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Environmental Public Health Tracking, an untapped resource for occupational health

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Background

The cornerstone of the Centers for Disease Control and Prevention's (CDC) Environmental Public Health Tracking Program (Tracking Program) is the Environmental Public Health Tracking Network (Tracking Network)—a web-based system with components at the local, state, and national levels (Qualters et al. 2015). The Tracking Network brings together standardized data on environmental hazards, exposures to these hazards, potentially related health effects, and other data such as socioeconomic and risk factors (CDC 2021). The Tracking Program uses these data to perform environmental public health surveillance activities, such as identifying and assessing the distribution of hazards in the environment and the health effects resulting from exposure to these hazards, to provide information that can be used to improve the public's health (Qualters et al. 2015; Eatman and Strosnider 2017). The CDC's National Institute for Occupational Safety and Health (NIOSH) surveillance programs perform similar activities but with workers as their target

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population, and with the goal to improve worker safety and health (Thomsen et al. 2007; NIOSH 2022a).

Population-based health and hazard data from environmental public health programs are useful in understanding the broader environment in which individuals, including workers, live. To account for and understand the multiple and cumulative exposure sources and risk factors, occupational health studies can be strengthened by environmental and health data within the Tracking Program, while occupational data can also improve population health studies. Collaboration between environmental public health and occupational health programs on these activities, and their strengths, expertise, and resources (e.g., analysis tools and data) helps both programs meet their goals.

Data on the Tracking Network

Data on the Tracking Network come from a variety of sources including state and local health departments and federal agencies (e.g., the Environmental Protection Agency [EPA] and the Census Bureau). The Tracking Program funds 33 state and local health departments (recipients) to implement state tracking networks and submit data on various health and environmental topics to the CDC. Data that Tracking Program recipients submit to the CDC include the following: drinking water contaminants, emergency room visits and hospitalizations (asthma, carbon monoxide poisoning, heart attack, and heat-related illness [HRI]), birth defects, and radon. Data from other sources presented on the Tracking Network include pesticide exposures and illnesses from America's Poison Centers, biomonitoring population exposures from the CDC's National Report on Human Exposures to Environmental Chemicals, and air quality from EPA.

Some of the datasets on the Tracking Network include occupational information. Occupational exposure site and exposure reason are included for approximately 5% of the pesticide data provided to the CDC from America's Poison Centers. About 1% of the radon test results from recipients include data collected on commercial, institutional, and other nonresidential buildings that would allow quantifying occupational exposures. Under the populations and vulnerabilities topic, data on the number of employees in various food and manufacturing industries are provided at the county level. The Tracking Program welcomes collaboration with occupational health programs to identify additional occupational topics and data to include on the Tracking Network and the appropriate sources and uses of these data.

In the following sections, three case studies from Tracking Program recipients are presented describing their occupational health activities and collaborations with occupational health programs within their state health departments. The methods, results, and impacts of this work are also described.

Case studies

California Tracking Program—Working with farmworker leaders to reduce heat-related illness

Public health issue—Ventura County, California is home to 41,600 farmworkers. Of these, 90.5% are from Mexico, 53% speak only Spanish, and 81% are not U.S. citizens (CAUSE 2015). Ventura is additionally home to over 20,000 indigenous southern Mexicans, many of whom speak only their native languages and work primarily in agriculture (MICOP 2021).

Of concern to farmworker leaders and advocates, is the county's recent warming trend. Farmworkers are 20 times more likely to die from heat stress than the U.S. civilian workforce overall (CDC 2008). This is because farmworkers carry out extended, strenuous labor under direct sunlight, potentially increasing "feels like" temperatures by up to 15 °F (Ferguson et al. 2019). Moreover, farmworkers typically wear long sleeves and multiple layers of clothing to protect against pesticides, which can increase "feels like" temperature by an additional 12 °F (Ferguson et al. 2019).

Despite the passage of workplace heat protection laws in California in 2005, state enforcement remains limited due to funding and staffing challenges at the California Occupational Health and Safety Administration, and at least 73 workers have died because of HRI since the standard's enactment (Edwards and Margolis 2021).

Collaboration with occupational health—The California Tracking Program (CA Tracking) is a founding partner in the Achieving Resilient Communities (ARC) project. Launched by the Public Health Institute in Ventura County in 2020, ARC seeks to make measurable community-driven improvements in resilience to climate change. ARC is working with farmworker leaders and advocates from the Central Coast Alliance for a United Sustainable Economy, the Mixteco Indigenous Community Organizing Project, and Lideres Campesinas—an organization of women farmworkers. CA Tracking is the overall fiscal lead and provides core staffing for all aspects of the project.

The ARC team used mapping and CA Tracking's pesticide and air quality data, as well as data on heat, wildfires, and drinking water from other sources, to highlight multiple potential climate-related health threats in Ventura County. Health and social data, such as the percentage of insured adults and asthma rates, were also mapped. The team then conducted focus groups with farmworkers who highlighted HRI prevention as a top priority, based on the data presented and experiences in their work environment.

Guided by a farmworker advisory committee, the team developed and led resilience and leadership training for farmworkers on climate change and workplace protections, created digital wildfire and heat stories, analyzed data on workplace inspections and violations, and conducted local community heat monitoring (CDPH et al. 2021; Carlson 2021). ARC is now supporting a farmworker-led campaign for an audio-based emergency alert system that will include indigenous Mexican languages, such as Mixteco, and a streamlined workplace complaint hotline. The team is also working with agricultural leaders in the county to

create a set of heat-related best practices, increase and improve heat protection training, and monitor heat in agricultural greenhouses and hoop houses (Ramirez and Krist 2021).

Impact of collaboration—The CA Tracking partnership developed a network of engaged farmworker leaders committed to community climate resilience. The partnership is making progress on substantive local changes to counter HRI at work. Next, they will focus on policy development and will track long-term gains for the farmworker community in Ventura County while expanding the farmworker engagement model into Kern and Fresno counties in California's San Joaquin Valley.

New Hampshire Tracking Program—Comprehensive exposure assessments to support occupational health surveillance

Public health issue—Uranium is a naturally occurring contaminant found in the bedrock of New Hampshire (NH), putting the 42% of NH residents that rely on domestic wells for drinking water at risk for exposure (Flanagan et al. 2014; NH EPHT 2022). The Biomonitoring New Hampshire (BiomonitoringNH) Program is coordinating the EMPoWER-U (Evaluating Metals in Private Wells and People for Exposure Reduction-Uranium) Study to assess uranium and other metals in groundwater and in the residents who use that water. This project is supported by the United States Geological Survey and the NH Tracking Program (NH Tracking).

Collaboration with occupational health—Approximately 200 households from areas with potential risk for uranium in groundwater were recruited to participate in the study. Urine specimens from study participants and private well water samples from each household were collected and tested for metals and metalloids. Home indoor air samples were also tested for radon, a breakdown product of uranium. Data on other potential exposure sources were collected, including occupational history, residential history, drinking water source, and hobbies.

The workplace can be an important source of metal exposure. Therefore, NH Tracking, in collaboration with the Biomonitoring NH Program and the NH Occupational Health Surveillance Program, developed job-related questions to be included on the EMPoWER-U Study exposure questionnaire, by NIOSH-accepted best practices (NIOSH 2022b). They included a focus on current and previous work history, separate industry and occupation questions for each job, and metals exposure in the workplace. The survey design included looping logic to capture multiple current jobs and asked about the longest-held job to account for metals with longer half-lives. The work information will be converted to standardized codes for comparison across different studies and jurisdictions.

Impact of collaboration—This is an ongoing project. The next phase is data analysis, in which the hazards, exposures, and biological measurements will be evaluated fromabout an occupational perspective. The technical assistance provided by NH Tracking will allow the BiomonitoringNH Program to explore differences in exposure by industry and occupation to evaluate the body burden of metals and the impact of workplace exposures. The study results will also provide insight into how NH residents are exposed to chemicals and how their

levels compare to the levels in the U.S. population. This work stands out as an exemplary model for integrating environmental health, biomonitoring, and occupational health into exposure assessments.

Maryland Tracking Program—Cancer cluster analysis in various workplace settings

Public health issue—Local health departments in Maryland receive questions and concerns about cancer from the public, including cancer concerns related to potential exposures to substances. Since 2006, Maryland's Tracking Program (MD Tracking) has worked closely with the Maryland Center for Cancer Prevention and Control (CCPC) to address these concerns. Over the years, those have included cancer concerns among workers in schools, hospitals, and other workplace settings.

Collaboration with occupational health—MD Tracking and CCPC jointly developed a framework that has been used successfully to address cancer questions, including cancer in the workplace. The first step involves a structured interview to evaluate the concerns (e.g., number and types of cancers, demographics of the employee population or surrounding community, detailed description of the workplace setting). MD Tracking, CCPC, and the local health department then agree on the next steps, which can include a review of the facility history, the environmental history of the property and surrounding area, and an analysis of relevant cancer frequencies in the community by the Maryland Cancer Registry (MCR), usually in the area where most of the employees live.

Where possible, the investigating team meets with employees to explain the investigation process, review the facility operations, and answer questions. The meeting with employees is used to evaluate potential exposures; occupational exposure assessments are not usually available through the employer, particularly if the exposed persons include current and former employees. MD Tracking epidemiologists are involved in the framing of the overall exposure assessment, particularly if it involves an understanding of occupational and community exposures or community rates of cancers.

Impact of collaboration—MD Tracking and the CCPC have generally been able to address questions raised about cancer clusters in the workplace by engaging directly with the concerned individuals or groups and describing what is known and knowable and what types of approaches would be required to answer the questions. For example, in diverse settings (e.g., law enforcement, schools, and healthcare) with similar concerns of indoor air quality and cancers observed in their populations, a thoughtful approach to indoor air quality exposure assessment, the biology of different cancers, and a careful occupational and environmental history have been critical elements of successful engagements. In many cases, a successful resolution depends less on a finding that there is or is not a cluster of cancers and more on determining whether there is an exposure or set of exposures that can be corrected or mitigated.

One difference between occupational and community cancer investigations is the relative lack of data in the MCR about the occupation, industry, or employer of the patient (Freeman et al. 2017; Silver et al. 2018). This lack of occupational history and the small population typically affected limits the statistical and epidemiological analyses possible for workplaces

without the collection of new data. Because many concerns about workplace cancers are related to exposures, it is critically important that exposure assessments are thorough, transparent, and addressed as part of the response.

Discussion

These case studies highlight different ways that environmental public health tracking and occupational health programs can collaborate and the resulting applications or impacts in public health practice. Some results of the collaborations include local changes to educate farmworkers and counter HRI at work, standardized occupational data linked to biomonitoring data to assess exposure results by occupation, and a framework to assess cancer clusters, including in workplaces.

Occupational programs provided expertise in developing and standardizing job-related survey questions and occupational exposure assessments. State tracking programs provided support in various ways e.g., providing data on health and environmental topics that can be used to understand, identify, and prioritize risk factors for a target population. Tracking programs also provided staff with various skills that are valuable in occupational health collaborations, such as data analysis, mapping, survey development, and community engagement. Existing project structures within tracking programs were also expanded by occupational health programs to help meet their goals.

Some challenges and limitations presented in these case studies are funding, staffing, implementing programs across agencies, and data gaps. Data gaps include limited data on some topics, such as HRI, and limited or lack of occupational data in health outcome data sources such as cancer registries. Some lessons learned are the importance and value of the following: descriptive data and maps from tracking programs to communicate exposure and risk, obtaining input from workers, e.g., farmworkers, on their lived experiences when designing and implementing programs, and standardized data to inform public health action and to track the effectiveness of interventions implemented.

Recently, to help identify vulnerabilities in the food manufacturing supply chain during the coronavirus disease 2019 (COVID-19) pandemic, the Tracking Program collaborated with NIOSH to include data on the number of employees in the food and manufacturing industry on the Tracking Network. The case studies presented here show the importance of additional categories of industry and occupation to be considered for inclusion. In the future, the Tracking Network aims to provide data on employee numbers by more industries and sub-industries and provide the ability to view some health outcomes data by occupation.

As mentioned, the radon dataset includes some information on testing in occupational settings. The Tracking Program can work with the states and laboratories that send these data to better document testing in commercial and occupational settings and work on increasing sources of these data by adding to the states and laboratories submitting these data to the CDC.

Most data on the Tracking Network are at the state or county level, with some data available at the census tract level. In its efforts to increase accessibility to data at sub-county

levels, the Tracking Program developed sub-county geographies, which are aggregations of census tracts to various population thresholds, that allow for finer spatial resolution data to be shared while ensuring stability and confidentiality (Werner and Strosnider 2020). Ultimately, this will allow for the display of local-level health outcome data that will help target local-level interventions and decision-making. Datasets that might be able to apply these sub-county geographies in the future include cancer, some exposure datasets (e.g., air quality), hospitalizations, and emergency department visits.

Current biomonitoring data on the Tracking Network are national in scope and are used to track trends of body burdens of environmental chemicals in the U.S. population. The Tracking Program is collaborating with CDC's Division of Laboratory Sciences to host data from state- or community-level biomonitoring studies on the Tracking Network. These data would provide more localized reference information for states and communities within the state.

Conclusion

The CDC's Tracking Program currently houses various datasets that are relevant and useful to public health programs, including occupational health programs. Working with recipients to spotlight the work in their jurisdictions can help occupational health programs better use these data. This can also increase collaborations between the Tracking Program and occupational health programs, such as, including occupational information in more datasets on the Tracking Network.

Data sharing

This article has generated no new data to share.

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