A. COVER PAGE

Project Title: **NIOSH (Region II) Educational Resource Center**	
Grant Number: **T42OH008422**	**Project/Grant Period**: 7/1/2016- 6/30/2021
Reporting Period: 07/01/2020 – 06/30/2021	**Date Submitted:** 1/31/2022
Program Director/ Principal Investigator **John D Meyer MD MPH** **Professor, Dept of Environmental Medicine & Public Health** **ICAHN SCHOOL OF MEDICINE AT MOUNT SINAI** **One Gustave L. Levy Place, Box 1057** **New York, NY 10029** **Phone: (212) 824-7057** **Email: john.meyer@mssm.edu**	**Administrative Official Information** **Jessica Ruth Moise** **Senior Associate Dean for Sponsored Programs** **ICAHN SCHOOL OF MEDICINE AT MOUNT SINAI** **One Gustave L. Levy Place, Box 1075** **New York, NY 10029-6574** **Phone: (212) 824-8300 Fax: (212) 241-3294** **Email: jessica.moise@mssm.edu**
Change of Contact PD/PI:	
Human Subjects: No	**Vertebrate Animals: No**
hESC: No	**Inventions/Patents: No**

B. ACCOMPLISHMENTS

B.1. What are the major goals of the project?

The New York and New Jersey Education and Research Center (NYNJERC) serves Federal Region 2, which includes New York, New Jersey, Puerto Rico, and the US Virgin Islands. The mission of the NYNJERC is to assure safe and healthful working conditions for workers by preparing the next generation of professional leaders in OSH through rigorous, intensely interdisciplinary, and constantly updated training programs. The NYNJERC is a consortium of five educational institutions serving the region and offering programs in occupational health and safety training and research:

- Occupational Medicine and Pilot Project Research at the Icahn School of Medicine at Mount Sinai (New York, NY);
- Occupational Medicine at the Rutgers School of Public Health (Piscataway, NJ);
- Industrial Hygiene at CUNY School of Public Health (New York, NY);
- Occupational Safety Engineering at the New Jersey Institute of Technology (Newark, NJ);
- Occupational and Environmental Health Nursing at New York University (New York, NY);
- Occupational Ergonomics and Biomechanics at New York University (New York, NY);
- Continuing Education, Outreach at Rutgers School of Public Health (Piscataway, NJ).

The major goals of the project have been:

- To prepare the next generation of professionals to be leaders in occupational safety and health through rigorous interdisciplinary academic training programs;
- To provide a broad range of continuing education to professionals to improve their occupational health and safety knowledge, skills, and behaviors;
- To conduct research to expand the occupational safety and health knowledge base;
- To disseminate credible information on occupational safety and health research and practice to professionals, students, and the lay public;
- To collaborate with OSH professionals and community-based organizations to increase exposure to OSH issues;
- To develop novel and innovative methods to provide effective transfer of knowledge to OSH professionals, unions, employers, and employees; and
- To provide guidance to OSH professionals, unions, employers, and employees on how to use the available online educational resources and OSH information and to increase awareness of OSH.

B.2. What did you accomplish under these goals?

Please see individual reports from each of the above components detailing the 5-year accomplishments of each within the program

B.3. Competitive Revisions/Administrative Supplements: None

B.4. What opportunities for training and professional development did the project provide?

Details are provided in each component's individual report. Overall the training activity provides the following degree programs and training:

- Occupational Medicine: GME (postgraduate medical/residency training) and Master in Public Health (MPH)
- Pilot Project Research: mentored research training
- Industrial Hygiene: Master in Public Health (MPH)
- Occupational Safety Engineering: Master's degree in Safety Engineering
- Occupational and Environmental Health Nursing: Doctorate in Nursing Practice (DNP) and PhD degrees
- Occupational Ergonomics and Biomechanics: Master's degree

- Continuing Education, Outreach at Rutgers School of Public Health: Multiple training opportunities for health and safety professionals

B.5. How did you disseminate the results to communities of interest?
The NYNJERC has been involved with a wide array of stakeholders since its inception, and these interactions have become increasingly stronger and more expansive. Our ERC has collaborated with other NIOSH programs in our Region, including the Northeast Center for Occupational Health and Safety (NIOSH Ag Center in NY), the NJ Department of Health NIOSH-funded Occupational Health Surveillance program, New York Committee for Occupational Safety and Health (NYCOSH), and the University of Puerto Rico TPG program.
The ERC has numerous collaborative interactions with other OSH programs in our region. The IH and CE Programs have collaborated extensively with organizations in our region. We have collaborated with the local chapters of AIHA to present the 2019 Northeast Regional AIHA Conference.
All of our ERC Program Directors and many faculty are active in their respective professional organizations, both nationally and locally. Graduates of our programs are leaders in local chapters of ASSP, AIHA, ACOEM, and AAOHN. Numerous publications and presentations have come out of the ERC's individual compnenets – these are detailed in the attached materials from each institution.

B.6 - What do you plan to do during the next reporting period to accomplish the goals?
Over the next five years, our Center-wide activities will focus on two key topics, the *Future of Work* and *Disaster and Emergency Preparedness*. Our position as one of the only ERCs with all four core disciplines is in itself an innovation. Bringing together faculty, staff, and trainees in these disciplines provides a broad-based training program that allows us to accomplish our goals. We have begun a focus on Future of Work themes, including work and health in immigrant and other vulnerable populations, construction safety, protective and assistive technology, and contingent work in the gig economy. We will continue to provide training in these areas, integrate responses to these current issues into academic programs, and provide opportunities for trainees to conduct their practicum work in these areas.

Our ERC has been keenly aware of the need for disaster and emergency preparedness stemming originally from our work with and response to 9/11 and the World Trade Center bombing. Since then, our ERC has been a resource for hurricane response, Ebola preparation, mitigation of opioid use in the workplace, and the COVID19 pandemic. Early in the development of the NYNJERC we incorporated online and distance education into our curricula , a function of the relative geographic dispersion of our core and allied programs. Our interdisciplinary programs have therefore included distance-based training and meetings for over 10 years. We have expanded those modalities in response to both the coronavirus pandemic and to programmatic needs for interdisciplinary training, and will continue to identify new and innovative ways to train our students. Our expertise in these areas, and our flexibility to respond to emerging needs, has been critically important to keeping workers safe in our region.

C. PRODUCTS

C.1. Publications, conference papers, and presentations
See individual reports for details on publications

C.2. Website(s) or other Internet site(s) – include URL(s)
http://www.nynjerc.org/

C.3. Technologies or techniques
None

C.4. Inventions, patent applications, and/or licenses
None

C.5. Other products and resource sharing
See individual reports for details

D. PARTICIPANTS

Commons ID	S/K	Name	Degree(s)	Role	Cal	Aca	Sum	Foreign Org	Component(s)	Country	SS
jmeyer424	Y	Meyer, John	MD	PD/PI	1.8	0.0	0.0				NA
jmeyer424	Y	Meyer, John	MD	PD/PI	0.9	0.0	0.0				NA
	N	Bracic, Sultana		Residency Coordinator	8.4	0.0	0.0				NA
	N	Bracic, Sultana		Residency Coordinator	3.6	0.0	0.0				NA
	N	Bukiewiz, Lori		Program Assistant	2.2	0.0	0.0				NA
	N	Cahill, Megan		Admin Assistant	1.8	0.0	0.0				NA
	N	Caruth, J		Mentor	0.6	0.0	0.0				NA
MATHILDACHIU	N	Chiu, Yueh-Hsiu Mathilda		Program Director	1.58	0.0	0.0				NA
	N	Choi, Theresa		Program Assistant	1.2	0.0	0.0				
	N	Cirillo, Tina		Residency Coordinator	2.4	0.0	0.0				NA
vd30.nyu	N	Dickson, Victoria Vaughan		Program Director	1.31	0.0	0.0				NA
	N	Ferguson, Cherie		Office Manager	1.2	0.0	0.0				NA
	N	Gazilano, Gina		Program Coordinator	1.44	0.0	0.0				NA
	N	Kipen, Howard		Mentor	1.2	0.0	0.0				NA
	N	Kothari, P		Instructor	3	0.0	0.0				NA
	N	Laumbach, Robert		Mentor	0.6	0.0	0.0				NA
	N	Olsen, G.		Instructor	3	0.0	0.0				NA
	N	Pratt, Michael		Program Director	0.6	0.0	0.0				NA
	N	Rockafellow, Megan		Program Assistant	1.2	0.0	0.0				NA

mrosen1	N	Rosen, Mitchel		Program Director	1.2	0.0	0.0				NA
mrosen1	N	Rosen, Mitchel		Program Director	0.4	0.0	0.0				NA
mrosen1	N	Rosen, Mitchel		Program Director	0.3	0.0	0.0				NA
	N	Sawyer, William		Equipment Tech	0.9	0.0	0.0				NA
	N	Schecter Weiner, Shira		Deputy Director	2.1	0.0	0.0				NA
SENGUPTAAK	N	Sengupta, Arijit K		Program Director	0.0	0.0	1.9				NA
Sheikhzadeh	N	Sheikhzadeh, Ali		Program	1.7	0.0	0.0				NA
	N	Udasin, Iris		Mentor	0.6	0.0	0.0				NA
AMYWIT	N	Stimpfel, Amy Witkoski	BOTH, PhD	Deputy Director	1.8	0.0	0.0				NA
BPAVILON	N	Pavilonis, Brian Thomas	BS,MPH, PhD	Program Director	0.0	0.6	0.3				NA
	N	Lee, May		Financial	0.1	0.0	0.0				NA
	N	Lee, May		Financial	0.2	0.0	0.0				NA

D.2 Personnel updates - NA

a. Level of Effort:
b. New Senior/Key Personnel:
c. Changes in Other Support:
d. New Other Significant Contributors:

E. IMPACT

E.1 - What is the impact on the development of human resources, if applicable?

The ERC has been responsive to the regional and national need for increased occupational safety training. There continue to be far too many workplace injuries and illnesses and an unmet need for professionals to address workplace health and safety issues. The NYNJ ERC has a long track record of successfully meeting the OSH needs of our region. Over the past five years, we enrolled 101 trainees in our academic programs. Approximately 40% of our ERC trainees are under-represented minorities. We have graduated 88 new OHS professionals with over 80% of them now working in the OSH field. Our CE program provided 963 courses, training 14,740 OSH professionals during the previous five years.

The program graduates continue to become employed in OSH positions, most within the NY and NJ region. Many graduates are employed in governmental positions in the NYC Departments of Environmental Protection, Health, Transportation, and Design and Construction, using their OSH training to improve the health of workers and residents of NYC. OM graduates are employed at NY and NJ hospitals, providing occupational medicine services and expertise for workers in our region. The ERC continues to be responsive to critical training needs during disasters that have affected NY and NJ in the past training cycle. The CE Program has been a leader in disaster response efforts, providing expertise to colleagues in Puerto Rico, the USVI, and Houston after hurricanes devastated those areas. The ERC programs have been active in the response of health care and academic organizations to the peak of the COVID-19 pandemic in the Northeast. Rutgers faculty and residents were active participants in the "Reopening Rutgers" planning process, providing leadership on development of PPE guidance for clinicians and staff and development of contact tracing and testing protocols, while IMSSM OM residents worked to keep the hospital's employee health service running and triaging personnel. The CE Program was selected by the NJ Small Business Development Center to provide safety and health training for essential and returning workers at small businesses.

E.2 - What is the impact the Public Health Relevance and Impact? The investigator should address how the findings of the project relate beyond the immediate study to improved practices, prevention or intervention techniques, legislation, policy, or use of technology in public health.

Regional workplaces continue to lack safety and health protections for employees. OSHA enforcement is low, with 0.6% of establishments in NY and 0.9% in NJ inspected by OSHA in 2016. OSHA regulations are not followed, and workers continue to be injured on the job. New York City has implemented Local Law 196 to create additional training requirements for construction workers and supervisors. New York State has created laws to protect nail salon workers, which includes personal protective equipment for employees, and New York City requires that ventilation systems are installed in the workplace. These types of local initiatives reinforce that workers still face the burden of OSH hazards.

The need for OSH expertise continues. NY is underserved for all OSH professions, and NJ is below national rates for OM and OS. The lack of OSHA inspections, injury/illness rates, and the lack of sufficient OSH professionals in our Region demonstrates a need for continued promotion, recruitment academic preparation, and CE training in our Region. The interdisciplinary structure of the NYNJERC provides our graduates with cross-cutting knowledge and skills that are valuable for industry, government, academia, and working populations.

Details of impact are outlined for each component program on the accompanying reports.

F. CHANGES

F.1 – Changes in approach and reasons for change, including changes that have a significant impact on expenditures

N/A

F.2 - Actual or anticipated challenges or delays and actions or plans to resolve them

N/A

F.3 - Significant changes to human subjects, vertebrate animals, biohazards, and/or select agents

N/A

G. Special Reporting Requirements

G.1 Special Notice of Award Terms and Funding Opportunities Announcement Reporting Requirements

N/A

G.2 Responsible Conduct of Research

N/A

G.3 Mentor's Research Report or Sponsor Comments
N/A

G.4 Human Subjects

G.4.a Does the project involve human subjects? No

G.4.b Inclusion Enrollment Data N/A

G.4.c ClinicalTrials.gov N/A

Does this project include one or more applicable clinical trials that must be registered in ClinicalTrials.gov under FDAAA? No

G.5 Human Subject Education Requirement

Are there personnel on this project who are newly involved in the design or conduct of human subject's research? No

G.6 Human Embryonic Stem Cells (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)? No

G.7 Vertebrate Animals

Does this project involve vertebrate animals? No

G.8 Project/Performance Sites
- Icahn School of Medicine at Mount Sinai (New York, NY);
- Rutgers School of Public Health/ Robert Wood Johnson School of Medicine (Piscataway & New Brunswick NJ);
- CUNY School of Public Health (New York, NY);
- New Jersey Institute of Technology (Newark, NJ);
- New York University Myers School of Nursing (New York, NY);
- New York University Ergonomics Center (New York, NY)

G.9 Foreign Component
None

G.10 Estimated Unobligated Balance

G.10.a Is it anticipated that an estimated unobligated balance (including prior year carryover) will be greater than 25% of the current year's total approved budget?

G.11 Program Income

Is program income anticipated during the next budget period? No

G.12 F&A Costs

Is there a change in performance sites that will affect F&A costs? No

I. OUTCOMES

I. Provide a concise summary of the outcomes or findings of the award, written for the general public in clear and comprehensible language, without including any proprietary, confidential information or trade secrets

The New York and New Jersey Education and Research Center (NYNJERC) serves Federal Region 2, which includes New York, New Jersey, Puerto Rico, and the US Virgin Islands. The mission of the NYNJERC is to assure safe and healthful working conditions for workers by preparing the next generation of professional leaders in OSH through rigorous, intensely interdisciplinary, and constantly updated training programs. The NYNJERC is a consortium of five educational institutions serving the region and offering programs in occupational medicine, occupational nursing, industrial hygiene, occupational safety, and ergonomics, along with mentored pilot research and continuing education and outreach programs serving the working public in the region.
The major goals of the project have been to prepare the next generation of professionals to be leaders in occupational safety and health through rigorous interdisciplinary academic training programs and to provide a broad range of continuing education to professionals to improve their occupational health and safety knowledge and skills. The ERC has been responsive to the regional and national need for increased occupational safety training. There continue to be far too many workplace injuries and illnesses and an unmet need for professionals to address workplace health and safety issues. The NYNJ ERC has a long track record of successfully meeting the OSH needs of our region. Over the five years of this reporting period, we enrolled 101 trainees in our academic programs approximately 40% of whom are under-represented minorities. We graduated 88 new OHS professionals with over 80% of them now working in the OSH field. Our CE program provided 963 courses, training 14,740 OSH professionals during the five year period. The ERC continues to be responsive to critical training needs during disasters that have affected NY and NJ in the past training cycle, providing expertise to colleagues in Puerto Rico, the USVI, and Houston after hurricanes devastated those areas. As well, the ERC programs were active in the response of health care and academic organizations to the peak of the COVID-19 pandemic in the Northeast, providing leadership on development of PPE guidance for clinicians and staff and development of contact tracing and testing protocols, working to keep hospital employee health services running and providing safety and health training for essential and returning workers at small businesses.

Individual Program Reports:

Occupational Medicine at the Icahn School of Medicine at Mount Sinai (New York, NY)

Occupational Medicine at the Rutgers School of Public Health (Piscataway, NJ)

Industrial Hygiene at CUNY School of Public Health (New York, NY)

Occupational Safety Engineering at the New Jersey Institute of Technology (Newark, NJ)

Occupational and Environmental Health Nursing at New York University (New York, NY)

Occupational Ergonomics and Biomechanics at New York University (New York, NY)

Pilot Project Research at the Icahn School of Medicine at Mount Sinai (New York, NY)

Continuing Education, Outreach at Rutgers School of Public Health (Piscataway, NJ)

Occupational Medicine – Mt Sinai – Progress Report

The Selikoff Centers for Occupational Medicine at Mount Sinai remain the renowned flagship for New York's unique statewide system of eight occupational medicine specialty clinics, established by the State Legislature in 1987. The Selikoff Centers, which continue to provide residents with a foundation of diverse clinical OEM experience, have long been known for their work in asbestos, heavy metals, and musculoskeletal disorders, and which remain the mainstay of this premiere specialty clinic. Upticks in silica exposure, combined with the institution of the new OSHA silica standard have provided opportunities for participation in surveillance and diagnosis of this traditional-but-still-current hazard. Further, across the program director's six-year tenure, the Selikoff Clinic has increased the number of cases seen with hand-arm disorders, dermatitis, and indoor-air-related disorders, expertise brought by Dr. Meyer from his prior positions in Connecticut and West Virginia. The diversity of cases and of referral sources enables trainees to see cases ranging from high-incidence occupational disorders (back, neck, and other musculoskeletal problems) to complex diseases or uncommon exposures, including pulmonary disorders and toxicologic (metals, solvents) cases, broadening the resident experience in the assessment and management of occupational illnesses. As both a center of expertise and the first point of contact for entry into the NYS workers' compensation system, the Selikoff Clinic provides residents with a full longitudinal experience from diagnosis, attribution, and initiation of a compensation case through workplace assessment, work modifications, accommodations, treatment, disability management, assessment, and mitigation, and case resolution. Graded and progressive responsibility was more rigorously introduced into the clinic via both this longitudinal system and via oversight from the PD to ensure the distribution of cases to residents based on proper level of complexity for the level of training. Residents work with the staff of the Center in administrative and legal aspects of case management, industrial hygiene assessments of working conditions, and ergonomic evaluations of patients' workplaces and work tasks, learning the multidisciplinary skills required for future practice in OEM.

Since September 11, 2001, the Selikoff Centers have opened their doors to the workers affected with the complex respiratory, digestive and mental health disorders seen in responders to the WTC disaster in 2001. This led to the establishment of a separate clinical entity known as the World Trade Center Medical Monitoring and Treatment Program. Formalized training in this clinic serves as an ancillary site for residents to gain expertise in the treatment of long-term respiratory disorders (asthma, COPD, fibrotic lung disease and obstructive sleep apnea) and, because of the nearly 20-year length of time since the disaster, in surveillance and screening methods used to detect and diagnose cancer in an aging population with numerous other occupational exposures. The development of this program is a critical example of our department's continued adaptation to changes in the forefront of occupational medicine needs of workers and continues the tradition of the Selikoff Centers as an excellent training site for leadership in the field of OEM.

The past grant cycle has been one of considerable renewal in the range and rigor of the practicum (field placement) components of the residency program. Practicum sites include a broad variety of corporate, clinical, and government settings. A new clinical rotation at ConEdison (NYC's electrical power utility) was established in 2018, and provides experience in both administrative occupational medicine and clinical patient assessment, including exposure surveillance and DOT-mandated exams, in the setting of a large (15,000 workers) utility company. Required external field placements continue to provide strong grounding in other aspects of OM specialty care. New leadership and a revitalized rotation at Memorial Sloan-Kettering Cancer Center, under the direction of Rebecca Guest MD, across the past three years, has improved administrative-level training in hospital employee health and wellness. Residents not only participate in the care of employees of a large medical and research institution but contribute to formation and promulgation of policy, and spend considerable time with component members of the institution's health and safety structure. Opportunities for OM training have also expanded in the NYC Department of Health, which has engaged this cycle's residents in construction safety, carbon monoxide poisoning, environmental toxicant exposure investigation (NY-HANES surveillance project) and NY City's rapid response to the COVID pandemic. Expanded connections with NY(State) OSHA, (government agency) and BASF (corporate headquarters of a multi-national chemical corporation) continue to emphasize the regulatory aspects of OM training; the BASF rotation is taken by both ISMMS and Rutgers residents in the ERC, which allows didactic and project work to be shared by the two sets of OM trainees in the ERC. Participation was re-established in the Office of Occupational Medicine and Nursing rotation at OSHA in Washington DC three years ago, with two residents rotating there, and has improved the involvement of residents in the work of the federal regulatory agency.

The academic curriculum is enhanced in scope and depth by the Icahn-Mount Sinai Graduate Program in Public Health (MPH) program in 1989. Formal accreditation by the Council on Education in Public Health (CEPH) has been continuous since inception in 2005 and extends now through 2023 with expectation of renewal. A recent CEPH site visit was highly successful with 35 of 36 review criteria having been fully met. Course offerings in the MPH program have expanded substantially, as well as an increase in the faculty available for teaching and mentoring. New and updated courses have been added to the MPH curriculum for the benefit of residents; these include an updated course in pulmonary disorders offered biannually, and an exposure assessment course taught by faculty in industrial hygiene. Additionally under the leadership of Dr Robert Wright, a renowned environmental researcher who assumed the EMPH Chair three years ago, courses within the Environmental and Occupational Health track in the MPH have been expanded and upgraded; these include a newly-revised course in toxicology, and new faculty teaching in the occupational and environmental epidemiology and toxicology courses, which improve the educational and didactic base on which residents can build their knowledge in both clinical and research arenas. ACGME and residency program requirements for ethics training, and training in the responsible conduct of research, are also met by coursework and programs within the MPH program. The residents are also required to take a Risk Assessment and Communication Workshop. Finally, a Public Health Law class has been launched as an elective for residents desiring a better background in law and regulation.

Collaborative research and resident research expertise have greatly expanded over the previous funding cycle, uniting residents with OM and Preventive Medicine faculty and other ERC and non-ERC faculty. Residents' research opportunities have increased within our own faculty and department as well as at our field placement sites. The program considers that participation in research is important for trainees to develop skills in the interpretation of articles and reports that guide OM practice, regardless of their subsequent location. These skills are achieved through requirements of an end-of-training thesis (also qualifying for awarding of the MPH degree) and participation with the preventive medicine residents in a monthly journal club where current articles are critiqued. Resources for trainees interested in additional research skills have expanded with the addition of numerous mid- and upper-level statistics and epidemiology courses in the MPH. Clinically-based resources for research are also available through the Outcomes Research track in the MPH. Three residents in the past three years received competitive awards from the ERC Pilot Project grant for their respective studies. Their research comprises studies on the frequency and determinants of modified work in low-income and contingent-work pregnant workers, and on quantification of short- and long-term lead exposure in telecommunications workers. Another resident's work on incidence and determinants of fatal falls in construction was developed into a public service announcement infographic by NYC and the NYCDOHMH to try to prevent these fatalities, which are disproportionately seen in minority, mainly Latino, workers. All residents in the 2016-21 grant cycle to date have had oral or poster presentations at the American Occupational Health Conference, with some presenting additionally at the American Public Health Association and ICOH-Epidemiology (EPICOH) meetings.

Teaching time and effort also expanded in the last five-year cycle. A new weekly OM didactic session was established by the Program Director, with guest lectures covering current problems and advanced topics in OM and providing a foundation for practice and board certification. Clinical case conference continues weekly with the residents and faculty, and now includes the participation of two industrial hygiene (IH) faculty members and an ergonomic and disability specialist who brings expertise in this realm. A new joint journal club, established with the Preventive Medicine residency program, meets monthly. The previous journal club was replaced with a broader Occupational Medicine Division Seminar, a multidisciplinary seminar consisting both of journal reports and seminars in which all department faculty participate (including faculty physicians, industrial hygienists and epidemiologists).

The OEM training program benefits from collaborative training efforts with other affiliated programs both within and without the NYNJERC. The ISMMS OM faculty continues its partnership with the ERC's OM Nursing program, providing access to the resources of the Selikoff Clinics and academic and research guidance for these doctoral nursing trainees in the ERC, while Dr Meyer has taught in the doctoral seminars in this NYU program. The OM training program also benefits from collaborative training efforts with other affiliated programs. The advanced-standing summer OEM course directed by Dr Meyer brings together trainees from the ISMMS OM residency with General Preventive Medicine (GPM) residents from two NYC programs (at Mount Sinai and the NYC Department of Health, as well as MD/MPH trainees and Mount Sinai residents in internal and family medicine. The OM faculty also supervise clinical rotations for GPM residents from the residency programs at MSSM, the NYC Department of Health, and New York-Presbyterian Weill-Cornell Medical Center, as part of their clinical requirements for training in occupational medicine. This provides the opportunity for our own OM residents to teach and act as clinical mentors for these colleagues. Additionally, the faculty mentor internal medicine trainees and other physicians-in-training upon request if they have an interest in the field.

Successes in the OM Program and in the Department of Preventive Medicine in recent years will enable the residency program, and the overall ERC, to continue to grow and to train expert practitioners. Stability of the program is in evidence as Dr Meyer completes a full cycle as PD under the ERC grant. Recent additions to the faculty include Dr. Tannis, who brings skills in GPM and environmental health, and a keen interest in the occupational health of minority and underserved workers. External training sites have been either added or fortified across the prior cycle, with clear delineation of expected skills to be acquired as well as these sites serving to supplement training in the Selikoff Clinics and ISMMS faculty. With these improvements, we have added richer hands-on clinical and didactic training to the other core ERC components. Similarly, clinical material and expertise has grown within the Selikoff and WTC Clinical Centers to be able to build further on links in joint precepting and didactic sessions with the OH nursing program, partnering with the OM residency to develop greater expertise in their trainees.

Program Deliverables

To meet the Program Aims, the program provides two-year training to selected individuals with demonstrable proficiency in general clinical medicine, to enable their development into leaders in OEM. This training includes:

- A robust didactic and clinical program in the core areas of public health, including epidemiology, biostatistics, healthcare administration, and environmental health, and the specialty areas of clinical OM, toxicology and ergonomics, and their application to the identification and solution of health problems in workers.
- Progressively graded experience in the diagnosis and care of individuals with occupational or environmental exposures and in the assessment of capacity for workplace employment.
- Training in research methods and the skills needed to critically interpret and apply research findings to practice.
- Training in toxicology, environmental monitoring, ergonomics, and safety evaluation.
- Training in administration and policy aspects of OM, encompassing payment models, compensation systems, regulation of the workplace, health care /workplace law, and corporate management of health, safety and environment

Measures of effectiveness comprise continuous assessment of programmatic operation, as well as prescribed measures of outcomes, including passing rates on the ABPM certifying exam and ongoing accreditation of the residency.

- The program has maintained full accreditation by the ACGME with no citations or areas of concern throughout this grant cycle
- All trainees (seven) supported during this grant cycle have taken and passed the board examination in occupational medicine, giving the program a five-year passing rate of 100%

Occupational Medicine Residency Program – Rutgers – Progress Report

Since our founding in the 1980s, the Program has graduated 61 practitioners, many of whom currently hold leadership positions in the field of occupational and environmental medicine. These graduates have fulfilled the mission of the residency Program and are a source of great pride.

Most of our graduates are currently engaged in the practice of occupational medicine. Tracking of graduates indicates that roughly half of all graduates work in the New Jersey, New York and Pennsylvania areas. Roughly 70% of the program's graduates are or have been board-certified in Occupational Medicine.

The table below identifies the employment location and type of position each recent resident obtained after they graduated from the Program.

Graduate	Year of graduation	Employer	Position
Yvonne Farnacio	2016	Hackensack Meridian Occupational Health (NJ)	Staff Physician
Aisha Chaudhry	2017	Kaiser Permanente (CA)	Staff Physician
Boris Kholdarov	2017	Con Ed (NY; through 2020)	Current position status unknown
Jessica Staller	2018	Concentra (NJ initially; now FL)	Center Medical Director
Sean Maloney	2019	Otsuka Pharmaceutical (NJ/US)	Director of Occupational Health & Safety
Manupreet Chawla	2019	RWJUH Occupational Medicine	Medical Director
Andrew Karasick	2020	FDA Center for Food Safety and Applied Nutrition, Office of Analytics, Division of Public Health Informatics and Analytics, Epidemiology Branch (MD)	Medical Officer/Medical Epidemiologist
Kimberly Arrington	2020	Princeton University Occupational Health Services	Staff Physician
Marygrace Hajec	2021	Concentra (NJ)	Staff Physician
Jennifer Bagley	2021	RWJBarnabas Health Corporate Care, Clara Maas	Medical Director

Select resident research projects:

Graduate	Title of Research Project or Topic
Yvonne Farnacio	Farnacio Y, Pratt ME, Marshall EG, Graber JM. Are Workplace Psychosocial Factors Associated With Work-Related Injury in the US Workforce?: National Health Interview Survey, 2010. *J Occup Environ Med*. 2017;59(10):e164-e171. doi:10.1097/JOM.0000000000001143
Sean Maloney	Maloney SR, Udasin IG, Black TM, Shah NN, Steinberg MB, Pratt ME, Graber JM. Perceived Health Risks Among Firefighters; The New Jersey Firefighter Health

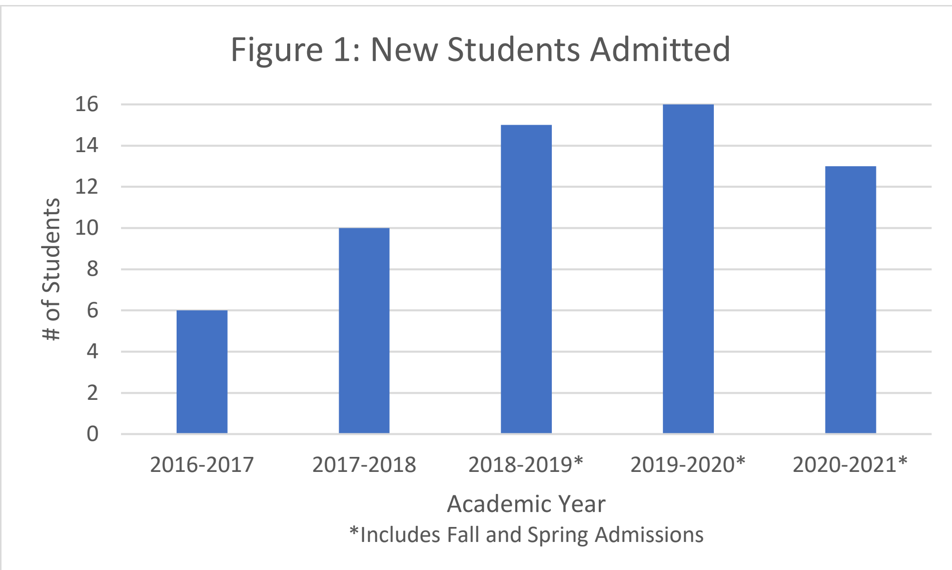
	Survey. J Occup Environ Med. 2021 Apr 1;63(4):317-321. doi: 10.1097/JOM.0000000000002125. PMID: 33769397.
Andrew Karasick	Karasick AS, Udasin IG, Gusmano MK, Dasaro CR, Graber JM. An Assessment of Healthcare Access and Utilization in the World Trade Center Health Program. J Occup Environ Med. 2021 Feb 1;63(2):166-171. doi: 10.1097/JOM.0000000000002110. PMID: 33323873.
Andrew Karasick	Karasick AS, Thomas RJ, Cannon DL, et al. *Notes from the Field:* Amphetamine Use Among Workers with Severe Hyperthermia — Eight States, 2010–2019. MMWR Morb Mortal Wkly Rep 2020;69:1004–1005. DOI: http://dx.doi.org/10.15585/mmwr.mm6930a5external icon.
Kimberly Arrington	Occupational contact dermatitis as related to worker facemask and respirator usage
Marygrace Hajec	COVID-19 in the Meat and Poultry Processing Industry (capstone based on work for OSHA rotation in Washington, DC.)

100% ACGME Board Pass Rate: Over the preceding three years (2018-2020) six residents took the occupational medicine boards for the first time and passed. This includes a resident trained earlier than that period.

Industrial Hygiene Program – Progress Report

Program Growth and Commitment to Diversity

During the past five-year grant period there were 94 applicants, resulting 60 students matriculating into the MS-EOHS program. Twenty-seven (45%) of the 60 matriculated students were from underrepresented racial and ethnic groups and twenty-six (43%) were female. The number of EOHS-MS students fluctuates year-to-year with a typical program enrollment of between 30 to 40 students. During the 2020-2021 academic year, there were 43 students enrolled in the program, 27 of whom are NIOSH Trainees. The industrial hygiene program is on an upward trajectory in terms of enrollment numbers since the 2016-2017 admission cycle (Figure 1). The increased enrollment is likely attributed to the addition of Spring semester admissions, greater financial assistance from external organizations, and more online course offerings. There was a small decline in 2020-2021 matriculates which is likely due to the ongoing pandemic. The growth in the program allows required courses to be offered on a more frequent basis. For example, Principles of Industrial Hygiene is now offered twice in the academic year (Fall and Summer).



New Program Faculty

As a result of the 2016 consolidation of the CUNY SPH along with several retirements within the department, the industrial hygiene faculty has changed since the last renewal. The new faculty additions bring a breadth of scholarly publications and commitment to occupational health and industrial hygiene research.

- Drs. C. Mary Schooling and Jean Grassman both joined the department in 2016. Dr. Schooling is chair of the department, an environmental epidemiologist, and Full Professor with more than 275 peer-reviewed publications. Dr. Grassman is an industrial hygienist and Associate Professor with over twenty-five years of experience and a member of the ACGIH Biological Exposure Indices (BEI) Committee. Additionally, she practices industrial hygiene on behalf of the members of her union and advocates for workplace justice as a member of the NYCOSH Board of Directors.
- Dr. Ilias Kavouras is an environmental chemist who has been working in environmental and occupational exposure and health sciences since 1998 and joined the CUNY SPH faculty in 2018 as tenured Full Professor. His research aims to understand the interplay between air

pollution and human health through the development and application of novel exposure characterization, chemical analysis and geospatial models. He had published more than seventy peer-review publications that are extensively cited in the scientific literature and NAAQS federal regulation. He is on the editorial board of Heliyon and a review panel member for NIEHS, NSF, EPA and NOAA.

- Dr. Suzanne McDermott was hired in the Fall of 2020 to strengthen the environmental and occupational epidemiology curriculum and research within the department. Dr. McDermott teaches epidemiology methods, she has over 130 peer reviewed publications, and she is the Co-Principal Investigator on three active grants that are funded by the Centers for Disease Control and Prevention (CDC).

Program Deliverables

In addition to revising the program's curriculum, faculty have been in the process of changing the instructional modality of the courses. The program has begun to offer core industrial hygiene courses and electives fully online or in a hybrid format. Since many of our students are working full-time, this allows them to progress through the program in a timely manner while maintaining employment. Offering high quality online courses is especially important during the SARS-CoV-2 pandemic. Assessment data shows students achieving better learning outcomes through the flexibility of this format. In addition to improved learning outcomes, enrollment numbers in core industrial hygiene courses have also improved, which allows for courses to be offered more frequently and maintains viability of the program. Table 1 shows the enrollment numbers for three industrial hygiene core courses across the two different instructional delivery options. The data shows a large increase in enrollment in courses offered online compared to in person with an average increase of 13 students per course.

Table 1: Industrial Hygiene Core Courses Enrollment by Method of Delivery

Course	Delivery	Offered	Course enrollment
Environmental and Occupational Toxicology	Online	Spring 2021	37
	Online	Spring 2020	58
	In-person	Spring 2019	33
Principles of Industrial Hygiene	Online	Fall 2020	28
	Online	Fall 2019	24
	In-person	Spring 2019	20
Industrial Ventilation and Indoor Air Quality	Online	Spring 2021	33
	Online	Spring 2020	37
	In-person	Spring 2019	17

Although class size has been increasing steadily over the last three years the student course evaluations (Table 2) have remained relatively unchanged. In both the Fall 2018 and Spring 2019 semester students rated online course better than in person for both the instructor and overall course evaluation. Overall, the online courses and faculty instruction were rated between excellent and very good.

Table 2: Course Evaluations by Instructional Modality

Questions	Fall 2018				Spring 2019			
	In-person		Online		In-person		Online	
	n	Mean	n	Mean	n	Mean	n	Mean
My overall evaluation of this instructor is*	80	1.81	68	1.62	89	1.78	61	1.62
My overall evaluation of this course is*	80	2.0	68	1.62	89	1.96	61	1.72
I would recommend this course to my peers**	79	1.76	68	1.49	89	1.84	61	1.62

*(1 = Excellent; 2 = Very good; 3 = Good; 4= Fair; 5 = Poor)
**(1 = Strongly agree; 2 = Agree; 3 = Neither agree nor disagree; 4 = Disagree; 5 = Strongly disagree)

Industrial hygiene trainees regularly engage with their occupational health counterparts through the NY/NJ interdisciplinary courses and events. Table 3 shows the number of CUNY SPH students that have participated in the historical perspectives tour as well as a three-credit occupational site assessment course (EOHS 646) taught by ERC faculty in the Spring semester and a one credit ERC research seminar in the Fall.

Table 3: Enrollment by ERC Activities

Academic Year	Historical Perspectives Tour	EOHS 646	ERC Seminar
2020-21	*	3	1
2019-20	*	6	1
2018-19	7	7	3
2017-18	3	5	0
2016-17	5	9	3

* Cancelled due to COVID

Occupational Safety and Health Engineering Progress Report

The Occupational Safety and Health Engineering (OSHE) Program at the New Jersey Institute of Technology (NJIT) leads to a Master of Science degree in OSHE. The objective of this program is to train engineers and safety professionals in the specialty of occupational safety and health engineering. This field involves the application of engineering principles to the design and maintenance of workplaces to minimize, or better yet eliminate, the spectrum of hazards that may arise in connection with job performance. It covers virtually all of the general areas that a safety professional might encounter. The program has a practical orientation and it aims to train students so that, upon graduation, they are able to assume both the technical and managerial responsibilities borne by safety professionals. NJIT's graduate program in OSHE was established in 1988 and forms an integral part of the NIOSH Region II ERC (the NYNJERC). With NIOSH partnership it has graduated 110 students from this program.

Enrollments and Program Graduates: Over the reporting period enrollment of OSHE students ranged from 5 to 12 students, with average enrollment of 9 in fall and spring semesters. We graduated 19 students, averaging 4 graduates per year (see Supplemental NIOSH Table 1 for more information). Eleven NIOSH-supported students graduated and they were mentored by Dr. Sengupta.

Placement details of our MS graduates include*:*

- 16 (84%) took private sector jobs with significant safety responsibility.
- 8 (42%) of the graduates from this reporting period currently hold Safety Manager or higher position.
- 9 (47%) graduates work as OSH specialist, HSE Coordinators, EHS Specialist, Risk Control Consultant, SHE supervisor, and, Quality and Compliance Supervisor
- 1 (5%) took state government job at Rutgers University as Principal Industrial Hygienist.
- 2 (11%) graduated in December 2019 and working in a non-safety related job, seeking safety jobs.
- 1 (5%) placement information in unknown.

Out of 19 graduates, only 11 (58%) received NIOSH support. The remaining 8 (42%) graduates relied on other financial resources (e.g. fellowships, employer support, and/or personal funds)

Trainee Honors: Over the project period, three international students received full scholarships from their home countries to study MS OSHE. Zuleyha Aydin and Ugur Oztas, came with BS in Industrial Engineering and received Turkish Government scholarship. Khaled Abdulhaimed came with a Safety Management BS degree and received Saudi Government Scholarship. Upon graduation they returned to their home county and working with significant safety responsibility. Zuleyha and Ugur work as OSH Specialist, and Khaled works as SSHE Supervisor.

Progress and Accomplishments of Program Graduates Supported with NIOSH Funds

1. **Evanda Henry** enrolled into the program in January 2013 after receiving her BS degree from NJIT and MS degree from New York University, NY, in Biomedical Engineering. She was awarded with a Pilot Project grant from the ERC on the topic "Estimation of Low Back Loading in Bedside Care: the Importance of Bed Positioning to Patient Handling Task". Her research was presented in the ERC's Annual Meeting at Mt. Sinai Medical School, NY, NY. She was supported by NIOSH for 4 semesters. Then she accepted a full time employment as a Risk Control Analyst at Travelers Insurance and continued as a part time student. She completed her MS thesis on "Analysis of muscle

activity and comfort in stylus grips" (see citation in the section A4), which was presented at the Poster presentation in the Safety 2014 Professional Development Conference, June 8-11, 2014 in Orlando, FL, and published in the conference proceeding of The XXVIth Annual Occupational Ergonomics and Safety Conference El Paso, TX, USA June 5-6, 2014: International Society of Occupational Ergonomics and Safety. She graduated in December 2016. Currently she is working as a Site EHS Manager at Amazon. She is Certified as Associate Ergonomist.

2. **Sofia Akhter** enrolled into the program in January 2015 after receiving her BS degree in Public Health from Long Island University, Long Island, NY. She was supported by NIOSH for three semesters out of five semesters she studied. She accepted employment at Amazon distribution center and completed her last two semesters as a part time student. Her research topic, "Health effects for prolonged standing – review" (see citation in section A.4). She graduated in August 2018 and currently she is the Global EHS Program Manager at Amazon and holds certification/license as ISO 45001 Lead Auditor and ASP.
3. **Matthew Miguel** enrolled into the program in January 2015 after receiving her BS degree in Chemical Engineering from NJIT. He was supported for three semesters by NIOSH, then he became a part time student and completed his MS degree in August 2017. He did an independent research on "Review of touchscreen use and sit stand workstations" (see citation in section A. 4). His employment history is unknown.
4. **Stephanie Rolon** enrolled into the program in January 2015 after receiving her BA degree in Liberal Arts from Rider University in 2010. Prior to the admission into the OSHE program, she was working as a full time safety professional at Hazteck, a safety management company. She was supported by NIOSH for the duration of her Master's Program. Her masters project was focused on safety climate and culture and workers performance. After graduation in August 2017, she accepted an employment in Consolidated Edison, a power generation company as a safety specialist. Currently she is working as EHS Manger at Skanska Building, a multinational construction and development company.
5. **Anthony Krake** enrolled into the program in September 2015 after receiving her BS degree in Mechanical Engineering from NJIT. Before enrolling into OSHE he was working as a Safety and Quality Coordinator in a Painting and Sandblasting Company. He was supported by NIOSH for the duration of his Master's Program. His Master's Project was on "Thumb muscle fatigue modeling – review and analysis", which was inspired from a safety design defect of dead man's switch in his previous employment. Upon graduation in May 2017 he accepted employment as a Safety Manager in a construction company, and currently he works as Vice President of Operations at ConstructSecure Inc..
6. **Danielle Mengistab** enrolled into the program in September 2016 after receiving her BS degree in Public Health from Rutgers University, NJ. She was supported by NIOSH for the duration of her Master's Program. Her MS thesis was on "Sit-stand computer workstation – Review". After graduation in May 2019, she accepted a full time employment as a Risk Control Consultant at Travelers Insurance Company.
7. **Alexis Frees** enrolled into the program in September 2017 after receiving her BS degree in Environmental Policy from Rutgers University, NJ. She was supported by NIOSH for the duration of her Master's Program. She defended her MS thesis on Auditory and non-auditory effects from noise in dentistry and graduated in December 2019. She is currently employed as an EH&S Manager at L'Oréal.
8. **Nicole Wondrack** enrolled into the program in September 2017 after receiving her BS degree in Biology from William Paterson University. She was supported by NIOSH for the duration of her Master's Program. She completed Independent Research on Patient

Handling Risk Assessment, and graduated December 2019. Currently she works as an Environmental Health Safety Specialist at Crane Aerospace & Electronics

9. **Adeleye Aderanti** enrolled into the program in September 2017 after receiving her BS degree in Biochemistry from Ladoke Akintola University. Prior to this program, he worked as a Shift quality and Safety Auditor in Kimberly-Clark, and as Document Control and Food Safety Specialist. He was supported by NIOSH for the duration of his Master's Program. His MS Project was focused on Prolonged standing vs. Sit-stand Workstation. Upon graduation in December 2018, he accepted employment at Refresco, and serves as Plant Safe Quality Foods (SQF) Practitioner.
10. **Daena Charles** enrolled into the program in January 2017 with BS with Geology major and Environmental Science minor. Her thesis was Cold Storage Work and Cold Protective Gloves – A Review. She was supported by NIOSH for the duration of his Master's Program. She is now working as Health Safety Environmental Lead, at JLL for Honeywell.
11. **Akif Hussain** started the program in January 2019 and came with a BS Chemical Engineering from NJIT. His research was on Forklift Truck Seat. He was supported by NIOSH scholarship. He works as the Site Safety/Environmental Engineer at TRC Company.

Consistent with OSHE program goals, the measures of effectiveness were in identified. Six main areas are monitored: (1) Enrollment, (2) Percentage of trainees with BS engineering/Public Health/Safety/Env. Sc degree, (3) Years to graduate, (4) Employment after graduation, and (5) Publications by core faculty and trainees. The table 1 evaluates the program effectiveness for the past project period.

Enrollment over the reporting period over the last 5 years averaged at 9.6. For the first three years of the reporting period, the average enrolment was 12, but during 2019-20 enrolment fell to its lowest level to 8. The down turn of graduate enrolment was noticed in majority of graduate programs at NJIT from AY 2017, attributed to immigration and visa policies of the current administration. Due to increased visibility and recruitment effort of NJIT, we have received 20 applications and admitted 4 students in the program for fall 2020. We hope that we would be able to maintain a high enrollment standard.

The OSHE program is designed to train degreed engineers and safety professionals in the field of safety engineering. During the project period 52% student came with BS in engineering degree and 26% were working Safety Professionals with environmental science, safety science, public health, and health science. This objective measure was satisfactorily maintained.

12 full time students who were accepted into the program, completed the program and received the MS OSHE degree within 1.3 to 2.7 years, with an average time of 2.23 year. This was close to the targeted value of 2 years, especially with 36 credit hours and thesis or project requirement of many students. Two students (Evanda and Sofia) took 4 and 3.7 years respectively, from break in the middle of the program due to personal reasons. These two are excluded from the count .

Table 1. Objective measures of effectiveness and outcomes of the program reporting period 7/1/2016 to 6/30/2021

Measures of effectiveness	Minimum	Target	2016-20	Intervention
Average enrollment	12	20	9.6	Increases visibility in local industry, continue trainee recruiting events.

% students with BS Eng., Safety Science, Env. Sc and Public health degree (See Appendix # 1)	60%	70%	78%	Exceeded target
Average years to graduate for Full time student (See Annual Enrollment Table in OSHE Appendix # 1)	3	2	2.4	Satisfactory
% of graduates secure employment in OSHE related field within 6 months of graduation (See Trainee Detail Table in OSHE Appendix # 1)	70%	85%	81%	Satisfactory
Annual scholarly output of Presentations/seminars Research Papers/reports (see section A 4)	2 1	5 2	2 3.8	Satisfactory

Similar to our previous grant period this program enjoyed a very high placement rate during the reporting period. 16 out of 19 (84%) of the program graduates have either been able to secure employment or have advanced in their OSH professional careers. One program graduate, Matthew, did not report his placement information. The other two graduates, Kasem and Nicole are working in a non-safety profession.

Overall, MS OSHE program maintains its effectiveness at a high level, and we are pleased that with the help of NIOSH fund, the program completed it 32 years of existence successfully.

A. 4 Program Deliverables

Refereed Publications

1. Sengupta, A. K. and Jiang, X., Analysis of internal torso loading in asymmetric and dynamic lifting tasks, Occupational Ergonomics, v13, number 3,4, 2016, 139-146.
2. Aydin, Z., “Shiftwork effects on alertness, sleep and health of police personnel under non-rotating shifts”, presented and abstract published at the 15th Annual Regional National Occupational Research Agenda (NORA) Young/New Investigators Symposium, held at the University of Utah’s Rocky Mountain Center for Occupational and Environmental Health (RMCOEH) and Department of Mechanical Engineering Department, Salt Lake City, Utah, USA, on April 20-21, 2017.
3. Sengupta, A., Aydin, Z., Lieber, S. C. (2018). In S. Bagnara et al. (Ed.), Differential Effects of 8 and 12 Hour Non-rotating Shifts on Alertness, Sleep and Health of Public Safety Workers (vol. II, pp. 522–531). IEA 2018 Conference proceedigs, Springer. https://doi.org/10.1007/978-3-319-96089-0_56
4. Sengupta, A. K and Ahmed, G., Surface EMG analysis of posture and muscle load for medical sonography tasks - a pilot study, In the proceedings of 50th Annual Conference of the Association of Canadian Ergonomists (ACE), St. John’s, Newfoundland and Labrador, August 12th to the 15th, 2019.
5. Sengupta A.K., Oztas U., Krake A. (2021) Development of Thumb Endurance Curves Applicable for Deadman Switches in Sandblasting Machines. In: Black N.L., Neumann W.P., Noy I. (eds) Proceedings of the 21st Congress of the International Ergonomics

Association IEA 2021. pp. 190–195, 2021. Lecture Notes in Networks and Systems, vol 222. Springer, Cham. https://doi.org/10.1007/978-3-030-74611-7_26

Masters Theses, Project and Independent Research Report

1. Evanda Henry, Get a grip: analysis of muscle activity and perceived comfort in using stylus grips, MS Thesis, New Jersey Institute of Technology, December, 2016
2. Zuleyha Aydin, “Effects of 8 and 12 hour non-rotating shift schedules for security and protective services workers”, MS Thesis, New Jersey Institute of Technology, December 2017.Danielle
3. Mengistab, “Sit-stand computer workstation – Review”, MS Thesis, New Jersey Institute of Technology, May 2019.
4. Ugur Oztas, “Thumb fatigue modelling for static muscular work”, MS Thesis, New Jersey Institute of Technology, August 2019.
5. Alexis Frees, “Auditory and non-auditory effects from noise in dentistry”, MS Thesis, New Jersey Institute of Technology, December 2019.
6. Khaled Abuhaimed, “Repetitive Strain Injuries: An overview and an investigation”, MS Project Report, May 2017.
7. Miguel, Matthew, “Review of touchscreen use and sit stand workstations”, Independent Research Report, New Jersey Institute of Technology, August 2017.
8. Stephanie Rolon, “Safety climate and culture and workers performance”, MS Project Report, New Jersey Institute of Technology, August 2017.
9. Anthony Krake, “Thumb muscle fatigue modeling – review and analysis”, MS Project Report, May 2018.
10. Sofia Akhter, “Health effects for prolonged standing – review”, MS Project Report, New Jersey Institute of Technology, August 2018.
11. Adeleye Aderanti, “Prolonged standing vs. Sit-stand Workstation”, MS Project Report, New Jersey Institute of Technology, December 2018.
12. Nicole Wondrack, “Patient Handling Risk Assessment – Review”, Independent Research Report, New Jersey Institute of Technology, December 2019.
13. Daena Charles, “Cold Storage Work and Cold Protective Gloves – A Review”, MS Thesis, New Jersey Institute of Technology, December 2020.
14. Akif Hussain, “Evaluation of Forklift truck seat”, Independent Research Report, April 2021.

Formal Presentations

1. Evanda Henry, Get a grip: analysis of muscle activity and perceived comfort in using stylus grips, MS Thesis defense, New Jersey Institute of Technology, December, 2016
2. Aydin, Z., “Shiftwork effects on alertness, sleep and health of police personnel under non-rotating shifts”, presented at the 15th Annual Regional National Occupational Research Agenda (NORA) Young/New Investigators Symposium, held at the University of Utah, Salt Lake City, Utah, USA, on April 20-21, 2017.

3. Zuleyha Aydin, “Effects of 8 and 12 hour non-rotating shift schedules for security and protective services workers”, MS Thesis defense, New Jersey Institute of Technology, December 2017.
4. Aydin Z., Differential Effects of 8 and 12 Hour Non-rotating Shifts on Alertness, Sleep and Health of Public Safety Workers. 20th Congress of the International Ergonomics Association, Florance, Italy.
5. Sengupta, A., Surface EMG analysis of posture and muscle load for medical sonography tasks - a pilot study, In the 50th Annual Conference of the Association of Canadian Ergonomists (ACE), St. John’s, Newfoundland and Labrador, August 12th to the 15th, 2019.
6. Danielle Mengistab, “Sit-stand computer workstation – Review”, MS Thesis defense, New Jersey Institute of Technology, May 2019.
7. Ugur Oztas, “Thumb fatigue modelling for static muscular work”, MS Thesis defense, New Jersey Institute of Technology, August 2019.
8. Alexis Frees, “Auditory and non-auditory effects from noise in dentistry”, MS Thesis defense, New Jersey Institute of Technology, December 2019.
9. Daena Charles, “Cold Storage Work and Cold Protective Gloves – A Review”, MS Thesis Defense, New Jersey Institute of Technology, December 2020.
10. Sengupta, A.K, Development of Thumb Endurance Curves Applicable for Deadman Switches in Sandblasting Machines, In 21st Triennial Congress of the International Ergonomics Association, Vancouver, Canada, June 17, 2021

5-year Progress report (as of 6/2021)

OEHN PhD/DNP Curriculum

We developed the OEHN courses and received approval by the NYU Meyers Curriculum Committee, Faculty Council, and the New York State Education Department (NYSED). The Occupational and Environmental Health Nursing (NURSE-GN 3366) and Health Policy (NURSE-GN 3814) courses were held in Spring 2017, Fall 2017, Fall 2018, Fall 2019 and Fall 2020; all trainees have completed these courses. DNP trainees completed 400 hours in OEHN focused clinical experiences at NY/NJ ERC affiliated sites.

Interdisciplinary Training

Trainees participated in interdisciplinary training opportunities including the Industrial Site Visit course, NIOSH ERC Interdisciplinary Seminar, annual Historical Perspectives on Occupational Safety and Health tour; and the Annual NY/NJ ERC scientific meeting. (For example, Ridge, LJ, Niles, PM, Irby, S**.** The OEHN Doctoral Program at NYU Meyers College of Nursing: An Overview (poster presentation) (2018) 39th Annual NY/NJ ERC Scientific Meeting)

2018 Historical tour: PhD trainee Waterfront Fishing Safety Portland, ME

NYU Meyers hosted an OEHN seminar series with invited speakers:

- Dr. Jack Caravanos, Clinical Professor, NYU College of Global Public Health, "The Global Burden of Environmental Disease"
- Dr. Cassandra Thiel, Assistant Professor, NYU School of Medicine, Department of Population Health, NYU Wagner Graduate School of Public Service and NYU Tandon School of Engineering; "Nursing & the Planet: Environmental Sustainability in Healthcare Services"
- Dr. Barbara Sattler, RN, DrPH, FAAN, Professor, Public Health Program, University of San Francisco "Is Your Shampoo Making You Sick and Other Important Environmental Health Questions"

In addition, PhD/DNP trainees participated in the MSSM Occupational Medicine clinical grand rounds (examples in table 1) and NIOSH/NIEH webinars. Examples of recent webinars include: Occupational Exposure and Ventilation Assessment in New York City Nail Salons; Minimizing Workplace Exposures through Design and Engineering Controls; Ethical Issues around Contact Tracing/Testing in the Workplace.

Table 1: Clinical Rounds Occupational Medicine	Date
Health Equity and Biosocial Approach to Occupational Safety and Heatlh	June 4, 2021
Overview of Industrial Hygiene	February 21, 2021
Infection Prevention- An Overview of COVID 19 and Outpatient Medicine	October 30, 2020
Occupational COVID-19	May 29, 2020
Psychosocial Dimensions of Infections Outbreaks	April 17, 2020
The Role of OEM in Corporate Social Responsibility	February 20, 2020
Occupational to Disinfectants and Asthma Control in US Nurses	February 9, 2019
Determinants of Medical Provider Referrals to Occupational Health Clinics: a Behavioral Change Communications Approach	October 5, 2018
Functional Capacity Evaluations	March 9, 2018
Risk Factors for Adverse Respiratory Outcomes in World Trade Center Firefighters	March 23, 2018

Trainees (2016-2021)

We have successfully enrolled a diverse group of OEHN trainees: 9 PhD trainees (8 FT, 1 PT) and 6 DNP trainees; our total enrollment is 15 (36% Black; 14% Hispanic). To date, 5 PhD and 4 DNP trainees have graduated. One DNP student left the NYU Meyers program due to medical reasons.

Below is a summary of our graduate dissertation and capstone topics (Table 2 shows current trainee topics):

Melissa Ojemeni, PhD, RN (2018) Dr. Ojemeni conducted a comparative case study of policy initiatives pertinent to nurse migration in the United States and the United Kingdom between 2004 and 2014.

Jin Jun, PhD, RN (2018) Dr. Jun analyzed the relationship of nursing unit culture and use of evidence-based practice among nurses in hospitals. Findings suggested that workplace unit

culture can be used to create interventions to promote a work environment that enhances the professional well-being of nurses.
Paulomi Niles, PhD, MPH, CNM (2019) Dr. Niles used Karasek's Job Demand and Control model to examine the factors that contribute to worker's professional well-being, with a focus on midwives working in NYC's public healthcare system.
Laura Jean Ridge, PhD, ANP-BC (2020) Dr. Ridge, funded by a Medique AAOHN grant, examined the relationship of task shifting among healthcare workers in Liberia and occupational health risks.
Lauren Ghazal, PhD, RN (2021) Dr. Ghazal, funded by an ERC pilot project award studied work ability among working young adult cancer survivors.
Shani Irby, DNP, RN (2018) Dr. Irby used educational outreach visits to improve the uptake of a Multiple Myeloma Treatment Template in an outpatient oncology setting treating occupational related cancer.
Yvelande Couamin, DNP, FNP-BC (2021) developed a web-based ergonomics education program to increase awareness of upper body mechanics among dental practitioners.
Ganesh Ram, DNP, AGCNP-BC, (2021) developed a web-based ergonomics education program to increase awareness of upper body mechanics among dental practitioners.
Le-Jeune Sealey-Horsford DNP, FNP-BC NP-C RNC-MNN developed a quality improvement intervention to improve preventative screening for World Trade Center responders through a structured communication guide.

Table 2

Current PhD trainee dissertation topics	Current DNP trainee capstone topics
• Return to work after breast cancer diagnosis • Work life balance and job stress among working caregivers to persons with Parkinson's Disease • Work life balance among new mothers • Nursing workforce Burnout	• Telehealth occupational exposure assessment

***External Advisory Board (EAB*)**
Our External Advisory Board chaired by Monica Fernandes, RN, COHN-S, with members Mary Doyle, MPH, RN, COHN-S/CM, Yolanda C**.** Lang, DrPH, MSN, CRNP, COHN, FAAOHN, Karlene Lavelle, PhD, MPA, RN, Steven Marks, DNP, RN, APN-C, COHN-S, FAAOHN and Kim Olszewski DNP, CRNP, COHN-S/CM, FAAOHN have met annually (4 times to date: December 2017, August 2018, May 2019, June 2020).

Internal Advisory Board (IAB)
We are also supported by an IAB (current IAB members are: Dr. Gail D'Eramo Melkus, Professor and Vice Dean for Nursing Research, Dr Sean Clarke, Executive Vice Dean, Dr. Allison Squires, PhD Program Director, Dr. Mary Jo Vetter, DNP Program Director and Dr. Kimberly Glassman, Clinical Professor and Senior Associate Dean of Academic Affairs), which meets biannually; as well as the monthly PhD and DNP workgroups.

Evaluation
As described in this report, the OEHN PhD/DNP training goals for this program period were met:
1) Total enrollment 15 trainees (8 PhD, 1 BS to PhD and 6 DNP); trainee diversity (36% Black; 14% Hispanic).
2) 9 graduates (5 PhD and 4 DNP); all successfully completed coursework and OEHN-focused dissertation research or capstone projects.100% of PhDs in academic positions; DNP in clinical faculty or practice roles in NYC
3) Training progression on target
4) 100% trainees attended formal interdisciplinary courses and activities.

OEHN Program Evaluation: Excellent scores for OEHN course content (mean 4.5) and instructors (mean 4.5).
OEHN Program Graduate survey: 100% rated support by NYU Meyers T42 and the ERC faculty as very or extremely good. Trainees most strongly agreed with statements focused on their understanding of vulnerable working populations, their use of these skills in their current roles, and the positive impact the program will have on achieving their academic and professional goals in a timely manner.

Program Deliverables
Trainee Publications and Presentations:
Our trainees have 29 publications (13 as first author; 6 in review); and 28 presentations. Listed below are 10 selected papers and 10 selected presentations (a full list is found in the appendix).

1. **Ojemeni** MT, **Niles P**, Mfaume S, Kapologwe NA, Deng L, Stafford R, Voeten MJ, Theonestina K, Budin W, Chhun N, Squires A. (2017). A case study on building capacity to improve clinical mentoring and maternal child health in rural Tanzania: the path to implementation. *BMC Nurs*. 16:57. doi: 10.1186/s12912-017-0252-0. PMID: 28959139
2. **Niles, P., Ojemeni, M.T**., Kibwana, M., Deng.L., Voten, M.J., Kaplogwe, N., Stafford, R., Theonestina, S., Budin, W., Chhun, N.& Squires. (2017). Mentoring to build nursing and midwifery capacity in Sub-Saharan Africa: An integrative review. *International Journal of Africa.* doi 10.1016/j.ijans.2017.10.002
3. Landgren O, Zeig-Owens R, Giricz O, Goldfarb D, Murata K, Thoren K, Ramanathan L, Hultcrantz M, Dogan A, Nwankwo G, Steidl U, Pradhan K, Hall CB, Cohen HW, Jaber N, Schwartz T, Crowley L, Crane M, **Irby S,** Webber MP, Verma A, Prezant DJ.(2018) Multiple Myeloma and Its Precursor Disease Among Firefighters Exposed to the World Trade Center Disaster. *JAMA Oncol*. 4(6):821-827. doi: 10.1001/jamaoncol.2018.0509. PMID: 2971019.
4. **Melnyk H**, Rosenfeld P, Glassman KS. (2018) Participating in a Multisite Study Exploring Operational Failures Encountered by Frontline Nurses: Lessons Learned. *J Nurs Adm*. 2018 Apr;48(4):203-208. doi: 10.1097/NNA.0000000000000600. PMID: 29470383
5. **Ojemeni MT**, Karanja V, Cadet G, Charles A, Dushimimana E, McMahon C, Abbasi S, Davis S. (2019) Fostering nursing leadership: An important key to achieving sustainable development goals and universal health care. *Int J Nurs Stud*. 2019 Dec;100:103421. doi: 10.1016/j.ijnurstu.2019.103421. PMID: 31630806
6. **Ridge, L.J.,** Dickson, V. V., Stimpfel, A.W. (2019) The Occupational Health of Nurses in the Economic Community of West African States: A Review of the Literature. *Workplace Health & Safety*. DOI: 10.1177/2165079919859383
7. **Jun J,** Kovner CT, Dickson VV, Stimpfel AW, Rosenfeld P. (2020) Does unit culture matter? The association between unit culture and the use of evidence-based practice among hospital nurses. Appl Nurs Res. 53:151251. doi: 10.1016/j.apnr.2020.151251. PMID: 32451012.
8. **Jun J**, Costa DK (2020) Is It Me or You? A Team Approach to Mitigate Burnout in Critical Care. *Crit Care Nurs Clin North Am*. 32(3):395-406. doi: 10.1016/j.cnc.2020.05.003. PMID: 32773181
9. **Jun J**, Tucker S, Melnyk BM (2020) Clinician Mental Health and Well-Being During Global Healthcare Crises: Evidence Learned From Prior Epidemics for COVID-19 Pandemic. *Worldviews Evid Based Nurs*. 2020 17(3):182-184. doi: 10.1111/wvn.12439. PMID: 32246793

10. **Ghazal LV**, Ma C, Djukic M, Squires A. (2020) Transition-to-U.S. Practice Experiences of Internationally Educated Nurses: An Integrative Review *West J Nurs Res*. 42(5):373-392. doi: 10.1177/0193945919860855. PMID: 31271112
11. **Melnyk, H**., Djukic, M., Merriman, J., & Vaughan Dickson, V. (2021). An integrative review: Women's psychosocial vulnerability in relation to paid work after a breast cancer diagnosis. *Journal of advanced nursing*, *77*(5), 2144–2154.

Selected Presentations (10 of 28 total)

1. **Jun, J**., Mindfulness Practices Used With Nurses in Work Settings: Integrative Review. Paper presentation at Work, Stress, and Health 2017, June 7-10th, 2017.
2. **Irby, S (2019)** The Development of a Multiple Myeloma Treatment Template for World Trade Center Health Program General Responders with Multiple Myeloma Being Treated in an Outpatient Setting ENRS 31st Annual Scientific Sessions, Providence RI
3. **Jun, J**, Kalamdani, R., Tong, J., Crecelius, M., & **Ojemeni, M.M**. (2019,). Nurse burnout and its effects on patient and organizational outcomes: a systematic review. Podium presentation. National Clinician Scholars Program Annual Meeting.
4. **Jun, J**, He, L., & Rosemberg, M-A. (2019,). Stress levels among employees at a major academic institution. Podium presentation. APA Work, Stress, and Health Conference.7.
5. **Jun, J** Rosemberg, M-.A., Jones, L. (2019). Employee Health and Blood Pressure Outcomes by Job Family. Poster presentation. Academy Health Annual Research Meeting.
6. **Ridge, L.J.** The Occupational Health of Nurses in Liberia. (2020) American Association of Occupational Health Nurses' 2020 Conference. American Association of Occupational Health Nurses. San Antonio, TX, April 2020 (virtual due to COVID-19).
7. **Melnyk, H**. (2020) Disparities in Maintaining Employment in Women with Breast Cancer: An Integrative Review. ENRS 32nd Annual Scientific Conference (virtual due to COVID-19).
8. **Melnyk, H**. (2020) Women's Perceptions of Psychological and Social Vulnerability in Relation to Paid Work after a Breast Cancer Diagnosis: An Integrative Review. ENRS 32nd Annual Scientific Conference (virtual due to COVID-19).
9. **Ghazal, L**., Gormley, M., Merriman, J. & Santacroce, S. (2020). Financial Toxicity in Adolescent and Young Adult Cancer Survivors: A Concept Analysis. Paper presentation presented at the Eastern Nursing Research Society (ENRS) 32nd Annual Scientific Conference (virtual due to COVID-19).
10. **Helmers, N** & Dickson, VV (2020) Barriers and Facilitators of Work Life Balance in Caregivers of Individuals with Parkinson's Disease: An Integrative Review. ENRS 32nd Annual Scientific Conference (virtual due to COVID-19).

Trainee Awards and Honors

Melissa Ojemeni, PhD (2018) NYU Office of the Provost: University-wide Best Dissertation Award: Allied Health

Jin Jun, PhD (2018) Philip Jaisohn Foundation, Jane Song Scholarship Recipient, Second Place, Doctoral Student Oral Presentation, Eastern Nursing Research Society, STTI Upsilon Chapter Scholarship for Doctoral Student Recipient, Fred Schmidt Scholarship Award Recipient

Paulomi Niles, PhD (2019) Johnson & Johnson/American Colleges of Nursing Minority Faculty Award, Jonas Nurse Scholars Program

NYU Office of the Provost: University-wide Best Dissertation Award: Allied Health

Laura Ridge, PhD (2020) Jacqueline Fawcett Award in Nursing Science, *American Association of Occupational Health Nurses' Research Grant Sponsored by Medique, STTI Upsilon Chapter Research Grant*

Shani Irby, DNP (2018), Jonas Nurse Scholars Program,
NYU Meyers Distinguished DNP Student Award
Le-Jeune Sealey-Horsford, DNP (2021) McGee Nursing Faculty Scholarship Award

Shani Irby, DNP, RN
2018 Distinguished Student Award

Grants and other Notable Projects

Laura Ridge, PhD, RN (2020), received the *American Association of Occupational Health Nurses' Research Grant Sponsored by Medique ($1800) for her dissertation research: The Occupational Health of Nurses in Liberia*

Lauren Ghazal,**PhD, RN *(2021)*** received a 2020 *NY/NJ ERC Pilot Project Award ($12,000) for her dissertation research: Exploring Multilevel Factors Impacting Quality of Life in Working Young Adult Hematological Cancer Survivors: A Mixed Methods Study*

Natalie Helmers,(current *PhD OEHN trainee)* received a 2021 *NY/NJ ERC Pilot Project Award ($12,000) for her dissertation research: Work-life Balance Among Family Caregivers of Adults with Parkinson's Disease: A Mixed Methods Study*

Laura Ridge, PhD, RN (2020) is coauthoring a chapter, "Political, Economic, and Business Factors in Occupational Health" in American Association of Occupational Health Nurses Fundamentals Of Occupational and Environmental Health Nursing AAOHN Core Curriculum, 5th Ed.

Current PhD OEHN trainee **Halia Melnyk with Program Director Dr. Dickson** provided comments to the Future of Nursing 2020-2030 Committee on the important role that OEHNs play in creating and fostering a national culture of health that reduces health disparities, improves population health in the US, and increases capacity to the nursing.

Deputy Director, Dr. Witkoski Stimpfel received a 2017/18 Pilot Project Award with collaborators across the ERC (Dr.Dickson (Meyers), Dr. Ali Sheikhzadeh & Dr. Shira Weiner (NYU Ergonomics) to study aging nurses' workability. The subsequent publication in *The Western Journal of Nursing Research* was highlighted by NIOSH in the NIOSH Research Rounds (June) https://www.cdc.gov/niosh/enews/enewsv18n2.html and was featured in the NIOSH Science Blog (August) https://blogs.cdc.gov/niosh-science-blog/2020/08/12/older-nurses/. Dr. Witkoski Stimpfel was invited by the University of California at Berkley, Center for Occupational and Environmental Health, to present a webinar on the study in May 2020. Currently, in an NYU-funded COVID-19 catalyst grant, Dr. Witkoski Stimpfel (with PhD OEHN trainee Lauren Ghazal and co-inv Drs. Dickson and Goldsamt) is studying the effects of the COVID-19 pandemic on nurses' psychosocial health; recruiting nurses from across ERC regions.

Program director **Dr. Dickson** and **Deputy Director** Dr. Witkoski Stimpfel's abstract "Innovations in Occupational and Environmental Health Nursing Education: An intraprofessional and interprofessional approach" was accepted at the 2020 AAOHN Annual Conference.

Ergonomics and Biomechanics Program – NYU – Progress Report

The program-related goals, objectives, and achievements in the past five years include: 1) enhancing the academic program; 2) expanding partnerships with industry; and 3) increasing research initiatives focusing on the aging workforce. Program accomplishments are highlighted below.

Enhancing the academic program:

ERBI faculty, with approval from the Dean's office in 2016, revised the curriculum and graduation requirements by integrating a two-track Master's program capstone experience. The core curriculum is identical for both tracks; one track offers enhanced training for students intending to perform OSH research and includes a MS thesis, while the other targets those geared toward industrial application and requires an additional course and comprehensive written MS exam. Since then 3 students have completed Track 1 and 8 students completed Track 2. Based on student feedback, the tracks seem to meet their needs.

ERBI has ensured that we are well-represented in all NYU GSAS recruitment efforts, including those that target female and minority students. ERBI has increased its efforts in community networking, both within and outside of NYU by promoting the value of an ERBI degree to program directors in feeder programs including Kinesiology, Physical Therapy, and Sports Science. This outreach increases ERBI's visibility and accessibility to diverse groups of undergraduate/graduate students.

We have improved ERBI's visibility in search engines through the redesign and upgrade of the ERBI website. As most students find us through the website, the ERBI administration worked closely with the NYU digital communication professionals and web designers. The new website was launched in the fall of 2019.

Two faculty members joined ERBI, one with national and international ergonomics expertise, and the other with extensive research on aging and functional performance.

ERBI renewed the ergonomics accreditation with the Oxford Research Institute (ORI; oxfordresearch.org/). This provides ERBI with full accreditation at the graduate level in ergonomics and authorizes Oxford to represent ERBI as "fully accredited" for the 5-year period from January 1, 2018 through December 31, 2022.

We have integrated aging and work into the ERBI curriculum by adding focused readings and assignments. Students integrate issues of aging into all independent research assignments.

<u>Simulated worksite visits</u>

In April 2021, ERBI received ERC funding to develop simulated site visit cases that can be used as a substitute/complement to traditional ERC site visits. ERBI agreed to develop two cases with an emphasis on occupational health and safety, and focusing specifically on the specialized areas of training provided by member programs within the NY/NJ ERC.

To execute this plan, ERBI expanded its collaboration with Mursion, a leader in online virtual reality that uses avatars for training, controlled in real time. ERBI engaged in interdisciplinary discussions and consultations with members of the NY/NJ ERC board to identify worksites that can be featured in the simulated cases. Nursing and construction were identified to be featured, based on the high prevalence of work related injuries in these groups. ERBI faculty identified occupational risks factors associated with these two groups. ERBI further developed the cases and training materials for the students to enable engagement in Mursion simulations. A four-step sequential pilot testing process ensued, starting with ERBI developers, followed by ERC faculty, ERBI trainees, ERC trainees (non-ERBI). Feedback from the pilot phase led to development of supplemental training materials for ERC trainees.

Based on initial results of the pilot project and the positive response of students and faculty, ERBI believes in the value of expanding this initiative and developing a virtual ERC site visit library. We foresee that such a library may feature cases representing a range of at-risk workers and varying levels of OSH exposures. The advantage of such a system is that it can be tailored to highlight specific working groups, environments or risks of highest priority to NIOSH.

Expanding partnerships with industry

To fulfill the mission of the ERC ERBI has taken steps to strengthen existing relationships and develop new relationships with industry. These industry partnerships directly translate to enhanced learning and practical opportunities for students.

ERBI, through its affiliation with OIOC, has a long-standing relationship providing ergonomic services, including developing medical standards and job profiles, to the New York Transit Authority (TA). Faculty Drs. Marco Campello and Ali Sheikhzadeh are engaged in this initiative. Currently there is a multi-year contract in place to update and broaden the scope of this work, to cover two of New York's transit authorities, commuter rail systems Metro North and the Long Island Railroad. The addition of these two other transit authorities enlarges the reach of our collaboration with the TA from New York City, and stretching to the northern suburbs including Connecticut and as far as the eastern tip of Long Island.

ERBI has had a continuous collaboration with Con Edison (a New York utility company), working closely with their wellness department (former occupational health department). Dr. Marco Campello, ERBI faculty, consults with Con Edison in an effort to curtail the incidence and severity of musculoskeletal disorders. Con Edison administrators and ERBI faculty meet regularly to identify ways to optimize services to Con Edison. In his role, Dr. Marco Campello provides consultation and education to employees with work related spine injuries, providing guidance to workers and collaborating with occupational physicians and nurses to facilitate safe return to work and/or stay at work strategies.

Two ERBI faculty, Drs. Marco Campello and Katia Costa Black, and ERBI ERC Trainee Emanuel Simkhayev, worked with an interdisciplinary team of professionals and managers at Environmental Health and Safety at NYULH to design and implement an institution-wide ergonomics initiative. The new initiative was approved by leadership of the institution and launched on March 1, 2018. This effort aimed at reducing employees' workplace discomfort and rates of injuries, and provide a framework for monitoring work-related musculoskeletal complaints campus-wide, among NYULH employees. The program includes a web-based communication system that allows employees to initiate a request for ergonomic services. This online process triggers notification to several departments responsible for providing the employee with an evaluation, equipment, medical resources and can facilitate communication with any necessary service or department needed to address the problem. ERBI is integral to this program, which allows for surveillance of high-risk jobs, providing recommendations for intervention and monitoring employee outcomes. As a result of this initiative, several other projects have emerged, as described below.

Dr. Costa Black and Emanuel Simkhayev implemented a participatory ergonomics program focused on safe manual materials handling at the NYULH animal care facilities. A follow up initiative was carried out by Dr. Costa Black and Shari Berkowitz, ERBI trainee, to assess outcomes. Subsequently, Dr. Campello and Aresio de Souza, ERBI PhD, ERC Trainee, conducted a post occupancy walk-through in the facilities to assess overall implementation.

ERBI faculty Drs. Ali Sheikhzadeh and Marco Campello, and Zifang Liu, ERBI Trainee, initiated an ergonomic project with the NYULH Department of Surgery. The first phase of this project, completed in January 2020, involved a walk-through of the various surgical sites to identify ergonomic risks. The second phase is ongoing and involves conducting a musculoskeletal symptom survey of all surgical staff and residents throughout the NYULH system. The data will be used to inform ergonomic recommendations for work procedures. It is expected that this project will serve as a model for other surgical departments throughout NYULH.

Dr. Marco Campello and Zifang Liu, ERBI Trainee, provided ergonomic evaluation and recommendation for the radiology department of the NYULH. An ergonomic evaluation was conducted in radiology reading rooms to identify ergonomic risks and to collect the employee's comments on their working environments. The outcome was recommendations for optimal use of department resources, and a proposal for implementing staff training, aimed at addressing worker's musculoskeletal complaints.

Increasing research initiatives focusing on the aging workforce

Since 2016 ERBI faculty has dedicated its efforts to applying its collective expertise to the understanding of work ability and aging workers. These efforts include adding elements of aging workers to all relevant course curricula, and encouraging students to engage in independent projects related to aging. ERBI PhD Trainee Jeff Snyder, completed his dissertation research, "A comparison of the effects of shoulder muscle fatigue caused by sustained overhead activity on scapulothoracic kinematics in young and old populations" and his doctoral defense dissertation in 2020. His thesis was partially funded by an ERC Pilot Project Research Award in 2015. One ERBI PhD trainee is at the early stages of developing his dissertation topic related to age and fatigue during manual lifting tasks. Drs. Weiser and Campello submitted a proposal to study meaningful outcomes from spine injuries, including work, in patients over 65, to Eurospine, an international spine society, in 2019. The proposal expects to be funded in the coming year.

ERBI initiated research with the faculty of NYU's College of Nursing Occupational and Environmental Health Nursing (OEHN) Program. Drs. Ali Sheikhzadeh and Shira Schecter Weiner collaborated with Drs. Victoria Dickson and Amy Stimpfel from the NYNJERC Occupational and Environmental Health Nursing (OEHN) Training Program, along with two ERC trainees. The project received a Pilot Research Award (2017) titled: "Organization of Work Factors Associated with Work Ability in Older Nurses". The mixed methods project included a literature review completed by ERBI and structured interviews completed by OEHN. The purpose of the literature review was to identify variables related to work ability among aging nurses using the framework, Organization of Work. Using qualitative methods, structured interviews with older nurses were conducted, informed by the literature review, to describe the perceived barriers and facilitators of working in the acute care setting. These interviews allowed the researchers to explore the relevance of work-related factors to lived occupational experiences of an urban, older nursing cohort. This was the first collaboration between ERBI and OEHN and resulted in a publication in a peer-reviewed journal in 2020, a presentation at the 2018 NYNJERC Annual Scientific Meeting and a NIOSH webinar series presentation titled, Work factors associated with work ability among aging nurses, in May 2020.

In the simulation initiative, the cases were developed with a focus on older workers. Built into the cases were details related to the workers' ages such as emerging and worsening chronic medical conditions, coping with aging parents, and contemplating seeking alternative less-demanding work. Age related details readily emerged in the simulations drawing the students' attention to the complex interaction of physically and mentally demanding work with age-related factors. The impact of these factors on work performance and overall well-being was highlighted.

Program Impact

Trainee impact: Trainees were engaged as Research Associates on various projects focused on healthcare workers (Hospital-wide ergonomic policies and implementation), nurses (Organization of work factors associated with work ability among aging nurses), office staff (A review of the goldilocks principle and how it relates to ergonomic furniture design), and aging workers (The effect of shoulder muscle fatigue caused by sustained overhead work on scapulothoracic kinematics in younger and older populations). Other important projects include basic science investigation in ergonomics (The utility if muscle oxygen monitoring in work related tasks – a physiological investigation of NIOSH lifting equation and the upper limb localized fatigue threshold limit values), and biomechanical modeling (Evaluation of clinical shoulder tests to optimize surgical plication by quantifying in-vitro 3D kinematic and kinetic contribution of the capsule). During the current funding cycle some promising alumni include Gilvan Vasconcelos Da Silva, ERBI PhD, an officer in the Brazilian Air Force, who published two peer reviewed articles on back pain and helicopter design among Brazilian Air Force pilots and assumed a position as lead ergonomist at Samsung International, Tejbir Singh Pannu, ERBI MS, who is currently an Orthopaedic Surgery Research Fellow at Cleveland Clinic and Andrew Krazsewski, employed as a Senior Engineer at the Hospital for Special Surgery.

Publication impact: Since 2016, ERBI students co-authored four peer-reviewed publications and had one abstract/poster accepted at scientific conferences, published two doctoral dissertations. In addition, ERBI faculty co-authored one paper and presented three posters with other program's ERC funded trainees.

Industry impact: ERBI has been recruited to lead MSD surveillance and management initiatives by local industries with high rates of worker disability including Con Edison (utilities), New York Transit Authority (transportation) and NYULH (healthcare). ERBI trainees are involved in these initiatives. Through ERBI involvement with these industries we are shaping safe work and healthcare management throughout the region by facilitating expedited return to work when injuries occur, developing job profiles that match worker abilities and occupational demands, and promoting industry-wide implementation of ergonomics.

Pilot Projects Research Training Program – Progress Report

Demonstrated progress has been achieved in the range of applications received and in the yield of products from the projects funded by the Pilot Projects Research Training (PPRT) Program. Since 1999, the NYNJERC (Region 2) PPRT Program has funded a total of 114 projects (ranging from $5000 to $12,000) from more than 20 different institutions within Region 2. The last 5-year ERC grant period (2016-2021) yielded a total of 49 applications and 27 (55%) funded projects. We have established a target goal of 8-10 applications per year with 5-6 funded projects based on the highest impact scores as evaluated by the Scientific Review Panel. Our goal of supporting interdisciplinary research training opportunities to trainees, junior faculty, and new occupational safety and health (OSH) investigators continues to guide the awards decisions as the program matures. Below we describe in detail the significances of the PPRT Program's operation in the last 5-year grant period.

<u>Highlights and Impacts</u>

1. Expanding Supports towards Non-ERC Institutes and Underrepresented Investigators

Increasing diversity of gender and race among the pilot project awardees is a priority for the Program. During 2016-2021, a total of 52% of the PPRT awards were made to female principal investigators. With regard to racial/ethnical identities, 30% were African American or Hispanic, and 26% were Asian or Indian. The improvement in the number of applications received from, and awards made to, investigators in non-ERC-member institutions – 15 applications received, 9 funded (among 27 in total), in the last 5-year ERC grant period – has also demonstrated the effect of the PPRT Program's efforts to expand its visibilities and diversities. Notably, since 2017, 30% of the funded projects were by PIs in non-ERC institutions, and 86% went to early-stage investigators (62% trainees and 24% at an Assistant Professor rank).

The PPRT Program has expanded efforts to encourage applications from investigators in Region 2 beyond New York and New Jersey, specifically Puerto Rico and the U.S. Virgin Islands. We have engaged the investigators in occupational health related departments and programs in these areas, such as University of Puerto Rico, University of Ponce, University of the Virgin Islands, as well as researchers from the Department of Health. These efforts include circulating the call-for-proposal RFAs with invitation letters specifically addressing the PPRT Program's mission to support researchers from underrepresented populations and areas, as well as inviting established investigators in these regions to participate in ERC seminars and review the pilot project proposals. As a result, we have successfully received and funded an application from an investigator in Puerto Rico for the 2020 funding cycle. Additionally, reviewers from other institutions both within and outside Region 2 have been asked and have agreed to serve as reviewers of individual proposals in their respective areas of expertise. Over the years, reviewers have been recruited from academia, clinical occupational medicine, complementary and alternative medicine, industrial hygiene consulting firms, ergonomics firms, corporations, unions and departments of health. In the upcoming grant cycles, we will continue to extensively promote applications from non-ERC institutions as well as underrepresented populations/areas.

2. Substantial Improvement in Review Criteria & Scoring Sheet

Starting from 2018 funding cycle, we have remodeled and improved our review criteria and scoring sheet, by breaking down the essential criteria under the previous global "Scientific Merit" and "Programmatic Merit" categories. Previously, the reviewers were only asked to give one score for "Scientific Merit" and one score for "Programmatic Merit", along with an overall score. However, this was not as effective in terms of distinguishing the quality and strength of the proposals, as there was no further or more-detailed information to indicate the standards that reviewers used to derive the score under each category, and that the scores were often given within a close range. Hence, we remodeled the scoring sheet based on general NIH grant review criteria guidelines while tailoring these towards the ERC and PPRT Program's objectives, by further breaking down into 4 sub-criteria for each overarching merit category. Specifically, the "Scientific Merit" score is now supplemented by 4 sub-criteria scores, including Personnel & Environment, Significance & Specific Aims, Innovation, and Research Approach; "Programmatic Merit" score is now supplemented by 4 sub-criteria scores, including NORA & ERC Objectives, Research Capacity, Future Projects & Publications, Multidisciplinary & Stakeholders. We also provide detailed descriptions on each sub-criterion in the instruction section of the reviewer packet. These changes in the review materials not only provide more comprehensive guidelines and standards for the reviewers to objectively evaluate the proposals, but also allow the Scientific Review Panel and the PPRT Program Director to better understand how the reviewers derived their final scores. As a result, it allows the PPRT Program to more effectively identify high-quality proposals, which likely lead to the success of the projects. We have received positive feedback from the reviewers indicating that the updated scoring sheet and guideline is easier to follow and provides the reviewers clear information about the criteria that are most essential for evaluating these projects.

3. Essential Changes in Application and Project Timeline

During the last grant period, we have undergone extensive self-assessment on the most effective application and project timeline, based on the number and quality of the applications received, awardees' project progression and productivity, as well as administrative effectiveness. Previously, the 1-year project funding cycle was set for January 1st to December 31st with the RFA announcement made in August and notification of award made in mid-December. However, this pilot project cycle did not align with the trainees' academic year nor with the ERC/institutional fiscal year that generally starts on July 1st and ends on June 30th. Consequently, it weakened the effectiveness and efficiency of research proposals in several aspects: (1) project completion and productivity was weakened as the trainees might not be able to obtain adequate training before developing capabilities to undertake their research project, or they decided not to apply for the award since they would be graduating or leaving the position in June, which was in the middle of the previous project cycle; (2) the timeline did not allow enough time for the awarded projects to apply and receive Institutional Review Board (IRB) approvals prior to the set funding start date, which significantly delayed the actual start time of the project; (3) it added additional and unnecessary burden to the administrative and grants office staff of both the ERC and the awarded institutes to process and track the funds as the timeline did not align with academic and NIOSH fiscal year.

To overcome these pitfalls, starting from the 2019 funding cycle, the pilot project application and funding timeline now align with the academic-training calendar and the NIOSH fiscal year. Specifically, the funded project period starts on July 1st and ends on June 30th of the following year, with the call-for-proposals RFA released in early fall and the submission deadline in late-January/early February. Taking 2019 funding cycle as an example:

September 15th, 2018:	Call for proposals RFA
February 1st, 2019:	Deadline of application submission
April 15th, 2019:	Awardees announcement
June 30th, 2019:	Deadline of IRB approvals
July 1st, 2019:	Project start date
January 15th, 2020:	Deadline of mid-term progress report
June 30th, 2020:	Project end date
July 31st, 2020:	Deadline of final report

November 13th, 2020: Presentation at the ERC research webinar
December 2020 & December 2021: End-year annual follow-up reports (mandatory for 2 years post-project, up to 5 years of tracking)

We have received positive feedback from the applicants and awarded principal investigators (PIs) regarding this change, including the statements that this timeline allows a longer preparation period, provides sufficient time to work on and apply for IRB approvals, enhances training/career planning as this timeline aligns with the ERC's academic calendar, as well as largely reducing the workload of administrative procedures with the grants office.

4. Initiation of Annual Special Research Webinar Featuring Pilot Project Awardees
In December 2020, we launched the 1st Special Research Webinar featuring project presentations from the pilot project awardees. All the 2019 pilot project awardees presented their research findings during the Webinar. This event provides all awardees with an opportunity to present their work, and all Webinar attendees with an opportunity to discuss emerging issues in OSH research with trainees and faculty within our ERC and throughout Region 2. The 2020 Special Webinar was successfully advertised and attracted a total of 117 attendees. All 2020 presentations were recorded and can be viewed on the ERC website at: http://www.nynjerc.org/library.html .

Of the 114 pilot projects funded through our PPRT Program up to Year 5 (2020) of the last grant period, the majority were led by ERC trainees, junior faculty and new investigators. During the last grant period, we received 49 applications and 27 (55%) projects were funded. Of the funded projects, 18 (67%) were led by ERC-member investigators and 9 (33%) by non-ERC investigators. In the Year 5 competition (2020) from 10 strong applications, 3 of the 6 awards went to non-ERC investigators, highlighting the effects of our continued efforts to invite applications outside of the ERC institutes. The program has fostered outreach to trainees and investigators at a variety of institutions and agencies in Region 2, as well as other stakeholders working in OSH. The diversity and quality of proposals funded remain consistently high, and through our Continuing Education and Outreach initiatives, we anticipate that our pool of qualified applicants will continue to expand throughout Region 2.

<u>2016-2019 Funding Cycles</u>: there were 39 applications submitted and 21 projects funded, including 10 to trainees/fellows, and 6 to investigators in non-ERC institutes. The projects represent multiple and diverse NORA sectors and priority areas. Complete list of the funded projects can be found at: https://bit.ly/PilotList2016-2020 .

<u>2020 Funding Cycle</u>: We received 10 applications and funded 6 projects. Among the 6 funded projects, 3 were awarded to NYNJERC trainees in New York University, Rutgers University, Icahn School of Medicine at Mount Sinai, and 1 to a non-ERC institution University at Buffalo. Two were awarded to faculty seeking new research directions at non-ERC institutes, including SUNY Downstate and University of Puerto Rico. Of note, this was the first year that we received the applications beyond New York and New Jersey, highlighting the effects of our continued efforts to invite applications from Puerto Rico and The U.S. Virgin Islands. The PPRT Program's goal of supporting trainees and new investigators as well as underrepresented population and areas conducting OSH research is of primary importance.

Funded projects for 2020 represent multiple NORA sectors and priority areas: Special Populations at Risk, Oil and Gas Extraction, Public Safety, Indoor Environment, Exposure Assessment, Organization of Work, Risk Assessment Methods, Healthy Work Design and Well-being, Emerging Technologies, Intervention Effectiveness Research, Social and Economic

Consequences of Workplace Illness and Injury, and Organizational interventions to reduce stress. They address a wide range of significant chemical, ergonomic, physiological, and psychological job-related stressors facing workers in our region, as well as quality of life of working cancer survivors. The diversity of projects underscores the dedication to supporting interdisciplinary research, exceptional collaboration with labor groups, and novel use of existing data sources, advanced imaging techniques, and biomarkers of exposure fostered through the program. The awards bridged multiple occupational sectors, including public safety and construction workers.

The table below includes brief abstracts for the six projects awarded for 2020 funding cycle.

Project Title	PI	Brief Abstract
Effects of Air Density on Aerosol Transport Velocity Capability in a Local Exhaust Ventilation System	Sergio Caporali-Filho, PhD	The objective of this project is to evaluate the effects that lower air densities may have on the minimum transport velocity (MTV) of aerosol contaminants (aerodynamic diameter greater than 2 μm) inside a local exhaust ventilation (LEV) system, which may be utilized to guide the improvement of the workplace and industrial ventilation system.
Exploring Multilevel Factors Impacting Quality of Life in Working Young Adult Cancer Survivors	Lauren Ghazal, MS (trainee)	Guided by Bronfenbrenner's Social Ecological model and the Life Course Perspective, the overall purpose is to explore the relationship of work-related goals (WRGs) and quality of life (QOL) in working young adults with cancer with a focus on factors at the individual level (anxiety, depression, fatigue, emotional distress, work ability, and financial health), and work-related characteristics at the microsystem (job control, psychological and physical job demands, workplace support, and job security) and mesosystem levels
A Data-driven Framework for Task Recognition via Wearable Sensors for Electric and Gas Workers	Sahand Hajifar, MS (trainee)	The overarching goal of the proposed project is to take full advantage of available wearable sensors and statistical learning techniques to develop a data-driven framework to classify the multiple activities performed by electric and gas utility workers, using machine learning models based on an in-lab experiment collected wearable sensors data and demographic information.
Lead Exposure in Communication Workers in New York City	Rabeea Khan, MD (trainee)	The aim of this project is to ascertain whether communications workers would benefit from the establishment of a routine lead surveillance program. We will accomplish this via the following: (1) Determine current and long-term exposure to lead in communications workers through measurement of both blood and bone lead levels; (2) Establish sources and magnitude of lead exposure in communications workers
Evaluation of Relationship between Occupational Health and Organizational Structure	Paul Landsbergis, PhD, MPH	Targeting worker cooperatives (democratic workplaces) in New York and New Jersey as a natural experiment of an alternative organizational structure, this project will utilize a mixed methods approach to evaluate the relationship between sources of job stress, or job stressors, and organizational management structure.
Exploring the Challenges and Facilitators to Physical Health in Volunteer Firefighters Across their Tenure	Nimit Shah, MPH (trainee)	The purpose of this proposal is to explore and describe the challenges and promoters to improvement and maintenance of physical health in volunteer fire fighters of the Toms River Fire Department (TRFD) in New Jersey at different stages of their tenure.

<u>Publications and Grants</u>

All awardees are strongly encouraged to publish their study results in peer-reviewed research journals and through presentations at national meetings and local meetings. We have listed the publications, presentations, dissertations, and grant submissions/awards produced by PPRT Program awardees over the last grant period below. During the latest grant period, the PPRT pilot project awardees have generated a total of 22 peer-reviewed journal research articles, 9 academic dissertations (3 doctoral, 4 master's, 2 medical research residency; of which 3 graduated with honors), 5 larger research grant submissions (4 funded, 1 resubmitted), and 24 conference presentations/abstracts. This demonstrates an outstanding track records with respect to carrying out higher-quality outputs, especially under the circumstances that the

COVID-19 situation has impacted and delayed most of the 2019-2020 awarded projects. We have continued to engage the awardees in supporting the program's initiatives to increase and track productivity. Evaluation of the impact and effectiveness of the funding was determined by setting an acceptable goal of two products per pilot project, one lower impact (e.g., conference abstracts) and one higher impact (e.g., dissertation/thesis/capstone; national/keynote presentation; peer-reviewed journal articles; grant submission). Among the 2016-2018 funding cycles (i.e., projects period before COVID-19 impact), 11 (73%) of the 15 awardees met or exceeded this 'two products' level, whereas the other projects met at least one of the criteria. Four met an exemplary level of productivity by parlaying the preliminary data from their pilot project into submissions for larger grants.

The number and scope of dissertations, papers, presentations, and grant submissions/awards are evaluated on an ongoing basis as an indicator of the effectiveness of PPRT support in advancing OSH research. While the yield to date is indicative of the benefits of PPRT Program funding and oversight, we continue to encourage our awardees to disseminate and build upon their pilot findings, and to pursue subsequent support through other funding mechanisms.

A. PEER-REVIEWED JOURNAL ARTICLES

1. Myers S, Govindarajulu U, Joseph MA, Landsbergis P. Work Characteristics, Body Mass Index, and Risk of Obesity: The National Quality of Work Life Survey. Ann Work Expo Health. 2020 Oct 30 [Epub ahead of print] doi: 10.1093/annweh/wxaa098. PMID: 33125469
2. Tannis C, Chernov C, Perlman S, McKelvey W, Toprani A. Cardiovascular Health Risk Behaviors by Occupation in the NYC Labor Force. J Occup Environ Med. 2020 Sep;62(9):757-763. doi: 10.1097/JOM.0000000000001960. PMID: 32890215.
3. Harrichandra A, Ierardi M, Pavilonis B. An estimation of airborne SARS-CoV-2 infection transmission risk in New York City nail salons. Toxicol Ind Health 2020 Sep;36(9):634-643. doi: 10.1177/0748233720964650. PMCID: PMC7578841
4. Stimpfel AW, Arabadjian M, Liang E, Sheikhzadeh A, Weiner SS, Dickson VV. Organization of Work Factors Associated with Work Ability among Aging Nurses. West J Nurs Res. 2020;42(6):397-404. doi: 10.1177/0193945919866218. PMCID:PMC6980255
5. Miotto R, Percha BL, Glicksberg BS, Lee HC, Cruz L, Dudley JT, Nabeel I. Identifying Acute Low Back Pain Episodes in Primary Care Practice From Clinical Notes: Observational Study. JMIR Med Inform. 2020;27;8(2):e16878. doi: 10.2196/16878. PMID: 32130159
6. Rechtman E, Curtin P, Onyebeke LC, Wang VX, Papazaharias DM, Hazeltine D, de Water E, Nabeel I, Mani V, Zuckerman N, Lucchini RG, Gaughan D, Tang CY, Horton MK. Respirator usage protects brain white matter from welding fume exposure: A pilot magnetic resonance imaging study of welders. Neurotoxicology. 2020;78:202-208. doi: 10.1016/j.neuro.2020.03.008. PMID: 32217185
7. Stimpfel AW, Dickson VV. Working across Generations to Boost Staff Nurse Retention. West J Nurs Res. 2020;42(6):395-396. doi: 10.1177/0193945919893319. PMID: 31822197
8. Tannis C. Heat illness and renal injury in mail and package delivery workers. Am J Ind Med. 2020 Aug 24. [Epub ahead of print] doi: 10.1002/ajim.23169. PMID: 32833240
9. Crusco S, Smith E, Rajupet S. Improving Intranasal Naloxone Prescribing Through EMR Modification and Automation. J Addict Med. 2020 Aug 21 [Epub ahead of print] PMID: 32833748 DOI: 10.1097/ADM.0000000000000724
10. Myers S, Govindarajulu U, Joseph J, Landsbergis P. Changes in work characteristics over 12 years: Findings from the 2002-2014 US National NIOSH Quality of Work Life Surveys. Am J Ind Med. 2019;62(6):511-522. PMID:31046140
11. Dropkin J, Power P, Rasul R, Moline J, Kim H. Effect of resiliency and age on musculoskeletal injuries and lost workdays in emergency medical service personnel. Int J Ind Ergon. 2019;69:184-193.

12. Cruz, L. C., Alamgir, H. A., Sheth, P., & Nabeel, I. Development of a return to work tool for primary care providers for patients with low back pain: A pilot study. J Family Med Prim Care. 2018;7(6):1185. PMCID:PMC6293894
13. Pavilonis B, Roelofs C, Blair C. Assessing indoor air quality in New York City nail salons. J Occup Environ Hyg. 2018;15(5):422-429. PMID:29494285
14. Melnyk H, Rosenfeld P, Glassman KS. Participating in a Multisite Study Exploring Operational Failures Encountered by Frontline Nurses: Lessons Learned. J Nurs Adm. 2018;48(4):203-208. PMID:29470383
15. Kraszewski AP, Mayer SW, Kontaxis A, Hillstrom HJ, Sheikhzadeh A, Warren RP. Mapping glenohumeral laxity: effect of capsule tension and abduction in cadaveric shoulders. J Shoulder Elbow Surg. 2018;27(4):624-634. PMID:29269137
16. Kovner CT, Djukic M, Jun J, Fletcher J, Fatehi FK, Brewer CS. Diversity and education of the nursing workforce 2006-2016. Nurs Outlook. 2018;66(2):160-167. PMID:29037502
17. Zhang, Q., Thangavelu, V., Corbisiero, R., de Adana, I. G. R., Napp, N., & Cavuoto, L. Effects of Simulated Masonry Work on Physical and Cognitive Performance: A Pilot Study. Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2018;62(1):1749-1750. Sage CA: Los Angeles, CA: SAGE Publications.
18. Pajoutan M, Sangachin MG, Cavuoto LA. Central and peripheral fatigue development in the shoulder muscle with obesity during an isometric endurance task. BMC Musculoskelet Disord 2017;18(1),314.
19. Lin F, Song C, Xu X, Cavuoto L, Xu W, Patient handling activity recognition through pressure-map manifold learning using a footwear sensor. Elsevier Smart Health, 2017;1(2):77-92.
20. Onyebeke LC, Papazaharias DM, Freund A, Dropkin J, McCann M, Sanchez SH, Hashim D, Meyer JD, Lucchini RG, Zuckerman NC. Access to properly fitting personal protective equipment for female construction workers. Am J Ind Med. 2016;59(11):1032-1040 PMID: 27346435
21. Meyer JD, Muntaner C, O'Campo P, Warren N. Longitudinal assessment of effort-reward imbalance and job strain across pregnancy: A preliminary study. Matern Child Health J 2016;20(7):1366-74
22. Sanchez SH, Gargano LM, Yu S, Meyer JD, Edwards VJ, Cone J, Stellman SD, Brackbill RM, Farfel MR. Self-Reported Cognitive Impairment Among Exposed Adults 10 Years After the 9/11 World Trade Center Disaster. (submitted to Am J Indust Med).

B. THESIS / DISSERTATION

1. Elizabeth Milbank. "Pregnancy and work accommodations: A survey of employed pregnant women". MPH thesis accepted by Graduate School, Icahn School of Medicine at Mount Sinai, 2017
   With honor: Outstanding Culminating Experience
2. Luckshman Coomaralingam. "Trenching injuries in Bureau of Labor Statistics and Occupational Safety and Health Administration databases". Capstone accepted by the Occupational Medicine Residency Program, Department of Environmental Medicine and Public Health, Mount Sinai, 2018
3. Leon Levine. "The Association of Higher Carbon Dioxide Levels and Teachers' Perceived Air Quality and Well Being in New York City Elementary Schools". DrPH dissertation accepted by CUNY Graduate School of Public Health and Health Policy, 2019
4. Tamar Nobel. "Higher Clinical Suspicion is Needed for Prompt Diagnosis of Esophageal Adenocarcinoma in Young Patients". MPH thesis accepted by Graduate School, Icahn School of Medicine at Mount Sinai, 2019
   With honor: Outstanding Culminating Experience
5. Malika Garg. "Maternal occupation and hypertensive disorders of pregnancy". MPH thesis accepted by Graduate School, Icahn School of Medicine at Mount Sinai, 2019
6. Salvatore Crusco. "Improving Intranasal Naloxone Prescribing Through EMR Modification and Automation". MPH thesis accepted by Graduate School, Icahn School of Medicine at Mount Sinai, 2020
   With honor: Delta Omega Honorary Society in Public Health Induction
7. Candace Tannis. "Occupation and Health Risk Behaviors in the NYC Labor Force". Capstone accepted by the Occupational Medicine Residency Program, Department of Environmental Medicine and Public Health, Mount Sinai, 2020
8. Qian Zhang. "Real-time workload monitoring in human-robot collaboration". PhD dissertation in progress at University at Buffalo, June 2021.

9. Danielle Wald. “In the Eye of the Beholder: A Daily Diary Investigation of Appraisals of Illegitimate Tasks”. PhD dissertation in progress at The Graduate Center & Baruch College, CUNY. June 2021

C. GRANT / FUNDING

1. Horton M. Principal Investigator: “Risk and Resilience Factors for Adverse Mental and Physical Health Outcome Related to WTC Exposure” (1U01OH012075-01 NIOSH): Jul 2020 – Jun 2023. ($395,587 FY20)
2. Xu W. Co-Principal Investigator: “A Functional Upper Limb Training and Assessment Tool to Enhance Efficacy and Scalability of Rehabilitation in Ecological Environments” (1R21HD092243-01): Jul 2017 – Jun 2021. ($231,403 FY17)
3. Geltman E. Principal Investigator: "Atlantic Emerging Technologies and Industrial Hygiene Training Center" - research and training grant awarded to focus on radon, soil vapor and PCBs (5R25ES027082-01): Feb 2017 – Dec 2020. ($100,000 FY17)
4. Sheffield P. Principal Investigator: “Prenatal Pollution, Stress and Maternal-child Health: Role of Immunomodulation”. K23 Career Development Award (1K23ES024127-01 NIH/NIEHS): August 2014 – July 2019. ($169,166 FY17)
5. Stimpfel AW. Principal Investigator. “Newly Licensed Nurses at Risk: Evaluating the Association between Work Hours and Occupational Injury”. K01 Career Development Award (1K01OH010816-01) revision submitted.

D. CONFERENCE ABSTRACTS / INVITED PRESENTATIONS

1. Nobel T, Meyer J, Divino C. More Than a Feeling: The Relationship Between Work-Related Musculoskeletal Pain and Trainee Emotional Wellbeing. American College of Surgeons Clinical Congress 2020. October 2020.
2. Tannis C, Schanzer A, Afzal O, Meyer J. Accommodating working pregnant women: are employers listening? American Occupational Health Conference, May 2020.
3. LeNoble, C., Wald, D., & Verhoeven, D. What’s in a postdoc? Experts tell all about I/O’s best kept career secret. Alternative session accepted to the 35th annual conference of the Society for Industrial and Organizational Psychology, Austin, TX. June 2020.
4. Wald, D R., Che, X. X., Zhou, Z. E., & Wiston, R. Illegitimate tasks and CWB-O: Psychological Contract Violation as a Mediator. Poster presented at the 34th annual meeting of the Society for Industrial and Organizational Psychology, Washington, DC/National Harbor. April 2019.
5. Constantino C., Pavilonis B. Assessing Airborne Hazards and Determining the Need for Ventilation Systems in New York City Nail Salons. American Industrial Hygiene Association Annual Meeting, Minneapolis, MN, United States. May 20, 2019.
6. Zhang Q, Thangavelu V, Corbisiero R, de Adana IGR, Napp N, Cavuoto L. Effects of Simulated Masonry Work on Physical and Cognitive Performance: A Pilot Study. In Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2018.
7. Cruz LC, Nabeel I . “Development of a Return to Work Tool for Primary Care Providers for Patients with Low Back Pain: A Pilot Study”. American Public Health Association Annual Meeting & Expo in San Diego, CA. 2018.
8. Oagaz H, Sable A, Choi MH, Xu W, Lin F. VRInsole: An Unobtrusive and Immersive Mobility Training System for Stroke Rehabilitation. IEEE Annual Body Sensor Networks Conference (BSN 18), Las Vegas, Nevada, March 2018.
9. Yang Z, Song C, Lin F, Langan J, Xu W. Empowering a Gait Feature-Rich Timed-Up-and-Go System for Complex Ecological Environments. ACM/IEEE International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE 17), Philadelphia, Pennsylvania, July 2017.
10. Yang Z, Lin F, Xu W, Langan J, Cavuoto L, Li Z, Li Q. Validation of a Novel Gait Analysis System. ACM/IEEE International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE 17), Philadelphia, Pennsylvania, July 2017
11. Cruz LC, Sheth P, Abrams S, Cardozo E, Bean A, Lazaro A, Pajak A, and Nabeel I. Development of the Return to Work Guidelines for Low Back Pain Patients in a Primary Care setting: A Pilot Study. Mount Sinai Education Research Day. April 25, 2017. New York, NY & the Institute for Healthcare Delivery Science. 2017.

12. Nabeel I. Development of a Return to Work Tool for Primary Care Providers for Low Back Pain Patients: Pilot Study Assessment. NIOSH Expending Research Partnership meeting, Denver, CO. 2017.
13. Dropkin J, Moline J, Golden A. A qualitative study on barriers to Workers' Compensation and treatment of musculoskeletal injuries among Broadway actors. Hofstra Northwell clinical research symposium. 2017.

    Myers S, Govindarajulu U, Joseph J, Landsbergis P. Trends in work characteristics, 2002–2014: preliminary findings from the US National NIOSH quality of work life surveys. ICOH Abstract. European Journal of Preventive Cardiology 2017;24(2S):51.
14. Myers S, Govindarajulu U, Joseph J, Landsbergis P. Association Between Work Characteristics and BMI/Obesity: Findings from the 2014 National NIOSH Quality of Work Life Study. APA-NIOSH Work, Stress, and Health Conference, Minneapolis, Minnesota. 2017.
15. Milbank E, Schanzer A, Lozano M, Lee MJ, Meyer J. "Pregnancy and work accommodations." American Public Health Association Annual Conference, Poster Presentation, Atlanta GA, November 2017.
16. Geltman, EA. US Exposure Standards and Cleanup Levels for Soil Vapor Intrusion, Old Dominion University School of Community & Environmental Health, Norfolk Virginia. December 18, 2017 (invited oral presentation).
17. Geltman, EA. Soil Vapor Intrusion Exposure Standards & Cleanup Levels in the US, NIEHS Superfund Research Program Annual Meeting. Philadelphia, PA, Dec. 6, 2017.
18. Geltman, EA. Emerging Technologies to Promote Worker Safety and Protect Public Health from Adverse Impacts of Radon, PCBs and other Soil Vapor. Superfund Research Program RTCCEC webinar, June 8, 2017. (oral presentation)
19. Raja, A, Parth D. and Nabeel I . "Development of a Return to Work Tool for Primary Care Providers for Low Back Pain Patients: Pilot Study Assessment." PM&R 9.9(2017): S283. 2017.
20. Milbank E., Schanzer A., Lozano M., Lee M.J., Meyer, J. "Pregnancy and work accommodations." Public Health Research Day, Mount Sinai, Poster Presentation. May 2017.
21. Horton MK, Gaughan D, onahue A, Onyebeke L, Papazaharias D, Wang V, Tang C, Kovacic J, Mani V, Wright RO, Lucchini RG. Magnetic resonance imaging and positron emission tomography to examine the cardio-and cerebrovascular effects of welding fume exposure. Manganese Conference, New York, NY. 2016.
22. Myers S, Govindarajulu U, Joseph M, Landsbergis P. Work Characteristics and Risk of Obesity: Preliminary Findings from the 2014 National NIOSH Quality of Work Life Study. American Public Health Association Annual (APHA) Annual Conference, Denver, CO. 2016.
23. Dropkin J. Physical Therapy barriers in the evaluation and treatment of work-related musculoskeletal injuries among Broadway actors: a qualitative pilot study. Hofstra Northwell clinical research symposium. 2016.

Continuing Education Program Progress Report
In 2017 the Rutgers Center for Public Health Workforce Development hired a new evaluator for our training programs. Megan Rockafellow-Baldoni, PhD has brought her research skills to improve our evaluation systems. Dr. Rockafellow-Baldoni has transformed our registration and evaluation process so that trainees complete the forms through Qualtrics, an online survey tool available to Rutgers. The Qualtrics evaluation has vastly improved our data analytics and reporting. Students evaluate each course they attend. Almost 95% of our trainees indicated that our training was at the appropriate level of technical instruction, 96% indicated the course objectives were met, and over 94% trainees agreed or strongly agreed for each of the items listed below.

The CE Program also evaluates programs to identify items that are specific to a particular topic. These evaluations are conducted for conferences and other larger events. In addition to the evaluation form used in all courses, we evaluated each breakout session to identify how each session met the objectives, if the session provided information specific to their job, and other items.

In response to the spread of COVID-19, Rutgers suspended all in-person training in mid-March 2020. The CE Program pivoted to provide synchronous training through WebEx. We have successfully implemented courses, however, we have not been able to provide courses with hands-on activities, including hearing conservation and spirometry. We did offer industrial hygiene courses, which included demonstration of equipment instead of our usual hands-on use of equipment. We evaluated these courses, and added several questions to better understand how we were meeting the needs of our trainees. The data were very positive:

- 95% rate the overall online learning experience from good to excellent
- 93% reported good to excellent use of interactive tools such as polling or chat.
- 95% thought the interaction with the instructor was good/excellent
- 92% reported good/excellent interaction with other trainees.
- 24% reported technical issues but many reported that they were resolved
- 61% would prefer to take course online instead of in-person
- 94% would take another course online.

Based on this feedback, the CE Program will continue to expand opportunities for online learning.

Over the past five years, our CE Program has incorporated innovations into our training. We have worked with a small business to implement augmented reality to “detect” hazardous materials. The system consists of physical hazard props (identified by Bluetooth beacons) and a location-aware mobile phone application that simulates an air monitoring instrument used by workers assessing potentially hazardous conditions. This technology is used on hazardous materials and confined space entry courses.

With funding from another source, we used Powtoon.com to create short, online animated videos that are used in training courses, or a stand alone videos. The videos focus on how to conduct communicable disease investigations. (https://rutgerstraining.sph.rutgers.edu/NJDOHVideoTraining/). We expect to continue to develop training modules with powtoon.com for other topics.

COVID-19 suspended our in-person training programs in March 2020. We quickly implemented WebEx and Zoom training for several of our training programs. Over time, we have increased the number of courses conducted via a web-based platform. We have incorporated interactive exercises, including small group, white board, games, and other activities to engage our trainees. We expect to expand this aspect of our training over the next five years. We have initiated a working group of instructors and the Rutgers Teaching and Learning with Technology Center to increase both synchronous and asynchronous online training.

Each course has objectives that guide the design. A process to identify how material is taught is developed with course faculty and CE staff. The CE staff emphasize interactive and engaging techniques be included in each training course. These can include small group activities, hands-on equipment, demonstrations, or other activities. Course agendas are created to guide the courses, and course manuals are developed to provide materials for the learners. All course faculty must have experience in adult education and have the technical knowledge of the topics they are teaching.

The CE Program recruits trainees through several approaches. First we prioritize relationships with existing trainees and their organizations. We work to maintain long-term relationships with trainees that have received training from us. We send out a monthly email newsletter with OSH information, news items, and course registration information. We also mail a yearly course catalog to over 3,000 individuals in our region. We conduct follow-up calls with trainees about issues (both negative and positive) that they want to report back to us after they receive training. Second, we work with the local sections of AIHA, ASSP, ACOEM, and AAOHN to recruit trainees. These organizations are key regional stakeholders in OSH and are important parts of our recruitment. Third, we utilize local, state, and federal agencies for guidance on OSH needs within our States and Region. These data help us target specific industries that potentially need training. Fourth, our faculty have relationships with industry and governmental employees who need training. When faculty identify training needs, they connect us so that the training programs can be provided. And finally, we have social media sites for the NYNJERC (@nynjerc) and for the CE Program (@RutgersTraining).

The CE Program successfully meets the needs of the OSH workforce with the breadth and depth of the training provided. Over the previous five years, the CE Program provided 1,182 courses, training 17,264 students, providing over 238,000 contact hours of training. Courses range from 1-hour awareness programs to 40-hour competency-based training programs.

Trainees per program area, July 1, 2016 – June 30, 2021.

Program Area	**Trainees per Program Area**
IH	1,516
OM	747
OHN	263
OS	10,765
Other	3,973
Total	**17,264**

The following exemplifies our ability to identify and react to needs of our clients, to apply lessons learned to assist others in times of disasters, and to serve as a national resource. For over a decade we provided courses at worksites to meet employer and trainee needs. Among the many benefits employers realized is the elimination of student travel costs, scheduling programs at their convenience, and focusing workshops to their site-specific needs. This trend continues to grow in popularity, especially for occupational safety and industrial hygiene courses. Most frequently requested contract courses include air sampling, asbestos control, safety management, injury and illness recordkeeping, fall prevention, excavation safety, hazards of confined spaces, and respiratory protection. Since March 2020, COVID-19 forced us to pivot to provide training via WebEx and Zoom. We will continue to expand our synchronous and asynchronous training over the next five years.

Regional public sector employers have also utilized our training to building trainer capacity within their staff. Among the agencies we've assisted in this effort are the New York City Department of Environmental Protection (NYCDEP), New York City School Construction Authority (NYCSCA), and the New Jersey Department of Labor (NJDOL). Their trainer candidates have diverse work backgrounds, multiple years of work experience within the agency, some are inspectors, and most are in supervisory (management) positions. As most of them have limited formal education in safety and health, we've adapted a two-step approach to developing their trainer skills. Initially, they have completed a series of subject matter courses that increased their knowledge of critical subject areas like respiratory protection, electrical safety, and safety and health standards. A safety specialist certificate was awarded to them upon completing the course track. These candidates then developed their peer-to-peer and small group exercise facilitation skills in train-the-trainer courses.

Since 2016, we have provided Spirometry courses to occupational health nurses (OHN) at their worksites. Our offsite Spirometry courses are held at small to mid-size manufacturing sites, with multiple work shifts. Most of them do not have the scheduling flexibility for staff to attend multiple days of training at Rutgers. Bringing this course to worksites allows for scheduling flexibility and travel savings for the employers while meeting their training needs. Laurie Heagy, Medical Services Manager at East Penn Manufacturing Co. said, "We have been sending our staff to your training programs for over 25 years. I can't say enough about the opportunity to have these courses offered on our own site. These courses allow us to take a look at our own programs in more detail when we are the only ones in the class so we can improve our own programs. Thank you for providing great quality programs for occupational health professionals and especially for providing to us at our location."

In 2017, in response to the devastation of Hurricane Harvey, Dr. Mitchel Rosen traveled to Houston to provide assistance in the response and recovery to the storm. The lessons learned from Superstorm Sandy in 2012 were valuable for informing the response in Texas. Dr. Rosen identified worker and volunteer populations that need training and/or PPE.

When COVID-19 infections started to rise in NJ and NY, the CE Program was contacted to provide fit testing and respiratory protection training for local health and emergency response personnel. We provided two fit-testing courses for EMTs, local health, and hospital personnel, who in turn fit-tested hundreds of workers responding to COVID. In September 2002, the CE Program conducted respiratory protection and fit test training conducted synchronously to several sites across the RWJBarnabas Health system.

The CE Program continues to provide throughout the region. Training is provided across New Jersey, New York and Puerto Rico through strategic partnerships that reach a diverse target audience. We have partnered with the Universidad Ana G. Mendez in San Juan PR since 1999. Our Program has provided numerous train-the-trainer programs for their instructors, who have reached thousands of workers across Puerto Rico. We provided disaster resiliency training for their instructors after Hurricanes Maria and Irma. These programs stress the importance of mental health in the overall context of OSH. We have provided train-the-trainer programs for community based organizations, such as Make the Road New York and Wind of the Spirit (Morristown, NJ) so that they can provide essential disaster training within their community.

The CE Program has tried to work with the University of the Virgin Islands and community based organizations on the three islands of the USVI. We have been unsuccessful with these collaborations to date, however, we will continue to explore partnerships to ensure safety and health training is provided in the USVI.

<u>Needs Assessment</u>
Over the past five years, the CE Program has been active in the National needs assessment process with all the other NIOSH ERC CE Programs. In 2017, led by Josh Scott (MAPERC) and Mitchel Rosen, the CE Programs conducted a national needs assessment to answer the following questions:

- What is the local, regional, and national landscape for CE needs and interests?
- Are professionals seeking CE outside of their primary profession?
- What industries, occupations, and professions are most interested in CE?
- What CE topics and review courses are most relevant to OSH professionals?
- What type of courses and course content do professionals prefer?
- How do professionals search for and receive CE information?
- What costs do professionals expect for various types of CE offerings?

The results of the needs assessment were shared with all NIOSH ERC CE Directors, and were published in the American Journal of Industrial Medicine (https://doi.org/10.1002/ajim.23014). The results indicate the types of training identified as most needed fall within several broad topic areas, including management and legal issues, compliance with new standards, communication tools and skills, risk management and assessment, and safety training. The CE topics with the most interest include injury prevention (back injury prevention), occupational stress, exposure assessment, and safety culture. These overlapping topics show a clear need for cross-training and demonstrate the continued interdisciplinary shift of OSH professionals.

In 2019, the CE Program Directors decided to conduct another national needs assessment. The process was delayed due to COVID so the implementation date has been delayed until Fall 2021. The NYNJERC is an active participant of this effort, which is led by Joan Mazur (CARERC). To date, we have reviewed existing needs assessment documents, revised the needs assessment survey, developed a protocol, and have a plan to pilot the survey with supervisors and managers. The data received will provide benefit to all ERC CE Programs.

Follow-up Survey
The CE Program sends follow-up surveys to trainees 3 to 6 months after the course. Trainees reported that they work safer, make better decisions, and use skills learned in the courses.

Training impact follow-up survey
Think specifically about YOUR JOB and YOUR WORKPLACE. Since my last training at Rutgers, I have...

Question	Routinely	Pretty Often	Occasionally	Not at All
Used references and resources from class.	30.48%	25.00%	38.01%	6.51%
Used equipment more effectively.	40.48%	34.52%	21.03%	3.97%
Used a skill or procedure I learned at my training.	29.31%	32.41%	31.72%	6.55%
Planned my work better to minimize health and safety hazards.	48.39%	33.69%	16.13%	1.79%
Made decisions so that I work more safely.	62.83%	29.00%	7.06%	1.12%
Discussed health and safety practices with my coworkers.	54.01%	32.40%	12.54%	1.05%

Training impact follow-up survey level of agreement
Please tell us how much you agree or disagree with the following statements

Question	Strongly Agree	Agree	Disagree	Strongly Disagree
I had a positive training experience at Rutgers.	82.49%	17.17%	0.34%	0.00%
I would recommend the Rutgers training center to colleagues	82.89%	16.78%	0.34%	0.00%
I will attend another course at the Rutgers training center	82.37%	17.29%	0.00%	0.34%
I learned a new skill or knowledge in the training	67.58%	31.74%	0.68%	0.00%
I work safer because of the training	61.57%	36.65%	1.78%	0.00%
I am better able to assess hazards because of the training	66.44%	32.18%	1.38%	0.00%