwest Chapter (ASSP NWC): Minnesota OSHA Update: 09/11/17	40	2.0	80.0	5	4	1	30	0	40	32	4	4	0	0	40
ASSP NWC: Alternatives to Lock Out/Tag Out: 10/9	60	2.0	120.0	3	0	0	57	0	60	50	5	5	0	0	60
ASSP NWC: Robotics and Safety: 11/13/17	30	2.0	60.0	3	0	0	27	0	30	24	4	2	0	0	30
Northern Region Association of Safety Professionals Annual Safety and Health Conference: 11/29/17	85	14.0	1190.0	15	5	0	65	0	85	66	10	9	0	0	85

ASSP NWC: Safety Professional's Role in Distracted Driving Legislation: 12/11/17	38	2.0	76.0	0	0	0	38	0	38	34	3	1	0	0	38
ASSP NWC: Annual Professional Development Conference: 02/11/18	220	8.0	1760.0	18	54	2	108	38	220	185	20	15	0	0	220
North Dakota Safety Council Annual Conference: 2/23/18	37	24.0	888.0	0	0	0	37	0	37	24	5	8	0	0	37
ASSP NWC: Biopsychosocial Approach: Innovative Care Solutions for Comprehensive Worker Health: 3/12/18	30	2.0	60.0	8	2	0	20	0	30	23	3	4	0	0	30
ASSP NWC: Walking/Working Surfaces Safety/Ladder Safety: 4/9/18	32	2.0	64.0	4	1	0	27	0	32	26	4	2	0	0	32
ASSP NWC: Workers Compensation Fraud- 5/14/18	38	2.0	76.0	5	3	0	30	0	38	30	4	4	0	0	38
Chemical Hazards for Public Health Workers (Online)	16	1.0	16.0	0	0	0	16	0	16	16	0	0	0	0	16
Radiological Hazards for Public Health Workers (Online)	10	1.0	10.0	0	0	0	10	0	10	10	0	0	0	0	10
Best Management Practices for Animal Research Worker Safety (Online)	17	1.0	17.0	0	0	17	0	0	17	17	0	0	0	0	17
American Society of Safety Professionals Northern Plains Section: The Opioid Epidemic-7/18/18	15	1.0	15.0	0	0	0	15	0	15	10	5	0	0	0	15
American Society of Safety Professionals Northwest	40	2.0	80.0	5	4	1	30	0	40	32	4	4	0	0	40

Chapter (ASSP NWC): Minnesota OSHA Update: 09/11/18															
ASSP NWC: Alternatives to Lock Out/Tag Out: 10/9/18	60	2.0	120.0	3	0	0	57	0	60	50	5	5	0	0	60
ASSP NWC: Robotics and Safety: 11/13/18	30	2.0	60.0	3	0	0	27	0	30	24	4	2	0	0	30
Northern Region Association of Safety Professionals Annual Safety and Health Conference: 11/29/18	85	14.0	1190.0	15	5	0	65	0	85	66	10	9	0	0	85
ASSP NWC: Safety Professional's Role in Distracted Driving Legislation: 12/11/18	38	2.0	76.0	0	0	0	38	0	38	34	3	1	0	0	38
ASSP NWC: Annual Professional Development Conference: 02/12/19	220	8.0	1760.0	18	54	2	108	38	220	185	20	15	0	0	220
North Dakota Safety Council Annual Conference: 2/23/19	37	24.0	888.0	0	0	0	37	0	37	24	5	8	0	0	37
ASSP NWC: Biopsychosocial Approach: Innovative Care Solutions for Comprehensive Worker Health: 3/12/19	30	2.0	60.0	8	2	0	20	0	30	23	3	4	0	0	30
ASSP NWC: Walking/Working Surfaces Safety/Ladder Safety: 4/9	32	2.0	64.0	4	1	0	27	0	32	26	4	2	0	0	32
ASSP NWC: Workers Compensation Fraud-5/14	38	2.0	76.0	5	3	0	30	0	38	30	4	4	0	0	38
ASSE NWC): Minnesota OSHA Update: 09/15/15	90	2.0	180.0	5	2	0	83	0	90	80	5	5	0	0	90
ASSE NWC: Construction Liability: 10/13/15	66	2.0	132.0	3	0	0	63	0	66	60	4	2	0	0	66

ASSE NWC: Basics of Drug and Alcohol Testing: 12/08/15	56	2.0	112.0	1	2	0	53	0	56	51	3	2	0	0	56
ASSE NWC: Annual Professional Development Conference: 02/09/16	225	8.0	1800.0	17	6	2	200	0	225	203	10	12	0	0	225
Chemical Hazards for Public Health Workers (Online)	132	1.0	132.0	0	0	0	0	132	132	0	0	0	0	132	132
Radiological Hazards for Public Health Workers (Online)	71	1.0	71.0	0	0	0	0	71	71	0	0	0	0	71	71
Best Management Practices for Animal Research Worker Safety (Online)	69	1.0	69.0	0	0	0	0	69	69	0	0	0	0	69	69
ASSE NWC): Minnesota OSHA Update: 09/12/16	63	2.0	126.0	8	2	0	53	0	63	50	5	8	0	0	63
ASSE NWC: Construction Liability: 10/13/16	66	2.0	132.0	3	0	0	63	0	66	60	4	2	0	0	66
ASSE NWC: Ergonomics: 11/01/16	54	2.0	108.0	2	0	0	52	0	54	40	5	9	0	0	54
ASSE NWC: Technical Tour of 3M Innovation Center: 12/07/16	60	2.0	120.0	10	0	0	50	0	60	51	6	3	0	0	60
ASSE NWC: Annual Professional Development Conference: 02/14/17	225	8.0	1800.0	11	4	2	200	8	225	174	18	20	3	10	225
ASSE NWC: Current Perspectives on Higher Education in Occupational Health and Safety-4/11/17	39	2.0	78.0	3	2	0	34	0	39	29	0	10	0	0	39
ASSE NWC: Technical Tour of CHS Field: 05/09/17	35	2.0	70.0	2	0	0	33	0	35	26	8	1	0	0	35
Chemical Hazards for Public Health Workers (Online)	44	1.0	44.0	0	0	0	44	0	44	44	0	0	0	0	44

Radiological Hazards for Public Health Workers (Online)	27	1.0	27.0	0	0	0	27	0	27	27	0	0	0	0	27
Best Management Practices for Animal Research Worker Safety (Online)	19	1.0	19.0	0	0	0	19	0	19	19	0	0	0	0	19
ASSE NWC: MN OSHA Update: 9/9/14	66	2.0	132.0	0	0	0	66	0	66	56	5	5	0	0	66
ASSE NWC: Insufficient Sleep What does It Look Like and What Are Its Impacts? 10/14/14	49	2.0	98.0	0	0	0	49	0	49	49	0	0	0	0	49
ASSE NWC: The Safety of Unmanned Aerial Systems in the Workplace: 11/11/14	44	2.0	88.0	0	0	0	44	0	44	44	0	0	0	0	44
ASSE NWC: Gamification: 12/9/14	54	2.0	108.0	2	0	0	52	0	54	40	5	9	0	0	54
ASSE NWC Professional Development Conference: 2/2/15	244	8.0	1952.0	24	6	2	212	0	244	220	16	8	0	0	244
ASSE NWC: Student Presentations: 4/14/15	44	2.0	88.0	0	0	0	44	0	44	34	4	6	0	0	44
ASSE NWC: Technical Tour: 5/13/15	54	2.0	108.0	2	0	0	52	0	54	40	5	9	0	0	54
3M Hearing Loss Prevention: 9/9/14	148	8.0	1184.0	50	0	0	50	48	148	128	10	10	0	0	148
3M Hearing Loss Prevention: 9/30/14	148	8.0	1184.0	50	0	0	50	48	148	128	10	10	0	0	148
3M Hearing Loss Prevention: 10/6/14	148	8.0	1184.0	50	0	0	50	48	148	128	10	10	0	0	148
3M Hearing Loss Prevention: 2/5/15	148	8.0	1184.0	50	0	0	50	48	148	128	10	10	0	0	148
3M Hearing Loss Prevention: 3/12/15	169	8.0	1352.0	45	28	0	96	0	169	130	20	19	0	0	169
3M Hearing Loss Prevention: 6/22/15	100	8.0	800.0	10	10	0	80	0	100	100	0	0	0	0	100

Chemical Hazards for Public Health Workers (Online)	16	1.0	16.0	0	0	0	16	0	16	16	0	0	0	0	16
Radiological Hazards for Public Health Workers (Online)	10	1.0	10.0	0	0	0	10	0	10	10	0	0	0	0	10
Best Management Practices for Animal Research Worker Safety (Online)	17	1.0	17.0	0	0	17	0	0	17	17	0	0	0	0	17
ASSE NWC: Northern Plains Section: The Opioid Epidemic-7/18/19	15	2.0	30.0	0	0	15	0	0	15	10	5	0	0	0	15
ASSE NWC: Minnesota OSHA Update: 09/10/19	47	2.0	94.0	2	2	0	43	0	47	44	2	1	0	0	47
ASSE NWC: Technical Tour of 133rd Airlift Wing Maintenance Depot: 10/8/19	30	2.0	60.0	2	0	28	0	0	30	22	4	4	0	0	30
ASSE NWC: Fleet Risk and Winter Driving-11/12/19	38	2.0	76.0	3	0	0	35	0	38	29	5	4	0	0	38
Northern Region Association of Safety Professionals (NRASP) Annual Safety and Health Conference: 11/29/19	85	14.0	1190.0	15	5	0	65	0	85	66	10	9	0	0	85
NRASP Safety Conference: 12/2/19	40	8.0	320.0	5	5	0	30	0	40	36	4	0	0	0	40
ASSE NWC: Emerging Trends in Absence Management: 12/10/19	35	2.0	70.0	0	0	0	35	0	35	30	2	3	0	0	35
NRASP: FMCSA Clearinghouse Review: 1/15/20	8	2.0	16.0	0	0	0	8	0	8	6	1	1	0	0	8
ASSP NWC: Annual Professional Development Conference: 02/12/20	220	8.0	1760.0	18	54	2	108	38	220	185	20	15	0	0	220
North Dakota Safety Council Annual Conference: 2/23/20	37	24.0	888.0	0	0	0	37	0	37	24	5	8	0	0	37
ASSE NWC: Telehealth and Injury Prevention-5/19/20	68	1.0	68.0	8	4	0	56	0	68	60	5	3	0	0	68

ASSE NWC: COVID 19 Aerosol Transmission and Implications for Masks and Respirators: 4/28/20	200	2.0	400.00	48	11	8	133	0	200	170	15	15	0	0	200
ASSE NWC:	54	2.0	108.0	2	0	0	52	0	54	40	5	9	0	0	54
Other Totals	4128	146.5	9039.5	81	162	69	836	2616	4128	207	223	226	0	2473	4128
Hearing Loss Prevention: 03/10/18	54	8.0	432.0	6	2	0	46	0	54	43	7	4	0	0	54
Hearing Loss Prevention: 04/27/18	99	8.0	792.0	22	18	5	44	10	99	86	11	2	0	0	99
NORA Symposium: 05/04/18	126	1.0	126.0	40	12	18	51	5	126	96	20	10	0	0	126
Hearing Loss Prevention: 05/06/18	64	8.0	512.0	20	0	0	40	4	64	56	5	1	0	2	64
Threshold Limit Values (Online)	69	1.0	69.0	0	0	0	0	69	69	0	0	0	0	69	69
Unsafe Acts/Unsafe Conditions (Online)	101	1.0	101.0	0	0	0	0	101	101	0	0	0	0	101	101
Program Development (Online)	80	1.0	80.0	0	0	0	0	80	80	0	0	0	0	80	80
Recognition/Assessment: Physical and Psychosocial Hazards (Online)	48	1.0	48.0	0	0	0	0	48	48	0	0	0	0	48	48
Chemical and Biological Workplace Hazards (Online)	110	1.0	110.0	0	0	0	0	110	110	0	0	0	0	110	110
Control Strategies for Chemical and Biological Hazards (Online)	133	1.0	133.0	0	0	0	0	133	133	0	0	0	0	133	133
Control Strategies for Physical Hazards (Online)	140	1.0	140.0	0	0	0	0	140	140	0	0	0	0	140	140
History of Occupational Health and Safety (Online)	91	1.0	91.0	0	0	0	0	91	91	0	0	0	0	91	91
It's More Than Money: Making the Business Case for Occupational Health and Safety (Online)	56	1.0	56.0	0	0	0	0	56	56	0	0	0	0	56	56

Annual Joint Meeting of UMS AIHA, ASSP NWC: 1/8	50	2.0	100.0	25	2	0	23	0	50	40	4	6	0	0	50
NORA Symposlum:5/2	85	3.0	255.0	15	10	5	20	35	85	25	5	55	0	0	85
Threshold Limit Values (Online)	6	1.0	6.0	0	0	0	0	6	6	6	0	0	0	0	6
Unsafe Acts/Unsafe Conditions (Online)	4	1.0	4.0	0	0	0	0	4	4	4	0	0	0	0	4
Program Development (Online)	9	1.0	9.0	0	0	0	0	9	9	9	0	0	0	0	9
Recognition/Assessment: Physical and Psychosocial Hazards (Online)	11	1.0	11.0	0	0	0	0	11	11	11	0	0	0	0	11
Chemical and Biological Workplace Hazards (Online)	8	1.0	8.0	0	0	0	0	8	8	8	0	0	0	0	8
Control Strategies for Chemical and Biological Hazards (Online)	8	1.0	8.0	0	0	0	0	8	8	8	0	0	0	0	8
Control Strategies for Physical Hazards (Online)	8	1.0	8.0	0	0	0	0	8	8	0	0	0	0	0	8
History of Occupational Health and Safety (Online)	19	1.0	19.0	0	0	0	0	19	19	19	0	0	0	0	19
It's More Than Money: Making the Business Case for Occupational Health and Safety (Online)	14	1.0	14.0	0	0	0	0	14	14	0	0	0	0	14	14
Hearing Loss Prevention: 10/06/15	80	8.0	640.0	21	7	1	51	0	80	40	39	1	0	0	80
Hearing Loss Prevention: 11/12/15	29	8.0	232.0	10	0	1	18	0	29	23	4	2	0	0	29
Annual HAZWOPER Training for MN OSHA: 9/11/15	12	8.0	96.0	6	0	0	6	0	12	0	12	0	0	0	12
Annual Joint Meeting of UMS AIHA, ASSE NWC: Driving Sustainable Safety	98	2.0	196.0	26	2	0	70	0	98	80	10	8	0	0	98

and Health Excellence Through Global Systems: 01/12/16															
Team Approach to Occupational Health and Safety: Identifying and Diffusing Potentially Violent Situations in the Workplace: 03/10/16	55	2.0	110.0	15	16	0	24	0	55	39	8	8	0	0	55
Hearing Loss Prevention: 03/10/16	54	8.0	432.0	6	2	0	46	0	54	43	7	4	0	0	54
Hearing Loss Prevention: 04/27/16	99	8.0	792.0	22	18	5	44	10	99	86	11	2	0	0	99
NORA Symposium: 05/04/16	126	1.0	126.0	40	12	18	51	5	126	96	20	10	0	0	126
Hearing Loss Prevention: 05/06/16	64	8.0	512.0	20	0	0	40	4	64	56	5	1	0	2	64
Threshold Limit Values (Online)	69	1.0	69.0	0	0	0	0	69	69	0	0	0	0	69	69
Unsafe Acts/Unsafe Conditions (Online)	101	1.0	101.0	0	0	0	0	101	101	0	0	0	0	101	101
Program Development (Online)	80	1.0	80.0	0	0	0	0	80	80	0	0	0	0	80	80
Recognition/Assessment: Physical and Psychosocial Hazards (Online)	48	1.0	48.0	0	0	0	0	48	48	0	0	0	0	48	48
Chemical and Biological Workplace Hazards (Online)	110	1.0	110.0	0	0	0	0	110	110	0	0	0	0	110	110
Control Strategies for Chemical and Biological Hazards (Online)	133	1.0	133.0	0	0	0	0	133	133	0	0	0	0	133	133
Control Strategies for Physical Hazards (Online)	140	1.0	140.0	0	0	0	0	140	140	0	0	0	0	140	140

History of Occupational Health and Safety (Online)	91	1.0	91.0	0	0	0	0	91	91	0	0	0	0	91	91
It's More Than Money: Making the Business Case for Occupational Health and Safety (Online)	56	1.0	56.0	0	0	0	0	56	56	0	0	0	0	56	56
Annual Joint Meeting of UMS AIHA, ASSE NWC: Life Cycle of the IH/Safety Professional: 01/10/16	53	2.0	106.0	24	4	0	25	0	53	45	5	3	0	0	53
Team Approach to Occupational Health and Safety: Legionellosis - 03/30/16	75	2.0	150.0	26	15	1	33	0	75	38	17	10	0	10	75
NORA Symposium:05/05/16	104	2.0	208.0	20	10	6	57	11	104	34	9	61	0	0	104
Threshold Limit Values (Online)	18	1.0	18.0	0	0	0	0	18	18	0	0	0	0	18	18
Unsafe Acts/Unsafe Conditions (Online)	32	1.0	32.0	0	0	0	0	32	32	0	0	0	0	32	32
Program Development (Online)	21	1.0	21.0	0	0	0	0	21	21	0	0	0	0	21	21
Recognition/Assessment: Physical and Psychosocial Hazards (Online)	36	1.0	36	0	0	0	0	36	36	0	0	0	0	36	36
Chemical and Biological Workplace Hazards (Online)	68	1.0	68.0	0	0	0	0	68	68	0	0	0	0	68	68
Control Strategies for Chemical and Biological Hazards (Online)	61	1.0	61.0	0	0	0	0	61	61	0	0	0	0	61	61
Control Strategies for Physical Hazards (Online)	78	1.0	78.0	0	0	0	0	78	78	0	0	0	0	78	78
History of Occupational Health and Safety (Online)	41	1.0	41.0	0	0	0	0	41	41	0	0	0	0	41	41

It's More Than Money: Making the Business Case for Occupational Health and Safety (Online)	42	1.0	42.0	0	0	0	0	42	42	0	0	0	0	42	42
Annual Joint Meeting of UMS AIHA, ASSE NWC: Eliminating the Dangers of Silica Dust: 1/20/17	54	2.0	108.0	25	4	0	25	0	54	40	6	8	0	0	54
Team Approach to Occupational Health and Safety: Pills and Weed: Managing Injury Risks; 3/21/17	45	2.0	90.0	11	10	3	21	0	45	35	5	5	0	0	45
NORA Symposium: 5/3/17	84	2.0	168.0	20	12	6	46	0	84	60	8	16	0	0	84
Threshold Limit Values (Online)	6	1.0	6.0	0	0	0	0	6	6	0	0	0	0	6	6
Unsafe Acts/Unsafe Conditions (Online)	4	1.0	4.0	0	0	0	0	4	4	0	0	0	0	4	4
Program Development (Online)	9	1.0	9.0	0	0	0	0	9	9	0	0	0	0	9	9
Recognition/Assessment: Physical and Psychosocial Hazards (Online)	11	1.0	11.0	0	0	0	0	11	11	0	0	0	0	11	11
Chemical and Biological Workplace Hazards (Online)	8	1.0	8.0	0	0	0	0	8	8	0	0	0	0	8	8
Control Strategies for Chemical and Biological Hazards (Online)	8	1.0	8.0	0	0	0	0	8	8	0	0	0	0	8	8
Control Strategies for Physical Hazards (Online)	8	1.0	8.0	0	0	0	0	8	8	0	0	0	0	8	8
History of Occupational Health and Safety (Online)	19	1.0	19.0	0	0	0	0	19	19	0	0	0	0	19	19

It's More Than Money: Making the Business Case for Occupational Health and Safety (Online)	14	1.0	14.0	0	0	0	0	14	14	0	0	0	0	14	14
NORA Symposium: 2020	143	1.5	214.5	0	0	0	0	143	143	0	0	0	0	143	143
2020 UMASH Community Forum Aging on the Farm- Wisconsin and Minnesota: 6/15/20	109	1.5	163.5	0	0	0	0	109	109	0	0	0	0	109	109
2020 UMASH Community Forum Aging on the Farm- North Dakota and Minnesota: 6/30/20	53	1.5	79.5	0	0	0	0	53	53	0	0	0	0	53	53
Annual Joint Meeting of UMS AIHA and ASSP NWC: 1/21/20	86	2.0	172.0	25	6	0	55	0	86	72	5	9	0	0	86