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Connecticut Occupational Health Expanded Surveillance 07/01/2005-06/30/2008

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List of Terms and Abbreviations

CT DPH (Connecticut Department of Public Health)

UConn DOEM (University of Connecticut Division of Occupational and Environmental Medicine)

NIOSH (National Institute of Occupational Safety and Health)

CSTE (Counsel of State and Territorial Epidemiologists)

OIISS (Occupational Injuries and Illnesses surveillance System)

NIOSH/CSTE Occupational Health Indicators

CCIA (Connecticut Construction Industries Association)

WCC (Workers' Compensation Commission)

CT DOL (Connecticut Department of Labor)

OSH-PLAN (Occupational Safety and Health Planning and Action Network)

COHeN (Connecticut Occupational Health Electronic News)

CRISP (Connecticut Road Industry Surveillance Project)

AFS (Asian Family Services)

Abstract

The State of Connecticut Department of Public Health's (CT DPH) Occupational Health Unit was funded by NIOSH for the Connecticut Occupational Health Expanded Surveillance Project, from 07/01/2005 through 06/30/2008. The specific aims for this project built on the foundation of existing occupational health surveillance, and also included new ideas to enhance existing surveillance capacity in Connecticut. Success was measured on the ability to both meet the objectives outlined in the specific aims and to build and expand those aims throughout the funding period to create the greatest public health impact possible with the awarded resources.

Project staff were successful in completing all aspects of the outlined specific aims during the three-year project period. For Specific Aim 1: Continuing Longitudinal Analysis of Occupational Disease Underreporting in Connecticut Through Comparison of Existing Data Sources, longitudinal analysis was completed for years 2003 through 2005, in collaboration with our partners at the University of Connecticut Health Center's Department of Occupational and Environmental Medicine (DOEM). This data analysis allowed CT DPH and its partners to better understand the scope of occupational disease underreporting in Connecticut. In 2008, CT DPH worked with a software developer and began the preliminary planning and development of an electronic diseases reporting system to replace the traditional paper occupational disease reporting forms currently used. This new electronic disease reporting system is in its final stages of production and will be piloted in CT occupational health clinics in late 2008.

Specific Aim 2: Continuing Longitudinal Analysis of the Occupational Health Indicators for Connecticut broadened into an expanded project to further the utility of the indicators. Program staff compiled the Occupational Health Indicators for years 2003 through 2005, and presently Connecticut has a six-year data set that is published to the web in the form of a web-based report. This web report, developed in 2007, will continue to be updated annually with the most current data. This report was sent to our regional partners and stakeholders in Connecticut for their use and adoption for similar projects. In addition, Connecticut expanded its analysis for *Indicator #1 Non-Fatal Work-Related Illnesses and Injuries Reported by Employers* into a retrospective study analyzing data as far back as 1974 to examine trends in injury and illness rates.

Specific Aim 3, has made progress over the funding period. We continued our survey and contact protocol for work-related asthma and mercury as part of Specific Aim 3: Expanding Surveillance Activities for Work-Related Carbon Monoxide Poisoning and Mercury Poisoning and Continuing Expanded Surveillance Activities for Occupational Asthma. Asthma surveys were delayed during 2007 and early 2008, due to the loss of program staff who worked specifically on this survey tool. Due to a very low response rate to carbon monoxide (CO) poisoning surveys (5% during 2005 and 2006), we are no longer sending out surveys for each reported CO case. This change was implemented in Spring 2006, because of the lack of return on the resources expended in sending the surveys. Instead, CO follow-up will be limited to those cases where a known

occupational exposure has occurred. Mercury surveys have been continuously mailed from 2005 through 2008. Throughout this time period, CT DPH collected 422 mercury reports. Of those, 169 were ≥ 1.5 ug/dL of whole blood and 28 were ≥ 3.0 ug/dL. The CT DPH Occupational Health Unit sent out 30 patient surveys from 2005 through 2008, and received 10 surveys back.

Initially, progress on Specific Aim 4, broadening the representation and scope of duties for the Connecticut Occupational Health Advisory Group was delayed due to problems with the contracting process. Presently, there has been considerable progress toward this project goal. All appropriate advisory group members were solicited and organized to formulate the network. Meetings were held quarterly to gain insight from members on occupational health priorities; and a draft report was published in June 2008. Currently all input from the planning network has been compiled into a final recommendations report that will be published in September 2008, with delivery to key stakeholders shortly thereafter.

Regional Collaboration has been a priority during the past funding period because of the importance of developing partnerships with our counterparts in other states. Under specific aim 5, Maintaining Regional Collaboration with Occupational Health Partners from the Other Northeast States on Specific Surveillance Activities, Including Expanded Analysis of Selected Occupational Health Indicators; we have made great progress and developed an excellent working relationship with other Northeast states on collaborative surveillance data analysis projects. Connecticut organized a regional project examining Occupational Health Indicator #6: Work-Related burn hospitalizations. Connecticut worked with occupational health surveillance partners from New York, New Jersey, and Massachusetts to determine what regional differences existed among these states with regards to demographics and hospitalization charges for workers who experience work-related burn hospitalizations. Connecticut is presently working with these three states to finalize the project and draft a publication detailing the studies findings. In addition, Connecticut has utilized a small portion of the NIOSH funding to convene the Northeast States Regional Surveillance Meeting for 2006 through 2008. This meeting has been a way to bring together all occupational health surveillance partners from throughout the Northeast States, as well as Federal partners from NIOSH to discuss various health topics of interest to our states.

In 2006, the CT DPH Occupational Health Unit partnered with UConn DOEM to develop the Connecticut Nail Salon Work Group. This work group was designed with the goal of developing a pilot project to determine the knowledge, attitudes, and practices of Vietnamese-owned nail salon employees in Connecticut's Hartford County, and also provide outreach and educational materials to nail salon workers. CT DPH partnered with Asian Family Services, Inc., a social service organization in Hartford, CT to interview representatives from 28 nail salons on demographics, chemical exposures, ergonomics, and symptoms that may have been caused by their work environment. The survey data showed these nail salon workers experienced long working hours, poorly designed workstations, and inadequate engineering controls at many of the nail salons.

Project funding has also allowed program staff to develop educational materials in the form of Connecticut Occupational Health Alerts. These publications replaced the Connecticut Occupational Health e-News (Cohen) in 2006. These alerts differ from the COHeN because they are directed at a targeted audience as opposed to a publication intended for broader education. Program staff utilized existing resources and developed new partnerships to get these materials to their target audiences. One example was sending our Health Alert " Preventing Carbon Monoxide Poisoning While Using Gas-Powered Tools Indoors" in 2007 to all construction contractors that were members of the Connecticut Construction Industries Association (CCIA). The CCIA now has a working relationship with CT DPH and is willing to send out any new educational materials through their monthly newsletter to over 600 of their members.

Highlights/Significant Findings

- **Specific Aim 1. Continue longitudinal analysis of occupational disease underreporting in Connecticut through comparison of existing data sources**

With our collaborators at the University of Connecticut Health Center Division of Occupational and Environmental Medicine (UConn DOEM), longitudinal analysis using capture-recapture estimation methodology has been completed for years 2003-2005. Analysis confirms significant disease underreporting to Workers' Compensation and the CT DPH.

- **Specific Aim 2: Continue longitudinal analysis of the occupational health indicators for Connecticut**

Calculated *Occupational Health Indicators* during three-year funding period. Developed a five-year web-based indicators report, which is updated annually. Conducted a retrospective 30-year analysis of work-related injury and illness in Connecticut. Results indicate considerable declines in injury and illness rates from 1974 to 2004. Partnerships were developed with other programs at CT DPH and indicator data was shared to help set department priorities and goals.

- **Specific Aim 3: Expand surveillance activities for work-related carbon monoxide poisoning and mercury poisoning and continue expanded surveillance activities for occupational asthma**

Follow-up surveys have been sent throughout the funding period to workers diagnosed with Work-Related Asthma and mercury poisoning. Due to very low return rates (<5% during 2005 and early 2006), CT DPH is no longer sending follow-up surveys to all patients with CO poisoning. Instead, CO follow-up will be limited to those cases where a known occupational exposure has occurred. This change was implemented in 2006 because of the low return on investment of time expended to complete the survey.

- **Specific Aim 4. Broaden the representation and scope of duties for the Connecticut Occupational Health Advisory Group**

Coordinated the development of the Occupational Safety and Health Planning and Action Network (OSH-PLAN). Convened multiple meetings and achieved the project goal of identifying occupational health priorities in Connecticut. Collaborators at the UConn DOEM are currently formulating those priorities into a report to be disseminated to stakeholders in Connecticut.

- **Specific Aim 5. Maintain regional collaboration with occupational health partners from the other Northeast states on specific surveillance activities, including expanded analysis of selected occupational health indicators**

Facilitated a regional project that analyzed *Indicator #6 Hospitalizations for Work-Related Burns*, resulting in regional analysis by demographic characteristics, and hospitalization charges. Hosted the Northeast Regional Surveillance Meeting in May in 2006, 2007, and 2008. This meeting brought together all occupational health surveillance partners from throughout the Northeast States, as well as Federal partners from NIOSH, to discuss various health topics of mutual interest. Developed occupational health educational materials and a training module on test pit safety for septic inspectors and disseminated these materials to targeted audiences and regional partners. CT DPH convened the Connecticut Nail Salon Work Group, and developed a survey tool to interview Hartford County nail salon workers about their knowledge, attitudes, and practices regarding working in nail salons.

Translation of Findings

The Connecticut Occupational Health Expanded Surveillance project expanded the amount of occupational illness and injury surveillance data available to CT DPH and our state partners that can be used to improve workplace safety and health in the State of Connecticut. Longitudinal analysis using capture-recapture estimation methodology was beneficial in the prevention of workplace illnesses and injuries. In 2008 a new Epidemiologist was added to the Occupational Health Unit to expand our capabilities for investigatory follow-up of occupational illness and injury cases received as part of our surveillance system. This Epidemiologist has been responsible for the investigation of work-related asthma and workplace burns that are identified as a concern. Data from the Occupational Illness and Injury Surveillance System (OIISS) is analyzed and provided to this Epidemiologist to determine what cases require investigation and follow-up. Currently, the CT Occupational Health Program has conducted 23 telephone consultations, which involved providing in-kind support to worksites. There have been two workplace hazard assessments conducted, where program staff provided in-person consultation to worksites, and two investigational reviews, where program staff provided intervention strategies to workplaces, through the assessment of companies written workplace protocols. These intervention strategies are possible because of the expanded surveillance data available through the OIISS and other sources developed during the three-year project period.

Through the utilization of the *Occupational Health Indicators* methodology, CT DPH has provided useful data regarding work-related injuries and illnesses to stakeholders and to the public over the past three years. For example, the Demographic Profile component of the indicators showed in detail data on the increasing Hispanic workforce in Connecticut. This was subsequently used to educate and encourage employers, state agencies, and other stakeholders to increase efforts toward the development of bilingual educational materials and specialized trainings. Responding to this noted trend, CT DPH has had two fact sheets that were previously developed translated into Spanish during this funding period (Safe Application of Pesticides and Herbicides, and Lead Hazards in the Workplace).

The Occupational Safety and Health Planning and Action Network (OSH-PLAN) was very successful in meeting its project goals over the past three years. The true measure of success for this aim will be seen in OSH-PLAN's ability to influence employers, agencies, and other stakeholders on behalf of the health of the Connecticut workforce in the future. With the publication of the OSH-PLAN recommendations report in September of 2008, CT DPH can begin to assess how much of an impact will be derived from the resources expended.

Regional work with our state partners always provides a way to improve worker safety in Connecticut. There are many established surveillance states that Connecticut

has frequent meaningful interaction with, through the Northeast Regional Surveillance Meeting, and other avenues. These states provide a historical knowledge and expertise that allows Connecticut to further its understanding of the process of translating occupational health surveillance into health and safety practice. In addition many of these states develop studies and educational materials that Connecticut has adopted over the past three years, which has positively impacted worker health in Connecticut.

The results of the Connecticut Nail Salons Survey provided knowledge to the CT DPH Occupational Health Unit on the knowledge, attitudes, and practices as they pertain to Vietnamese-owned nail salons. Educational materials now can be directed toward this group of people, in the form of targeted intervention materials and through translation of existing materials.

Outcomes/Relevance/Impact

Fundamental Program funding from 2005-2008 significantly increased Connecticut's capacity for occupational health surveillance. In addition, there were several major projects performed as part of our Fundamental Program that led to improvements in occupational safety and health in our state. Each of the specific aims outlined impacted worker health in Connecticut, or provided data to direct future interventions and projects.

Specific Aim 1: Continuing Longitudinal Analysis of Occupational Disease Underreporting in Connecticut through Comparison of Existing Data Sources, provided three-years of data that enabled us to partially understand the scope of disease underreporting in Connecticut. This data demonstrated that very few of the estimated number of occupational disease cases occurring in our state are received by the Occupational Illness and Injury Surveillance System (OIISS) at CT DPH (3.5% of all cases 2005-2008). During 2004, an interview of each occupational health clinic in our state was conducted to attempt to better understand clinic diagnostic and reporting logistics. This survey revealed that one roadblock in disease reporting was the inability for clinicians to quickly fill out paper forms and send them to the appropriate state agencies. This survey feedback, in conjunction with our capture-recapture findings, validated our need to develop a web-based electronic disease-reporting system for use by occupational health clinics in our state. This was an effort to partially increase the numbers of cases that we receive through our surveillance system, to foster more investigations and intervention efforts, and to provide an easier course of reporting for our occupational health clinics.

Our work as part of Specific Aim 2: Continuing Longitudinal Analysis of the Occupational Health Indicators for Connecticut provided a direct public health impact in Connecticut as well. Presently, a six–year dataset of occupational health indicators have been compiled, along with a thirty-year analysis of the work-related injury and illness indicator (*NIOSH/CSTE Occupational Health Indicator #1*). This thirty-year analysis provided data that showed variable trends in injury and illness rates across industry groups in our state, potentially due to changes in workplace safety practices, various standards that have been put in place by OSHA and other regulatory agencies, and shifts in industry composition. This analysis provided CT DPH with a tool to plan future interventions targeting industries that remain disproportionately high in their rates of occupational illness and injury. In addition, indicator data was utilized to impact workers in Connecticut through the Connecticut Injury Prevention Plan. This plan is currently used in an attempt to lower the number of accidental and intentional injuries in Connecticut. Specifically, indicator data was used for the occupational health section of the plan and will impact Connecticut's workers through targeted interventions identified by the Injury Community Planning Group, an internal and external stakeholders group organized to develop the injury plan and implement the plans goals.

Ongoing follow-up surveys of workers with work-related asthma, carbon monoxide, or heavy metals poisonings provided us with continued insight into the risk

factors present in workplaces that lead to these conditions. Several targeted education materials have been developed to address specific areas of concerns for workers in our state. For example, our Health Alert, "Preventing Carbon Monoxide Poisoning While Using Gas-Powered Tools Indoors", was developed after we received several cases of carbon monoxide poisoning in workers using powered tools with inappropriate ventilation over the course of a year. As a result of this Health Alert, 600 construction contractors in Connecticut were provided with materials to help prevent CO poisoning.

The Occupational Safety and Health Planning and Action Network (OSH-PLAN), has also been significant in developing recommendations to improve worker health in Connecticut. During the three-year project period, OSH-PLAN has put together a list of recommendations that we hope will influence employers, agencies, and other stakeholders on behalf of the health of the Connecticut workforce in the future.

Regional collaborative work between Connecticut and other Northeast states has been key for several years in positively impacting the health of Connecticut's workers. The largest impact has come from the knowledge Connecticut gains during the Northeast States Regional Meeting, which is later applied to education and intervention efforts in our state. This meeting provides an opportunity to learn from states that have significantly more resources dedicated to occupational illness and injury surveillance and also to review and utilize, as appropriate, their education materials and intervention programs and practices. Regional efforts to better characterize several of the NIOSH/CSTE Occupational Health Indicators has also allowed us to target intervention efforts toward industries, occupations, and conditions of greatest impact on the Connecticut workforce.

The Connecticut Nail Salons Survey provided the CT DPH with a better understanding of the operation of Vietnamese-owned nail salons in Connecticut. The survey provided a knowledgebase that can be shared with stakeholders and utilized to provide improved public health services to this community. Educational materials targeted toward nail salons in the future will be developed based on the findings of this survey.

Scientific Report

Background:

Occupational diseases represent an array of significant conditions, some of which can impact health, livelihood, and daily activities, as well as leading to disruption in an individual's family life.[i] The magnitude and seriousness of occupational diseases have been highlighted through a report outlining the work of a NIOSH/CSTE Surveillance Planning Workgroup, submitted to NIOSH in 1999,[ii] and recommendations incorporated into the NIOSH Surveillance Strategic Plan.[iii]

Since 1990, when the Connecticut Departments of Public Health and Labor published the baseline report entitled *Occupational Disease in Connecticut,*[iv] Connecticut has developed a coordinated approach for the recognition and evaluation of occupational diseases. Progress toward such recognition and evaluation is described in a follow-up report from June 2000, titled *Occupational Disease in Connecticut: Data for Action.*[v] This report also details the guidelines for Minimum and Comprehensive State-based Activities in Occupational Safety and Health,[vi] published by the National Institute for Occupational Safety and Health (NIOSH), and highlights Connecticut's progress toward implementing them.

In the years since that initial report, Connecticut has implemented activities geared toward compliance with the minimum guideline activities in occupational safety and health, in the areas of Surveillance, Policy Development, Intervention, and Infrastructure and Resources. In addition, Connecticut, through its integrated system, has implemented several Comprehensive approaches in the areas of Surveillance, Policy Development, Intervention, and Infrastructure and Resources. The vision underlying this integrated activity is that the use of data pertaining to occupational diseases leads to action to prevent these conditions. Thus, knowledge of the occurrence and causes of occupational diseases provides the basis for creating intervention and education programs to reduce those diseases in the workforce.

The most significant component of Connecticut's comprehensive occupational health program, developed jointly by the Department of Public Health (DPH) and Department of Labor (DOL), is the Connecticut Occupational Illness and Injury Surveillance System (OIISS). The OIISS is the primary source of occupational disease data utilized by CT DPH to tracking occupational diseases occurring in the state. Connecticut State Law requires reporting of occupational disease cases by all practicing physicians within 48 hours of diagnosis.[vii] The OIISS serves as a computerized database for physician reports of occupational diseases received by CT DPH. Since its inception, the top four disease categories reported to the OIISS by physicians in Connecticut have been cumulative trauma disorders, skin diseases and disorders (including burns), poisonings (primarily lead and mercury), and respiratory diseases and disorders.[viii]

One area where significant progress toward affecting change in the health of Connecticut workers has been made over the past decade is occupational lead poisoning. With an emphasis on lead poisoning prevention and intervention programs, including the Connecticut Road Industry Surveillance Project (CRISP), the Connecticut Adult Blood Lead Epidemiology Surveillance Program (ABLES), and the OSHA Lead in Construction Standard, there has been a steady decline in the number of lead poisoning cases in Connecticut, even while reports of other conditions have increased. [ix,x] Similar efforts are currently underway in Connecticut to address the areas of occupational asthma (including RADS), young worker injuries and illnesses, and carbon monoxide and heavy metals poisonings. It is our goal that these activities will lead to decreases in the occurrence of these conditions, similar to those seen for adult lead poisoning.

Specific Aims:

Specific Aim 1. Continue longitudinal analysis of occupational disease underreporting in Connecticut through comparison of existing data sources

Background and Methods

The Connecticut Occupational Illness and Injury Surveillance System (OIISS) is the primary source of occupational disease data utilized by CT DPH to track occupational diseases occurring in the state. Connecticut State Law requires reporting of occupational disease cases by all practicing physicians within 48 hours of diagnosis.[xi] The OIISS serves as a computerized database for physician reports of occupational diseases received by CT DPH. As part of our previous capacity building grant, funding was provided to our research collaborators at the University of Connecticut Health Center Division of Occupational and Environmental Medicine (UConn DOEM) to perform comparisons of the OIISS data with other existing data sources. As part of these analyses, capture-recapture methodology is used to determine the amount of overlap in identified cases and the extent to which cases fail to be captured by one or more of the existing systems. Even prior to the existence of funding for capacity building in Connecticut, this group had performed similar analyses specific to musculoskeletal disorders very successfully.[xii]

As part of our fundamental program activities, we continued annual comparison of the OIISS data with other existing data sources using capture-recapture analysis. Occupational disease data was obtained annually from the Connecticut Workers' Compensation Commission (WCC). The WCC maintains a complete database of employer First Report of Injury in electronic form. Disease reports from the OIISS were cross-referenced with data from the WCC to determine the level of overlap in case identification between these data sources.

Results and Discussion

All activities under this specific aim were successfully completed during the funding period. Capture-recapture methodology was used to estimate the level of underreporting of occupational diseases through comparison of OIISS data with data from the Connecticut Workers' Compensation Commission (WCC) for years 2003-2005. Generally speaking, capture-recapture is a statistical method that utilizes maximum likelihood estimation to approximate total population size based on two independent population samples. For the purposes of occupational disease surveillance, the methodology allows for an estimation of the extent of underreporting of certain conditions based on reporting data from two sources containing potentially overlapping records, where a higher amount of overlap indicates fewer underreported cases. This methodology has been utilized successfully in the past for various occupation-related health events.[38-40]

Capture-recapture analysis for 2003 data found that 106 cases of occupational diseases cases were reported to both the OIISS and Workers' Compensation system. (7 lung disease, 79 MSD, 16 skin disease, and 4 other disease types). This generated an unadjusted estimate of 25,592 unreported occupational illnesses. Adding the 3,793 unique cases reported to at least one system, the total number of unreported occupational illnesses was 27,385. This total results in an estimate of only 10.6% of occupational illness cases being reported to the Workers' Compensation system and only 3.7 being reported to the CT DPH OIISS. Capture-recapture analysis for 2004 elicited a similar degree of underreporting. Overall there were 3,867 occupational illness cases reported to Workers' Compensation. A comparison of overlaps of reports to the two systems (matching on first and last name, not adjusting for misspellings but adjusting for duplicates) found 128 cases reported to both systems (26 lung, 65 MSD, 30 skin, and 7 other diseases). This generated an unadjusted estimate of 33,242 unreported occupational illnesses (in addition to the 5005 unique cases reported to at least one system) for a total estimate of 38,247 cases. This estimate results in only an estimate of 10.1% of occupational illness cases being reported to Workers' Compensation, and 2.4% of cases reported to the OIISS. The most recent longitudinal analysis involves 2005 data. Overlap comparison of the same two data systems found 133 cases reported to Workers' Compensation and the OIISS (25 lung, 65 MSD, 36 skin and 4 other diseases). This generated an unadjusted estimate of 29,700 unreported occupational illnesses (in addition to the 4,381 unique cases reported to at least one system) for a total estimate of 34,081 cases. For 2005, this estimate results in an estimate of only 8.9% of occupational illness cases being reported to Workers' Compensation, and 4.4% of cases reported to the OIISS. Longitudinal analysis will be ongoing during the next funding period to establish a dataset inclusive of additional years to examine trends and to plan for ways to further encourage disease reporting.

The CT DPH Occupational Health Unit contracted in 2007 with Consilience Software to develop an electronic disease reporting system that will be used to report all cases of occupational disease in the state. This disease-reporting module has an electronic reporting form in the likeness of the paper forms that are presently used. The

benefit of this type of electronic reporting system is having "real time" data. Prior to this system, there were filters that delayed CT DPH from receiving occupational disease cases in a timely fashion. This electronic reporting system will remedy that problem, and reduce the likelihood of reporting errors as well. Currently CT DPH has a "live" system and has two occupational health clinics ready to pilot the system before implementing it statewide.

Limitations and Conclusions

Potential difficulties with regards to the proposed capture-recapture methodology included the fact that traumatic occupational injuries, as well as a subset of other injuries, are not included in the WCC database. This limited the analyses to only those occupational illnesses and injuries present in both data sets. In addition, WCC reports are coded by the employer for such things as occupation, industry, and disease type, and incorrect coding is common. To minimize this potential problem, each WCC record was reviewed individually, including the text description of the injury or illness, to ensure proper coding prior to analysis.

Logistic problems may be encountered when attempting to implement the electronic disease surveillance system statewide. Problems such as individual clinics inability to interface well with the system, and staffing issues at clinic may be some roadblocks encountered throughout this process. CT DPH hopes to overcome these roadblocks by conducting in person training on how to use the electronic reporting system, as well as providing technical support to assure a smooth transition to the new system.

Specific Aim 2. Continue longitudinal analysis of the occupational health indicators for Connecticut

Background and Methods

Previous funding for capacity building allowed CT DPH to participate with 10 other states in the piloting effort for the *Occupational Health Indicators Project*. To date, we have completed analysis of state-specific data for all 19 indicators and the state profile, for the years 2000 through 2005.

As part of our Fundamental Program activities, we had proposed to continue analysis of all 19 occupational health indicators and the state profile information on an annual basis. Maintenance of our activities related to the occupational health indicators provided us with a comprehensive method of surveillance for overall occupational health within our state. In addition, funding for this activity allowed us to maintain continuity with our inter-agency contacts, from whom it is necessary to obtain data for specific indicators. Utilization of the occupational health indicators "how-to" document on an annual basis also provided us with an opportunity to perform a review of the indicator

methodology provided in the document and allowed us to suggest changes and/or updates as appropriate.

In addition to gathering data on the 19 indicators and profile, we had proposed to develop a Connecticut-specific report for the *Occupational Health Indicators Project* annually. This report proposed to include data for all indicators from 2000 through 2004 as well as available summary national data. National data for the occupational health indicators was made available on an annual basis as part of the responsibilities of the group of funded states and its Federal agency partners. In the event this national data was unavailable, a protocol was put in place for indicators to be calculated using available data sources, where possible. The Connecticut-specific report for the *Occupational Health Indicators Project* was set for completion during Year 1 of the proposed project period, including data from 2000, the first year of data gathered for our state, through 2003. In addition to providing data regarding the occupational health of workers in our state, this initial indicators report was used to introduce the overall concept of indicators and specifics regarding the occupational health indicators to our inter-agency partners and other external stakeholders.

Results and Discussion

CT DPH program staff decided it would be more appropriate to combine the concepts of an annual indicators report and a five-year report into a web-based report that currently includes five years of indicators data, as well as an annual addition of the newest compiled indicators. Presently, Connecticut's five-year web report is published to the CT DPH website [xiii]. We found this format for publishing indicator data to be the most useful because it allows all interested stakeholders to view and utilize our data. In addition, it allows for a template that can be easily modified and updated. Data for 2005 will be added to the existing five-year report in September 2008, and new indicator data will be added during the summer each subsequent year. In addition to the Connecticut-specific data, national data is presented alongside Connecticut's data for comparison.

In addition to the outlined specific aim, a more extensive project was developed focusing on NIOSH/CSTE Occupational Health Indicator #1:, *Non-Fatal Work-related Injuries and Illness Reported by Employers*. This project, titled " Workforce characteristics and the Burden of Occupational Injuries and Illnesses in Connecticut: A Retrospective Review" was a 30-year expanded analysis, designed to determine whether rates of work-related injury and illness in Connecticut were increasing or decreasing over the past 30 years, to what extent, and what some of the contributing factors might be. Research related to this project involved collaboration with the Connecticut Department of Labor to gather data and reports needed to complete this analysis. The results of this research were analyzed and published as part of a Masters level thesis at the University of Connecticut in 2007, and also presented at the 2007 Northeast States Occupational Health Surveillance Meeting. This project has inspired other regional partner states to adopt the methodology for a similar state-specific project.

The Occupational Health Unit has expanded the use of the indicators to aid other programs at CT DPH in their planning efforts. Specifically, work-related injury data is now provided to the to CT DPH Injury Program. This data was used to help drive their statewide injury plan developed in 2007 and 2008. This plan incorporated indicator data from 2000-2004, to set priorities and goals for the occupational health section of the plan and quantify the burden of occupational injuries in Connecticut.

Limitations and Conclusions

The methodology outlined for this specific aim was based on the currently available occupational health indicator "how-to" document, developed by the participating pilot states in conjunction with NIOSH and CSTE. Although this has proven to be a very useful document to this point in collecting indicator data, the "how-to" guide has become less useable over time as data sources have changed and website links became outdated. This limitation was minimized through a central point of contact for states to report problems they encounter over time in using the occupational health indicator "how-to" document.

An additional methodological issue with the activities surrounding the indicators described above for Connecticut was our ability to easily obtain data in a timely fashion from our available sources. Difficulties such as these only minimally delayed the delivery of the most recent indicator data set.

Specific Aim 3. Expand surveillance activities for work-related carbon monoxide poisoning and mercury poisoning and continue expanded surveillance activities for occupational asthma

Background and Methods

Information on cases of occupational asthma occurring in the state is collected as described previously through the OIISS (see Specific Aim 1). In 1999, CT DPH began performing expanded surveillance activities for occupational asthma cases in the state. These activities included passively contacting reported cases by mailed survey to collect additional information regarding their specific job duties, the workplace, and any co-workers that may be at similar risk for the development or exacerbation of asthma at that specific work location. The past funding CT DPH received for capacity building has allowed us to develop and implement a more active contact algorithm, which includes mailing of a survey followed by a series of telephone contacts to address any questions and to prompt cases to return the survey to CT DPH.

The OIISS also captured information on cases of carbon monoxide and mercury poisoning occurring in workplaces throughout the state. However, the majority of work-related carbon monoxide and mercury poisoning cases are not submitted by occupational medicine clinics to the OIISS but rather are submitted by laboratories or hospitals directly

to CT DPH as part of the state-mandated reportable disease process.[xiv] Although carbon monoxide and mercury poisoning appear on the list of reportable diseases in Connecticut, the *Laboratory Report of Significant Findings* form collects only cursory demographic information and laboratory findings which are insufficient for occupational disease and hazard surveillance.

As part of our Fundamental Program activities, we proposed to continue our expanded surveillance activities for occupational asthma using the active contact algorithm already developed. The data collected through our occupational asthma expanded surveillance activities will help us to better target educational and intervention efforts to prevent new cases of work-related asthma in potentially problematic workplaces not yet identified.

We also proposed to use this Fundamental Program support to expand surveillance activities for work-related carbon monoxide and mercury poisoning cases. A supplemental data collection survey was finalized in consultation with our clinical and industrial hygiene collaborators from UConn DOEM. The expanded activities for carbon monoxide and mercury poisoning were similar to those currently used for occupational asthma. Surveys designed to determine the work-relatedness of the poisoning event and to collect additional information on the circumstances surrounding the poisoning event were mailed to reported cases, followed by a series of telephone contacts to encourage the case to return the survey. In addition, we attempted to contact the reporting physician to ascertain additional exposure or clinical information regarding the poisoning, as needed.

Data collected as part of the expanded surveillance activities for occupational asthma, carbon monoxide poisoning and mercury poisoning was entered into an electronic database and analyzed on a quarterly basis to determine trends and to help target interventions and educational activities. A summary report from each analysis was generated and distributed internally to assist with targeting activities.

Results and Discussion

The success of the activities under this specific aim were measured through the analysis of the return rate of follow-up surveys sent to workers reported to CT DPH with work-related asthma, carbon monoxide poisoning or mercury poisoning.

Asthma surveys were delayed during 2007 and early 2008, due to losing program staff who worked specifically on this survey tool. From July 1, 2005 through March 31, 2007, the CT DPH Occupational Health Unit received 46 work-related asthma cases. These cases were sent surveys and we received 27 surveys back, eliciting a 59% response rate.

Due to a very low response rate to carbon monoxide (CO) poisoning surveys (5% during 2005 and 2006), we are no longer sending out surveys for each reported CO case. This change was implemented in Spring 2006 because of the lack of return on the resources

expended in sending the surveys. Instead, CO follow-up will be limited to those cases where a known occupational exposure has occurred. Of a total of 99 carbon monoxide surveys mailed between 07/01/2005 and 12/31/2006, 10 Carbon monoxide surveys were returned to CT DPH. Survey respondents reported various causes of CO exposure, the most common being automobile exhaust (n=3), and furnace problems (n=2). No respondents reported their workplace as being the source of CO exposure.

Mercury surveys have been continuously mailed from 2005 through 2008. Throughout this time period, CT DPH collected 422 mercury reports. Of those, 169 were ≥ 1.5 ug/dL of whole blood and 28 were ≥ 3.0 ug/dL. The CT DPH Occupational Health Unit sent out 30 surveys from 2005 through 2008, and received 10 surveys back. The protocol for sending mercury surveys changed slightly in 2007. Initially, surveys were sent to all cases with a mercury level ≥ 1.5 ug/dL of whole blood, but has been changed to only include only those cases ≥ 3.0 ug/dL. Examples of routes of mercury exposure primarily included fish consumption, but some occupational exposures were identified. Some occupational tasks that caused the work-related exposures in the manufacturing industry sector included refilling pumps containing a mercury solution, and cleaning out traps that contained mercury.

In addition, our ability to collect complete and accurate information about the circumstances surrounding each case, including the work-relatedness of the event, in a timely fashion was evaluated on an on-going basis. An additional evaluative component for this specific aim was the usefulness of the expanded surveillance information, as measured by the degree to which data collected through the expanded surveillance activities are utilized in developing educational or intervention strategies.

Limitations and Conclusions

The willingness of workers to participate in the surveys outlined as part of this specific aim posed a potential methodological problem. Workers were sometimes unwilling to provide CT DPH with complete and accurate supplemental information regarding their work situation or medical history, as they may have been unsure of the confidentiality of the data and how it was to be used. Although some individuals may have disregarded the request for additional information as unimportant, we have found through similar activities with the Connecticut Adult Blood Lead Epidemiology and Surveillance (ABLES) program that the majority of workers who refuse to provide information to CT DPH do so because they fear reprisal from their employer or coworkers at their workplace. One way we attempted to maximize the number of carbon monoxide poisoning, mercury poisoning, and asthma surveys returned to CT DPH was by using an active contact algorithm, which included the mailing of a survey followed by a series of telephone contacts to address any questions and to prompt workers to return the survey. This active contact algorithm was coupled with a risk communication message that stressed the importance of the requested information to preventing similar occupational disease problems in their fellow workers as well as the extreme level of confidentiality with which occupational disease surveillance information must be handled according to Connecticut State Law.[xv]

Specific Aim 4. Broaden the representation and scope of duties for the Connecticut Occupational Health Advisory Group

Background and Methods

Funding for capacity building provided CT DPH with the opportunity to convene a workgroup that provided a sounding board for issues related to occupational injury and illness surveillance in Connecticut. This workgroup met quarterly and included representation from CT DPH, the Connecticut Department of Labor (DOL), and the 13 occupational health clinics in the state that receive some level of DOL funding. In general, this workgroup focused its efforts on occupational medicine and industrial hygiene issues in the state as well as issues specific to surveillance activities. What this workgroup lacked however, was a formal mechanism for discussing and making specific recommendations regarding occupational disease surveillance, intervention and education activities, training programs, and legislation to State and Federal government entities.

We had proposed to use some Fundamental Program funding provided to formally convene the Connecticut Occupational Safety and Health Planning and Action Network (OSH-PLAN). This advisory network includes representation from a variety of stakeholders, such as employee unions, worker advocacy groups, business and industry associates, our current clinical partners, and others with an interest in occupational health in our state. Although state agents, who currently participate in the surveillance workgroup, are not official members of the advisory group, state agents including the Principal Investigator, are invited to attended quarterly meetings of the group to observe and provide topical input, as requested. The network met on a quarterly basis and its duties included consideration of all factors that affect the health of Connecticut workers as well as preparation of formal advice and delivery of specific recommendations regarding necessary changes to program activities or legislation designed to protect Connecticut workers from occupational injuries and illnesses.

Results and Discussion

The first year of activities for this specific aim involved identifying stakeholders in the state that would be invited as members. This process involved meeting with representatives from constituent groups to solicit support and refine the network plan. Initially, the project goals involved reviewing and refining the current occupational health indicators, discussing and prioritizing the most serious occupational health and safety concerns, assist CT DPH in developing a state plan to reduce occupational illness and injuries and developing an evaluation plan using data to track the effectiveness of the plan, and assist CT DPH in outreach to constituent groups in implementation of the plan. Recruitment of network members resulted in a team of 14, from diverse backgrounds, who had agreed to work together to achieve the project goals.

During the second year, meetings to achieve our team goals were held, along with frequent communication focusing on developing a document detailing OSH-PLAN

recommendations. One evaluative measure for this specific aim was the ability of the advisory group to reach consensus and deliver specific recommendations for improving the overall occupational health of the state's workforce, and currently OSH-PLAN has developed a draft report detailing the recommendations of the group, and is working toward a finalized version. Future meetings will involve planning for report dissemination and next steps.

On a longer-term basis, the success of the planning network to affect change will be measured by the degree to which these recommendations detailed in the report generated by the group are instituted by state agencies and other partners outside of state government or proposed over time as part of legislative agendas.

Limitations and Conclusions

Our ability to successfully broaden the representation and scope of duties of OSH-PLAN was dependent on the willingness of the identified stakeholders to actively participate in the group on an on-going basis. One difficulty as with any advisory group or consortium was sustaining the initial interest in the mission of the group on a long-term basis, in this case for a three-year period. During this funding period some of the initial members were lost, due to either scheduling conflicts or inability to dedicate the time to the group. We believed the goal-oriented nature of these OSH-PLAN meetings helped to sustain the interest level and work of the group throughout the funding period.

Specific Aim 5. Maintain regional collaboration with occupational health partners from the other Northeast states on specific surveillance activities, including expanded analysis of selected occupational health indicators

Background and Methods

The CT DPH Occupational Health Unit has had a long-standing working relationship with the occupational health programs in our partner states in the Northeast region. As we began our efforts to build capacity for occupational disease surveillance in our state, we found these relationships to be critical to our understanding of the core functions of programs in the more established states and the common struggles of our partnering capacity building states.

In addition to periodically working with other states on regional projects, for several years Connecticut has hosted the *Northeast Regional Occupational Health Surveillance Meeting*, which is organized by our partners at the University of Connecticut Health Center Division of Occupational and Environmental Medicine (UConn DOEM) and supported through funds from the Connecticut and Massachusetts Departments of Public Health. This meeting is held each spring in Farmington, CT and brings together our occupational health program partners from the Northeast states, partners from other state-agencies and advocacy groups from the region, and our Federal partners from

NIOSH and OSHA. These meetings give the states involved an opportunity to present the work our programs produce every year and to learn about activities happening in other states that may translate well to their program goals.

We proposed to utilize a portion of the Fundamental Program funding provided through this program to support the *Northeast Regional Occupational Health Surveillance Meeting* on an on-going basis. During this time of change in many of the state-based occupational health programs in the Northeast, collaboration among partners in the region is perhaps more critical now than ever before. Funding through this mechanism to support the continued success of the *Northeast Regional Occupational Health Surveillance Meeting* ensures a sustained source of information and collaboration for occupational health surveillance programs in the Northeast states as well as our Federal partners.

Meetings of the Northeast states occupational health programs often spawn ideas for various regional surveillance projects. At the 2003 meeting, the group collaborated on a project to further examine data for one of the occupational health indicators. The indicator chosen for this project was *Indicator #13: Elevated Blood Lead Levels among Adults*. Data from the participating states was compiled and analyzed to attempt to determine the cause of variation among states that, based on their regional proximity and similarities in industries and population demographics, should have similar lead exposures for adults. Representatives from each participating state attended quarterly conference calls to discuss the progress of the regional project and additional analyses to be performed as a result of interim findings. The results of the study were presented at the 2004 Council of State and Territorial Epidemiologists (CSTE) Meeting and showed that much of the variation is likely due to the effect of a small number of companies in selected states with very high occupational exposures to lead (such as battery manufacturers) as well as coding variations among the different states. Funding through the current Fundamental Program mechanism has allowed for a similar project examining variations in work-related burn hospitalizations among the states of Connecticut, Massachusetts, New York, and New Jersey.

Results and Discussion

Measures of success for this specific aim were reflected annually in our ability to convene the *Northeast Regional Occupational Health Surveillance Meeting* each year as well as in the number of State, Federal, and non-governmental partners participating in the meeting. The level of new information and innovative work presented by various partners at this meeting was a useful evaluative measure not only of the success of the meeting but also of the success of individual states in sustaining capacity for occupational disease surveillance. Our ability to perform expanded regional investigation of selected occupational health indicators was evaluated on an on-going basis through the discovery of causes of regional variation in indicator data and our ability to reach consensus on how to better standardize systems for data collection across the region. In addition, the degree to which the Northeast states as a group can make recommendations to NIOSH and

CSTE regarding changes and updates to the *Occupational Health Indicators* in general, and the "how-to" document specifically, was a valid measure of the success of these regional collaborative activities.

Fundamental Program funding has provided some support for the *Northeast Regional Occupational Health Surveillance Meeting* for three consecutive years (2006, 2007, and 2008). During the 2006 meeting, Connecticut presented the retrospective 30-year analysis conducted on *Occupational Health Indicator #1: Non-fatal Work-Related Injuries and Illnesses Reported by Employers* as well as preliminary regional work conducted on work-related burns. The 2007 meeting allowed for the presentation of a training module developed for the safe inspection of septic test pits, along with a presentation of the methodology and progress with our nail salon survey. At the 2008 *Northeast Regional Occupational Health Surveillance Meeting*, Connecticut presented a new workplace violence initiative focusing on State Workers, as well as holding a planning meeting to finalize plans for the regional work on work-related burns.

In 2006, the CT DPH Occupational Health Unit partnered with UConn DOEM to develop the Connecticut Nail Salon Work Group. This work group was designed with the goal of developing a pilot project to determine the knowledge, attitudes, and practices of Vietnamese-owned nail salon employees in Connecticut's Hartford County, and also to provide outreach and educational materials to nail salon workers. The Connecticut Nail Salon Work Group included three Epidemiologists, a Toxicologist, an Industrial Hygienist, and Social Service Providers from CT DPH, UConn DOEM, and Asian Family Services, Inc. (AFS), a social services provider to the Asian community in Hartford, CT. Together, the group discussed priorities, and the recommendation of the workgroup was to target Vietnamese-owned nail salons in Hartford County for a health and occupational risk survey, as well as educational efforts. AFS attempted to interview 35 nail salons in Hartford County. All 35 surveys were conducted in person at the salon and 7 salons refused the interview, eliciting a sample of 28 interviewed salon employees. The interview collected a wide variety of information, examples of which were demographic data, chemical exposures, ergonomics, and a symptoms survey. Long working hours were experienced by many of the salon workers. The average working day for those interviewed was 8.7 hours, and no worker spent less than 8 hours per day at work. The longest workday was from a salon owner who worked 11-hour days. The mean number of hours worked per week by respondents was 53.1 hours, and ranged from 28 to 77 hours. The vast majority of this working time was spent in a static sitting position. Questions relating to environmental controls showed only one salon that reported having windows that could be opened, while 26 salons (93%) reported having doors that could be opened to the outside; and 25 (89%) of the salons reported that they sometimes or always had their door open. Ten salons (36%) had some form of ventilation system that supplied air into the workspace, and 4 salons (14%) had fans to circulate air. Eight salons (29%) had ventilation at the tables to draw vapors away from the workers. Seventeen salons (61%) reported that their employees wear gloves while they are working.

As part of our Fundamental Program activities, Connecticut organized a project examining work–related burn hospitalization data in 2006. Connecticut collaborated with the states of Massachusetts, New York, and New Jersey to look at demographic and cost differences that exist among states with regards to work-related burn hospitalizations. The goal of this collaborative project was to determine whether there are differences in rates and costs associated with work-related burns among the Northeast states that would not be expected given the geographic, industrial, occupational, and demographic similarities among those states. Progress on this project was maintained through quarterly conference calls between participating states, as well as annual meetings at the *Northeast Regional Occupational Health Surveillance Meeting*, and at other meetings, when possible. The first project year allowed for a complete analysis of racial, gender and age differences among the Northeast States. We continued to expand our analysis throughout the second project year by examining hospitalization charges by state for each work-related burn hospitalization. In addition, the second year was used to strategize a plan to present our findings to stakeholders.

Currently, partnering states are completing hospitalization charge analysis and drafting a publication presenting the findings and conclusions from the study, with a publication submission goal of Fall 2008. In addition, this regional examination of the occupational health indicators will benefit not only the Northeast states in helping to pinpoint differences in our systems for data collection that may warrant standardization but also NIOSH and CSTE as they consider possible revisions to the *Occupational Health Indicators* and the supporting "how-to" documentation over time.

In January 2007, program staff developed a training module on septic test pit safety as part of an eight-week training of Registered Sanitarians in the State (Appendix B). The module was the result of a collaborative effort between the CT DPH Occupational Health Unit, and the CT DPH Environmental Engineering Program to provide septic test pit safety training to Registered Sanitarians during their initial training and refresher courses. In addition, this module has been disseminated to our regional partners and other surveillance states for their use.

From Spring 2004 until Fall 2006, the Occupational Health Unit published a quarterly web-based health and safety newsletter titled *Connecticut Occupational Health e-News* (COHeN). During Fall 2006, program discussion took place to redesign the COHeN, replacing the broad worker education format with a shorter, more targeted publication as topics important to occupational health emerged. In Winter 2007, the first CT DPH Occupational Health Alert was published, focusing on carbon monoxide dangers associated with the use of gas-powered engines in enclosed areas. The target audience for the Winter 2007 issue was building contractors, hardware store owners and power washing companies. In addition, the CT DPH Occupational Health Alerts were posted on the CT DPH website in order to allow for easier access by the targeted audience as well as other stakeholders. In addition, the Winter 2007 Health Alert allowed for a partnership between the CT DPH Occupational Health Unit, and the Connecticut Construction Industries Association (CCIA). This partnership allowed a no-cost delivery of the Health Alert to over 600 members of CCIA. The Summer 2007 Health Alert

"Bronchiolitis Obliterans in Workers Exposed to Food Flavorings" was published and mailed to Connecticut-based pulmonologists in 2008. Included along with the newest health alerts are copies of Summer and Fall 2006 COHeN publications.

Limitations and Conclusions

The most significant limitations experienced related to the regional collaboration activities described above was the ability of representatives from each of the Northeast states to convene. In past years, a number of states have been unable to participate in the conference due to various factors, most notably budgetary restrictions or restrictions on travel that exist within their particular states. In addition, the number of participants joining the conference from each state is often limited by similar restrictions. Our workgroup has overcome this limitation partially in the past by organizing conference calls as opposed to in person meetings, even though conference calls do not allow for in-person interaction. The same logistical problems occurred while working on the expanded work-related burn study. In particular conference calls tended to be less productive that our in person meetings, and that resulted in delays that could have otherwise been avoided if it were possible to meet in person.

Publications

1. Putting Data To Work In Connecticut; A Five-Year Review of Occupational Health Indicators, 2007.

2. Test Pit Safety Module for Septic Inspectors, CT DPH 2007

3. Health Alert; Preventing Carbon Monoxide Poisoning Wile Using Gas-Powered Tools Indoors.

4. Health Alert; Bronchiolitis Obliterans in Workers Exposed to Food Flavorings

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[xiii] http://www.ct.gov/dph/lib/dph/environmental_health/eoha/pdf/indicatorswebreport.pdf

[xiv] General Statutes of Connecticut. Section 19a-215.

[xv] General Statutes of Connecticut. Section 19a-25.