A. COVER PAGE

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List of Terms and Abbreviations

IOSP – Illinois Occupational Surveillance Program
NIOSH - National Institute for Occupational Safety and Health
CDC - The Centers for Disease Control and Prevention
OSHA – Occupational Safety and Health Administration
IDPH – Illinois Department of Public Health
IWCC – Illinois Workers' Compensation Commission
IPC – Illinois Poison Center
BLS – Bureau of Labor Statistics
USD – United States Dollar ($)
OHI – Occupational Health Indicator

ABSTRACT

Grant Number: 5U60OH010905
Project Title: Illinois Occupational Surveillance Program 2
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Illinois is the 5th most populated state in the U.S. with 6.2 million employed, of which 20% are employed in high risk occupations. While occupational injury and illness rates have declined over the past 20 years in Illinois, there continues to be a substantial number of workers suffering harm on the job.

This CDC-NIOSH funded Occupational Surveillance Fundamental-plus program at the University of Illinois at Chicago School of Public Health Division of Environmental and Occupational Health Sciences is leading the effort to establish dynamic and sustainable occupational safety and health surveillance programs in Illinois. Unlike most other funded states, investigators in this project are academicians serving as bona fide agents of the Illinois Department of Public Health. As such, we have been able to conduct investigations that entail hypothesis testing and uses methods that frequently are beyond the expertise of state agencies. We have also, over the past ten years of funding as a State Based Surveillance program, strengthened collaborations among state agencies that have not allocated resources to occupational surveillance and have not seen occupational health and safety as part of their mission.

Through funding from NIOSH, we have been able to hire faculty, staff and students to build occupational surveillance staffing capacity in Illinois and improve occupational surveillance by laying the groundwork for a comprehensive, stable, and active program in the State. During the past five years we have accomplished the following:

- Continued to expand our partnerships and collaborations with occupational health stakeholders in Illinois, the Midwest, nationally and internationally.
- Established data sharing agreements with all key federal and state agencies to use essential surveillance data and build a repository of nine different databases.
- Trained over 200 students in different aspects of occupational health, safety and surveillance.
- Submitted to NIOSH 6 annual reports summarizing occupational health indicators in Illinois and posted 196 reports and factsheets to the NIOSH clearinghouse.
- Completed more than 50 novel research studies resulting in 39 publications in peer-reviewed scientific journals in addition to numerous reports, white papers, policy briefs,

and factsheets published through different media platforms including our website at www.illinoisinjuryprevention.org.

- Assisted our state health department complete follow backs of lead cases to provide complete reporting of elevated of blood lead levels in adults.
- Established an advisory board of key stakeholders from government, business sector, worker groups, labor attorneys and community advocacy groups. In addition, we convene an annual meeting of stakeholders with an attendance ranging between 50-100 persons each year.
- Raised the profile of occupational health by conducting workshops, presenting at conferences, providing legal testimonies to lawmakers, and having our work covered by journalists.

We have expanded our program to improve public health practice by working to enhance local authorities' ability to improve safety and oversite in the workplace. These activities are integral to understanding, highlighting, and preventing injuries and illnesses in the Illinois workforce. Without occupational surveillance funding from NIOSH, Illinois would have limited occupational health infrastructure. The investment made by NIOSH helps keep the Illinois workforce safer.

SECTION 1: SUMMARY

Illinois has a diverse population, geography and economy that is highly representative of the US population overall. Illinois is the 5th most populated state in the U.S. with 6.2 million employed, including robust employment across multiple high risk sectors in transportation, utilities, mining (predominately coal, sand/gravel, peat, & tripoli), agriculture, manufacturing, and construction. Over 20% of the workforce is employed in high risk occupations as defined by NIOSH. While occupational injury and illness rates have declined over the past 20 years in Illinois, there continues to be a substantial number of workers suffering harm on the job. Based on BLS data, each year approximately 170 Illinois workers are killed and 125,000 suffer OSHA recordable injuries across private and public sectors, with over $2.3 billion USD in workers' compensation benefits paid out annually.

This CDC-NIOSH funded Occupational Surveillance Fundamental-plus program describes a collaboration between an academic institution, a state health department, a state workers' compensation program, a state department of labor, a state poison center, Illinois OSHA, employers, worker advocacy groups, attorneys, and other stakeholders to address worker health and safety in Illinois. As the bona fide agent of the Illinois Department of Public Health, the occupational surveillance group at the University of Illinois at Chicago School of Public Health Division of Environmental and Occupational Health Sciences is leading the effort to establish dynamic and sustainable occupational safety and health surveillance programs in Illinois that:

1. Enhances the use of Federal and State data sources for occupational surveillance with a particular focus on low wage, immigrant, minority, and precarious workers and those employed by small businesses.
2. Conducts research based on secondary data analyses using cutting edge hypotheses, mixed methods approaches, and advanced quantitative statistical methods aimed at primary, secondary, and tertiary prevention of severe occupational injuries.
3. Re-establishes the adult lead poisoning prevention program in Illinois.
4. Improves sustainability of an active occupational surveillance program by embedding academic personnel at state agencies, producing state-approved publications, co-authoring manuscripts, jointly attending national occupational surveillance meetings, training the next wave of public/occupational health professionals, and collaborating with local health departments, employers and worker advocates to set priorities and initiate interventions.

These activities are integral to understanding, highlighting, and preventing injuries and illnesses in Illinois workplaces. However, with its size and workplace diversity, Illinois is among the most representative states in the US in terms of occupational hazards/risks which increases the capacity to find solutions that are transferable to other states.

Prior to the first five years of the Illinois Occupational Surveillance Program, our state agencies did not conduct proactive surveillance at the state level; rather, their principal role was to manage the data collection for their respective data systems. The entire occupational surveillance program in the Illinois Department of Public Health consisted of one full-time employee who managed data collection for the Bureau of Labor Statistics and the Adult Blood Lead Registry. Our state workers' compensation commission had one data analyst, but their function was to conduct a limited analysis for the annual report to the Governor. The Illinois Department of Labor had limited capacity to engage in strategic surveillance activities and are principally engaged in regulatory and enforcement activities for the protection of public sector employees.

Illinois Occupational Surveillance Program: 2015-2021

Through funding from NIOSH, we have been able to hire faculty, staff and students to build occupational surveillance staffing capacity in Illinois and improve occupational surveillance by laying the groundwork for a comprehensive, stable, and active program in the State. During the past five years we have accomplished the following:

1. Continued to expand our partnerships and collaborations with occupational health stakeholders in Illinois, the Midwest and nationally.
2. Established data sharing agreements with all key federal and state agencies to use essential surveillance data.
3. Built a data repository of nine different databases to be used as a central data point for occupational surveillance in Illinois.
4. Generated annual reports, peer reviewed research, white papers, policy briefs, and fact sheets and maintain a website that has an average of 5000 unique visitors each year (www.illinoisinjuryprevention.org).
5. Trained over 200 students in different aspects of occupational health, safety and surveillance.
6. Submitted 24 proposals for grants and contracts with various federal, state and non-profit agencies to ensure that the Illinois Occupational Surveillance Program remains viable and stable and to enhance our capability and productivity.
7. Submitted 6 annual reports to NIOSH summarizing occupational health indicators in Illinois and posted 196 reports and factsheets to the NIOSH clearinghouse.
8. Conducted workshops on occupational health, made 45 different research presentations at conferences, provided public health and scientific testimonies to lawmakers, and had our work covered by journalists numerous times.
9. Completed more than 50 novel research studies resulting in 39 publications in peer-reviewed scientific journals, in addition to numerous reports and factsheets published through different media platforms.
10. Assisted our state health department complete follow backs of lead cases to provide complete reporting of elevated of blood lead levels in adults. All call backs are handled through our team at the University of Illinois. Over the course of the grant period, we analyzed over 8000 cases of elevated blood lead in adults, of which we made 1366 follow back inquiries. Follow back inquiries requires calling laboratories, exposed workers, and treating physicians. In addition, one of our summary reports was published in the Illinois Morbidity and Mortality Bulletin.
11. Established an advisory board of key stakeholders from government, business sector, worker groups, labor attorneys and community advocacy groups. In addition, we convene an annual meeting of stakeholders with an attendance ranging between 50-100 persons each year.
12. Contributed occupational data to the Illinois Hazardous Substances Registry on lead toxicity and pesticide related illness in the state.
13. Our key investigators sit on 16 different committees, advisory boards and board of directors representing local, state, federal and international bodies. We also partner with other key occupational health programs funded by NIOSH such as the Education and Research Centers (ERCs) and Total Worker Health programs in our own university, across the region and the U.S.
14. Our key investigators provide services to community groups and non-profit organizations to help build occupational safety capacity and knowledge in the broad community.

Without occupational surveillance funding from NIOSH, Illinois would likely continue to have limited occupational health infrastructure. The investment made by NIOSH helps keep the Illinois workforce safe.

SECTION 2

2.1 SCIENTIFIC REPORT

BACKGROUND

In the U.S., there are over 4300 deaths from occupational injury, an estimated 49,000 deaths from occupational illness, and some 3.8 million incidents of non-fatal illnesses and injuries. Each year approximately three million workers are treated in emergency departments and around 150,000 of these workers are hospitalized. According to Leigh (2011), the annual cost of occupational illnesses and injuries is estimated to be $192 billion, primarily attributable to health care, lost wages, and lost productivity. The indirect costs to workers, their families, and society is unknown. The Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health (NIOSH) funds state programs to develop occupational surveillance programs, including the Illinois Occupational Surveillance Program, in order to reduce injury and illness in the U.S. workforce.

Occupational Surveillance

Epidemiological surveillance is the systematic collection, analysis and dissemination of health data for planning, implementing, and evaluating public health programs. Occupational surveillance focuses on monitoring the health of working populations and exposure hazards in the workplace (Halperin 1985). The essential components of an occupational surveillance system include: 1) gathering information on adverse health events and exposure circumstances; 2) distilling and analyzing the data; 3) disseminating information to "those who need to know;" 4) intervening on the basis of the evidence provided by the data to alter the factors that produced the hazards and adverse health outcomes; and 5) evaluating those efforts. Occupational surveillance data enables public health officials, businesses, researchers, government officials, worker advocates, and other stakeholders to become familiar with the magnitude and distribution of occupational illnesses and injuries; monitor trends over time; identify emerging health and exposure problems; flag specific cases or situations for follow-up investigations; set intervention priorities; and evaluate intervention efforts.

Traumatic occupational injuries and illnesses are preventable. Occupational surveillance can target industries, occupations, job tasks, and work forces that are at particular high-risk. Expansion of occupational surveillance to elucidate conditions, proximate causes, and post-injury protocols informs interventions that reduce the occurrence and the consequences of workplace injury.

Occupational Health in Illinois

Illinois has a diverse population, geography and economy that is highly representative of the US population overall (Kolko, 2016; USCB, 2020a; USCB, 2020b). Illinois is the 5th most populated state in the U.S. with 6.2 million employed, including robust employment across multiple high risk sectors in transportation, utilities, mining (predominately coal, sand/gravel, peat, & tripoli), agriculture, manufacturing, and construction (IOSP, 2020). Over 20% of the workforce is employed in high risk occupations as defined by NIOSH. There are about 700,000 workers (11.3% of the Illinois workforce) employed in high morbidity occupations and high mortality industries (IOSP, 2020).

While occupational injury and illness rates have declined over the past 20 years in Illinois (BLS, 2020d), there continues to be a substantial number of workers suffering harm on the job. Based on OSHA data, each year approximately 170 Illinois workers are killed and 125,000 suffer OSHA recordable injuries across private and public sectors, with over 2.3 billion USD in workers' compensation benefits being paid out annually (BLS, 2020d; NASI, 2020). Half of these injuries result in days away from work, job transfer, or job restriction (BLS, 2020d). Of the work related injuries, 40,000-50,000 result in indemnity claims that are contested in the Illinois workers' compensation administrative court system, where workers wait an average of 2.4 years before receiving benefits for lost wages or permanent disability (IWCC, 2020).

Beyond focusing on high morbidity and mortality jobs, an estimated 20-30% of the Illinois workforce consists of underserved workers in precarious employment conditions. This includes low wage workers, immigrants, contingent workers (independent contractors and persons employed by temporary employment agencies) and individuals who are underemployed (persons working part-time but are seeking full-time employment). The total number of precarious workers in Illinois is not entirely clear because there is substantial overlap across these subgroups. In Illinois, 78,000 workers were paid at or below the minimum wage in 2019 with an estimated 10-15% of the workforce earning less than $13.20/hour, which is the average minimum living wage in the state for a single person with no dependents (BLS, 2020a; BLS, 2020f; Glasmeier, 2020).

Underserved workers are disproportionately the youngest and oldest in the workforce, female, African- American, Hispanic, and foreign-born and have fewer years of education (USBLS, 2011a). They also tend to work in low-wage service occupations: as cashiers, food service workers, housekeepers, hand packagers, child care workers, and personal and home care aides. As temporary or low-wage workers they are often excluded from worksite health and safety programs and not invited to participate in workplace health promotion activities. The proportion of underserved workers in the workforce is expected to grow rapidly in the next decade (USBLS 2005; USBLS 2011). These low wage, immigrant, minority, and "precarious" workers bear an inequitable burden of work-related injuries and fatalities compared to higher wage, US born, and non-minority workers, in addition to those with stable employment, and those working in larger businesses. Reasons for these disparities are associated with work in hazardous jobs, lack of training, lack of hygiene protections, unrealistic deadlines, and rogue employers; in addition, limited education, limited English fluency, lack of experience, and willingness to do hazardous work on the part of the workers have been described (Baron, 2014).

These segments of the workforce are difficult to reach through traditional surveillance mechanisms because the data elements that identify them as underserved workers are generally not captured. In addition, there are barriers to reporting cases on the part of employers, workers, and health care providers (Azaroff, 2002). Finally, enforcement activity targets workplaces by a specific event or generalized rates for specific industries, rather than by segments of employees within a worksite. However, risk of injury and illness is not uniformly distributed across a workforce in an industry, but clusters within specific groups of employees who can be tracked through the use of nontraditional surveillance tools.

SPECIFIC AIMS

As the bona fide agent of the Illinois Department of Public Health, the occupational surveillance group at the University of Illinois Chicago, School of Public Health, Division of Environmental and Occupational Health Sciences is leading the effort to establish a dynamic and sustainable occupational safety and health surveillance program in Illinois that:

Aim #1 - Enhances the use of Federal and State data sources for occupational surveillance with a particular focus on low wage, immigrant, minority, and precarious workers and those employed by small businesses.

Aim #2 - Conducts research based on secondary data analyses using cutting edge hypotheses, mixed methods approaches, and advanced quantitative statistical methods aimed at primary, secondary, and tertiary prevention of severe occupational injuries.

Aim #3 - Re-establishes the adult lead poisoning prevention program in Illinois.

Aim #4 - Improves sustainability of an active occupational surveillance program by embedding academic personnel at state agencies, producing state-approved publications, co-authoring manuscripts, jointly attending national occupational surveillance meetings, training the next wave of public/occupational health professionals, and collaborating with local health departments, employers and worker advocates to set priorities and initiate interventions.

These activities are integral to understanding, highlighting, and preventing injuries and illnesses in workplaces that employ significantly at-risk segments of the workforce. With its size and its worker and workplace diversity, Illinois is among the most representative states in the US in terms of occupational hazards, risks, and the capacity to find solutions that are transferable to other states.

METHODOLOGY

AIM #1. Enhance the use of Federal and State data sources for occupational surveillance with a particular focus on low wage, immigrant, minority, and precarious workers and those employed by small businesses

Over the past six years (2015-2021), we assembled and reported all required Occupational Health Indicators (OHIs) to NIOSH, annually, using the guidelines from the CSTE OHI group. We gleaned some of these data from the databases that we maintain in a secure data library for which we have interagency agreements to obtain and store them (hospital discharge, emergency room data, workers' compensation data, poison center). Other OHI data come from publicly available sources (US Bureau of Labor Statistics, US Bureau of Census, and Occupational Safety and Health Administration). Death records are maintained and provided to us by the State health department by request. Data on adults with elevated blood lead levels is managed by our team in conjunction with the State health department. In coordination with the state health department, the workers' compensation commission, and community partners, we co-publish an annual report of our findings for each of these sentinels.

In addition to the OHIs, we examined specific injury sentinels in this project, including but not limited to: burns, musculoskeletal injuries, severe traumatic injuries, amputations, and toxic exposures to various agents including pesticides. We continually examine the role of race, ethnicity, age, gender, and wage differentials on risk of injury, severity of injury and recovery from injury and illness. We have used, and will continue to use, appropriate data sources to examine injury/illness sentinels and vulnerable segments of the workforce. Workers' compensation data gives information about wages, in which we use to examine low wage workers.

We have conducted data linkage projects using probabilistic data linkage, matching individual cases across different data bases by six data elements. Because data are collected by different mechanisms (health care data bases do not require active reporting by the worker or the employer, while workers' compensation and BLS data do) data linkage across different databases can give a better estimation of the total number of work-related cases each year. Furthermore, merging of databases provides a larger number of variables that allows for testing associations between exposure hazards and outcomes. Probabilistic data linkage methods are necessary because we do not have personal identifiers in most of the datasets. For this project, we conducted linkages across data bases to describe numbers, rates, trends, demographic characteristics, time lost, and permanent partial disability payments for workers injured by race/ethnicity, type of employment, and mechanism of injury.

AIM #2. Conduct research based on secondary data analyses using cutting edge hypotheses, mixed methods approaches, and advanced quantitative statistical methods aimed at primary, secondary, and tertiary prevention of severe occupational injuries

We continue to assess, analyze, and link underutilized data systems in order to expand research, enforcement activities and policy recommendations. We currently utilize many data systems that are not part of the OHI core surveillance system for occupational health surveillance such as: police crash reports, court records for workers' compensation claims, emergency medical services pre-hospital run data, outpatient hospital visits, and private clinic and employer data. We continue to expand utilization of the BRFSS for analyses of risk factors associated with industry and occupation which Illinois has collected since 2012. We also use data from the National Burn Repository and National Health Interview Survey to analyze work-related injuries.

We also continue to advocate for inclusion or improved data capture of industry, occupation and other work-related data elements in our state-level Reportable Conditions Knowledge Management System (RCKMS). We also expanded utilization of our outpatient emergency department (ED) visits database which is currently not part of the OHIs, but capture 23-fold more cases than inpatient hospitalization records. Unlike most states, we receive access to both ED and inpatient hospital records within 6 months of the most current hospitalizations (most states have a lag of 1-2 years). In 2019, there were 101,925 work-related ED visits compared to 3,931 inpatient admissions. Internationally, this data source has been underutilized. Unlike the inpatient dataset, outpatient cases predominately involve musculoskeletal and connective tissue disorders that require surgical intervention; 20% involve surgeries primarily involving the back/spine, shoulder, knees and forearms/wrists (including carpal tunnel syndrome). However, the dataset also captures approximately 450-550 amputations each year that are missed by the inpatient records. Another strength of the ED system is that it captures data on occupational illnesses which are poorly captured by nearly every occupational health surveillance system.

Utilizing ICD-9 and 10 codes, 10% of cases have a principal diagnosis for illnesses covered by workers' compensation with the most common being disorders of the central and peripheral nervous systems, gastrointestinal system, skin, eyes and ears, and circulatory and respiratory systems. The ED dataset includes detailed spatial, temporal and comorbid condition data (captured across 29 fields in the dataset) that allows us to identify high risk subgroups in the workforce for developing illnesses and potentially emerging health conditions. We have developed SAS code to easily query and recode ICD-9/10 codes, payer, MDC, MSDRG, CPT and procedure codes.

In addition to quantitative analyses, we conducted a qualitative data analysis to measure the long-term impacts of occupational injuries. For this study we interviewed individuals with a history of suffering work related injuries. Participants were recruited through Chicago area worker centers and local union branches. Worker centers are community organizations that assist individuals with improving their working conditions. The mission of each worker center varies. However, like local union branches, they all provide information regarding worker rights, how to navigate the workers' compensation system, regulations about organizing and advocating on the job, as well as providing safety training. A semi-structured interview guide was developed for the interviews. The interviews focused on a description of the injury event and subsequent long term outcomes including changes to workplace safety practices following the injury, compensation provided through workers' compensation insurance and legal proceedings, impact on employment with the company where the injury occurred and subsequent employers, changes to personal finances, how personal views of job safety evolved following the injury, ensuing long term psychological or physical adverse effects, and the role of social support and changes to family integrity and social support networks.

AIM #3. Re-establish the adult lead poisoning prevention program in Illinois

Objective #7 of Healthy People 2020 is to reduce the rate of adults (age 16 or older) who have blood lead levels (BLL) equal to or greater than ten micrograms per deciliter (BLLs ≥10 μg/dL). In the past, the Illinois Department of Public Health received funding for the Adult Blood Lead Epidemiologic Surveillance (ABLES) program. The ABLES program has been integrated into state occupational surveillance programs since 2012. As part of IOSP, we conduct follow-up interviews with workers and laboratories that conduct blood monitoring of exposed workers to gather missing information and additional details regarding sources of exposure and scope of prevention practices at the worksite to prevent exposure to lead. We also develop fact sheets about health effects and hygiene practices to prevent lead exposure at work in English, Spanish and Polish. We also provide referrals for technical assistance and enforcement. We coordinate with the Childhood Lead Poisoning Prevention Program to identify and analyze childhood cases with elevated blood lead that persist into adulthood. We also reach out to local health departments whom we already support to include information about the risk of parental exposure to lead in the workplace and the potential impact on family members.

AIM #4. Improve sustainability of an active occupational surveillance program by collaboratively establishing real-time surveillance and reporting of occupational health sentinels; embedding academic personnel at state agencies; producing state-approved publications; co-authoring manuscripts; jointly attending national occupational surveillance meetings; training the next wave of public/occupational health professionals; and

collaborating with local health departments, employers and worker advocates to set priorities and initiate interventions

A sustainable and active occupational surveillance program requires a strong legal framework and stakeholders committed to utilizing data for the purpose of prevention. Despite strong partnerships with stakeholders across Illinois and being the bona fide agent of the state health department, we do not have investigative or regulatory authority. We view our role as the strategic coordinator for our state and local agencies. In order to effectively communicate surveillance data and coordinate strategic planning, investigations, and policy changes between the numerous stakeholders in the state we do the following:

1. Convene an annual stakeholder meeting and ad hoc meetings throughout the year to address emerging issues. These meetings bring together stakeholders that rarely meet outside of the meetings we convene. (paused during the pandemic)
2. Clean and reformat stakeholder datasets so personnel within state agencies can more easily access and analyze their own data.
3. Serve as a central hub for occupational health surveillance data in the state and provide access to our data repository, which helps the various stakeholders prioritize their activities, communicate with other agencies, and solicit funding to maintain or expand their programs.
4. Generate and publish annual reports, peer reviewed research, white papers, policy briefs, fact sheets and maintain our website (www.illinoisinjuryprevention.org). Our annual report covers the most recent five years of data and we provide access to the larger summary dataset that includes data from the year 2000. We continue to disseminate surveillance data findings and recommendations based on these findings for prevention, intervention and policies that integrate proven hygiene approaches to address areas of concern identified in our surveillance data, both in targeted priority workplaces and high-risk employees. We also continue to publish our reports and documents on the NIOSH Occupational Health Clearinghouse.
5. Participate on various public health policy panels in order to advocate for inclusion of occupational health metrics and interventions as part of general public health planning in such programs as Healthy People 2020 initiatives, Housing and Urban Development initiatives, local public health planning committees and other programs across the state.
6. Engage with national and international policy agencies and encourage state stakeholders to join us in these activities. This helps our state improve identification and communication of emerging hazards, and build occupational surveillance capacity by bringing in new funding and talent into our state agencies through various grants, fellowships and employment programs.
7. Train the future occupational health workforce in Illinois. We coordinate training across our faculty in the School of Public Health within three main programs: UIC Education and Research Center (ERC), UIC Center for Total Healthy Work and our Illinois Occupational Surveillance Program.
8. Participate in all NIOSH surveillance calls, web meetings and in person meetings. We also continue to present findings on related NIOSH webinars.

The goal of our partnerships and collaborations are to: (1) provide occupational health stakeholders targeted materials and resources to assist them with reducing workplace injuries and illnesses as part of their organizational missions, (2) broadly improve occupational

surveillance in Illinois, and (3) integrate occupational health priorities into strategic goals of organizations that have a broad public health focus, but typically omit workplace issues from their agendas.

RESULTS AND DISCUSSION

Major Goal #1: Enhance the use of Federal and State data sources for occupational surveillance with a particular focus on low wage, immigrant, minority, and precarious workers and those employed by small businesses.

Grant Proposals Submitted – We submit proposals for grants and contracts with various federal, state and non-profit agencies to ensure that the Illinois Occupational Surveillance Program remains viable and stable.

1. Submitted and funded by Illinois Education and Research Center: "Establishing Research Methods to Study the Occupational Health Risks of Hair Braiders" PI: Holloway-Beth; Faculty Mentor: Forst. $20,000
2. Submitted and funded by Illinois Education and Research Center: "Community Concept Mapping to Describe Work as a Determinant of Health" PI: Jennifer Hebert-Beirne; Faculty Mentor: Forst
3. Submitted and funded by NIOSH: Total Worker Health Program. R01: "Building a Culture of Total Worker Health at the Community Level." Co-PIs: Conroy L, Hebert-Beirne J. Co-I: Forst.
4. Submitted to OSHA/Susan Harwood: "Training Temp Workers and Employers." PI: Forst.
5. Submitted to National Institute of Justice: Assessing the Involvement of Alcohol and Drugs in Fatal and Non-fatal Assaults on American Law Enforcement. PI: Swedler.
6. Submitted and funded. CDC Prevention Research Center. SIP in Worker Health Research Network
7. Submitted and funded joint project between IDPH and University of Illinois Chicago. Pre-hospital Surveillance of Occupational Injuries among EMS Personnel. Funding Period. 2017-9. $32,000
8. Submitted and funded to NIOSH/CDC. Pesticide Surveillance in Illinois. Funding period: 2016-8. $105,000
9. Submitted and funded to NIOSH/CDC. Community Concept Mapping to Explain Work as a Determinant of Health. NIOSH/CDC. Pilot Project. Funding period: 2016-7. $20,000
10. Submitted and funded to Alpha Foundation. For the improvement of mine safety and health. Funding period: 2017-2020. $300,000. (Friedman Co-Investigator).
11. Our Co-I, Dr. Jennifer Hebert-Beirne, was awarded an international travel award for her and Dr. Linda Forst to travel to Israel to teach about labor migration and health in a summer course on global health, and to develop collaborative research projects in the realm of occupational health in Israel. The award was granted by the University of Illinois System, Office of the Vice President for Economic Development and Innovation. They completed a grant proposal to replicate a community based occupational health project, submitted to the Israel Science Foundation; it did not get funded.
12. Submitted and funded to the US Department of Labor to further evaluate underreporting of injuries to MSHA. PI: Cohen. $149,999.

13. Wrote a grant proposal and submitted it to multiple non-profit organizations to develop a State surveillance system to monitor injuries to both civilians and law enforcement officers during police-civilian contact.
14. Submitted a proposal, funded by American Massage Therapy Association (AMTA). Proposal to develop a longitudinal survey of massage therapists taking continuing education (CE) courses on injury prevention and body mechanics through the American Massage Therapy Association (AMTA). The focus of the study is to describe body mechanics and self-care injury prevention knowledge and techniques employed by massage therapists, as well as prevalence of musculoskeletal complaints. $50,000.
15. Contract with state workers' compensation commission to reconstruct and reorganize First Reports of Injury system. Funded.
16. Co-wrote a grant proposal with Dr. Emily Stiehl received funding for a pilot project to develop a survey tool on Safety Climate among precarious workers. PI: Forst.
17. Submitted to USDA / NIFA grant. PI-Salah Issa. (not funded) Safeguarding Farmers and Farmworkers during the COVID-19 Pandemic: Rapid Resource Delivery via Existing Channels. Forst is PI of a sub-contract that focuses on migrant and seasonal farm workers.
18. Submitted and funded, to NIOSH PPRT. Linda Forst is co-investigator (Bassi C, PI). Develop point-of-care testing for elemental mercury using biosensor technology. Linda Forst and Ian Papautsky from COM/Bioengineering, faculty advisors. Funded, 7/1/2020-6/30-2021.
19. Submitted and funded, to UIC Center for Clinical and Translational Science. Linda Forst is co-investigator. (PI. Elizabeth Papautsky) User-centered approach to developing an interface for a point-of-care blood metal analysis system. 2019-2020.
20. Linda Forst is co-investigator and co-wrote proposal in collaboration with the City of Chicago. COVID-19 Response Contact Tracing Resource Coordination. Evaluated Sales Force contact tracing software. On contact tracing team.
21. Submitted and funded, to CDC. Lee Friedman is PI on an Opioid Data to Action grant in collaboration with the Cook County and Chicago Departments of Public Health. The grant focuses broadly on characterizing and improving surveillance of persons affected by the opioid epidemic. A key element is related to occupational injuries caused while under the influence of opioids.
22. Submitted and funded, to NIOSH. Lee Friedman is PI had the third renewal of the occupational health and safety surveillance program in the State of Illinois. This project continues to develop a collaborative, integrated occupational health and safety surveillance program in the State of Illinois. The expanded program involves three projects: (1) core fundamental surveillance program (Friedman, PI and Lead), (2) OSHA coordination project (Friedman, Lead), and (3) Pesticide surveillance in Illinois (Forst, Lead)
23. Submitted and funded, to NIOSH. Lee Friedman as PI and Dana Madigan as project lead were funded by NIOSH to build on prior work aimed at strengthening occupational surveillance and utilize surveillance data to inform policies for safe return to work, as well as reduce and prevent work-related COVID-19 exposures and outbreaks. The data will be used to identify high risk subgroups of workers and occupations/industries, evaluate the efficacy of public health actions on transmission in the workplace, and inform ongoing prevention strategies for infectious diseases.
24. Submitted and funded, to NIOSH. Linda Forst as project lead were funded by NIOSH to increase vaccine uptake among low-wage, essential workers. We will build on our

partnership with the Chicago Workers Collaborative (CWC), a workers' center in Chicagoland that addresses the health and safety of low-wage workers with a particular focus on those hired through temporary staffing companies. The primary strategy is to scale up the Mobile Vaccine POD (point of dispensing) Program, bringing COVID-19 educational workshops--via social media and community forums--and mobile vaccine pods to the places where essential workers are located: their neighborhoods, apartment complexes, trailer parks, factories, warehouses, supermarkets, laundromats, food pantries, schools, and faith communities.

Reports

1. Occupational Health Indicators, 2013. Reported to NIOSH, Illinois State Based Surveillance
2. Occupational Health Indicators, 2014. Reported to NIOSH, Illinois State Based Surveillance
3. Occupational Health Indicators, 2015. Reported to NIOSH, Illinois State Based Surveillance
4. Occupational Health Indicators, 2016. Reported to NIOSH, Illinois State Based Surveillance
5. Occupational Health Indicators, 2017. Reported to NIOSH, Illinois State Based Surveillance
6. 196 reports and factsheets have been published in the NIOSH clearinghouse
7. Provided occupational injury data for the Illinois Strategic Plan on Injury Prevention under CDC funded Core Violence and Injury Prevention Center; See page 35 in: http://dph.illinois.gov/sites/default/files/publications/ohpm-ivp-databook-v2-041618.pdf
8. The Illinois Partnership for Safety (IPS) added occupational health information related to pesticides from IOSP pesticide research. We also added it to the Illinois Hazardous Substances Annual Report.

Press Releases/Interviews/Testimonies/Presentations/Workgroups

1. Friedman L. "Clashes with Cops." Press release. https://news.uic.edu/clashes-with-cops and National Public Radio.
2. Forst L. Ethnic Disparities in Occupational Injuries. Public Health Minute. January 2016. http://wp.lehman.edu/public-health-minute-with-william-latimer/ethnic-disparities-in-occupational-injuries-linda-forst-md-mph-university-of-illinois-at-chicago/
3. Swedler D. "Police more likely to be killed on duty in states with high gun ownership. https://news.uic.edu/police-more-likely-to-be-killed-on-duty-in-states-with-high-gun-ownership
4. Press conference by Cook County Department
5. Friedman L. "Trauma on the South Side". Crain's Chicago Business, April 11, 2016. Discussing lack of trauma services in southern Cook County that impacts injured workers and non-workers.
6. Forst L. Workers' Compensation in Illinois. Testimony on new legislation to IL Legislature. June 2016
7. Forst L. Workers Compensation in Illinois. Testimony on new legislation to IL Senate. March 2017
8. Forst L. Illinois House Bill 690. Job Creation Act. Press conference presentation. 2017

9. Used data to testify at state legislative hearings on a new amendment to the Chicago municipal code regarding establishment of the Office of Labor Standards to enforce the minimum wage, paid sick leave ordinances; this ordinance passed in Nov 2018.
10. Provided data to the Illinois Injury Strategic Plan and participated on the strategic planning committee. Played key role in getting occupational injury issues on to the final published report and future strategic planning. Dr. Linda Forst continues to sit on the data committee for the implementation of the strategic plan. In addition, we compiled a comprehensive list of publicly available databases that can be used for injury epidemiology in general and specifically for work-related injury; this is currently being evaluated by stakeholders through an online survey.
11. Provided occupational injury data on the latest report for the Illinois Strategic Plan on Injury Prevention under a CDC funded Core Violence and Injury Prevention Center. Additional data was added regarding pesticide related poisoning. Dr. Linda Forst also continues to participate on the strategic plan implementation committee and the data committee. She played key role in getting more occupational injury issues on to the final published report and expanding work-related content on new reports.
12. Conducted four workshops with different Worker Centers on the workers' compensation system in Illinois, risk of work related injuries based on the Occupational Health Indicator data, and special issues/concerns among low wage workers and undocumented workers in Illinois.
13. Attended working group on pesticide surveillance issues. NIOSH annual Pesticide Surveillance meeting. August, 2018 and May 2019.
14. Presentation. Hebert-Beirne, J. and Forst, L. (2018). Occupational and Community Health and Social Justice. Ben-Gurion University in the Negev in Israel. Beersheba, Israel
15. Presentation. Forst L. A Policy Initiative in Illinois using Occupational Surveillance Data. Presented at the CSTE/NIOSH winter meeting of SBS grantees.
16. Presentation. Forst L. Publicly Available Data for Injury. Illinois Partnership for Safety Workshop at the National Safety Council. March 21, 2019
17. Dr. Linda Forst convened a statewide working group in Springfield Illinois in March 2020. The workgroup included USEPA, Illinois EPA, Illinois Dept. of Agriculture, Area 5 OSHA, Illinois Dept. of Labor, Illinois Dept. Public Health, Local Departments of Public Health, Southern Illinois University at Carbondale, and UIC School of Public Health. The goal of the workgroup is to foster collaboration and communication between authorities to improve surveillance, safety and regulatory oversite of employers, applicators and agricultural workers, and develop a state surveillance system for Pesticide Related Illness. Currently no single government organization has regulatory authority over workplace pesticide exposures because of loopholes in the laws relating to pesticides. A PhD student is taking this on as her dissertation work and will be participating in a policy writing group in collaboration with Southern Illinois University.
18. Dr. Linda Forst was an invited speaker and workshop Leader in the WestON meeting in Denver CO in September 2019. She presented on "Creating an Elevator Speech" related to funding of occupational health surveillance programs.
19. Dr. Linda Forst presented at the OSHA Temporary Worker Safety Seminar on October 24 in Joliet, Illinois. The workshop focused on the responsibility and liability for temporary workers' safety, workers compensation, the Illinois Temporary Labor Services Act, and the requirements for day-to-day supervision of temporary workers. Dr. Forst's presentation focused on preventing injuries in the temporary staffing industry.

20. Dr. Linda Forst in June 2020 gave a webinar titled "Returning to work after COVID-19" for State Ombudsmen for the Elderly. In addition to the webinar, there was been ongoing consultation work with this agency.
21. Media coverage for manuscript "Association Between Financial Conflicts of Interest and ILO Classifications for Black Lung Disease". Medscape - Donavyn Coffey (June 03, 2021) - Are These Docs Paid to Change Their Medical Opinion? Black Lungs, Big Coal, and Bias https://www.medscape.com/viewarticle/952401#vp_3 also repurposed in Chest.
22. Media coverage for manuscript "Association Between Financial Conflicts of Interest and ILO Classifications for Black Lung Disease". Kari Lydersen – five piece expose:
    a. https://energynews.us/2021/07/12/faulty-equipment-poor-training-are-main-factors-in-illinois-coal-mining-deaths/
    b. Black lung story: https://energynews.us/2021/07/14/black-lung-a-scourge-of-the-past-still-plagues-illinois-mines/
    c. Contractors: https://energynews.us/2021/07/13/contract-coal-miners-face-longer-hours-higher-risk-than-full-time-peers/
    d. Fines: https://energynews.us/2021/07/12/a-small-price-to-pay-illinois-mines-routinely-appeal-safety-penalties/
    e. Family: https://energynews.us/2021/07/12/for-generations-of-illinois-coal-mining-families-risk-is-part-of-everyday-life/
23. Media coverage for manuscript "Association Between Financial Conflicts of Interest and ILO Classifications for Black Lung Disease". https://ohiovalleyresource.org/2021/03/26/study-shows-bias-conflicts-of-interest-among-doctors-who-read-black-lung-x-rays/
24. Media coverage for manuscript "Association Between Financial Conflicts of Interest and ILO Classifications for Black Lung Disease". Curtis Tate of West Virginia public radio. He said it'll play in WV Ohio and Kentucky and will be on Their web sites. https://www.wvpublic.org/health-science/2021-03-26/study-shows-bias-conflicts-of-interest-among-doctors-who-read-black-lung-x-rays
25. Multiple engagements with the lay media regarding various work related COVID-19 issues.
    a. Protecting Essential Workers of Illinois. Press conference with Chicago Workers Collaborative. https://www.facebook.com/ChiTemps/videos/214288773181132/
    b. CBS Chicago News. Paid Sick Leave and COVID-19
    c. Milwaukee Sentinel. COVID-19 and Meat Packing
    d. WBEZ. Essential Workers (not published)
    e. Daily Herald. Opening Hair Salons after COVID-19 Stay and Home order
    f. WBEZ/NPR - Nursing home safety

Website

Upgraded and populated our website: www.illinoisinjuryprevention.org. Based on website traffic statistics, we have an average of 5000 unique visitors each year between 2015-2021. Most of the visitors download at least one publication including the occupational health indicator reports, peer-reviewed articles, policy briefs and fact sheets. The most popular downloads are the various fact sheets we have relating to different industries and occupations, as well as our policy briefs.

State Based Datasets used for Occupational Surveillance Program

- Facilitated a new data sharing agreement established between NIOSH and the Illinois Department of Public Health for sharing of Illinois EMS data with NIOSH. The goal was to evaluate injuries among EMS providers. Illinois Dept of Public Health holds the primary contract with NIOSH and UIC-IOSP is a sub-contractor. This project is ongoing through December 2020.
- Coordinated data sharing agreement with the US Department of Labor and the Mine Safety and Health Administration to get complete data files on Part 50 program, production and employment data, Coal Workers' Health Surveillance Program (CWHSP), and the Federal Black Lung Benefits Program (FBLP). The data request was done in partnership with our close UIC collaborators in the MINER group, led by Dr. Robert Cohen.
- Facilitated a data sharing agreement with the Cook County Department of Public Health to get Essence data, hospital records and vital records of both civilians and law enforcement officers injured during police-civilian contact.
- Facilitated data sharing agreement and data transfer of Illinois Department of Transportation Police Crash Reports. This data has been used to look at crash risk among various occupations and to evaluate the impact of road safety policies implemented in the State of Illinois.
- Fostered relationships and signed letters of agreement with five area Worker centers and 4 unions to collaborate on our primary research activity related to long term outcomes following a workplace injury.
- Facilitated a new data sharing agreement between UIC and the Illinois Workers' Compensation Commission (IWCC). This agreement renews data sharing of workers' compensation data with UIC. The new agreement will expand the older data sharing agreement to provide access to both electronic First Reports of Injury and all court records related to contested workers' compensation claims ("case management claims"). In the past, this data has been very helpful in identifying high risk occupations in Illinois and has led to numerous peer-reviewed manuscripts.
- We are working with an Illinois DPH State epidemiologist to include work indicators in all data systems. This is particularly focused to INEDSS and a data linkage project with the Illinois Department of Employment securities to link COVID-19 cases (positive tests) with employers and business sectors.
- The UIC hospital was selected to participate in the National Electronic Injury Surveillance System which is used for the CDC WISQARS and NIOSH Work-RISQS data systems. We were contacted by CPSC because they found our IOSP website. Under the new CPSC-NEISS contract, which is being finalized, IOSP will conduct the data extraction for the survey. In partnership with the hospital (UI Health), we will also use this program to train medical staff in injury/occupational epidemiology.
- Obtained and analyzed employment and workers' compensation claim data from our own University of Illinois health system (demographics, wage, job titles, health and safety data). The community benefit project has been shared with UI Health leadership with the goal of increasing employment and career development of residents living in Chicago communities surrounding our university. In addition, the study identified high risk occupations within the hospital system for injuries.
- Though unfunded, IOSP is participating in the pesticide related illness SENSOR group and have submitted 2018data to SENSOR. We are currently working on 2019 data to submit, as well.

- Dr. Friedman is Co-I on several projects in collaboration with the Mining Education and Research Center (MinER) at UIC. Role is to expand utilization of MSHA, clinic and international data systems for evaluation of miner health and safety. Our researchers focus on injury research and bias in the data systems to compliment the principal work of the center that focuses on respiratory health issues. Multiple peer-reviewed publications have resulted from this collaboration.
- Assisted NIOSH to validate data collected on COVID-19 related deaths among first responders. State collaboration involved IOSP, Illinois DPH, Chicago DPH and NIOSH. We extracted data from death records on all known first responder deaths along with demographics, comorbidities, and time and place of death.
- **Hospital outpatient and inpatient databases** – used to describe work-related heat and cold injuries, law enforcement injuries, pesticide poisoning, cost to employers from lost productivity caused by common foodborne pathogens, and common occupational respiratory diseases. Used to describe hospitalization patterns of the precariously housed/employed in Illinois, cost of foodborne illnesses from lost productivity at work, triage of burn patients to non-burn centers in Illinois (including occupational injuries), and injuries from working with and riding large animals.
- **Emergency Medical Services pre-hospital ambulance data** – planning use for injuries among EMS personnel
- **Illinois Workers' Compensation Commission Claims Database**. Used in a wide array of analyses including injuries to law enforcement personnel, temp workers, public transportation workers, taxi drivers, workers in the oil refinery industry, professional athletes and hospital workers. In addition, we are conducting an analysis evaluating the impact of recent legislative changes in Illinois on the WC system.
- **Illinois Poison Center Data.** Used to evaluate the efficacy of poison centers in reducing hospital costs, heavy metal exposures from occupational and non-occupational sources, and pesticide exposures. Used to evaluate the efficacy of poison centers in reducing hospital costs, heavy metal exposures from occupational and non-occupational sources, and pesticide exposures.
- **Illinois Police Crash Report Data** – used to evaluate truck driver crashes, EMS personnel crashes and safety of all wheel drive vehicles.
- **Department of Energy data files** – used to assess association between employment in a plutonium manufacturing plant and mortality.
- **National Burn Repository** – used to create a definition to identify work-related injuries and characterize burns by industry. Currently being used in a text analysis to identify hazards and processes associated with burn injuries by industry and specifically among firefighters.
- **National Health Interview Survey –** used to assess injury and illness among miners, employment history and psychosocial status of persons suffering epilepsy, and triage of burn injuries suffered by U.S. workers. used to assess injury and illness among miners, employment history and psychosocial status of persons suffering epilepsy, and triage of burn injuries suffered by U.S. workers, hearing loss among emergency responders, history of injuries among first responders, the impact of recent immigration legislation on absenteeism from work and school, and injury and illness profile among personal care workers.

- **Illinois Adult Blood Lead Registry** – used to describe spatial and temporal patterns among Illinois adults with elevated blood lead levels above 10ug/dl. The findings are being published with our partners at IDPH.

Major Goal #2: Conduct research based on secondary data analyses using cutting edge hypotheses, mixed methods approaches, and advanced quantitative statistical methods aimed at primary, secondary, and tertiary prevention of severe occupational injuries

- Over the past six years our research has been broad in scope. **See complete list of related peer-review publications below.**
- In addition to research activities conducted by the research team, as part of our mission to train the next generation of occupational health researchers we have provided targeted data from our data repository to students at the University of Illinois for the following analyses: relationship between pesticide exposure and adverse birth effects, risk of burn injury among firefighters; relationship between fatigue and crash risk among heavy truck drivers; hearing loss among law enforcement officers; distribution and high risk groups for elevated blood lead; evaluation of medical errors across all hospitals in Illinois; hiring practices and injury risk among low wage healthcare workers; risk factors for crashes involving police vehicles with a focus on the role of lights and sirens, high speed pursuits and protocols to cross intersections during a red light; workplace injuries involving specialized indoor vehicles (e.g. forklifts); heat injuries at work and in the community setting; utilization of outpatient data to characterize elective surgeries for work-related musculoskeletal injuries; risk factors and characteristics of persons suffering workplace chemical burn injuries; pesticide surveillance in Illinois; and work related bike injuries.
- We conducted a multi-year, mixed methods study to evaluate the association between work-related injuries and long-term changes in physical and psychological health, activities of daily living, social support and home life, finances, ability to sustain work at a comparable level of compensation, and attitudes about workplace safety. As part of the qualitative analysis, we recruited and interviewed 42 workers about long term impacts following an occupational injury, half of which were undocumented workers. Undocumented workers have different access to resources and social safety nets following an injury. We have completed three manuscripts based on the interviews relating to how undocumented workers navigate the legal system after an injury, different ways employers violate the law following a workplace injury, and barriers to accessing workers' compensation and medical care following an injury. We are completing a fourth paper on long-term adverse psychological effects following an injury.
- We completed a secondary data analysis on occupational burn injuries, with analysis of data from the National Burn Registry and from Illinois Hospital Discharge data. Risk factor and text analysis research have been drafted into manuscripts that are now in review for publication.
- We completed a secondary data combined with primary data collection has led to publications on occupational safety and health in residential construction, green construction, healthcare sustainability, and the workers' compensation needs of the working poor.

- We completed a research using MSHA part 50 data. The research evaluates injury risks during extended work hours in all mine operations in the U.S. We also conducted a similar study evaluating risk factors associated with injuries in mining during the first hour at work.
- We completed a secondary data analysis to evaluate musculoskeletal disorders among the high risk occupations of nursing and transportation jobs. Both occupational groups disproportionately are required to engage in heavy exertion and long standing during working hours, and the findings showed a substantially higher proportion of workers in these two occupations reported work related lower back pain.
- We completed a completed a report on health hazards among solar panel manufacturing workers and wastewater biosolids management workers. The solar panel report is the most downloaded product on our website. Both reports were also listed in NIOSH eNews.
- We completed an analysis characterizing home, work and health in epileptic adults using secondary data. The focus of the analysis was to characterize the impact of epilepsy on a person's ability to find a job, maintain employment, as well as the type and quality of employment.
- An intervention training project has been completed which trained interns in chiropractic medicine on occupational history taking during medical examination.
- A qualitative survey of barriers to employment among persons with a history of precarious housing has been completed. The focus was to assess needs and barriers for reemployment among individuals of a residential rehabilitation program to compare those with and without a self-reported history of unstable housing.
- A needs assessment for the development of a poison control system in Ghana has been completed. Medical and public health professionals were interviewed about current surveillance system needs and barriers to implementation.
- Conducted a neighborhood inventory of employers in hardship communities in Chicago. This analysis has resulted in a manuscript that has been submitted for peer reviewed publication.
- Recent PhD graduate of our program and mentee of Dr. Friedman published work evaluating 2004-2016 National Health Interview Survey data to characterize work related injuries treated at different levels of the medical system. Findings showed that 53.1% of occupational injuries were exclusively treated outside of a hospital setting and never captured by hospital/emergency department data systems, which comprises 40% (3.0 million) of total missed days of work and 44% ($452 million) of total cost of lost productivity among full-time workers. These are cases are missed in state OHI data collections.
- Recent PhD graduate of our program and mentee of Dr. Friedman published work on reemployment program for precariously housed individuals. The lead author is currently working with the surveillance group to develop programs in the Chicago area to assist those precariously employed to gain employment (temp workers, ex-felons, recovering substance users, homeless).
- Recent PhD graduate of our program and mentee of Dr. Forst published work on characterizing pesticide related adverse health events in Illinois using three surveillance data systems. The data led to a policy paper and was shared with the NIOSH SPIDER program.

- Recent PhD graduate of our program and mentee of Dr. Friedman published work evaluating differences in COPD and emphysema specifically among miners by commodity type extracted.
- In collaboration with the UIC Miner Center, Dr. Friedman co-authored manuscript investigating progression of black lung disease in miners after cessation of exposure.
- In collaboration with a current PhD student and two former occupational medicine physicians from our UIC residency program, we completed an analysis of temperature related injuries in Illinois during 2011-2018. We evaluated injuries occurring in both the community and occupational setting.
- Our research team collaborated with NIOSH to evaluate the efficacy of using internet searches of news reports to monitor mortality of first responders during the SARS-CoV-2 pandemic. Dr. Friedman along with others in Illinois and collaborators across the country contributed data, assisted with the analysis and writing a manuscript. The manuscript has been published in a peer-reviewed journal.

Presentations

1. Forst L, Friedman L, Chin B, Madigan D. Burden of Occupational Injury on Communities. Council of State and Territorial Epidemiologists. Anchorage Alaska, June 22, 2106
2. Forst L. Occupational Hazards among Artisanal and Small Scale Gold Miners. American Occupational Health Conference. Chicago, April 2016
3. Swedler D. Homicides of Law Enforcement Officers on-the-job in the United States: Understanding the Role of Firearms. College of Medicine and Public Health, University of Wisconsin, Madison, WI, February 9, 2016.
4. Swedler D. Considering the Evidence on Drug-Involved Truck Crashes in the United States, 2000-2013. Volpe National Transportation Systems Center Speaker Series. Cambridge, MA, July 27, 2015.
5. Forst L. Invited Speaker. University-Community Collaborations. National Safety Council. Safe Communities Coalitions Annual Conference. August 8, 2016
6. Velonis A, Forst L. Invited Workshop Presenter. Concept Mapping for Public Health Professionals. Council of State and Territorial Epidemiologists. Boise, Idaho. June 4, 2017
7. Forst Occupational Illness Surveillance in the US. International Labour Organization meeting and Continuing Medical Education program. Milan, Italy. June 26, 2017
8. Madrigal J, Forst L. Occupational Health in the Illinois Behavioral Risk Factor Surveillance System. EPICOH. Barcelona, Spain. September 2016
9. Forst L. Global Activities to Develop Diagnostic Criteria for Occupational Diseases. Council of State and Territorial Epidemiologists. Boise, Idaho, June 2017.
10. Velonis A, Forst L. Session Presenter. Concept Mapping for Public Health Professionals—to triangulate last year's findings. Council of State and Territorial Epidemiologists. West Palm Beach. June 2018
11. Forst L. Course Instructor. Global Migration, Work and Health. In Summer Course at Ben Gurion University, Beer Sheva, Israel. July 2018.
12. L Forst, B Chin, L Friedman. Occupational Injuries at the Community Level. Occup Environ Med 71 (Suppl 1), A70-A71. 2015.
13. KS Almberg, L Friedman, JM Graber, EL Petsonk, C Rose, LHT Go, Cohen R. Cardiopulmonary Disease Among Illinois Miners, Results Of An Analysis Of State

Workers' Compensation Data. OCCUPATION, OBESITY, AND LUNG HEALTH, A1748-A1748. 2015.

14. KS Almberg, L Friedman, JM Graber, EL Petsonk, C Rose, LHT Go, Cohen R. Cardiopulmonary Disease Among Illinois Miners, Results Of An Analysis Of State Workers' Compensation Data. American Journal of Respiratory and Critical Care Medicine 191, 1
15. K Almberg, L Friedman, D Swedler, J Graber, C Rose, EL Petsonk, RA Cohen. Completeness Of Respiratory Injury And Illness Reporting In The Illinois Mining Industry: Comparing Workers' Compensation Claims To The Msha Part 50 Program. American Journal of Respiratory and Critical Care Medicine 193, 1. 2016.
16. K Almberg, L Friedman, D Swedler, J Graber, C Rose, EL Petsonk, RA Cohen. Completeness of Respiratory Injury and Illness Reporting In the Illinois Mining Industry: Comparing Workers' Compensation Claims to the MSHA Part 50 Program. OCCUPATIONAL MEDICINE AND LUNG FUNCTION, A5442-A5442. 2016.
17. SL Mabila, K Almberg, L Friedman, N Ndlovu, N Vorajee, J Murray, Cohen RA. Emphysema in South African Miners at Autopsy, 1975-2014. ISSUES IN COPD, A1747-A1747. 2017.
18. D Madigan, E Quinlan-Ruof, J Cambron, L Forst, J Zanoni, LS Friedman. Occupational health history taking attitudes and behaviors of chiropractic interns. Occupational and Environmental Medicine 75 (Suppl 2), A103-A104. 2018.
19. L Forst, L Topete, J Zanoni, L Friedman. Finding at-risk, low wage workers in community health centres in the US. Occup Environ Med 75 (Suppl 2), A159-A159. 2018.
20. D Madigan, TP Johnson, L Forst, LS Friedman. Re-employment needs and barriers of individuals in a residential rehabilitation program. Occupational and Environmental Medicine 75 (Suppl 2), A514-A514. 2018.
21. T Bonney, E Kyeremateng-Amoah, L Forst, L Friedman. Acute occupational pesticide poisoning in Illinois 2010–2015: data linkage of hospital discharge and poison control center databases. Occupational and Environmental Medicine 75 (Suppl 2), A155-A155. 2018.
22. L Forst, B Chin, D Madigan, L Friedman. Predicting occupational injuries at the community level. Occup Environ Med 75 (Suppl 2), A137-A137. 2018.
23. S De, RA Cohen, KS Almberg, L Friedman. Risk Factors Associated with Early Shift Injuries Among US Miners, 1983-2015. PULMONARY HEALTH EFFECTS CAUSED BY OCCUPATIONAL EXPOSURES, A1857-A1857. 2019.
24. RA Cohen, KS Almberg, LS Friedman. Injuries Associated with Long Working Hours: Risk Factors and Adverse Outcomes. PULMONARY HEALTH EFFECTS CAUSED BY OCCUPATIONAL EXPOSURES, A1856-A1856. 2019.
25. K.S. Almberg, L. Friedman, J. Graber, E.L. Petsonk, C. Rose, R.A. Cohen. Cardiopulmonary Disease Among Illinois Miners, Results of an Analysis of State Workers' Compensation Data. Abstract 64682. Category: 01.20 - Occupational and Environmental Respiratory Diseases (EOPH). American Thoracic Society Annual Conference January 2015.
26. KS Almberg, L Friedman, JM Graber, EL Petsonk, C Rose, LHT Go. Cardiopulmonary Disease Among Illinois Miners, Results Of An Analysis Of State Workers' Compensation Data. American Journal of Respiratory and Critical Care Medicine 191, 1. 2015.
27. Fitts R, Wueste M and Friedman LS. Clinical outcomes of temperature related injuries treated in the hospital setting, 2011-2013. APHA 2015 Conference. (**Winner best student poster**).

28. D Swedler, L Friedman, P Ruestow. Analysis of Workers' Compensation Claims by Professional Athletes in Illinois, 2005–2013. APHA 2016 Annual Meeting & Expo (Oct. 29-Nov. 2, 2016). 2016.
29. A Holloway-Beth, L Forst, S Brandt-Rauf, S Freels, L Friedman. Assessing Possible Underestimation of Legal Intervention. APHA 2016 Annual Meeting & Expo (Oct. 29-Nov. 2, 2016).
30. K Almberg, L Friedman, D Swedler, J Graber, C Rose, EL Petsonk. Completeness of Respiratory Injury and Illness Reporting In the Illinois Mining Industry: Comparing Workers' Compensation Claims to the MSHA Part 50 Program. American Journal of Respiratory and Critical Care Medicine 193, 1. 2016.
31. D Madigan, EQ Ruof, JA Cambron, L Forst, J Zanoni, L Friedman. Occupational health history taking of chiropractic interns. APHA 2017 Annual Meeting & Expo (Nov. 4-Nov. 8). 2017.
32. A Holloway-Beth, L Friedman, K Joshi, LR Murray, R Rubin. Surveillance of Legal Interventions in Illinois. APHA 2017 Annual Meeting & Expo (Nov. 4-Nov. 8). 2017.
33. SL Mabila, K Almberg, L Friedman, N Ndlovu, N Vorajee, J Murray. Emphysema in South African Miners at Autopsy, 1975-2014. ISSUES IN COPD, A1747-A1747. 2017.
34. D Madigan, E Quinlan-Ruof, J Cambron, L Forst, J Zanoni, LS Friedman. Occupational health history taking attitudes and behaviours of chiropractic interns. Occupational and Environmental Medicine 75 (Suppl 2), A103-A104. 2018.
35. L Forst, L Topete, J Zanoni, L Friedman. Finding at-risk, low wage workers in community health centres in the us. Occupational and Environmental Medicine 75 (Suppl 2), A159-A159. 2018.
36. D Madigan, TP Johnson, L Forst, LS Friedman. Re-employment needs and barriers of individuals in a residential rehabilitation program. Occupational and Environmental Medicine 75 (Suppl 2), A514-A514. 2018.
37. Forst, B Chin, D Madigan, L Friedman. Predicting occupational injuries at the community level. Occupational and Environmental Medicine 75 (Suppl 2), A137-A137. 2018.
38. T Bonney, E Kyeremateng-Amoah, L Forst, L Friedman. Acute occupational pesticide poisoning in Illinois 2010–2015: data linkage of hospital discharge and poison control center databases. Occupational and Environmental Medicine 75 (Suppl 2), A155-A155. 2018.
39. D Madigan, L Friedman, JA Cambron. Work-related Musculoskeletal Disorders in Massage Therapists. APHA's 2019 Annual Meeting and Expo (Nov. 2-Nov. 6). 2019.
40. M Novak, M Wahl, L Friedman, A Holloway-Beth. Incidence & Injury due to hydrocarbon abuse: Fluorinated inhalants vs. other hydrocarbons. Clinical Toxicology 57 (10), 1023-1023. 2019.
41. S De, RA Cohen, KS Almberg, L Friedman. Risk Factors Associated with Early Shift Injuries Among US Miners, 1983-2015. A51. Pulmonary Health Effects Caused By Occupational Exposures, A1857-A1857. 2019.
42. RA Cohen, KS Almberg, LS Friedman. Injuries Associated with Long Working Hours: Risk Factors and Adverse Outcomes. A51. Pulmonary Health Effects Caused By Occupational Exposures, A1856-A1856. 2019.
43. KS Almberg, L Friedman, L Go, DA Harris, K Mastel, CS Rose, M Tomann. Substantial Burden of Lung Obstruction Observed Among Former US Coal Miners Who Never Smoked. Residential And Occupational Exposures: Where We Live, Work, And Breathe. American Thoracic Society. Pages: A3033-A3033. 2021.

44. KS Almberg, CN Halldin, L Friedman, L Go, CS Rose, RA Cohen. Excess Mortality from Chronic Lower Respiratory Disease, Lung Cancer, and Pneumoconiosis Is Increasing in US Coal Miners. Residential And Occupational Exposures: Where We Live, Work, And Breathe. American Thoracic Society. 2021.
45. Friedman LS and Holloway-Beth A. Development of a Surveillance System to Track Civilian Injuries Caused by Legal Interventions. Council of State and Territorial Epidemiologists 2021 Conference. (**Winner best poster Environmental/ Occupational/ Injury Tracks**)

Major Goal #3: Re-establish the adult lead poisoning prevention program in Illinois

- UIC assists IDPH in follow backs of lead cases to provide complete reporting of elevated blood lead levels in adults. All call backs are handled through our team at the University of Illinois. Over the course of the grant period, we made 1366 follow back inquiries which requires calling laboratories, exposed workers, and treating physicians.
- In collaboration with IDPH, we completed a longitudinal report of adult blood lead levels in Illinois. Publication of longitudinal adult blood lead data in IDPH Illinois Morbidity and Mortality Bulletin. Distributions and Trends in Elevated Blood Lead Levels in Adults – Illinois, 2005-2017 http://www.dph.illinois.gov/sites/default/files/publications/publicationsoppsimmb-vol-4-issue-1.pdf
- UIC faculty developed a case study from an adult lead poisoning case to be used in the classroom for matriculated public health students.
- Worked with the Illinois Department of Public Health and Area 5 OSHA office to enhance data sharing of adult blood lead data so that OSHA can act in a timely manner and target facilities with multiple cases. UIC has met with OSHA Region V annually regarding reporting of elevated blood lead level cases.
- Completed two analyses of adult exposures to lead at gun ranges and we shared the data with IDPH and OSHA.
- A report on high risk industries and occupations in Illinois was submitted to IDPH and OSHA. The analysis was based on the ABLR data using reports for cases with 10ug/dl or higher blood lead levels. We also provided information on employers with multiple employees with elevated blood lead levels to both IDPH and OSHA.

Major Goal #4: Improve sustainability of an active occupational surveillance program by collaboratively establishing real-time surveillance and reporting of occupational health sentinels; embedding academic personnel at state agencies; producing state-approved publications; co-authoring manuscripts; jointly attending national occupational surveillance meetings; training the next wave of public/occupational health professionals; and collaborating with local health departments, employers and worker advocates to set priorities and initiate interventions

These stakeholder collaborations have led to renewed inter-agency data sharing agreements, partner feedback/surveys, and contracted services which help improve occupational health surveillance in Illinois. We have data sharing agreements with these organizations, members of most of these organizations are part of our advisory board, and we regularly meet with decision makers in these organizations throughout the year to discuss surveillance data we provide them and receive their input regarding priorities for surveillance (i.e. data and analyses we provide

them). We regularly publish the materials we develop in collaboration with our partners in the peer-reviewed literature, on state agency websites, the NIOSH clearinghouse and/or on our website.
Over the past five years, we continued to expand our partnerships and collaborations with occupational health stakeholders in Illinois, the Midwest and nationally. We have working relationships with all the key stakeholders in Illinois: the Illinois Department of Public Health, local municipal and county health departments (e.g. Chicago, Cook County and other agencies across the state), the Illinois Workers' Compensation Commission, the Illinois Department of Labor, the Illinois Environmental Protection Agency, Illinois Department of Agriculture, the Illinois Poison Center, the regional OSHA office, state and regional attorney generals, legislators, employers, worker centers, labor attorneys, community advocacy groups and other stakeholders.

While we try to keep our advisory board restricted to no more than 15 members, for our annual meeting we have 50-100 attendees to ensure we are inclusive of the broad audience of stakeholders. These meetings bring together stakeholders that rarely interact outside of the meetings we convene. The annual meetings have led to collaborations on priority areas involving such topics as workplace amputations and burns, pesticide poisoning, and issues facing temp agency and foreign born workers.

Our key personnel also sit on committees, advisory boards and board of directors on the following organizations: Council of State and Territorial Epidemiologists, NIOSH work groups, Workers' Compensation Research Group, International Association of Industrial Accident Boards and Commissions, Midwest Injury Prevention Alliance, American Association of Poison Control Centers, Washington State Advisory Committee Firefighter Disease Presumption Laws, American Public Health Association, American Industrial Hygiene Association, Illinois Partnership for Safety, Illinois local health department meetings, CPWR-Center for Construction Research and Training, the United Nations Environmental Program, the World Health Organization, and the Pan American Health Organization. The goal of these activities is to expand our network of partners so that we can more broadly disseminate our surveillance data and work with stakeholders to promote adoption of policies to improve worker health.

In addition, we continue to collaborate with other CDC funded programs in Illinois to develop and communicate targeted educational materials, outreach programs, and other materials that improve awareness and policies for reducing occupational injuries and illnesses. Through the University of Illinois, our key personnel are co-investigators and partners with the following CDC and NIH funded programs: UIC Education and Research Center Great Lakes Center (ERC), UIC Center for Healthy Work (a Total Worker Health program), UIC Mining Education and Research Center, UIC Population Health Analytics, Metrics and Evaluation (PHAME), and UIUC Agricultural Safety and Health program. We also have collaborated on research and training with regional ERCs and Ag Centers in Iowa, Ohio, Minnesota and Wisconsin.

Over the past 11 years our two key investigators in the Illinois Occupational Surveillance Program have trained over 200 students in different aspects of occupational health, safety and surveillance. We have also added occupational surveillance competencies to new courses offered at the UIC School of Public Health. Our team also developed a seminar for fall semester on COVID-19 – features frontline workers.

Dr. Hebert Beirne also oversaw an evaluation of IOSP which involved interviews of 13 key collaborators. We used stakeholder feedback to describe the strengths of IOSP and identify key areas targeted for improvement.

Partnerships

- Intergovernmental agreements with the Illinois Department of Public Health renewed April 16, 2016.
- Intergovernmental agreements with the Illinois Workers' Compensation Commission renewed through 2020.
- Collaborative projects with worker centers in Illinois – Chicago Workers Collaborative (addressing temp worker health and safety), Latino Union (addressing gender based violence at work), ARISE Chicago (advising on workers' compensation support group), Warehouse Workers for Justice (supervised OHIP interns who just published an article on this)
- Collaborative projects with community health centers – Community Health Partnership (migrant health center), Miles Square (underserved population), and Salvation Army (transition from prison to work).
- Collaboration with Labor Unions – Chicago Federation of Labor, Raise the Floor, Change to Win, Service Employees International Union.
- Collaboration on mining safety and respiratory health programs in Illinois, US, and internationally in coordination with Dr. Robert Cohen's research team. Dr. Friedman traveled to meet with PATHAUT research group in South Africa.
- Collaboration with New Lenox Safety Community Coalition to solicit businesses to complete the CDC's Worksite Health ScoreCard.
- IOSP2 convened a stakeholders meeting May 8, 2017 to discuss ways to support IL House Bill 690. Group discussed the difficulties in doing advocacy as governmental employee. Brainstormed ideas for communicating with the state legislature/senate to support this bill. Also renewed collaboration ideas and made plans for sharing data. The following organizations were represented:
    - Illinois Workers Compensation Commission
    - Illinois Department of Public Health
    - Worker Centers: Chicago Workers Collaborative. Arise Chicago. Latino Union
    - Illinois Poison Center
    - Unions: Chicago Federation of Labor
    - OSHA Region 5 Officers
    - OSHA Illinois Area Office Directors
    - Academic Investigators
    - Workers' Compensation Attorney
- Participated in Strategic Planning for Injury Prevention in Illinois, convened by IDPH. IOSP supported the IDPH Strategic Plan for Injury Prevention in Illinois, convened under the CDC/NCIPC award, CDC-RFA-CE16-1602 Core State Violence and Injury Prevention Program. Occupational Injury is included in the State Plan because of our involvement with this effort. We continue to serve on the Data Team and the Implementation Team.
- Collaboration on mining safety and respiratory health programs in Illinois, US, and internationally in coordination with Dr. Robert Cohen's research team. Dr. Friedman traveled to meet with PATHAUT research group in South Africa and overseeing epi research. Dr. Cohen's

group received a renewal in funding from ALPHA to continue to research lung disease among coal miners (includes Dr. Friedman).

- Partnership with CDC Worksite Health Promotion group to obtain data and conduct an analysis of the CDC Worksite Health ScoreCard for Illinois from 2014-2017 (N=42).
- IOSP worked with our own medical center, UIHealth, and university, UIC, to analyze employment data with the goal of developing an evidence based health promotion/protection program for low wage employees who work in surrounding communities.
- We received a contract from NIOSH to report pesticide related illness in Illinois; we conducted a policy analysis of PRI reporting across the US, which was completed and presented at a workshop- PRI meeting in Washington DC in August, 2018. After this, we began working on establishment of new surveillance system on PRI in the State with IEPA, IDAg, and IDPH.
- Provided consultation to CDPH regarding ICD9 and ICD10 coding in hospital discharge data
- Personnel attend biannual meetings of NIOSH and CSTE each year through the duration of the grant.
- Provided consultation to a local workers' center (Arise Chicago, Centro de Trabajadores Unidos, Chicago Community and Worker's Rights, The Chicago Workers' Collaborative, Latino Union of Chicago, Warehouse Workers for Justice, Working Family Solidarity) regarding workers' compensation, the long term impact of work related injuries study, worker rights for undocumented workers, and testified in hearings, in collaboration
- Dr. Forst coordinated and helped develop a policy workgroup in the UIC School of Public Health. This workgroup provides training seminars on how to write and distribute policy briefs.
- IOSP-2 hosted Dr. Catharina Wesseling to speak and meet with researchers related to chronic kidney disease among sugar cane harvesters at the UIC School of Public Health.
- Dr. Linda Forst. Advisory Committee/OSHA 10 for Construction Evaluation Project (summer 2020)
- Dr. Lee Friedman. Consulting to Illinois Poison Center and American Association of Poison Control Centers relating to general poisoning prevention and work related issues.
- Dr. Linda Forst. Occupational COVID-19 surveillance case definition. CSTE committee to produce algorithm for CDC
- Dr. Linda Forst. State of Illinois Occupational Health Equity committee during COVID-19; on migrant farmworker sub-committee (see below for COVI-19 activities, under Dean's Office 50%)
- Dr. Linda Forst. Consulting to IDPH on a variety of issues related to COVID-19: farmworker housing, meatpacking outbreaks, triaging "asks" [occ med residents on lit reviews, referrals to SPH faculty]
- IDPH Health Equity work group (working on "essential worker" issues)
- Migrant farmworker sub-group: organized student staffing, listserv, Box storage site, running down information (rural FQHCs and testing sites), creating documents
- Dr. Linda Forst. Consulting to Ergo (private – funds to EOHS). COVID-19 Phase 3 return to work in restaurant/food service industry
- Ad hoc IDPH groups to prevent COVID outbreaks in the meatpacking industry (calls with employers, IDPH, local HDs, IDOL)
- Staffed our state health department (IDPH) COVID-19 Hotline
- Consultation to Illinois Ombudsmen Program in preparation of Illinois Phase 3 Restoration. Gave presentation on protecting workers from COVID-19 when they go back to work
- Consultation to Restaurant Industry regarding return to work. Assisted in design of recommendations
- Assisted in populating SPH website for COVID-19

Community Service Activities

- Cook County Department of Public Health. Friedman and Holloway-Beth. Invitation to serve on committee to develop a surveillance System for police officer and civilian injuries related to law enforcement
- Health and Medicine Policy Research Group. Friedman and Holloway-Beth. Invitation to serve on a work group on surveillance of police and civilian injuries
- National Safety Council. Friedman. Invited to assist in evaluating Safe Communities coalitions.
- National Safety Council. Forst. Invited to speak at summer conference on Safe Communities and serve on strategic planning for Illinois.
- Canadian Ministry of Labour. Swedler. Grant review for Research Opportunities Program.
- Friedman joined advisory board of Midwest Injury Prevention Alliance, an organization of injury professionals from state in Federal Health and Human Services Region V.
- Miles Square research advisory board. Forst.
- Little Village Community Health Assessment. Hebert-Beirne
- Cook County Department of Public Health. Friedman and Holloway-Beth. Invited to serve on committee to develop a surveillance system to monitor injuries suffered by both law enforcement personnel and civilians injured during legal interventions.
- Little Village Community Health Assessment. (Includes "work" in the survey). (Hebert-Beirne)
- American Association of Poison Control Centers, ICD9-10 mapping to AAPCC Generic Code Work Group. (Friedman)

CONCLUSIONS

Translation of Findings and Outputs

Prior to the first five years of the Illinois Occupational Surveillance Program, the entire occupational surveillance program in the Illinois Department of Public Health consisted of one full-time employee who managed data collection for the Bureau of Labor Statistics Census of Fatal Occupational Injuries, the BLS Survey of Occupational Illnesses and Injuries, and the Adult Blood Lead Registry. However, this individual did not conduct proactive surveillance at the state level; rather, their principal role was to manage the data collection for these data systems. Our state workers' compensation commission had one data analyst, but their function was to conduct a limited analysis for the annual report to the Governor. The primary role of the Illinois workers' compensation system was to educate workers about the court system and litigation process, not to conduct surveillance and prevention activities. The Illinois Department of Labor has limited capacity to engage in strategic surveillance activities and are principally engaged in regulatory and enforcement activities for the protection of public sector employees.

To address the limited occupational surveillance capacity, the Illinois Occupational Surveillance Program has been recognized as a bona fide agent of the Illinois Department of Public Health. Through funding from NIOSH, we have been able to hire faculty, staff and students to build occupational surveillance staffing capacity in the state. Before our surveillance program began, the lack of occupational surveillance capacity and strategic organization limited the State's ability to protect and improve the health of the workforce in Illinois in several ways.

First, there was a lack of coordination across stakeholders to address existing and emerging issues impacting the Illinois workforce. Over the last 11 years, the Illinois Occupational Surveillance Program has served to facilitate communication and coordination among the array of stakeholders in the state. We convene an annual stakeholder meeting and numerous ad hoc meetings throughout the year to address emerging issues. These meetings bring together stakeholders that rarely communicate, despite their shared mission.

Second, as a result of the lack of occupational health surveillance infrastructure in Illinois, access to valuable statewide datasets was limited, and there was little documentation about how and why these systems were established, their key data elements, data dictionaries, the utility or potential of each dataset, and examples on how to utilize and link the data systems. The databases were underutilized or not being used in any meaningful manner. Our program has served as a central hub for occupational health surveillance data in the state by building a data repository which helps the various stakeholders prioritize their activities, communicate with other agencies, and solicit funding to maintain or expand their programs. Internally, we have used the data repository to set up ongoing surveillance of these data systems and linked the datasets in order to gather greater insights into occupational health and safety in Illinois. In addition, we actively utilize federal datasets to augment our state-level data including the Survey of Occupational Injuries and Illnesses (SOII), Census of Fatal Occupational Injuries (CFOI), Behavioral Risk Factor Surveillance System (BRFSS), Mine Safety and Health Administration (MSHA) Part 50 reports, National Trauma Databank (NTDB), National Poison Data System (NPDS), National Health Interview Survey (NHIS), National Burn Repository, Department of Energy Comprehensive Epidemiologic Data Resource (CEDR), US Census Bureau data, Quarterly Census of Employment and Wages (QCEW), and the Current Population Survey (CPS). We have published reports, factsheets and peer-reviewed manuscripts using all of the datasets. Our program generates annual reports, peer reviewed research, white papers, policy briefs, and fact sheets and maintains a website that has an average of 5000 unique visitors each year (www.illinoisinjuryprevention.org). Because our team has the scientific expertise needed to build and maintain an occupational surveillance program in Illinois, we have conducted novel qualitative and quantitative analyses that have provided important insights into surveillance methodology, persistent occupational health disparities, emerging occupational hazards, and high risk groups. We have published numerous peer-reviewed manuscripts and government reports utilizing all of these datasets, in addition to developing linkage methodology that we use on an ongoing basis to enhance our analyses.

Third, most of the public health agencies in Illinois do not have employees with an occupational health background to coordinate, define, or implement strategic policies to improve worker health; occupational health was not considered a part of general public health strategic planning. Our group has actively sought membership on various public health policy panels in order to advocate for inclusion of occupational health metrics and interventions as part of public health planning in such programs as Healthy People 2020/2030 initiatives, Housing and Urban Development initiatives, local public health planning committees, the Hazardous Substances Registry, and other programs across the state. We have also successfully advocated for the inclusion of occupational metrics or state participation in national surveys that collect industry and occupation, like the Behavioral Risk Factor Surveillance System. The OHIs and additional surveillance data have informed safety programs related to injury/illness sentinels, workplace hazards (e.g. electrocutions, pallet injuries, falls, motor vehicle crashes, solar panel manufacturing, bio solids), injury and illness types (amputations, burns, traumatic brain injuries, lung disease, cancer) and long term adverse outcomes (e.g. lost days of work, permanent disability, psychosocial outcomes). We collaborate with stakeholders to develop interventions, policy proposals and rule changes utilizing the surveillance data we provide on persistent and emerging issues.

As an example, in the most recent funding period, we engaged with our state partners to develop numerous interventions (e.g. state investigation of carpal tunnel syndrome risk factors among correctional officers which led to a detailed risk assessment and policy proposal for the implementation of automated cell door systems), policy proposals (e.g. statewide public health surveillance system for pesticide related illness/injury), rule changes (e.g. new law protecting persons employed by temporary staffing agencies), and advocacy for legislative changes at the municipal, county and state level (e.g. ordinances on minimum wage and paid sick leave).

Fourth, the lack of staffing capacity at the state level also resulted in limited engagement in national and international policy agencies. Broader coordination with groups outside of Illinois raises the profile of Illinois, leads to improved identification and communication of emerging hazards, and helps further build occupational surveillance capacity by bringing in new funding and talent through various fellowship and employment programs. The Illinois Occupational Surveillance Program has gleaned recognition from both federal and international bodies that resulted in solicited engagement with activities related to occupational surveillance. Our program has been invited to assist with writing criteria for occupational illness and injury codes in the upcoming WHO ICD 11 and the ILO's occupational disease list; participate on several committees related to occupational health strategic planning during the COVID-19 pandemic; include our healthcare organization in the Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS); participate in the NIOSH Workers' Compensation group to conduct surveillance and edit related publications; develop training programs for future occupational surveillance workers; and coordinate the hiring of fellows and employees in various public and non-government agencies across the state. The Illinois Occupational Surveillance Program is working in partnership with many workers' centers— community based worker advocacy groups—to address health and safety problems in these workforces. In addition, IOSP is partnering with OSHA Region V to address the particular needs of workers in the Temporary Services Industry.

Fifth, one of the root causes for the lack of occupational surveillance capacity in Illinois was the lack of public health professionals with adequate training in surveillance. As the only academic institution in Illinois with experts in occupational surveillance, our team at The University of Illinois Chicago has evolved to take on the role of training the future occupational health workforce in Illinois. We coordinate training across faculty in our School of Public Health and three main programs that play a critical role in training future occupational health experts: UIC Great Lakes Education and Research Center (ERC), UIC Center of Excellence for Total Worker Health and our Illinois Occupational Surveillance Program. Over the past 11 years, our two key investigators in the Illinois Occupational Surveillance Program have trained over 200 students in different aspects of occupational health, safety and surveillance.

Sixth, despite a reduction in occupational injury rates and cases involving lost days of work over the past 20 years and the increase in occupational surveillance capacity resulting from our NIOSH funded program, Illinois continues to struggle with workplace safety issues and has a substantial segment of its workforce employed in high morbidity and mortality jobs or precarious employment. Sustaining NIOSH funding of the Illinois Occupational Surveillance Program is essential in order to prevent a rollback of all of these achievements over the past 11 years.

2.2 Publications

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Book Chapter

1. Forst L. Worker Health in Urban Environments. Chapter in Urban Health Issues: Exploring the Impacts of Big-City Living. Ed, Richard Crume. Santa Barbara, CA: ABC-CLIO 2019 ISBN 9781440861727

Bulletins/Reports/Policy Briefs/ Public Health Guidance Documents

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- Policy Brief. Workers' Compensation. 2019. Workers Compensation Should Protect the Illinois Workforce. https://publichealth.red.uic.edu/wp-content/uploads/sites/302/2019/06/policy-brief-workers-compensation-2.pdf
- Affidavit for Illinois Attorney General, Kwame Raoul. 2019. Consulted with Illinois Attorney General's Office. Provides data to support multi-state lawsuit against the US Dept of Labor to reinstate mandatory centralized reporting of OSHA 300 Logs.
- Black E, Forst L, Leikin J. Case Report: Consequences of Lead Intoxication in a Construction Worker. Illinois Moribidity and Mortality Bulletin. In review, 2020
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2.3 Cumulative Inclusion Enrollment Table:

For the deidentified data, we collect data on all age groups who are employed in Illinois. Our work conforms with CDC-NIOSH exclusion criteria, which frequently limits the inclusion to persons 16-64 years or 18-64 years. The inclusion criteria by age varies with each deliverable. However, for most of the activities the surveillance project principally focuses on working age adults - participants between the ages of 18 and 64, who experienced a work related injury and illness.

Some of the datasets and surveillance work does require us to include children and older persons 65 years and older. Data regarding children only comes from secondary data sources. Children are not included in the adult blood registry. For older adults (65 years and older), the analyses only involve secondary data.

Below is a table showing the distribution by gender, age and race/ethnicity for all of the key datasets used in this project. The data is based on the last available year of complete data (2019 for all datasets except workers' compensation).

	Hospital Data	Workers Compensation	Poison Center	Blood Lead Registry	Police Crash Reports	Medical Examiner
Total Cases per Year	**155000**	**140000**	**2500**	**2000**	**20000**	**200**
Gender						
Male	92845	91980	1371	1872	17160	142
Female	62155	47880	1086	110	960	58
Age Group						
<16 years	775	140	168	0	0	1
16-17 years	2945	280	88	22	0	2
18-64 years	136090	136360	2065	1864	19340	165
65 and older	15190	3164	180	114	660	32
Race / Ethnicity						
White, Non-Hispanic	90520	no data	no data	580	no data	83
Hispanic	21545	no data	no data	178	no data	30
African-American	18445	no data	no data		no data	82
Asian/Pacific Islander	2170	no data	no data		no data	3
American Indian/Alaska Native	465	no data	no data		no data	0
Other / Unspecified	21855	no data	no data	1242	no data	1

2.4 Inclusion of gender and minority study subjects.

The Illinois Occupational Surveillance Program data includes subjects from all identified sexes and all races/ethnicities. No special populations are recruited or excluded, which is why a Cumulative Inclusion Enrollment Report is not being submitted or practical for completion. The surveillance data used for this proposal involves secondary data sources. The table above shows the distribution by gender and race/ethnicity for each dataset based on the most recent year of complete data.

2.5 Inclusion of Children.

Some of the datasets and surveillance work does require us to include children. Data regarding children only comes from secondary data sources. Children are not included in the adult blood registry. The table above shows the distribution by gender and race/ethnicity for each dataset based on the most recent year of complete data.

2.6 Materials available for other investigators

The primary datasets involve proprietary data that we are not permitted to share with persons outside of our research team. We have legal agreements outlining the scope of use of each of the datasets we include in our data repository. All of our interagency data sharing agreements, memoranda of understanding, and data access protocols relevant to the collection of OHIs and maintaining our data repository have been renewed and will expire after 2026 (last year of this funding renewal). These data sharing arrangements cover the hospital data, workers' compensation data, police crash reports, EMS pre-hospital data, Illinois Poison Center data, mortality data, cancer registry data, adult blood lead registry, and the state level Behavioral Risk Factor Surveillance System data. If a non-UIC researcher/person wants access to the data sources, they are required to make a direct request with the primary contact for each organization or submit a FOIA request. We provide those inquiring about accessing data the contact information for each data manager at each organization.

All other data comes from publicly available sources. We actively utilize federal datasets to augment our state data including the Survey of Occupational Injuries and Illnesses (SOII), Census of Fatal Occupational Injuries (CFOI), Mine Safety and Health Administration (MSHA) Part 50 reports, National Trauma Databank (NTDB), National Health Interview Survey (NHIS), National Burn Repository, Department of Energy Comprehensive Epidemiologic Data Resource (CEDR), US Census Bureau data, Quarterly Census of Employment and Wages (QCEW), and the Current Population Survey (CPS).

We have an inter-governmental agency agreement with the Illinois Department of Public Health. We also obtain laboratory reports of Blood Lead data with identifiers. This is part of a mandated program under Illinois law. As the bona fide agents of the state health department, we conduct follow-up interviews. Each data system is protected by Illinois statute and by HIPAA legislation. As bona fide agent, we do not have the authority to provide raw data that comes from health department data bases to other researchers. All IDPH controlled data must be solicited directly from IDPH through FOIA request.

We have an Interagency Agreement with the Illinois Workers' Compensation Commission (IWCC), as well. This covers our ability to receive raw data from the First Reports of Injury (FROIs) and Case Management Claims data bases. We clean, analyze, and report from those datasets. We then return cleaned data to IWCC. We continue to work with IWCC to develop a mechanism to provide these data to researchers in a confidential fashion. UIC does not have the authority to respond to data solicitations directly. The Case Management Claims are publicly available on an IWCC website and can be solicited in a Freedom of Information Act (FOIA) request to IWCC. All of the workers' compensation data is under the control of IWCC and we are custodians of the data we receive and are not permitted to share the data with any external parties, unless we receive direct approval from the commission.

For the hospital data, we receive our data through UIHealth which is the medical organization and hospital associated with our University. UIHealth has a data sharing agreement with the Illinois Hospital Association (IHA) to gain access to all state outpatient and inpatient visits captured by member hospitals of the Illinois Hospital Association. Our research team has a data use agreement with the primary UIHealth office that is secondary to the agreement between UIHealth and IHA. Our agreement prohibits us from disseminating any of the hospital data to any person not on our research team and those who have not completed UIC approved IRB training. Persons who want access to the data must make a formal request with the Illinois Hospital Association or the Illinois Department of Public Health.

The police crash reports are received annually through the US Department of Transportation and the Illinois Department of Transportation. Each time we request the data, we submit a new data sharing agreement form. All of the police crash data are under the control of the Department of Transportation and we are custodians of the data we receive and are not permitted to share the data with any external parties.

We continue to work with Illinois Poison Center data and have been granted access to the National Data Poison System. All of the Illinois Poison Center data is under the control of the poison center and we are custodians of the data we receive and are not permitted to share the data with any external parties, unless we receive direct approval from the poison center. Persons who want access to the data must make a formal request with the Illinois Hospital Association or the Illinois Department of Public Health.

Workers' compensation data that we receive from individual employers or third party administrators is provided to us on a case by case basis. We must request specific data for individual projects. We do not receive data continuously through a data sharing agreement. When we do receive data from these parties, the data is deidentified and we are not permitted to share the data with any external parties.

We have data dictionaries and summary of methods used for data collection provided by each organization that provides us data. For some of the data sources, we have developed summaries explaining the data sources and data dictionaries outlining all the variables in an easily accessible format. These supplemental files are made public through our website and upon email request for any external party. There are no restrictions on sharing these supporting documents with external parties.

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ENVIRONMENTAL
AND
OCCUPATIONAL
HEALTH SCIENCES
SCHOOL OF
PUBLIC HEALTH
UIC

September 23, 2021

Capt. Linda West, Associate Director
Office of Extramural Programs
National Institute for Occupational Safety and Health
Centers for Disease Control and Prevention

RE: UIC Illinois Occupational Surveillance Program 2
Award Closeout
Grant # 6 U60OH010905-06-01
PI: Lee Friedman

Dear Capt. Linda West:

Attached are the following documents for the award closeout dated September 23, 2021 for the application "Illinois Occupational Surveillance Program 2" U60OH010905 (PI: Lee Friedman):

A. Final Progress Report
B. Equipment and Inventory Report
C. Final Invention Statement and Certification

If there are any questions, please do not hesitate to contact me at lfried1@uic.edu.

Sincerely,

Lee Friedman, PhD
Principal Investigator

Joanna Groden, PhD
Vice Chancellor for Research

Phone (312) 996-1649 Fax (312) 413-1113 E-mail: lfried1@uic.edu

Form Approved Through 03/31/2020
OMB No. 0925-0002

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Procedure for Submission of Final Invention Statement and Certification (For Grant or Award) Form HHS 568

A Final Invention Statement and Certification (Form HHS 568) shall be executed and submitted within 90 days following the expiration or termination of a grant or award. The Statement shall include all inventions which were conceived or first actually reduced to practice during the course of work under the grant or award, from the original effective date of support through the date of completion or termination. The Statement shall include any inventions reported previously for the grant or award as part of a non-competing application. This reporting requirement is applicable to grants and awards by Department of Health and Human Services in support of research.

The Final Invention Statement and Certification does not in any way relieve the person responsible for the grant or award, or the institution, of the obligation to assure that all inventions are promptly and fully reported directly to the National Institutes of Health, as required by terms of the grant or award. Information regarding the reporting of inventions, including the reporting form to be followed, may be obtained from the Office of Policy for Extramural Research Administration, Division of Extramural Inventions and Technology Resources, 6705 Rockledge Drive MSC 7980, Bethesda, Maryland 20892-7980, Telephone: (301) 435-1986.

The original of the completed Final Invention Statement and Certification is to be returned to the awarding component that funded the grant or award. The entire grant or award number must appear in the designated box on the form. The period covered by the Final Invention Statement is the project period of the grant or award at a particular grantee institution. If no inventions were involved, insert the word “None” in the first block under item Title of Invention. Each Statement requires the signature of an institution official authorized to sign on behalf of the institution.

Privacy Act Statement. The NIH maintains application and grant records as part of a system of records as defined by the Privacy Act: NIH 09-25-0225 https://era.nih.gov/privacy-act-and-era.htm.

Form Approved Through 03/31/2020
OMB No. 0925-0002

Department of Health and Human Services

Final Invention Statement and Certification

(For Grant or Award)

DHHS Grant or Award No.

A. We hereby certify that, to the best of our knowledge and belief, all inventions are listed below which were conceived and/or first actually reduced to practice during the course of work under the above-referenced DHHS grant or award for the period

7/1/2015 *original effective date* through 6/30/2021 *date of termination*.

B. Inventions (Note: If no inventions have been made under the grant or award, insert the word *"NONE"* under

NAME OF INVENTOR	TITLE OF INVENTION	DATE REPORTED TO DHHS
NONE	NONE	NONE
(Use continuation sheet if necessary)		

C. Signature — This block ***must*** be signed by an official authorized to sign on behalf of the institution.

Title
Vice Chancellor for Research

Typed Name
Joanna Groden, Ph.D.

Signature
Joanna Groden, Ph.D.

Date
09/30/2021

Name and Mailing Address of Institution
The Board of Trustees of the University of Illinois
MB 502, M/C 551
809 S. Marshfield Avenue
Chicago, IL 60612-4305

CDC Procurement & Grants Office - Branch V
Equipment Inventory Listing

Report Date:	Septemeber 24, 2021	Grant Number:	5U60OH010905
Project Title:	Illinois Occupational Surveillance Prog 2	Project Period:	07/01/2015 to 6/30/2021
Grantee Name:	PI: Lee Friedman	Project Officer:	Captain Linda West
Grants Management Officer:		Grants Specialist:	

Description of Item: i.e. pH Meter	Mfr.[1] i.e. Fischer	Serial Number	Quantity	Condition[2]	Location[3]	Purchase Cost	Date Received [mm/dd/yyyy]
No equip purchased value +$5000							

[1]Mfr. (Manufacturer)
[2]Condition: (Excellent) (Good) (Fair) (Poor) (Inoperable)
[3]Location: complete physical address

For Government Use Only, not to be completed by the Grantee
Property Administrator & PO Disposition Recommendation and Instructions:

Description of Item	Disposition[1]	Address[2]
[Copy from above]	_____Transfer Title _____Retain and Compensate Awarding Agency _____ Return to Program Office _____Other (explain)	Attn: [Project Officer] CDC / NIOSH 1600 Clifton Road, NE MS E-74 Atlanta, GA 30329-4018
[Copy from above]	_____Transfer Title _____Retain and Compensate Awarding Agency _____ Return to Program Office _____Other (explain)	

[1]Check the appropriate disposition
[2]CDC Warehouse is the central receiving point for delivery of all non-hazardous and non-perishable supplies and equipment, CDC –AM–2004-03, update 2010

SCHOOL OF PUBLIC HEALTH
UIC

September 23, 2021

RE: Final Progress Report

Date the final report was completed: 9/23/2021
Notice of Funding Opportunity (NOFO) Number: PAR14-275
Grant Number: 5U60OH010905
Project Title: Illinois Occupational Surveillance Program 2
Start and End Dates: From 07/01/2015 to 6/30/2021
Sponsor: CDC – NIOSH
Program Officer: Captain Linda West

PI: Lee Friedman
Co-Investigators:
Linda Forst
Jennifer Hebert-Beirne
Alfreda Holloway-Beth
Dana Madigan
David Swedler
Institution: University of Illinois Chicago
809 S Marshfield Ave
Chicago, IL 60612-4305

Capt. Linda West,

Attached is the final progress report for all six years of the "Illinois Occupational Surveillance Program 2" grant. This report provides a progress report for major accomplishments and impacts during the budget period 7-1-2015 to 6-30-2021.

Thank you,

Lee Friedman

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