

Final Progress Report

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List of Terms and Abbreviations

Asthma Call-Back Survey.....	ACBS
Behavioral Risk Factor Surveillance System.....	BRFSS
Blood Lead Level.....	BLL
Carbon Monoxide.....	CO
Contingent Worker Survey.....	CWS
Council of State and Territorial Epidemiologists.....	CSTE
Current Population Survey.....	CPS
Department of Transportation and Development.....	DOTD
Emergency Department.....	ED
Environmental Protection Agency.....	EPA
Environmental Public Health Tracking.....	Tracking
Health-Related Pesticide Incident Report.....	HRPIR
Highway Safety and Research Group.....	HSRG
Industry/Occupation.....	I/O
Louisiana Childhood Lead Poisoning Prevention Program.....	LCLPPP
Louisiana Community and Technical College System.....	LCTCS
Louisiana Department of Health.....	LDH
Louisiana Early Event Detection System.....	LEEDS
Louisiana Emergency Response Network.....	LERN
Louisiana Morbidity Report.....	LMR
Louisiana Occupational Health and Injury Surveillance.....	LOHIS
Louisiana Opioid Data and Surveillance System.....	LODSS
Louisiana Poison Control.....	LPC
Louisiana Public Health Institute.....	LPHI
Louisiana State Police.....	LSP
Occupational Health Indicator.....	OHI
Occupational Health Internship Program.....	OHIP
Occupational Safety and Health.....	OSH
Occupational Safety and Health Administration.....	OSHA
Office of Public Health.....	OPH
Office of Workers' Compensation Administration.....	OWCA
Morbidity and Mortality Weekly Report.....	MMWR
Motor Vehicle Accident.....	MVA
National Institute for Occupational Safety and Health.....	NIOSH
National Response Center.....	NRC
Principal Investigator.....	PI
Section of Environmental Epidemiology and Toxicology.....	SEET
Southeastern.....	SE
Southeastern States Occupational Health Network.....	SouthON
Workers' Compensation.....	WC
ZIP Code Tabulation Area.....	ZCTA

Abstract

Project Title: Occupational Health and Injury Surveillance in Louisiana

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The Louisiana Occupational Health and Injury Surveillance Program (LOHIS) is a Fundamental-Plus Program housed in the Louisiana Department of Health's Office of Public Health. The program has grown an established and productive state-based occupational health surveillance program that has compiled and analyzed data for occupational health indicators, promoted use of findings with stakeholders for outreach and intervention, cultivated occupational health partners at the local, state, and federal level, and prepared reports, articles, and presentations of surveillance findings. This project has continued to enhance LOHIS's occupational health surveillance capacity. Expansion of outreach and prevention activities has occurred by leveraging the resources, skills and expertise of its network of partners and stakeholders, and the program's active population surveillance system has been improved through acquisition of new sources of occupational health data and development of targeted surveillance for priority issues affecting Louisiana's workforce. The program also continued to play a key public health role in identifying and responding to emerging and emergent occupational hazards and issues. The overall goal of the surveillance system is to improve worker safety and health through surveillance data that identify high-risk occupations and industries, emerging issues, and trends and to promote the use of these data to reduce occupational injuries, diseases, and mortality through targeted prevention actions. Specific aims of the project/program included, continue to acquire, analyze and interpret occupational health indicator data, including follow-up investigation of elevated blood lead cases; identify and respond to emerging and emergent events that impact Louisiana workers; identify and develop new occupational health data sources; develop and implement targeted surveillance system for occupational heat-related illness, including collection of causes and risk factors; periodically compile and analyze surveillance data and prepare reports, publications, and presentations; continue to interact regularly with partners and stakeholders to prioritize relevant issues for Louisiana workers, disseminate findings, and develop prevention strategies and interventions based on surveillance findings; and evaluate and improve program performance.

Section 1

The most important outputs/key findings, translation of findings, and *outcomes* are listed below by project aim:

Aim 1: Collect, Analyze, and Interpret Surveillance Data to Identify Trends and High-Risk Industries and Occupations

Annual Occupational Health Indicator (OHI) Report; contribute OHI data to Louisiana Health Report Card. OHI data is made available through several reports, webpages, and portals. *Intermediate Outcome(s): Publication of data provides a picture of the state of worker health and brings increased awareness of occupational safety and health (OSH) issues to the public, researchers, other public health officials, and decision makers. The Health Report Card disseminates OSH data directly to state legislators and brings awareness of occupational health-related issue to policy makers.*

Completed work-related motor vehicle accident (MVA) associated fatality report. Fatalities in Louisiana from 2009-2018 were described using death certificate data. Compared to the U.S., Louisiana had 1.3 times the rate of work-related MVA associated fatalities. The industry and occupations with highest rates were Agriculture and Farming, fishing and Forestry. Main prevention recommendations are discussed. The report was posted on LOHIS' webpage, shared with Chief Data Officer of the LDH's Bureau of Health Informatics, and Mr. Trey Jesclard, Highway Safety Assistant Administrator at the Department of Transportation and Development (DOTD). *Intermediate Outcome(s): Analysis of death certificate data is step toward learning which worker populations are most at risk for MVA associated fatalities as well as information about when and where these incidents occur; information that can be use help inform policy makers and prevention efforts.*

Published article analyzing work-related severe traumatic injury hospitalizations. Overall, severe injuries significantly increased relative to minor/indeterminate injuries, which supports tracking severe injuries separately from all hospitalizations in order to avoid obscuring these important trend differentials. *Intermediate Outcome(s): This research has important implications for worker safety prevention efforts as severe injuries, such as spinal cord and intracranial injuries, can result in death or lifelong disability and pain.*

Published article about tracking adult blood lead and produced a factsheet about how to prevent lead exposure in indoor shooting and firing ranges. Article highlighted an uptick in elevated blood lead level (BLL) among shooting range workers, primarily firearm instructors. In response, the factsheet was developed and disseminated in several ways (e-mail, mail, print ad, virtual ad, and television and radio interviews). *Intermediate Outcome(s): Surveillance allowed for the effective monitoring of trends and intervention to prevent continued over-exposures. Information-disseminating activities led to increased awareness of the dangers of lead exposures at indoor shooting ranges. End Outcome: By the end of two years of targeted research, the number of elevated BLLs being reported in firearm instructors decreased substantially.*

Aim 3: Identify and Develop New Occupational Health Data Sources

Behavioral Risk Factor Surveillance System (BRFSS) Service Workers Report. Compared to all other workers, significantly more service workers had poor mental and/or physical health, food insecurity, housing insecurity, smoked, lacked healthcare, and had chronic obstructive pulmonary disease, asthma,

diabetes, and/or depressive disorder. Disseminated online and at advisory committee meeting. *Intermediate Outcome(s): Report provides critical information on the health and well-being of service workers in Louisiana that can be used by policymakers, community leaders, and business leaders to understand the economic hardships, chronic health conditions, and other quality of life issues faced by this growing occupational sector. The information, in turn, can better inform policy, legislation, and health intervention and prevention programs.*

Successfully changed the disease reporting requirements of the Louisiana Public Health Sanitary Code, to make reporting of all work-related injuries and illnesses required. There is a potential for increase in the number of work-related injuries and illnesses reported to the program. *Intermediate Outcome: The legislature approved changes to the state public health sanitary code.*

Aim 4: Design and implement a surveillance system to track occupational heat-related illness (HRI) and mortality.

Created a HRI database; co-authored two published articles, and co-produced a Special Environmental and Occupational Edition of the Louisiana Morbidity Report (LMR). Study findings support a relationship between heat and work-related emergency department (ED) visits. About one-quarter of Louisiana's workforce is at risk of HRI due to outdoor and physically demanding work: agriculture, construction, oil and gas, transportation, warehousing and utilities, and some manufacturing. *Intermediate Outcome(s): Dissemination of publications and reports and outreach efforts help raise awareness of the risks of working and/or being outdoors in the heat too long without taking the proper precautions and the importance of HRI prevention. The HRI multisource database enables easy tracking of HRI and mortality in Louisiana.*

Aim 6: Interact regularly and collaborate with state partners and stakeholders to obtain input on priority issues, to disseminate findings, and to develop prevention strategies and interventions.

Created two educational products, the Introduction to OSH for the Louisiana Community and Technical College System (LCTCS), and the HRI course for LPHI's Louisiana Hurricane Response Hub (HRH) curriculum. THE LCTCS training is a general, non-industry specific, narrated PowerPoint presentation that gives students a basic understanding of OSH. It has information about federal and state agencies that protect worker health, work-related fatality statistics, work-related injuries and illnesses that are reportable in Louisiana, common workplace hazards, specific examples of workplace injuries and illnesses, and how to avoid them. It is available on the program webpage. The HRH curriculum's intent is to provide guidance and training to the public health workforce, response workers, volunteers, and community members who face hazards after hurricanes and floods that occur in Louisiana. Program staff served as the subject matter expert/instructor of the heat-related illness course, one of four courses in the curriculum, by providing the content and working with Tulane Learning Management System (LMS) staff on the design and execution of the final course. It is available on Tulane's LMS as well as CDC TRAIN. *Intermediate Outcome(s): The LCTCS presentation is a tool for faculty and staff to use in educating students about OSH before they enter the workforce. Students will be familiar with worker rights, the agencies that exist to protect workers, and common workplace hazards, which will help foster a safety-oriented mindset as they begin to work in their chosen fields. The HRI course helps address an identified knowledge gap amongst the public health workforce about disaster response and recovery as it specifically relates to environmental health and occupational health.*

Section 2: Scientific Report

Background

An accurate count of injuries and illnesses is necessary to identify and address unsafe work conditions, allocate resources, initiate and prioritize interventions, and evaluate work processes and changes. Since LOHIS was first funded in 2005, considerable progress has been made to increase programmatic capacity to conduct population-based surveillance of occupational illnesses, injuries, and hazards. In addition to annually compiling and calculating the grant-required indicators, LOHIS has developed expertise in conducting in-depth analysis of occupational health conditions relevant to Louisiana's diversified workforce. These projects have had numerous positive impacts: increased occupational safety and health outreach and education, expanded collaborations and partnerships, enhanced use of surveillance data, and increased awareness of occupational health issues.

While Louisiana is a relatively small state, a significant number of its workforce is employed in high-risk industries – oil & gas exploration, chemical manufacturing, agriculture and forestry, transportation, and construction – each with unique, geographic and hazard variability. Every year thousands of these workers are injured on the job or become ill because of exposure to health and safety hazards at work. These work-related health conditions have high human and economic costs not only for workers and employers, but also for society.

This project was for a Fundamental-Plus Program. Housed within the Louisiana Department of Health's Office of Public Health, the Louisiana Occupational Health and Injury Surveillance (LOHIS) Program has grown an established and productive state-based occupational health surveillance program that has compiled and analyzed data for occupational health indicators, promoted use of findings with stakeholders for outreach and intervention, cultivated occupational health partners at the local, state, and federal level, and prepared reports, articles, and presentations of surveillance findings. This project proposed to enhance LOHIS's occupational health surveillance capacity: expand outreach and prevention activities by strategically leveraging the resources, skills, and expertise from its network of partners and stakeholders, and its active population-based surveillance system will be further expanded through the acquisition of new sources of occupational health data and development of targeted surveillance for priority issues affecting Louisiana's workforce. The program will also continue to play a key public health role in identifying and responding to emerging and emergent occupational hazards and issues.

Specific Aims

The Louisiana Occupational Health and Injury Surveillance (LOHIS) Program has grown an established and productive state-based occupational health surveillance program that has compiled and analyzed data for occupational health indicators, promoted use of findings with stakeholders for outreach and intervention, cultivated occupational health partners at the local, state, and federal level, and prepared reports, articles, and presentations of surveillance findings. The goals of the project were to enhance LOHIS's occupational health surveillance capacity: expansion of outreach and prevention activities via leveraging the resources, skills and expertise from its network of partners and stakeholders, and its active occupational health data and development of targeted surveillance for priority issues impacting Louisiana's workforce. Specific aims of this project included:

1. Collect, analyze, and interpret surveillance data to identify trends and high-risk industries and occupations.
2. Identify and respond to emerging and emergent occupational issues.
3. Identify and develop new occupational health data sources.
4. Design and implement a surveillance system to track occupational heat-related illness and mortality.
5. Periodically prepare reports, publications, issue briefs, and presentations of surveillance findings, including annual reports summarizing indicator data.
6. Interact regularly and collaborate with state partners and stakeholders to obtain input on priority issues, to disseminate surveillance findings, and to develop prevention strategies and interventions.
7. Implement process and outcome evaluations.
8. Participate in NIOSH meetings and other grant-related activities.

Methodology/Approach

As the primary state program responsible for tracking and evaluating occupational health injuries, illnesses, and deaths, the Louisiana Occupational Health and Injury Surveillance (LOHIS) Program plays an important role in convening partners and stakeholders to foster occupational health surveillance activities throughout the state and the region.

This proposal seeks to enhance LOHIS's occupational health surveillance capacity by expanding outreach and prevention activities via the strategic leveraging of resources, skills, and expertise from our network of partners and stakeholders, and further expand our active population surveillance system through acquisition of new source of occupational health data and development of targeted surveillance for priority issues affecting Louisiana's workforce. The program will also continue to play a key public health role in identifying and responding to emerging and emergent occupational hazards and issues, including referrals from employees, employers, and physicians.

Results and Discussion (by Specific Aim)

Aim 1: Collect, Analyze, and Interpret Surveillance Data to Identify Trends and High-Risk Industries and Occupations

Occupational Health Indicators (OHIs)

LOHIS maintained access to all relevant datasets required to compile the state employment profile and calculate the OHIs each year, with a few exceptions. Louisiana stopped administering the Behavioral Risk Factor Surveillance System (BRFSS) Asthma Call-Back Survey (ACBS) after 2014; therefore, we were not able to report OHI # 21, Asthma among Adults Caused or Made Worse by Work, after the 2017 data call. In 2018, we began reporting OHI # 5, State Workers' Compensation (WC) Claims for Amputations with Lost Work Time, and OHI # 8, State WC Claims for Carpal Tunnel Syndrome with Lost Work Time. Before 2018, we did not have access to the required State WC data, but we have since been able to arrange a yearly data request with our partners at the Louisiana Office of WC Administration (OWCA) to obtain the data needed to calculate OHI #5 and # 8 for the annual data call. We were able to get the data for these two indicators going back to 2014, the year when WC data became available electronically. All OHI data computations have been tracked in Excel spreadsheets by year of data call. Data from state databases, such as the Louisiana hospital inpatient discharge database (LAHIDD), emergency department (ED) discharge database, and mortality database reside in SAS libraries; therefore, OHIs that rely on these data were collected from and calculated in SAS Enterprise Guide with data points transferred over to the

appropriate Excel spreadsheet. All SAS code has been saved so that it can be modified to obtain a different year of data quickly. Each year, as part of data quality assurance, OHIs are compared to previous years' data to look for any sharp differences that may signal a miscalculation or, in some cases, warrant further examination. For example, OHI # 4, Work-Related Amputations with Days Away from Work Reported by Employers, there were nearly twice as many cases in 2015 compared to 2014.

Each year, a report summarizing Louisiana OHI data is posted to LOHIS's webpage. In 2019, the format of the report was changed from a cumulative (since 2008) report to a rolling five-year report. The updated report produced after the 2019 data call covers the years 2012-2016, and the updated report produced after the 2020 data call covers the years 2013-2017. Previous years reports remain posted on the website. We also publicize our annual OHI reports on NIOSH's State-based Occupational Health Surveillance Clearinghouse. OHI data are also available on CSTE OHI website and on the Louisiana Environmental Public Health Tracking Program's Health Data Portal (Health Data Portal). The Health Data Portal provides a broad range of indicators and measures to the public, health officials, practitioners, researchers, scientists, and decision makers, and is available via the Office of Public Health (OPH), Section of Environmental Epidemiology and Toxicology's (SEET) website. Occupational Health data on the Health Data Portal go back as far as 2008. OHI data was also used in SEET presentations to LDH Administrative Regions in 2019, to fulfill partner/stakeholder data requests, and was submitted to the 2019 and 2020 Louisiana Health Report Card in 2020 and 2021, respectively. Louisiana law requires that LDH prepare a yearly report card describing the overall health of its citizens and health-related issues. In addition to informing Louisianans on the overall health in our state, this annual publication is an effective tool for health planning and evaluating the effectiveness of health programs. SEET submitted data for this report for the first time in several years in 2020 for the 2019 report card; included was OHI data. The 2019 Louisiana Health Report Card was submitted to the governor and legislature in May 2020. SEET and LOHIS submitted data for 2020 Louisiana Health Report Card again in 2021. The most recent report is available on LDH's Bureau of Health Informatics webpage. We also continued to participate in the Council of State and Territorial Epidemiologists (CSTE) Occupational Health (OH) Subcommittee OHI Workgroup and serve as the state lead for OHIs # 14-16, which track industries and occupations at high risk for morbidity and mortality, and OHI # 24, Occupational Heat-Related ED Visits. As state leads, we made sure that the how-to guide for these indicators was up-to-date in the OHI guidance document each year and provided technical assistance to states, upon request.

Intermediate Outcome(s): Increased awareness of OSH issues: We use the OHIs to create an annual report on the state of worker health in the Louisiana for the public. Publication of the indicator summary report to our webpage and OHI data to the Health Data Portal raises public awareness of occupational health and safety in Louisiana. The Health Report Card is an important vehicle for disseminating occupational health data to Louisiana legislators and bringing awareness of occupational health-related issues to policy makers. Fulfillment of outside data requests and publication of OHI data in other program and agency reports supports this and the next outcome listed. Increased stakeholder investment in OSH research and service: OHI data availability on the webpage and Health Data Portal also increases stakeholder investment in OSH research, as does the presence of OHI data in the SEET presentations made to the LDH Administrative Regions to re-acquaint the staff with SEET and our programs.

Young Cases of Silicosis Hospitalization and Death

In October 2017, we received a request from CSTE and NIOSH to expand the information collected for OHI # 9 (pneumoconiosis hospitalizations) and OHI # 10 (pneumoconiosis deaths) for cases \leq 55 years old by following-up with living cases (i.e., hospitalization cases) and next-of-kin of the decedents to ascertain source(s) of silica exposure. We submitted our completed surveys in August 2018. At the 2019 Winter meeting, California gave an interesting presentation about cases of silicosis in young people working in the engineered stone fabrication industry. NIOSH followed California's presentation ~~with~~ by informing state grantees that they would be expanding the timeframe of their request to collect additional information for pneumoconiosis hospitalizations and deaths from 2010-2013 to include 2014-2017. Information is obtained by following up with living cases and the next-of-kin of decedents to ascertain source(s) of silica exposure and latency to disease onset. Louisiana planned to participate in this expanded request. We were awaiting word from NIOSH concerning if we were to be using the same data collection templates and any other relevant tools that may be offered to assist with this project; however, the COVID-19 pandemic broke out and this project was put on hold. Should this project ever resume we will participate.

Potential Outcome: Increased awareness of OSH issues; Recommendations adopted by manufacturers, trade associations, or other; External organizations disseminate outputs: The collection of additional case-specific information could identify new sources of silica exposure or sources not well known. This information can help target prevention efforts and raise awareness for those workers in similar work environments.

Transportation Injuries and Fatalities

Transportation injuries and fatalities were identified as a priority issue. Transportation accidents dominate occupational injuries and fatalities, and Louisiana highways are some of the busiest and most dangerous in the nation due to the large volume of major water, rail, and ground transportation infrastructure in Louisiana that is vital to the national economy. We proposed to obtain transportation injury and fatality data from various sources including mortality, ED, LAHIDD, WC data, and Louisiana State Police (LSP) reports. We completed an analysis of work-related motor vehicle accident (MVA) associated fatalities in Louisiana from 2009-2018 using death certificate data, which was posted to LOHIS's webpage in October 2019. The average annual rate of work-related MVA associated fatalities in Louisiana during this time was 1.74/100,000 workers (n=341). Although there was an overall significant decrease in the Louisiana rate during this time (Kendall's Tau = -0.52, p = 0.04), compared to the entire U.S., workers in Louisiana had 1.3 times the rate of work-related MVA associated fatalities (95% CI = 1.2, 1.4). The work-related MVA associated fatality rate in four industries, Agriculture (13.80), Transportation and Utilities (12.77), Mining (4.37), and Public Administration (4.00) was significantly higher than the work-related MVA associated fatality rate for all workers in the state (1.74). These observations were similar to the national trends for industries with high rates of work-related MVA associated fatalities. Three occupational groups had a work-related MVA associated fatality rate that was significantly higher than the rate for all workers in the state: Farming, Fishing, and Forestry (12.08), Transportation and Material Moving (11.63), and Construction and Extraction (2.89). Most accidents occurred on a street or highway. The report also discusses risky driving behaviors, which are the most common cause of MVAs, the economic impacts MVAs have on employers, and some prevention strategies.

Finding a good data source for work-related MVA associated injuries has been challenging. With WC data, we are only able to make requests for aggregated data, and do not have access to any case level data or details. Because LAHIDD and ED discharge records currently lack a work-related field, we use primary payer = WC as a proxy for determining work-relatedness in those two data sources. This method is known to capture fewer than the true number of work-related cases, but it is the widely accepted method due to the limited availability of occupational health data sources and work-related information within data sources. Using primary payer = WC on LAHIDD and ED data records that have a MVA-related International Classification of Diseases, Tenth Revision (ICD-10) codes greatly undercounts the number of true cases, making these poor data sources. We also receive LSP Reports via email from SEET Emergency Preparedness staff when there is potential worker injury or fatality, and most of these are transportation related incidents. The problem with LSP Reports is that they can contain little to no demographic information about the injured or deceased, they can be unclear as to who is injured or deceased (worker or other non-worker), and they are often brief in description and may be incorrect as they are initial assessments. In addition, they are only generated when a hazardous substance is involved.

Motor vehicle crash reports contain a vehicle classification item that describes vehicle ownership (commercial/business vehicle; government vehicle; personal vehicle), as well as items describing vehicle configuration, body type, and other situational items that describe the circumstances of the accident. Based on work presented by our colleagues from Michigan at the annual CSTE conferences in 2019 and 2021, we thought we might be able to use this data to approximate and describe work-related MVA associated injuries in Louisiana. LDH's Chief Data Officer in the Bureau of Health Informatics was a member of the Louisiana Traffic Records Coordinating Committee, which includes stakeholders from the Louisiana Department of Transportation and Development (DOTD), who owns police motor vehicle crash report data. He facilitated a meeting between LOHIS and Mr. Trey Jesclard at the DOTD with whom we discussed the feasibility of using a combination of data elements found on motor vehicle traffic crash reports as a proxy for work-relatedness in order to capture crash-related injuries and fatalities. We also shared our report on work-related MVA associated fatalities from October 2019 with Mr. Jesclard. Although the goal is to analyze work-related MVA associated injuries, Mr. Jesclard suggested that we begin with fatalities. It is a smaller dataset to start working with, and we can compare the number of fatalities captured via motor vehicle crash report to the number captured via our death certificate review. We agreed with this plan. Based on the data elements available on the police crash report, a case definition for work-related fatalities due to a motor vehicle accident was developed, and we submitted an initial data request for fatality data to Mr. Jesclard. We received data, but did not yet start reviewing it. After we complete an analysis and report of fatalities, we will submit a request for injury data.

Intermediate Outcome: Increased awareness of OSH issues: The completed fatality analysis of death certificate data provides information about which worker populations are most at risk for MVA associated fatalities as well as other pertinent information about when and where these incidents most often occur. This information can be used to help inform policy makers and prevention/outreach efforts.

Potential Outcome: Increased stakeholder investment in OSH research and service; External organizations disseminate outputs: Our developing relationship with DOTD may be mutually beneficial,

in that our analysis of their data may provide DOTD with useful information as they plan for future projects and advocate for new policy.

Temporary Workers

The temporary worker population (which includes temporary help agency workers and contract or self-employed workers) has been growing, especially in hazardous jobs such as construction, manufacturing, and warehousing. These workers are more vulnerable to on-the-job hazards than permanent employees are, receive insufficient training, and have minimum job security. Temporary workers in Louisiana and other Southeastern (SE) states include a large number of Hispanic workers who migrated to the state for recovery and rebuilding following Katrina. Data on this workforce are difficult to obtain for various reasons including employment status (permanent vs temporary) is not captured in most data sets and temporary workers may not have WC insurance. Some potential data sources that were considered for exploring this issue included LAHIDD, ED, WC, OSHA investigation, and mortality data, all of which provide insufficient or scarce data. LAHIDD and ED data undercount work-related cases as discussed previously in the *Transportation Injuries and Fatalities* section, and there is definitely no way to tell if someone was a temporary worker or not. With WC data, we can only access aggregate level data. After talking to OWCA staff, the only approach we could come up with would be to look at WC claims from temporary staffing agencies, which would end up leaving out the rather large number of temporary workers who do not have WC insurance. OSHA investigations only occur in instances where the injury was severe or fatal, and severe injuries are not always reported appropriately, nor is worker status (permanent vs temporary/contract).

In late 2019, we became aware of the May 2017 Contingent Worker Supplement (CWS) of the Current Population Survey (CPS), which has state level data available. The CWS contains information about duration of employment, employment types, and job stability with the goal of identifying those doing contingent work or in alternative employment arrangements. Contingent workers are broadly defined as those who do not expect their employment to continue. Types of alternative employment arrangements included are independent contracting, contract work for a company, work for a temporary help agency, and on-call work. We decided that the CWS might be the most comprehensive and best available data source at this time for evaluating temporary work in Louisiana. The complete survey data is available for download from the Census Bureau. We had planned to finish a report on this by June 30, 2021; however, several lengthy complications arose, which prevented us from completing this project as planned. We were not able to get the downloaded survey data into a useable form in SAS until the end of June 2021, a task that was started in early 2020. Several problems made this a time-consuming job. First was the volume of data. The data key is very large and detailed, which required a lot of time to generate the proper classification coding. Second, many, many technical issues arose downloading the data and teleworking (circumstances related to the COVID-19 pandemic) that took multiple parties, including the LDH IT department, to resolve. Third, there were issues IT was not able to resolve regarding the data input method that made progress slow and tedious. We use SAS Enterprise Guide (EG) and had difficulties trying to adapt example code from Base SAS that we received from the National Bureau of Economic Research to be functional in SAS EG. We finally wrote our own code in the end to get the data into a useable form, and we are hoping to be able to work with and analyze the data in this next grant cycle.

Occupational Asthma

We continued to explore methods for identifying cases of work-related asthma and educating providers, employers and employees about asthmagens in the workplace. Using WC as a proxy for work-relatedness in LAHIDD and ED databases yields few cases of occupational asthma making these data sources inappropriate for this examining this condition. Early in the grant cycle we considered utilizing BRFSS ACBS and I/O data to look for patterns of asthma and chronic obstructive pulmonary disease among the different industry sectors and occupational groups; however, at the time, we did not realize that Louisiana had ended participation in the ACBS in 2014. Not only is the available ACBS data getting old, Louisiana just started asking the I/O module in the main BRFSS survey in 2013, so we would only have two years of ACBS data to pair with I/O data. Because nearly half of Louisiana BRFSS respondents tend to be unemployed, a year or two of BRFSS data would not provide a large enough sample to perform any in-depth analysis. For these reasons, using 2013-2014 BRFSS data for an occupational asthma analysis was not feasible. In our proposal, we also mentioned that targeting cases might also be addressed through hazard identification, such as isocyanate exposure, and working with Dr. Rando at Tulane University for guidance on this issue. We were unable to do this due to staff changes within LOHIS and lack of information concerning the project. At this time, we have exhausted potential avenues for approaching the issue of work-related asthma, but we will continue to be on the lookout for a potential data source.

While not occupational asthma, LOHIS did participate in some asthma surveillance this grant cycle. In July 2018, a physician practicing in Baton Rouge, Louisiana, contacted SEET expressing concerns regarding high rates of pediatric asthma-related ED visits from a mainly industrialized area in East Baton Rouge (EBR) Parish (County). In response, the Louisiana Tracking and LOHIS programs collaborated to provide a preliminary, sub-county analysis of pediatric asthma in EBR Parish. The ZIP Code Tabulation Areas (ZCTAs) with the highest asthma-related ED visit rates also had the highest concentration of industrial facilities in EBR Parish. A high percentage of the population of these ZCTAs were also minorities, lived in poverty, and had Medicaid listed as the primary payer for their ED visit. Findings were shared with the physician, and a report about asthma in EBR Parish was produced and published on the Tracking Program's webpage. LOHIS staff also co-authored an abstract and an article, titled *Sub-county Analysis of Pediatric Asthma Identifies Areas that May Benefit from Comprehensive Interventions: East Baton Rouge Parish*. An Environmental Health Breakout Session titled *Sub-County Analysis of Pediatric Asthma Catalyzes Comprehensive Asthma Interventions in Baton Rouge, Louisiana* was presented by Tracking staff at the 2019 CSTE Conference in Raleigh, NC. While the focus of this project was pediatric asthma, the most affected ZCTAs were the most industrialized, suggesting possible undetected occupational asthma exposures in this population as well.

Intermediate Outcome(s): Increased awareness of OSH issues: Findings serve to highlight demographic inequities in health outcomes in EBR Parish, and the resulting burden of asthma from both a healthcare and a cost perspective. Increased stakeholder investment in OSH research and service: SEET has undertaken outreach efforts in the areas of concern that promote better management of childhood asthma. Other: This collaboration, while not directly related to occupational health, has guided intervention strategies that have enabled SEET to advance the cause of health equity in Louisiana.

Injuries (fatal and non-fatal)

Louisiana has many industries that place workers at risk of injury. Other than the specific injuries and illness discussed above, there were several other injuries and one illness that were focused on during this past grant cycle.

Work-Related Severe Traumatic Injury Hospitalizations (OHI # 22)

In 2016, an in-depth analysis of OHI #22, Work-Related Severe Traumatic Injury Hospitalizations was conducted in collaboration with Dr. Jeanne Sears at the University of Washington and published in the Louisiana Morbidity Report (LMR) in an article titled, *Traumatic Injury Hospitalizations among Louisiana Workers, 2006-2014: Results of a Severity Threshold Analysis*. Approximately 42% (1,937) of work-related injury hospitalizations during this 9-year period were for severe traumatic injuries. There was a statistically significant mean annual decrease of 5.1% in minor/indeterminate work-related injury hospitalizations, while there was a 2.4% mean annual increase, although statistically non-significant, in severe work-related injury hospitalizations. Hispanic workers had a significantly elevated rate compared with non-Hispanics, which likely reflects the growing Hispanic population in SE Louisiana. The most common injury was fracture, fall was the most common cause of injury, and intracranial injuries had the highest case fatality rate. Overall, severe injuries significantly increased relative to minor/ indeterminate injuries, which supports tracking severe injuries separately from all hospitalizations in order to avoid obscuring these important trend differentials. In addition to the LMR article, which is also available on LOHIS's webpage, results were also presented at a LOHIS Advisory Committee Meeting and to the Louisiana Workplace Safety Taskforce. The article was also announced on NIOSH's State-based Occupational Health Surveillance Clearinghouse webpage.

Indeterminate Outcome(s): Increased awareness of OSH issues: This research has important implications for worker safety prevention efforts as severe injuries, such as spinal cord and intracranial injuries can result in death, or lifelong disability and pain. Other: Analysis helped lend support to need for monitoring OHI # 22.

Work-Related Amputations

The goal of this project was to support OSHA Region 6's targeted enforcement of mandatory reporting of work-related amputations using syndromic surveillance, a near real-time data source, due to concerns about employer underreporting of such injuries to OSHA. In Fall 2017, two Tulane University Preventive Medicine residents spent their Environmental Health rotation performing a project with LOHIS. Because receipt of LAHIDD and ED data occurs too long after the date of occurrence to make case referral to OSHA feasible, the Louisiana Early Event Detection System (LEEDS), a homegrown, syndromic surveillance system of ED data was used to explore the feasibility of timely capture of work-related amputation data. A syndrome was assigned to each record in LEEDS based on the text contents of the chief complaint, admit reason, and discharge diagnosis fields. LOHIS worked with the LDH/OPH/Infectious Disease Epidemiology Program (ID Epi), to develop several syndromes of interest to occupational health, one of which was "AMPUTATE". At the time, LOHIS received a subset of LEEDS data biweekly from ID Epi. About one and a half months (mid-September through November 1, 2017) of LEEDS data limited to the syndrome keyword 'AMPUTATE' and ages 16-80 years was analyzed. Of the resulting 78 cases, 41% were determined to be not work-related based on details in the chief complaint field or because they were duplicate records. Work-relatedness could not be definitively determined from LEEDS data for the remaining 59% (n=46) of cases, and the medical records were requested from

the treating facilities. We received 33 of the requested medical records. OSHA requires employer information in order to open an investigation; therefore, an attempt was made to gather this information if the case was work-related. Work-relatedness could be confirmed for 33% (n=11) of the medical records we received. Determining work-relatedness of the remaining 22 records would have required patient contact. It took several months to gather the 33 medical records we collected, and we lacked additional resources to pursue the project any further. We did contact the Area Director of the OSHA Baton Rouge office to see if the two cases that we were able to identify with employer information matched any of the cases reported to OSHA. She reported to use that they did not. We were not able to supply employer information to OSHA for more cases because it was not present in the record and we did not contact patients directly; however, this effort highlights under-reporting by employers and the need to identify a data source that provides not only timely identification of cases, but also employer information. In early 2018, project results were summarized and presented as a poster at Tulane University Health Sciences Center Research Day by one of Preventive Medicine residents that worked on the project, and an article titled, *Evaluation of the Louisiana Early Event Detection System for Timely Capture of Work-Related Amputations*, was published in the LMR.

*Intermediate Outcome(s): Increased awareness of OSH issues: Analysis has given us an understanding of work-related amputations in Louisiana, and has highlighted data source constraints regarding the determination of work-relatedness from health records. Increased stakeholder investment in OSH research and service: The residents who worked on the project gained an appreciation for the challenges involved with and the importance of occupational health and safety surveillance. Research used in setting standards, guidance or policy: This study was used as an example of state-based occupational health syndromic surveillance usage in CSTE Occupational Health Subcommittee's white paper titled, *Syndromic Surveillance for Occupational Health Surveillance Guidance Document and Examples*, published on CSTE's website in March 2021.*

Mortality Surveillance

Louisiana has one of the highest work-related fatality rates in the country, significantly greater than the national rate. A multisource mortality surveillance system was established to provide timely and detailed data on worker fatalities. The primary sources for the database are death certificates and OSHA Fatality and Catastrophe Reports (FAT/CATs), supported by other publically available data sources (e.g., news articles, police websites). New death certificates are reviewed monthly to identify fatalities that are not coded as work-related, but are suspected to be so. The database begins with 2005 and is up-to-date through 2019. As of June 30, 2021, we were waiting for the finalized 2020 death file to be released, which typically occurs in July, before adding that year to the database. In the past six years, we have identified about 30 cases with corroborating evidence that the fatal accident was work-related. We worked with Vital Records to request that the coroners revise these death certificates to classify the deaths as work-related. Of those, only five records were changed to work-related by coroners. Amongst the remaining records, several times coroners verbally consented to change a record, but then failed to follow through with the rest of the required process. In early 2021, a request was made to change the suicide of a uniformed police officer in front of his place of work to a work-related death. The coroner originally agreed to change a record to work-related, but then changed their mind, saying that "being considered work-related is questionable, can go either way, and there is more to the story". There was a lot of media coverage around this death, and we decided to add this death to our database. Coroners

agreed to review another two deaths, but we never heard from them again, even after repeated attempts; these were added to the database because we had OSHA FAT/CATs to support the change request to the death certificate. Ideally, we like to have coroners correct death certificates where appropriate. This has proven rather difficult to achieve, so, for the purposes of our work-related mortality database, verbal confirmation from the coroner is also considered positive; however, sometimes we do not receive any response at all to our coroner requests. In these situations, we look to the supporting evidence that we have and make a judgement on whether we should, for the purposes of the database count the death as work-related or not. All deaths, that are added to the database that were not originally marked as Y in the WORKINJ item on the death certificate were entered as Y-REV, if they were revised by the coroner, or a Y* if the coroner did not change the death certificate, but there was enough supporting evidence that LOHIS staff felt the death was indeed work-related.

LOHIS contributed data to a CDC/NIOSH led analysis of mortality data that resulted in an article titled, *Fatal Work-Related Injuries: Southeastern United States, 2008-2011*, being published in *Workplace Health and Safety* in April 2016. A report summarizing findings from 2015-2016 was published on the program's website in July 2017. Most fatalities occurred among workers aged 25-54. In 2016, workers aged 65+ years accounted for 16% of fatalities, but made up only 6% of the employed population. Males accounted for 93-97% of fatalities despite similar employment rates among males and females. Industries with the most fatalities were transportation, construction, and oil and gas. The types of events/exposures that resulted in the greatest number of fatalities were transportation, exposure to harmful substances or environments, and contact with objects and equipment.

Opioid-Related Fatalities

In 2018, LOHIS assisted Ms. Michelle Lackovic at the Louisiana Public Health Institute (LPHI) with part of a project to evaluate and analyze data sources related to occupational opioid use and exposures in Louisiana. We provided opioid-related fatality data from 2012-2015. We used NIOSH's Industry and Occupation Computerized Coding System (NIOCCS) to code the free text industry and occupation fields on death certificates. Opioid-related fatality rates per 10,000 by occupation were calculated. Rates were highest among farming, fishing, and forestry workers (12.3; unstable due to small number of fatalities) and construction and extraction workers (10.7), followed by food services workers (6.7), and transportation workers (5.1). Ms. Lackovic presented project results at the 2018 Southeastern States Occupational Network (SouthON) Annual Conference in Savannah, GA.

Workplace Homicides

In an effort to inform safety and prevention strategies, particularly in the Baton Rouge and New Orleans areas, which have some of the highest violent crime rates in the country, an analysis of workplace homicides in Louisiana was undertaken to describe risk in terms of demographic and employment variables. This project was begun in 2017 with the analysis covering the years 2005-2015. The analysis compared state and United States rates; characterized workplace homicides by demographics, parish (county) of occurrence, occupation of decedent, and assailant/criminal intent type; and identified areas on which to focus prevention strategies. This is the first analysis of its kind for Louisiana, and some findings were presented at the 2019 Southeastern States Occupational Network (SouthON) Meeting in Miami, FL. In addition, a manuscript was submitted for publication to the *Journal of the Louisiana State Medical Society* in February 2018, but was returned with a decision of "revise and resubmit" in late

2018. Revisions were made and the manuscript was resubmitted in December 2018, but the Journal of the Louisiana State Medical Society had decided to stop publication of the journal after 2018 without notifying authors. The manuscript was then submitted to Public Health Reports in March 2019. In April 2019, the article was accepted for external peer review. In November 2019, the article was rejected unfortunately. The reviewers provided some very instructive criticisms and comments; therefore, it was part of our plan to add data through the year 2019, revise to the manuscript, and find another journal to submit to for publication in the extension year of the grant cycle. At the end of the extension year, revision was still ongoing, but we plan to finish the manuscript in the next grant cycle. Progress was slow due to the outbreak of the coronavirus, the transition to working from home, and Dr. Reilly (the lead on this project) being out on medical leave for nearly two months at the beginning of 2020. Work was also hampered by errors found in LOHIS's multi-source work-related mortality database that had to be addressed before new cases of workplace homicide (2015-2019) could be added to existing dataset. We have been able to identify a journal of interest, Safety and Health at Work (SH@W).

Intermediate Outcome(s): Increased awareness of OSH issues: The 2015-2016 report provided timely and reliable occupational fatality data with industry and cause of death details, which is essential for increasing awareness about high-risk occupations and activities, and is an important complement to CFOI data. Monthly death certificate review allows for timely feedback to coroner for cases where we wish to question the work-relatedness status. The opioid data provide a first glimpse of the relationship between occupation and opioids in Louisiana. This can be expanded upon. Finally, analysis of workplace homicides in Louisiana has not been previously undertaken. The article promotes awareness of the scope of the issue in the state and identifies prevention policies, programs, techniques, and available resources. All final reports and published articles are posted on LOHIS' webpage. All of these activities also Increased stakeholder investment in OSH research and service. Other researchers build on knowledge to pursue additional research or service: LOHIS work-related mortality data was used by NIOSH in a multi-state study that was published in a scientific journal.

Adult Blood Lead Epidemiology Surveillance (ABLES), Other Heavy Metals, and Carbon Monoxide (CO) Louisiana disease reporting requirements mandate reporting of all laboratory (lab) test results for lead, arsenic, cadmium, mercury, and CO, regardless of blood level, to LOHIS. Although the law does not specify data reporting format, the majority of test results are sent electronically in HL7-format via a secure server. We still receive some results via mail and fax from a few labs that do not have the capability to send electronic results. LOHIS has participated in ABLES since 2007 and has well-established protocols for data management and case investigation for lead, the other heavy metals, and CO in place. Cases above action level (see Table 1.) are investigated in an attempt to discover the source of exposure. Case investigations begin with a fax to the physician's office, but may go on to include phone consultation and/or interview with health care provider and/or worker, and in some instances, referral to OSHA.

Table 1. Heavy Metal and CO Action Levels for Follow Up

Substance	Patient	Sample	Action Level ¹
Lead	Adult (16+ yrs)	Blood	≥ 10 µg/dL

Table 1. Heavy Metal and CO Action Levels for Follow Up

Substance	Patient	Sample	Action Level ¹
	Child (6.1-15 yrs)		Cases aged 0-6 years are referred to Childhood Lead Program.
Arsenic	Adult	Urine	≥ 35 µg/L (inorganic & methylated metabolites)
			≥ 50 µg/g (organic)
		Blood	≥ 70 µg/L
Cadmium	Adult	Blood	≥ 5 µg/L
		Urine	≥ 3 µg/g creatinine-adjusted
Mercury	Adult (16+ yrs)	Blood	> 10 µg/L
		Urine	≥ 20 µg/g creatinine-adjusted
	Child (< 16 yrs)	Blood	> 10 µg/L
		Urine	> 10 µg/L
CO	All ages	Blood	≥ 12 (if known smoker)
			≥ 9 (if known non-smoker)

¹ Thresholds are based on the following: Lead: CDC's Healthy People 2020 and CDC/NIOSH/ABLES program; Arsenic: American Conference of Governmental Industrial Hygienists (ACGIH) for occupational exposures & ATSDR; Cadmium: ACGIH & OSHA; Mercury: CDC & ACGIH

We receive between 40,000-50,000 laboratory results each year. With our current system, we sort through these results and remove the ones for metals we do not monitor, are duplicates, or are unreviewable for other reason (usually due to missing or nonsensical information). From 2015-2021, 157,630 lab tests were screened for 61,274 unique patients (Table 2), on average, about 22,520 tests for 12,255 unique patients per year. The majority of tests were for lead (73%), followed by arsenic (14%), and mercury (8%). Table 2 provides a summary of lab surveillance efforts during this grant cycle. The number of elevated tests reflects the number of test that the Heavy Metals and CO Surveillance Coordinator attempted to follow-up on via case investigation, with the exception of elevated mercury tests, which are investigated by SEET Section Chief Shannon Soileau, as part of SEET's Fish Advisory Program. The majority of mercury exposure cases are related to seafood consumption.

Table 2. Heavy Metals and CO Surveillance, Louisiana, January 1, 2015-June 30, 2021¹

	2015	2016	2017	2018	2019	2020 ²	2021 ²	2015 - 2021 Total
Tests received	20,048	14,557	9,144	12,751	21,715	52,254	27,161	157,630
Patients tested²	14,416	12,586	7,956	10,263	16,053	n/a	n/a	61,274
<u>Elevated Tests²</u>	365	276	232	329	433	608	189	2,432
<i>Lead</i>	<i>310</i>	<i>252</i>	<i>186</i>	<i>258</i>	<i>207</i>	<i>439</i>	<i>118</i>	<i>1,770</i>
<i>Mercury</i>	<i>25</i>	<i>15</i>	<i>26</i>	<i>23</i>	<i>40</i>	<i>42</i>	<i>24</i>	<i>195</i>
<i>Arsenic</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>36</i>	<i>162</i>	<i>106</i>	<i>46</i>	<i>350</i>

<i>Cadmium</i>	3	3	4	1	2	1	1	15
<i>CO</i>	27	6	16	11	12	20	0	92

¹ We cannot separate out 2015 data by month at this time. ² 2021 data end on June 30th. 2020 and 2021 data have not been cleaned and processed yet; therefore, tests received are total numbers before data is cleaned of duplicates, etc. Number of patients tests is not available (n/a); elevated tests for lead include individuals 6.1+ years of age older, mercury tests include children and adults, arsenic, cadmium and CO are for all ages.

We submitted 2015-2018 ABLES data, and have 2019 ready to submit. We had to change the way we transmit ABLES data to CDC/NIOSH, and are waiting for CDC to provide a public pretty good privacy (pgp) key so the LDH IT department can encrypt the ABLES data file that needs to be sent. As of June 30, 2021, Mr. Metoyer was finishing the processing of the other heavy metals and CO data for the 2019 annual heavy metals and CO reports that are posted to the surveillance webpage, and had not yet begun processing 2020 lab records. Although we are still running a bit behind on data processing for reporting out, lab surveillance is ongoing and case follow-up for elevated tests is near real-time (within 30 days of test result). We maintained (last update 2017) comprehensive information sheets for healthcare providers summarizing sources, exposure pathways, laboratory testing, recognition, and reporting for the different heavy metals on the Heavy Metal and CO Exposure website. In addition to surveillance activities and fielding calls from concerned workers and citizens, the following specific education/outreach activities surrounding heavy metal and CO surveillance were undertaken during this grant cycle:

- There were two articles published: 1) LOHIS contributed the Louisiana ABLES data used in a NIOSH-led study of elevated blood lead that was published in the Morbidity and Mortality Weekly Report (MMWR) in October 2015 titled, *Elevated Blood Lead Levels Among Employed Adults – United States, 1994-2012*. A link is available on the NIOSH State-based Occupational Health Surveillance Clearinghouse. 2) LOHIS published an article titled, *Tracking Exposures Through Louisiana’s Adult Blood Lead Epidemiology Surveillance (ABLES), 2012-2016*, in the July-August 2017 LMR. The results from this analysis showed that firearms instructors at shooting ranges had a notable increase in the number of elevated cases in 2016, with the occupation accounting for at least 12 of the 19 work-related target-shooting cases. This article was posted on the Heavy Metal and CO Surveillance webpage and the NIOSH State-based Occupational Health Surveillance Clearinghouse.
- 2015-2016: An in-depth healthcare provider consultation was conducted for a case with a blood lead level (BLL) > 45 µg/dL.
- 2016-2017: One worksite was referred to OSHA due to elevated BLLs. LOHIS received reports of 34 cases with BLLs ≥ 10 µg/dL from shooting range workers, primarily firearm instructors. In response, about 800 firearm instructors were mailed general information about lead exposure (e.g., health effects, how to protect yourself and your students, enforcement requirements, etc.). Additionally, findings and a recommendation for increased OSHA enforcement of indoor firing ranges were presented at a workplace safety conference sponsored by OSHA-Consultation. A more in-depth, 2-page guide, *Prevent Lead Exposure in Indoor Shooting and Firing Ranges*, containing information regarding prevention measures and employer protection requirements was published on LOHIS’s webpage, the Heavy Metal and CO Surveillance webpage, the NIOSH’s State-based Occupational Health Surveillance Clearinghouse, and shared on the ABLES listserv.

- 2017-2018: Mailed health education awareness packets to four construction workers concerned about potential workplace and take-home lead exposures. Three of these construction workers were referred by the Louisiana Childhood Lead Poisoning Prevention Program (LCLPPP) after their children (aged < 6 years) had elevated BLLs. Packets were also mailed to the parents of two children older than 6 years with elevated BLLs. Because LCLPPP does not monitor children older 6 years of age, we also screen individuals aged 6.1-15 years. Efforts to disseminate the *Prevent Lead Exposure in Indoor Shooting and Firing Ranges* guide continued. Posters of the guide were placed in the LSP joint emergency services training centers in Zachary and Baton Rouge as well as at the ammunition warehouse. Interviews with LDH staff were featured on the Louisiana Radio Network and in a Fox 8 evening news segment in New Orleans in late October 2017. Advertisements were placed in the April 2018 edition of the Louisiana Sportsman magazine and on BayouShooter.com, a Louisiana-based firearm discussion board for fans of shooting sports, from March 5, 2018 to June 28, 2018.
- 2018-2019: One worksite was referred to OSHA during this time. Health education awareness packets were mailed to parents of two children older than 6 years with elevated BLLs. Health education regarding lead abatement was provided to an organization involved in rebuilding homes after natural disasters. We discussed potential take home exposures with the Louisiana Healthy Homes and Childhood Lead Poisoning Prevention Program. As a reminder of what tests are reportable by law, 500 color copies of a single-page factsheet, *Heavy Metal & Carbon Monoxide & Pesticide Test Reporting*, was disseminated to healthcare providers and laboratories by email, at health fairs, health education conferences, and at a rural physicians' meeting.

In total, two ABLES articles were published; two worksites were referred to OSHA; lead exposure health education packets were mailed to eight people; one healthcare consultation was performed; and the *Prevent Lead Exposure in Indoor Shooting and Firing Ranges* guide was distributed to 117 gun shops, shooting ranges, shooting clubs, and police departments, 13 physicians, and 930 firearm instructors.

There were several barriers and issues with lab surveillance during the latter part of the grant cycle. In early 2019, Dr. Jocelyn Lewis, a long-time staff member who also functioned as both the ABLES and Heavy Metals and CO Surveillance Coordinator, was out on medical leave for three months with no warning. We had no time to prepare for her absence. While she was out, we were able to screen faxed and mailed copies of lab tests, but not electronic lab results because Dr. Lewis was the only staff member with access and trained to administer the Louisiana Occupational Tracking Technology System (LOTTTS), the program's heavy metals and CO SQL server database. Dr. Reilly, LOHIS' principal investigator (PI), reached out to LDH's I.T. department to gain access to LOTTTS, which took about a month; however, there was no lab surveillance manual explaining how to navigate LOTTTS or enter new data. This impediment was compounded when in May 2019, a few weeks of gaining access to the system, electronic reporting switched to a new import software, Rhapsody. The parser, Alexis, which was custom built to work with LOTTTS, is not compatible with Rhapsody; therefore, HL7 lab results do not import into LOTTTS anymore. We do not have the source code for LOTTTS or Alexis. They were custom built for LOHIS in 2006, and the builder has since retired; therefore, I.T. cannot fix the problem. Working with LDH I.T. to figure this out took months, as we tried different workarounds. In the meantime, when Dr. Lewis returned, she was tasked with the creation of a lab surveillance manual that would explain the process of importing new data into LOTTTS as well as how to maintain and navigate the database, so that there would be more than one staff member trained on how to perform these activities. At this time, we still thought we were going to be able to solve the parser issue. She started the manual, but did not

complete it when we realized that LOTTs was defunct. In order to make sure that surveillance continued, Dr. Lewis started screening lab HL7 messages for elevated results by eye, a very time consuming process, with the idea that we would worry about getting the results into the database when the problems were resolved. In the meantime, another staff member, Mr. Shay Hollie, was hired in June 2019 to help with LOHIS' workload. In the first week of January 2020, Dr. Lewis resigned from LDH, leaving the lab surveillance program with no staff, and the surveillance system issue still unresolved. In addition, Dr. Reilly went out on planned medical leave in mid-February for nearly two months, leaving LOHIS with one staff member, Mr. Hollie, who had been with the program for less than one year. Mr. Hollie took over screening incoming lab results until we could hire new staff. One process improvement we implemented with the help of electronic health record I.T. staff is that we now receive a batch Excel file of translated HL7 message lab results every few days in a secure folder in a secure location on a shared drive. While still time consuming and cumbersome, this is an improvement over eye-scanning HL7 messages, and allows for better processing and recordkeeping. We hired and began training Mr. Devin Metoyer as Dr. Lewis' replacement in May 2020. Mr. Metoyer had a steep learning curve to overcome. Due to being hired in the middle of the COVID-19 pandemic, all of his training was done via Zoom and telephone calls. Because this system of Excel spreadsheets is new to us, Mr. Hollie and Dr. Reilly spent a lot of time teaching Mr. Metoyer how to go about process and cleaning the data as we were learning about it ourselves. We helped him with learning some basic SAS code, but out of necessity, he had to learn a lot on his own, as he got familiar with data. Once we realized that the communication issue between Rhapsody and LOTTs was not resolvable, we began discussing alternative surveillance system options with I.T. As of June 30, 2021, we had narrowed it down to one of two open-source software systems, and were working with I.T. to acquire one.

*Intermediate Outcome(s): Increased awareness of OSH issues: LOHIS published an ABLES article in the LMR. The ABLES program as well as the surveillance of the other heavy metals and CO allows LOHIS to effectively monitor trends and intervene to prevent over-exposures. Information-disseminating activities led to increased awareness of the dangers of lead exposure among shooting range workers, and helped inform OSHA of lead exposures concentrated at indoor firing ranges. Mail-out effort made to healthcare providers and labs helps reinforce the need to report heavy metal and CO data to the state health department. Members of the public were also provided with lead exposure health education. Increased stakeholder investment in OSH research or service: Having a state-based occupational health program that can field questions that the public, workers, and healthcare providers have about heavy metal exposures helps increase awareness and support for OSH. External organizations disseminate outputs: A result of posting the Prevent Lead Exposure in Indoor Shooting and Firing Ranges to the ABLES listserv, two state health departments asked if they could tailor the guide for use in their state. Other researchers build on knowledge to pursue additional research or service: Louisiana ABLES data part of a NIOSH-led and -published national study. **End Outcome:** By the end of the two years of targeted outreach LOHIS carried out, the number of elevated BLL tests being reported in firearm instructors decreased by 76%.*

Aim 2: Identify and Respond to Emergent and Emerging Occupational Issues

LOHIS has continued to play a key public health role in identifying, evaluating, and responding to emerging and emergent occupational hazards and events. Program responses and activities depend upon the issue or event, and we often collaborate with other agencies. Our emergency response activity has two primary complementary components. The first is to respond to an emergency event (e.g.,

hurricane, plant explosion, chemical spill); the second is to respond to complaints and concerns filed by employees, employers, or physicians.

Chemical and Pesticide Exposures (LSP, NRC, and LPC Report Surveillance)

Protocols established by the LDH/OPH/Emergency Preparedness Program (Emergency Preparedness) are in place that address the review, evaluation, response, and follow-up process for responding to an emergency event. These protocols recognize the multi-agency and program effort required in emergency response activities, including occupational health. The primary, real-time sources are LSP, NRC (National Response Center), and Louisiana Poison Control (LPC) Reports. There are over 700 chemical plants, manufacturers, water utilities, and other facilities that use and store extremely hazardous substances in Louisiana. State law requires that owners and operators of fixed facilities report any release or incident involving an uncontrolled or illegal acute release of a toxic substance to the LSP, the on-scene incident commander for hazardous materials incidents. SEET's Emergency Preparedness Program receives real-time incident notifications from the LSP as well as the NRC, part of the federally established National Response System, staffed 24 hours a day by the U.S. Coast Guard. The NRC is the designated point of contact for all oil, chemical, radiological, biological, and etiological discharges into the environment, anywhere in the U.S. LOHIS continued to work with the Emergency Preparedness Program to respond to real-time email alerts of emergency events received from LSP and NRC Reports. Emergency Preparedness staff evaluate between 5,300-7,100 LSP and NRC Reports each year. From January 1, 2017-June 30, 2021, LOHIS reviewed over 500 potentially worker-involved incident reports, 212 of which involved a worker injury or fatality. One of these events warranted a referral to OSHA. On January 1, 2021, LOHIS began adding LSP and NRC reports involving a possible worker injury or fatality to an Excel spreadsheet that a predecessor had begun in 2015, but abandoned for some unknown reason.

Each month we receive LPC case reports for all calls involving exposure to a heavy metal, carbon monoxide (CO), or a pesticide. We also receive a separate file of all of the cases that fit this description and were work-related. We review all case reports for use of restricted pesticides, use in public spaces/multiple cases, work-relatedness, hospitalization, and fatality. From 2017-2020, LOHIS reviewed about 1,090 LPC Reports a year, about 275 cases of these were work-related. Of these 275, five cases were referred to the Louisiana Department of Agriculture and Forestry (LDAF) for use of a restricted pesticide. No referrals to OSHA were made based on LPC reports; however, we did make a referral to OSHA after the New Orleans Health Department contacted LOHIS about two workers who fell ill at a construction site following a pesticide application. This case was also reported to LDAF because the product was being misapplied. We do not have 2015-2016 data to report due to staff turnover and records being misplaced. We now keep track of all incoming reports in a designated spreadsheet on a shared drive to which all program staff have access to prevent this from happening in the future. We also continued to administer Louisiana's Health-Related Pesticide Incident Report (HRPIR) Program. This complaint-based, statewide program's purpose is to investigate and evaluate reported adverse health effects associated with acute pesticide exposure. A HRPIR is initiated when LDAF's Pesticide and Environmental Programs receive a complaint of health effects possibly associated with pesticide exposure. LDAF and SEET/LOHIS jointly investigate all HRPIRs. These joint investigations involve the collection and review of environmental and health data relevant to the reported pesticide exposure. From January 1, 2015-December 31, 2020 LOHIS investigated 118 HRPIRs (28 work-related) by conducting phone interviews. We also continue to work with LDAF to maintain the Pesticide

Hypersensitivity Registry for Louisiana residents. The registry serves as a way help notify residents with pesticide health sensitivities before commercial application of pesticides near their homes occurs. Licensed pesticide applicators, owners and/or operators are asked to notify registrants of scheduled pesticide applications within 100 feet of the person's home. The program is voluntary and strongly encouraged by LDAF as it helps pesticide applicators protect the health of the communities in which they work.

In addition to all of our continuous surveillance of emergency and emergent events, we assisted with the contribution of Louisiana pesticide surveillance data to three multistate analyses, all published in the MMWR. The first was a multi-state collaboration titled, *Acute Occupational Pesticide-Related Illness and Injury -- United States, 2007-2010* that was published in October 2015. Findings included that most affected persons were exposed to insecticides or herbicides, and the most common herbicides were glyphosate and the dipyridyls (i.e., paraquat and diquat). NIOSH published a similar article which also utilized Louisiana data to evaluate acute occupational pesticide-related illness and injury in the U.S. from 2007-2011, which was published in the MMWR in October 2016. From 2007-2011, the acute pesticide-related illness and injury rate for agricultural workers was 37 times higher than the rate for nonagricultural workers. Most exposures were to herbicides, glyphosate (paraquat) and dipyridyls (diquat), in particular. These herbicides have the potential to be highly toxic and/or life threatening to humans. While it is illegal to transfer these pesticides to other containers, since 2000 there have been 17 deaths, 3 involving children, caused by people mistakenly drinking paraquat that had been transferred to a beverage container. We also provided data to NIOSH to support a paper about injuries and illnesses related to total release foggers (TRFs) that was published in the MMWR on February 2, 2018. Because TRFs pose a risk for acute illness, the Environmental Protection Agency (EPA) requires manufacturers to place improved labels on all TRFs made after September 2012. In the first three years after the label revision was put in place, data from 10 states failed to show a statistically significant reduction in the overall incidence of TRF-associated injuries and illnesses. We also created and posted a *Work-Related Asbestos Hazards Factsheet* in to LOHIS' webpage and NIOSH's State-based Occupational Surveillance Clearinghouse in June 2016.

Intermediate Outcome(s): Increased awareness of OSH issues: Surveillance of pesticide and chemical exposure data reports, publication of articles in journals, and posting reports on webpages provide a resource for learning about the types of exposures occurring at workplaces in the state, and enhance efforts to protect worker health. Increased stakeholder investment in OSH research and service: Fostered collaboration through multi-state pesticide surveillance project; partnership with Emergency Response. By working with our partners and stakeholders, we were able to identify a potentially hazardous worksite environment and have the situation investigated and addressed in order to protect worker health and safety. Research used in setting standards, guidance, or policy: In 2016, the Environmental Protection Agency (EPA) took the several actions to minimize accidental paraquat ingestions and to reduce exposure to workers who mix, load, and apply paraquat. One of the EPA's safety-increasing measures aimed at reducing risk to the public was to require something that was recommended in the MMWRs, a closed-system packaging designed that prevents transfer or removal of pesticide except directly into proper application equipment. The new design prevents spills, mixing or pouring the pesticide into other containers or other actions that could lead to paraquat exposure. Data from the TRF study show that more comprehensive strategies are needed to reduce acute TRF-related illnesses, including promoting integrated pest management and identifying better approached for motivating

users to read and follow label instructions. Redesigning TRFs to prevent sudden and, unexpected activation might also be useful. External organizations disseminate outputs: Louisiana ABLES data is available using NIOSH's Worker Health Charts.

Concerns and Complaints

We also provided indoor air quality consultations as well as responded to other complaints and concerns from workers regarding potential workplace exposures to various substances and hazards including mold, arsenic, asbestos, phenol, and lead. In 2019, SEET received 22 Indoor Environmental Quality calls that were related to workplace issues; seven of these were referred to OSHA. Unfortunately, the log of the calls that were received and responded to by LOHIS staff was lost. The program has experienced a lot of turnover; all of the original staff from the beginning of the grant is no longer with the program. From the records we have kept, since 2017, there have been seven referrals made to OSHA from calls that were received from the public.

Intermediate Outcome(s): Increased awareness of OSH issues: Calls sometimes spur OSHA referral. Other: These consultations help protect worker health and safety.

Aim 3: Identify and Develop New Occupational Health Data Sources

Behavioral Risk Factor Surveillance System (BRFSS) Industry and Occupation (I/O) Module

BRFSS is an annual telephone survey that collects uniform, state-specific data on preventive health practices and risk behaviors that can be linked to chronic diseases, injuries, and preventable infectious diseases in the adult population. Since 2013, LOHIS has helped finance the addition of the optional I/O Module to Louisiana's annual BRFSS survey. The I/O Module includes two standardized employment questions, "In what kind of business or industry do you work?", and, "What is your job title?" Verbatim responses are documented during the interview and later coded by NIOSH to Census Industry and Occupation codes. Many data sources used in occupational health lack information about I/O, but BRFSS can be used to address those data gaps by characterizing Louisiana's working population by education, health status, risk factors, and other variables. LOHIS has continued to advocate for the inclusion of the I/O Module in core of BRFSS surveys.

The first in-depth analysis of Louisiana's BRFSS employment data was conducted with an emphasis on service workers' health and well-being. BRFSS 2013 and 2014 data for employed respondents were aggregated into two occupational groups, service workers and all other workers. Service workers represent a broadly defined group that includes healthcare support, protective service, food service, cleaning and maintenance, as well as personal care and service occupations. Although there is variation among service occupations, many of the jobs are held by women and minorities and involve shift work, low wages, and have minimum job security. These jobs, especially service jobs that pay below \$20 per hour and require only a high school education or less, are predicted to grow far more quickly than higher-wage jobs over the next decade. Findings indicate that many service workers do not earn enough money to afford necessities, such as medical care, food, and shelter. Thirty-nine percent did not have health insurance, and 30% could not see a doctor due to medical costs. Further, 17% reported that they were stressed about being able to afford their rent or mortgage, and 34% were stressed about being able to afford nutritious meals. Service workers also had a greater prevalence of chronic health conditions (asthma, COPD, depression, and diabetes), smoking, and poor health status. Results of this

analysis were presented in several forums and a final report, *Louisiana Service Worker Wellness Report, Results from the Behavioral Risk Factor Surveillance System, 2013-2014*, was posted on the program's webpage and the NIOSH State-based Occupational Surveillance Clearinghouse in May 2016.

We have since processed three more years (2015-2017) of BRFSS data. Data years 2013-2016 was briefly examined in terms of demographics as well as responses to questions about health care coverage, medical costs, total health, several chronic disorders, risk behaviors, and preventive measures stratified by occupational category. It was determined that the data set was not large enough to do any additional stratification by occupational groups outside of service workers. Because of this, we decided to wait before we analyzed BRFSS data until 2017 BRFSS data was processed and added to the data. After 2017 data was added, we began working on what was supposed to become a manuscript or report, *Health Risk Factors and Employment among Louisiana Adults* (working title). This was to be a summarization of an analysis of the 2013-2017 BRFSS data for health risk behaviors (obesity, smoking, physical activity) by demographics, industry, and occupation. Major findings from this preliminary analysis were that nearly 40% of Louisiana workers reported being a smoker, which was 1.7 times the prevalence of all Louisiana adults. All of the health risk factors examined were more prevalent in the youngest (18-44 years) and white workers. Smoking and binge drinking were most prevalent in the construction and mining, quarrying, and oil and gas extraction industries and the maintenance and construction and extraction occupations. We realized that we have too much data for one report, and needed some direction/focus, so instead of writing up a report at this point, we decided to step back and first get a snapshot of the health of Louisiana's workforce in the form of a "BRFSS Indicator Report". This report will be similar to work done to by Massachusetts and Connecticut. The report will examine health indicators, health risk behaviors, health protective behaviors, and chronic conditions. We will use this report to help guide our next steps with analyzing BRFSS data.

Intermediate Outcome(s): Increased awareness of OSH issues: The inclusion of the state added I/O Module to Louisiana's BRFSS survey adds a much-needed source of occupational data to our program. The use of BRFSS data in the context of industry and occupation allows us to report on the state of worker health as it pertains to specific industrial and occupational sectors in Louisiana. LOHIS' analysis provided critical information on the health and well-being of service workers in Louisiana that can be used by policymakers, community leaders, and business leaders to better understand the economic hardships, chronic health conditions, and other quality of life issues faced by this growing occupational sector. This information, in turn, can better inform policy, legislation, and health intervention and prevention programs.

Louisiana Early Event Detection System (LEEDS)

LEEDS was a homegrown syndromic surveillance system that contained daily patient summaries from about 70 Emergency Departments (EDs) statewide that were automatically tagged with syndromes based on pre-defined text strings. LOHIS worked with ID Epi to develop several syndromes of interest to occupational health using chief complaints text including work-related, heat illness, pesticide, amputation, and heavy metal. We received bi-weekly line listings tagged with identifying syndromes; approximately 14,000 cases were received each reporting period. In a pilot project, we evaluated LEEDS' feasibility for the timely capture of work-related amputations (See Aim1. Work-Related Amputations). Some cases were excluded as non-work-related based on the Chief Complaint field, but none of the

remaining records definitively indicated work-relatedness. Medical records were requested for those 47 cases; of the 33 medical records we received, work-relatedness could be confirmed for 10 (30.3%). We were unable to make the patient contact required to determine work-relatedness for the remaining 23 records. We were only able to supply employer information to OSHA for two of the cases because it was not present in the rest of the records and we did not contact patients directly; however, this effort highlights under-reporting by employers and the need to identify a data source that provides not only timely identification of cases, but also employer information. Louisiana has since switch to ESSENCE as its method of syndromic surveillance.

Intermediate Outcome(s): Increased awareness of OSH issues: Because work-relatedness is not consistently captured in the LEEDS system, and it is resource intensive to request medical records and follow up with patient contact, this data source is not particularly useful for the capture of this type of work-related injury at his time. Increased stakeholder investment in OSH research and service: Based on case matching efforts by OSHA, work-related amputations are not being regularly reported by employers.

Work-Related Injury and Illness Reporting

LOHIS successfully facilitated the amendment of the disease reporting requirements of the Louisiana Public Health Sanitary Code, make reporting of all work-related injuries and illnesses to SEET/LOHIS required. The amendment went into effect May 20, 2019. Prior to this date, only exposures to CO, heavy metals, pesticides, excess radiation, and pneumoconiosis were potentially work-related conditions subject to mandatory report.

Intermediate Outcome: Increased stakeholder investment in OSH research of service: The legislature approved changes to the state public health sanitary code.

Louisiana Emergency Response Network (LERN)

Trauma registry data was identified as a potential data source while working on the LEEDS work-related amputation pilot project. During medical record review, we reached out to the trauma coordinator at one of the two Level I trauma centers in Louisiana to learn more about trauma data. We learned that all trauma centers in Louisiana must be certified by the American College of Surgeons Committee of Trauma and submit data to the National Trauma Data Bank. This data is also submitted to LERN's trauma registry, which has adopted the National Trauma Data Standards' data elements. These data elements describe the injury event, demographics, prehospital information, care outcomes, and cost. Collected data of particular interest to occupational injury surveillance include work-relatedness, and patient's industry and occupation. We submitted a proposal and data request to receive LERN work-related trauma registry data for 2015-forward. We completed some basic data cleaning and created some occupational-related figures for 2017 data, which was shared with LERN staff. The LERN coordinator seemed interested in the data, and we are discussing the inclusion of some of the figures in the yearly State Trauma Registry Reports. We currently have data for 2015-2018. Prior year's data becomes available about six months after a new year begins. We should have received 2019 and 2020 data by now. There was a delay with receipt of 2019 data on LERN's end, LOHIS lost a staff member in January 2020, and Dr. Reilly went out on medical leave in mid-February 2020. When she returned at end of March 2020, COVID-19 had arrived and everyone was teleworking. We lost connectivity with the shared

drive between LOHIS and LERN that had to be fixed. All of these things slowed overall program progress for a time. In the summer of 2020, the 2019 LERN data was still not ready, since then we have not had a chance to reconnect with LERN since hiring Mr. Metoyer and getting him on-boarded and trained in lab surveillance, applying for the next grant cycle, and other program projects. We plan to analyze this new data source in the future.

Intermediate Outcome(s): Increased awareness of OSH issues: Use of LERN trauma registry data has the potential to capture more cases of traumatic work-related injury than we currently capture with retrospective ED data using WC as a payer to identify work-relatedness. Contribution of occupational-related content to yearly trauma registry reports helps bring awareness of the work-related component of traumatic injuries to a wider audience than is typically reached with some other LOHIS products, and helps Increase stakeholder investment in OSH research and service.

Highway Safety and Research Group (HSRG)

The Highway Safety and Research Group (HSRG) at Louisiana State University collects, analyzes, and distributes motor vehicle crash data from law enforcement and other state agencies. The LACRASH software system is used by law enforcement agencies throughout the state to capture motor vehicle crash reporting information electronically. HSRG produces data reports using LACRASH data, including Commercial Motor Vehicle (also known as Uniform Trucks or Busses; vehicles weighing 10,000+ pounds or a bus with seats for at least nine people) crash reports that are updated nightly. We worked with HSRG on a data quality project to evaluate the coding of health severity in the LACRASH data. The project was based on previously validated work by the National Highway Traffic Safety Administration that linked LACRASH data with health databases such as hospitalization and mortality records to determine the severity of crash-related health effects. Piloting with 3-years of hospitalization data (2012-2014), we computed severity using International Classification of Diseases Programs for Injury Classification, which translates injury diagnosis into standard injury categories. The computed hospitalization data are probabilistically linked to LACRASH data. Results indicate that of matched cases, about 75% had a severity score more severe than the LACRASH code, including 21 fatalities that were coded with severe or moderate injuries.

Intermediate Outcome(s): Increased awareness of OSH issues: LACRASH is a data source that can be used in tracking work-related injuries and fatalities from motor vehicle crashes, but its use is limited to Commercial Motor Vehicles. This prompted us to begin questioning what types of information is being collected. Eventually, we ended up at essentially the same parent data source, but accessing it directly from the data owner. See next section. Use (potential) of new surveillance method by others: LOHIS' findings prompted HSRG to re-evaluate their methods for determining fatalities in order to improve LACRASH data quality.

Louisiana Department of Transportation and Development (DOTD)

LOHIS completed a report about work-related motor vehicle accident (MVA) associated fatalities in Louisiana by analyzing death certificate data, but we have not had a good data source for evaluating injuries resulting from work-related MVAs. We were just beginning to explore the uniform crash report that law enforcement officers fill out at the scene of an accident as a possible data source. Around this time, we saw a presentation by our fellow state grantees from Michigan at the 2019 CSTE Annual

Conference in Raleigh, NC that made use of this data. Shortly after this, LDH's Chief Data Officer from the Bureau of Health Informatics was able to facilitate a meeting with LOHIS and DOTD. We met with Mr. Trey Jesclard to discuss the feasibility of using a combination of data elements found on motor vehicle traffic crash reports as a proxy for work-relatedness. Crash reports contain a vehicle classification item that describes vehicle ownership (commercial/business; government; personal) as well as items describing vehicle configuration, body type, and other situational items describing accident circumstances. Our goal was to analyze work-related MVA associated injuries and fatalities. During our conversation with Mr. Jesclard we decided to begin with work-related MVA-associated fatalities, because it is a smaller dataset, and we can make comparisons with the fatalities captured our death certificate review. As of June 30, 2020, a case definition for work-related MVA associated fatalities has been developed, and the data request is being finalized for submission to Mr. Jesclard. After the fatality project, we will submit the request for injury data.

Intermediate Outcome(s): Other: Discovery of potential new data source, particularly for work-related MVA associated injuries. We have started developing a new relationship with the DOTD that may be mutually beneficial, in that our analysis of their data may provide them with useful information as they plan for future projects and develop new policy. This may lead to Increased stakeholder investment in OSH research and service.

Aim 4: Design and Implement a Surveillance System to Track Occupational Heat-Related Illness (HRI) and Mortality

LOHIS continued to take a lead role within LDH to develop public health capacity to address and respond to climate change. Recognizing that robust surveillance systems are needed to track climate-sensitive health events and other measures, in 2004, CSTE established the State Environmental Health Indicators Collaborative Climate Change Subcommittee to create a suite of indicators to allow health departments to measure current vulnerability to climate variability and change at the state and community level. Indicators include measures from five categories: Environmental, Health Outcome, Mitigation, Adaptation, and Policy; many of these indicators have potential worker impacts. In 2015, LOHIS hosted a Tulane University School of Public Health student intern to calculate nine of the 14 Environmental, Health Outcome, and Mitigation indicators for Louisiana. Indicators were chosen based on the availability of data. A report including a summary description of the indicators with data for the most recent years' available and historical data for the past 25 years is available on LOHIS's webpage and via NIOSH's State-based Occupational Surveillance Clearinghouse. The indicator process represents an important first step in developing a public health response as indicator data can be used to assess human vulnerability to climate change, identify areas for intervention and prevention, and serve as an important communication tool to educate and inform various stakeholders about local climate change concerns.

A multi-source occupational heat-related illness (HRI) database containing cases from the emergency department (ED), LAHIDD, and death certificates was created. The database houses all cases of HRI, not just work-related cases. Records are flagged as work-related in the ED and LAHIDD data for easy selection. Mortality data already has a built-in work-related variable. The database currently contains ED cases for 2010-2018, LAHIDD cases for 2010-2019, and mortality cases for 2010-2019. The database will be managed as part of the HRI expanded project going forward.

LOHIS was involved in multiple activities to expand its technical and organizational capacity to track HRI. LOHIS served as the state lead for advocating for the addition of the occupational HRI ED visit indicator that was formally adopted by state occupational health programs as OHI # 24, and continues to serve as the state lead for OHI # 24. LOHIS co-authored a paper titled, *Occupational heat-related illness emergency department visits and inpatient hospitalizations in the southeast region, 2007-2011*, that was published in the American Journal of Industrial Medicine in October 2015. This study analyzed ED and inpatient hospitalization data from nine southeastern SE states to identify occupational HRI numbers and rates, demographics, and comorbid conditions. The HRI ED visit rate for the SE region was 6.5/100,000 workers and 0.61 HRI hospitalizations/100,000 workers. Rates for ED visits and inpatients hospitalizations were significantly elevated in males and blacks. Some Louisiana specific results from that analysis were that Louisiana has an elevated HRI inpatient hospitalization and ED visit rate in comparison with the nine other SE states included in the study. Significantly elevated results were observed in males and blacks, and also in Hispanics. LOHIS promoted both OHI # 24 and the results of the October 2015 heat paper through several presentations and a webinar hosted by CSTE titled, *Occupational Heat-Related Illness Surveillance in the Southeast*, in September 2015.

LOHIS, in partnership with Kentucky and NIOSH, also had an article titled, *Association Between Work-Related Hyperthermia Emergency Department Visits and Ambient Heat in Five Southeastern States, 2010-2012—A Case-Crossover Study*, published in GeoHealth in July 2020. This study combined data from five SE states and two unique data sets: ED visits and weather data. This project began in 2016, and took many years to come to fruition. Preliminary results were first presented at the 2017 Annual SouthON Conference. The study's findings indicate that from 2010-2012, ambient heat contributed to work-related ED HRI visits in the five SE states. A 1°F increase in average daily mean temperature was associated with a 14% increase in risk of a work-related HRI ED visit. Additionally, there was a 54% increase in risk for a work-related HRI ED visit during an extreme heat event. A large percentage of work-related HRI ED visits occurred on days when heat index was at temperatures OSHA designates as having a "lower" or "moderate" risk. Statistically significant odds ratios were observed for a lag period of up to three days. These results indicate that work-related HRI ED visits were associated with ambient heat from up to three days prior to the ED visit and suggest that a recovery period may have been critical during periods of extreme heat stress.

LOHIS, in collaboration with LDH's Tracking Program and the Louisiana state climatologist, Dr. Barry Keim, produced a Special Environmental and Occupational Edition of the LMR in November 2019 which focused on extreme temperature and HRI in Louisiana from 2010-2016. Dr. Reilly co-authored several of the articles, and was primary author of an article devoted to work-related HRI ED visits and hospitalizations in Louisiana and its climate divisions. A strong to moderate correlation was found between the monthly number of occupational HRI ED visits and the average monthly maximum temperature and average monthly maximum heat index for each of Louisiana's nine climate divisions. There was also a strong to moderate correlation between monthly occupational HRI ED visits and days per month the maximum temperature or heat index was $\geq 95^{\circ}\text{F}$.

LOHIS and the LDH's Tracking Program planned to collaborate with the Louisiana Workforce Commission to promote heat safety in the summer of 2020 by developing social media messages targeted at

individuals working in outdoor and hot indoor environments. Once approved by LDH's Bureau of Media and Communications (BMAC), the messages were to be posted on LDH's Facebook, Twitter, and Instagram channels. A heat safety poster was also developed which was to be published on LOHIS' webpage. The messages were developed, but once COVID-19 arrived, BMAC was overwhelmed with their workload, and this project could not be carried out.

There was also a manuscript completed and submitted to the Journal of Public Health Management and Practice in July 2016, titled, *Impacts of extreme heat: an evaluation of heat-related illness in Louisiana for 2010-2011*. This was a statewide analysis of heat-related illness ED data and temperature data in parallel completed in collaboration with LSU Health Sciences Center, Louisiana's state climatologist, and the LA Tracking Program. Unfortunately, it was rejected for publication in September 2016. Dr. Keim has expressed interest in revisiting writing the paper again or a similar project. Somewhat in response, in January of 2021, LOHIS, Michelle Lackovic, LA Tracking Program staff, Dr. Keim, a local National Weather Service meteorologist, and several others formed a Health and Climate Workgroup to discuss current projects, knowledge gaps, and opportunities for collaboration.

Intermediate Outcome(s): Increased awareness of OSH issues: Public health plays an important role in tracking and responding to the population health impacts of climate change and promoting mitigating activities to reduce greenhouse gas emissions (e.g., active transportation, energy conservation). Louisiana has a hot and humid climate, and heat-stress illness is an ongoing concern. Dissemination of publications and reports and outreach efforts help raise awareness of the risks of working and/or being outdoors in the heat too long without taking the proper precautions and the importance of HRI prevention. Increased stakeholder investment in OSH research or service: The development of the Health and Climate Workgroup with various traditionally non-occupational health partners and stakeholders is an important opportunity for mutually beneficial collaborations that expand LOHIS program capacity. Other: HRI multisource database enables easy tracking of HRI and mortality in Louisiana.

Aim 5: Periodically Prepare Reports, Publications, Issue Briefs, and Presentations of Surveillance Findings, Including Annual Reports Summarizing Indicator Data

See publications list.

Aim 6: Interact Regularly and Collaborate with State Partners and Stakeholders to Obtain Input on Priority Issues, to Disseminate Surveillance Findings, and to Develop Prevention Strategies and Interventions

BRFSS Workgroup

LOHIS participated in the NIOSH supported BRFSS Multi-State Injury Question Workgroup composed of nine states that included a work-related injury question in their BRFSS survey as part of a coordinated effort to examine health conditions, health-related behaviors, and health care access by industry and occupation. The arrival of the COVID-19 pandemic put workgroup meeting and progress on hold. The group did not meet its June 30, 2021 deadline for producing a report or article, and is still working toward this goal. *Potential Outcome(s): Increased awareness of OSH issues: Publication of report/article; Increased stakeholder investment in OSH research or service: Collaboration between states may present other opportunities for further collaborations.*

Occupational Health Internship Program (OHIP)

From June-August 2015, LOHIS served as co-mentors with the National Guestworker Alliance (a worker center organization based in New Orleans) for the Occupational Health Internship Program (OHIP). Two interns conducted in-depth interviews of 25 Latino shipyard workers in SE Louisiana. Results from this analysis were presented at an OSHA-Baton Rouge staff meeting, a NIOSH OHIP videoconference, the annual American Public Health Association conference, and annual Southeastern States Occupational Network (SouthON). A final report was also prepared. This was the first OHIP program in the South.

Intermediate Outcome(s): Increased awareness of OSH issues: Assessment of work conditions experienced by immigrant workers can lead to improved prevention and enforcement activities.

Increased stakeholder investment in OSH research and service: The expansion of OHIP to the South provided opportunity for ongoing occupational safety and health capacity development.

Southeastern States Occupational Health Network (SouthON)

In collaboration with state health departments, NIOSH, academic partners, CSTE, regional ERCs, and other OSH partners, SouthON builds on the foundation for occupational health surveillance capacity and collaborative research in the SE U.S. region. LOHIS co-planned and hosted the fifth annual SouthON conference March 8-9 2016 in New Orleans. Other co-planners of this event include other SE state occupational health leads, CSTE, staff from NIOSH Education and Research Centers (ERCs) in Florida and Alabama, and staff from the NIOSH Morgantown office. The 1.5-day meeting brought together about 70 attendees from state health departments, academia, NIOSH ERCs, Agricultural Centers, and other key stakeholders to discuss and address occupational safety and health issues affecting workers in the Southeast. We continue to be an active member state of SouthON. *Intermediate Outcome(s): Increased awareness of OSH issues: SouthON continues to build occupational health surveillance and research capacity at the state and regional levels. Increased stakeholder investment in OSH research or service: This conference is critical for strengthening the occupational health community in the southeast, and establishing connections between key stakeholders including state health departments, academia, education and research centers, and NIOSH.*

National Violent Death Registry

We collaborated with the National Violent Death Registry System to link their violent death surveillance data with our work-related mortality surveillance system. We also provide technical assistance on industry and occupation coding of their data. *Intermediate Outcome(s): Increased stakeholder investment in OSH research and service: Our expertise with industry and occupation coding improved the newly established National Violent Death Registry System's occupational data. Combining the activities of both programs with regard to work-related fatalities strengthened data quality, partnerships, and interventions.*

Louisiana Office of Workers' Compensation Administration (OWCA)

LOHIS worked with OWCA to prepare and submit a funding application for the WC Surveillance Grant. Through this process, we demonstrated to OWCA leadership the value of WC claim data for improved injury surveillance and targeting high-risk occupations and industries. Unfortunately, the grant was not funded, but we have continued to strengthen our relationship with OWCA through other activities described throughout this progress report, including obtaining annual WC-related OHI data and the WC

data used in the NIOSH Oil and Gas Occupational Health Working group project. We also began participating in the NIOSH WC COVID-19 Workgroup with OWCA in June 2020. The purpose of the workgroup is to collaborate with states to use WC systems to track and prevent COVID-19. The main activities are to share best practices to help harmonize COVID-19 case definitions, develop state tracking reports to share with stakeholders, and help develop prevention strategies for workplaces during the pandemic. *Intermediate Outcome(s): Increased awareness of OSH issues: Data may be used to inform prevention strategies for COVID-19 and to help meet critical occupational surveillance needs to characterize the prevalence and severity of COVID-19 infection among workers and investigate risk factors and related health issues. Increased stakeholder investment in OSH research and service: Participation in the NIOSH WC COVID-19 workgroup will expand LOHIS familiarity with WC data and build capacity. The collaboration with OWCA strengthens our relationship. Over time we have developed an open relationship where we freely discuss ideas for future collaboration. Other: Development of WC claim data as data source.*

Louisiana Community and Technical College System (LCTCS)

Representatives of the LCTCS are members of LOHIS' Advisory Committee. During an Advisory Committee meeting, a need was identified for the development of a training module to increase the amount of occupational safety and health educational resources made available to students. LOHIS Program partnered with LCTCS to create a general, non-industry specific, narrated PowerPoint presentation, that would help introduce students to a basic understanding of Occupational Safety and Health (OSH). The course objectives are to better prepare students for entry into the workforce by improving their knowledge about the protections available to them as workers, and to provide a springboard to those interested in pursuing careers related to occupational health. The training includes information about federal and state agencies concerned with protecting worker health, work-related fatality statistics, work-related injuries and illnesses that are reportable by law in Louisiana, common workplace hazards, and specific examples of workplace injuries and illnesses and how to avoid them. The training presentation has been available on LOHIS' webpage since January 27, 2020, and is promoted to students (and a link is provided) each semester via Canvas, the LCTCS Learning Management System (LMS). The presentation link is also sent out to the healthcare deans and directors to share directly with their faculty members. *Intermediate Outcome(s): Increased awareness of OSH issues: This presentation provides a tool to LCTCS faculty and staff to assist in the education of their students about occupational safety and health before they enter the workforce. Students will be familiar with worker rights, the agencies that exist to protect workers, and common workplace hazards, which will help foster a safety-oriented mindset as they begin to work in their chosen fields. Increased stakeholder investment in OSH research and service: Provides an opportunity to educate future workers about occupational safety and health before they enter the workforce. External organizations disseminate outputs: LCTCS promotes LOHIS' presentation on their LMS.*

Louisiana Environmental Public Health Tracking (Tracking Program)

LOHIS worked with the Tracking Program whenever possible. We submitted updated OHI to be uploaded the Louisiana Health Data Portal, administered by the Tracking Program and LDH's Bureau of Health Informatics. Some other examples include, LOHIS coordinated with Tracking's Health Communications Specialist to create social media messages about protecting worker health and safety that were posted on LDH's Facebook and Twitter accounts during the 2018 North American

Occupational Safety and Health Week, which was observed May 6-12. We worked together on the asthma in East Baton Rouge project and collaborated to produce the Special Environmental and Occupational Edition of the LMR focused on HRI. Staff from each program also participate in the other program's Advisory Committee Meetings. The area we tend to work together most on is heat.

Intermediate Outcome(s): Increased awareness of OSH issues & Increased stakeholder investment in OSH research and service: Using different opportunities and methods for the dissemination of occupational health and safety information increases the size of the audience reached and increases public awareness. Relationship with Tracking provides continued support and new opportunities to collaborate and network.

Louisiana Public Health Institute (LPHI)

We worked with LPHI's Ms. Lackovic, the former LOHIS program manager, on two of her post-LOHIS projects. The first was the project related to evaluating data sources related to occupational opioid use and exposure. For the second, SEET and LOHIS contributed to LPHI's Louisiana Hurricane Response Hub (HRH). LPHI serves as one of five regional technical assistance centers for the HRH initiative led by the National Network of Public Health Institutes. Funded by the CDC, the national HRH program is designed to enhance disaster-related surveillance and environmental and occupational health recovery efforts. Using national resources, LPHI coordinates local, state, and regional partners to strengthen public health workforce capacity building activities in disaster-related surveillance, and more effectively address environmental and occupational needs in the event of a disaster. In collaboration with the HRH, SEET worked with Tulane University's LMS staff to develop a Louisiana HRH curriculum to provide guidance and training to the public health workforce, response workers, volunteers, and community members who face hazards that arise after hurricanes and floods occur in Louisiana communities. The four courses in the curriculum cover topics related to: 1) general safety and health considerations, 2) heat-related illness, 3) private water wells, and 4) mold exposure. Local resources related to Louisiana hurricane preparedness and recovery are provided to strengthen community awareness and resilience. LOHIS staff served as the subject matter expert/instructor of the heat-related illness course by providing the content and working with Tulane LMS staff on the design and execution of the final course. A certificate is available upon completion of the curriculum. The curriculum is available on Tulane's LMS as well as CDC TRAIN. *Intermediate Outcome(s): Increased awareness of OSH issues: This course will help address an identified knowledge gap amongst the public health workforce about disaster response and recovery as it specifically relates to environmental health and occupational health. External organizations disseminate outputs: SEET/LOHIS developed curriculum disseminated by Tulane University LMS and CDC TRAIN.*

NIOSH Oil and Gas Occupational Health Working Group

This working group began in 2018 with the goal of undertaking a multi-state collaboration to examine oil and gas extraction WC claims in oil states to better understand the nature, severity, and cost of non-fatal injuries and illnesses in the industry. LOHIS successfully requested WC claim data for 2014-2017, allowing the inclusion of Louisiana data in the project. Kyla Retzer, the NIOSH chair of the working group, along with her colleague Kyle Moller presented the data at the OSHA Oil and Gas Safety and Health Conference in Houston, TX in December 2018. Data was also presented at a LOHIS Advisory Committee Meeting in early 2019. LOHIS staff was participating in the drafting of a white paper about this project, but it was put on hold in 2019 and never picked back up. *Intermediate Outcome(s):*

Increased awareness of OSH issues: This was the first time Louisiana WC oil and gas data was presented to stakeholders outside of the OWCA, the data owners' agency. Increased stakeholder investment in OSH research and service: This was a successful data collaboration with the OWCA. Both OWCA and LOHIS have expressed the desire to work together further on other projects in the future.

CSTE Occupational Health Subcommittee Syndromic Surveillance Working Group

LOHIS joined the CSTE Occupational Health Subcommittee Syndromic Surveillance Working Group. The purpose of the working group was to produce a document that contains a syndromic surveillance primer and guidance for occupational health professionals to explore this new data source for occupational health surveillance in their own states. In March 2021, a white paper titled, *Syndromic Surveillance for Occupational Health Surveillance: Guidance and Examples*, was posted on the CSTE Occupational Health Subcommittee's webpage. The working group has decided to continue to meet even though our original goal of guidance document has been met. Intermediate Outcome(s): Research used in setting standards, guidance or policy: The work-related amputation project, which used syndromic surveillance as the data source, was used as an example of state-based occupational health syndromic surveillance usage in the working group's white paper. Other: Participation in this working group allows us to learn about approaches other states have taken with syndromic surveillance and to contribute to current knowledge by sharing our experiences.

Other Workgroups and Advisory Group Meetings

In addition to holding regular Advisory Committee meetings and participating in described projects with the above workgroups and partners, LOHIS staff participated in the following groups: Workplace Safety Taskforce; Louisiana Mold Task Force (serve as occupational health advisors); Louisiana Lead Advisory Board; Louisiana Healthy Homes Coalition; CSTE's Occupational Health Subcommittee OHI Workgroup; CSTE's Spatial Analysis Workgroup; CSTE's Climate, Health, and Equity Subcommittee; Louisiana Healthy Homes and Childhood Lead Poisoning Prevention Program Advisory Board; LDH's Electronic Health Record Workgroup; and LDH's BRFSS Advisory Group. LOHIS also participated in a statewide injury prevention stakeholder group that prepared a CDC Core Injury Prevention Research application, which was funded in 2016. Intermediate Outcome(s): Increased awareness of OSH issues & Increased stakeholder investment in OSH research and service: Advisory and workgroup meetings foster relationships with programs within and outside our own agency, allow for sharing of information and outputs among partners, receipt of feedback on projects, and help identify issues and projects for collaboration.

Aim 7: Implement Process and Outcome Evaluations

LOHIS developed an evaluation plan that included several objectives, evaluation questions, and performance measures.

Objective 1: Collect and analyze Occupational Health surveillance data:

Evaluation: Has the program staff maintained access to all required occupational health data sets?

Performance measures include, number of data sharing agreements, number of records by data source, number of records with incomplete and/or inaccurate records, and number of new data sources evaluated. Table 3 details information about data agreements/sources maintained by the occupational health program. Overall, a very small percentage of LAHIDD and ED records have missing data. From

2015-2020, less than 1% and about 1% of records were missing age, state of residence, or primary payer information in LAHIDD and ED records, respectively. The majority of missing data for both data sources was primary payer information, 82% and 85% for LAHIDD and ED data, respectively. Although the percentage of missing data for these two sources is very low there is the possibility that some of these records should have been coded WC as the primary payer, which means they would have been counted in LOHIS surveillance efforts as a work-related injury (also see Aim 1). Four new data sources were explored or identified, BRFSS data with I/O Module, LEEDS, LERN, and DOTD (see Aim 3).

Table 3. Louisiana Record Level Data Used in Occupational Health Surveillance

Data Source	Approximate # Record/Year	Currently Available*
Hospital Inpatient Discharge	550,000	1998-2020
Emergency Discharge	2,300,000	2010-2020
Mortality Records	46,000	1999-2019
Tumor Registry	23,000	1988-2018

** Some data source are updated annually, quarterly, or monthly; however, annual mortality data is not finalized until mid-July the following year.*

Objective 2: Conduct ongoing surveillance of blood leads, other heavy metals, & CO

Evaluation is only presented for 2017-present. Because of turnover and problems with LOTTs (see Aim 1), we were unable to extract data prior to 2017. The number of hospitals reporting lead results has increased in the last two years from around 16 a year to over 30. Less than 100% investigation completion means a percentage of cases were lost to follow-up or were unable to be investigated.

Table 4. Process and Outcome Evaluation Results for Heavy Metal and Carbon Monoxide Surveillance

Data from July 1, 2017 - June 30, 2021	Lead	Cadmium	Mercury	Arsenic	CO
Evaluation: Has the staff maintained a system for tracking adult lead, other heavy metal cases, and carbon monoxide?					
# of data assessments completed	68,832	5,643	6,296	9,288	1,440
# of records with missing field(s)*	2,097	936	1,331	1,447	252
# of records with invalid codes*	n/a	n/a	n/a	n/a	n/a
# of hospitals/laboratories annually	25	8	9	10	9
Evaluation: Has the staff maintained a system for investigating adult lead, other heavy metal cases, and carbon monoxide?					
# of cases investigated	456	6	46	41	42
% investigations completed within 3 months	84	100	100	91	75
# of referrals to OSHA	1	0	0	0	0
<i>*Data only available for FY 2018. It is difficult to report lab data by month or partial year beyond what is reported here.</i>					

Objective 3: Improve use of mortality data for use in occupational health surveillance

Evaluation: Has the program developed a system for improving the quality of their occupational illness and mortality data?

LOHIS staff maintain confidentiality agreements with Vital Records so that we may continue to work with death certificate data. On average, 46,000 death records are reviewed by LOHIS staff each year, and 121 death certificates are entered into the multisource work-related mortality database. This topic is discussed in more detail under Aim 1: Mortality Surveillance.

Objective 4: Design and implement surveillance system to track HRI and mortality

Evaluation: Has the staff developed a system for tracking and investigating occupational HRI and fatalities?

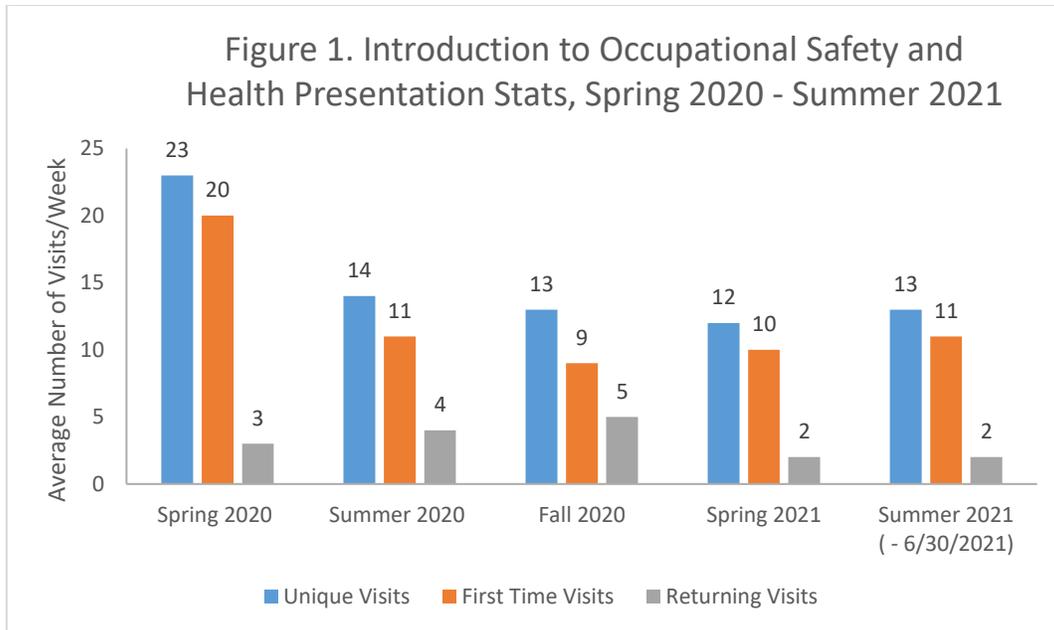
We have maintained data the confidentiality agreements with LAHIDD, ED, and mortality data owners, the data sources used to create the current HRI database.

Table 5. Process and Outcome Evaluation Results for Implementation of HRI Surveillance System

	LAHIDD (2010-2019)	ED (2010-2018)	Mortality (2010-2019)
All HRI Cases	2,907	24,335	131
# with missing primary payer	97	234	n/a
# Work-Related Cases	215	2,889	13

Additional project: LCTCS Presentation: Introduction to Occupational Safety and Health

LOHIS has been tracking web traffic to the LCTCS presentation/course. It was posted to the LOHIS webpage on January 27, 2020 as a means of documenting product uptake. Figure 1 displays the average number of unique, first time, and return visits per week during the different semesters of 2020-2021 (through June 30, 2021). A unique visit is counted when someone visits the presentation link, browses one or more pages, then leaves. A returning visit is when someone visits the presentation link then returns after being gone for more than 30 minutes. We have also received feedback from Allied Health faculty stating that “the content is designed very well as a broad overview for students who are exploring health occupations”.



Aim 8: Participate in NIOSH Meetings and Other Grant-Related Activities

Staff attended all grant-required meetings including the Occupational Health Subcommittee Workshops at the CSTE Annual Conferences and the NIOSH State Partners Meetings held in conjunction with the Annual CSTE Occupational Health Subcommittee Winter Meeting. LOHIS staff also attended SouthON conferences each year. We have participated in NIOSH and CSTE sponsored webinars and on grant-related calls.

Conclusions

In the past 6 years, the LOHIS has increased program capacity to conduct population-based surveillance of occupational injuries, illnesses, and hazards. In addition to annually compiling and calculating occupational health indicators, we conducted in-depth analyses of occupational health conditions relevant to Louisiana’s diverse workforce, and we completed our fundamental-plus program project goal of establishing a multi-source heat-related illness database. Completed projects have had many positive impacts and outcomes including increased occupational safety and health outreach and education, expanded collaborations and partnerships, enhanced use of surveillance data, identification of new data sources, and increased awareness of priority occupational health issues.

Publications

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Presentations

1. Shay Hollie a guest lecture about Occupational Health Surveillance to the LSU Health Sciences Center - New Orleans School of Public Health Epidemiology for Public Health Practice class on March 16, 2021 via Zoom.
2. Anna Reilly and Shay Hollie gave a guest lecture about Occupational Health Surveillance to the LSU Health Sciences Center – New Orleans School of Public Health Epidemiology for Public Health Practice class on April 23, 2020 via Zoom.
3. Hollie S. Update of Occupational Health Surveillance Activities in Louisiana. [Virtual Presentation]. Southeastern States Occupational Network (SouthON) Annual Conference, Birmingham, AL. February 26, 2020.
4. Jocelyn Lewis presented information about the Occupational Health and Injury Surveillance Program at the U.S. Army Corps of Engineers Health Fair on October 30, 2019.
5. Jocelyn Lewis presented information about the Occupational Health and Injury Surveillance Program at the U.S. Army Corps of Engineers Health Fair (October 25, 2018), the LSU Health Sciences Center Career Fair (October 9, 2018), and the Environmental Public Health Tracking Program’s Children’s Environmental Health Symposium (June 11, 2019).
6. Reilly A. *A Review of Work-Related Homicides in Louisiana, 2005-2015*. Southeastern States Occupational Network (SouthON) Conference. Tampa, FL, April 4, 2019.

7. *Louisiana's Occupational Health & Injury Surveillance Program/Construction Work Hazards/Prevent Lead Exposure at Indoor Shooting and Firing Ranges*. U.S. Army Corps of Engineers Annual Health and Safety Fair. J Lewis. October 26, 2017.
8. *Louisiana's Occupational Health & Injury Surveillance Program*. Louisiana State University Health Sciences Center/Occupational Health Sciences Class. J Lewis. November 9, 2017.
9. *Louisiana's Heavy Metal & Carbon Monoxide Surveillance Program/Prevent Lead Exposure at Indoor Shooting and Firing Ranges*. Louisiana Healthy Homes and Childhood Lead Poisoning Prevention Program Advisory Board Meeting. J Lewis. New Orleans, LA. October 25, 2017.
10. Singletary GB, Dauterive RS, Reilly A, Soileau S, Iberg Johnson J, Kurimella D. *Feasibility Evaluation of Use of Syndromic Surveillance Capture for Improved Reporting Times of Workplace Amputations*. Poster presentation at the Tulane University Health Sciences Research Day. New Orleans, LA, February 19, 2018.
11. *Louisiana's Work-Related Fatalities*. 3rd Annual Workers' Memorial Day Program. Louisiana OSHA Consultation/Louisiana Workforce Commission. April 28, 2017, Baton Rouge, LA. J. Lewis, M. Lackovic.
12. *Louisiana's Occupational Health & Injury Surveillance Program*. Louisiana State University Health Sciences Center/Epidemiology Class. J Lewis. March 9, 2017.
13. *Louisiana's Occupational Health & Injury Surveillance Program*. Tulane University School of Public Health & Tropical Medicine/Global Environmental Health Sciences Department Seminar. J Lewis. March 2, 2017.
14. *Louisiana's Occupational Health & Injury Surveillance Program*. Louisiana State University Health Sciences Center/Occupational Health Sciences Class. J Lewis. November 9, 2016.
15. *Louisiana's Heavy Metal & Carbon Monoxide Surveillance Program*. Louisiana Healthy Homes and Childhood Lead Poisoning Prevention Program Advisory Board Meeting. J Lewis. New Orleans, LA. October 2016.
16. *Louisiana's Work-related Fatalities (2007-2014)*. 2nd Annual Workers' Memorial Day Program. Louisiana OSHA Consultation/Louisiana Workforce Commission (April 28, 2016, Baton Rouge). J Lewis.
17. *Louisiana's Occupational Health & Injury Surveillance Program*. Louisiana Public Health Association Annual Conference (March 31-April 1, 2016, New Orleans). J Lewis.
18. *Louisiana's Occupational Health & Injury Surveillance Program*. Tulane University School of Public Health & Tropical Medicine/Global Environmental Health Sciences Department Seminar. J Lewis. March 3, 2016.

19. *Occupational Health Program Activities Update*. Louisiana Environmental Public Health Tracking Workgroup Meeting. J Lewis. New Orleans, LA. February 3, 2016.
20. *BRFSS: an Analysis of Industry & Occupation Data in the 2013 & 2014 Surveys*. BRFSS Advisory Meeting. J Lewis and V Paul. New Orleans, LA. January 20, 2016.
21. *Louisiana Occupational Health & Injury Surveillance*. Louisiana State University Health Sciences Center/Occupational Health Sciences Class. J Lewis. November 4, 2015.
22. *Shipwrecked: Working Conditions of Latino Immigrant Shipyard Workers in S.E. Louisiana*. LA Governor's Safety and Health Conference (September 28-29, Baton Rouge). A Kline, J Lewis.
23. *Provisional Results from a Case-Crossover Analysis in Louisiana, 2010-2012—Implications for Improved Worker Protection*. Jeffrey Shire, Ambarish Vaidyanathan, Michelle Lackovic, and Vanessa Paul. Fifth Annual SouthON Meeting. New Orleans, LA. March 8-9, 2016.
24. *Climate Change and Occupational Health: an Environmental Health, Injury, and Occupational Health Issue*. Occupational Heat-related Illness Surveillance in the Southeast. CSTE webinar: September 29, 2015.

Press Release/Social Media

Increasing Awareness about Carbon Monoxide Poisoning during Winter Months. January 2016. LDHH Facebook post, *State Receives CDC Grants to Advance Workplace Safety*, January 2016. Press Release.

Multiple Facebook and Twitter messages about protecting worker health and safety were posted during the week of May 6-12, 2018 in observance of North American Occupational Safety and Health Week.