September 2017

WISCONSIN DEPARTMENT of HEALTH SERVICES

After Action Report: Investigation of Lead Exposures Among Workers at Fraser Shipyard, 2016-2017

Wisconsin Department of Health Services | Division of Public Health
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P-01996 (09/2017)

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Executive Summary

Occupational lead exposure is an important health concern with 1.5 million workers at risk annually. Acute lead poisoning can result in illness and lost productivity, while chronic exposure can cause long-term adverse health effects. Families of exposed workers may also be at risk if lead is brought home on workers' clothes. Annual combined costs of occupational lead poisoning are estimated at $392 million.

In the spring of 2016, the Wisconsin Department of Health Services, Bureau of Environmental and Occupational Health, became aware of a large-scale occupational lead exposure at Fraser Shipyards, Inc. in Superior, Wisconsin. Two workers from Fraser had blood lead levels of greater than 40 micrograms per deciliter—eight times the cut-off for an elevated level. In response to these reports, the Bureau activated its incident command system (ICS) to better coordinate efforts to investigate exposures and protect worker health.

As Fraser is located in Superior, a large number of the affected workers were residents of Minnesota. Efforts were coordinated between the two states and Wisconsin assumed primary responsibility for the investigation. Minnesota had access to a secure, web-based system for conducting interviews. The two states jointly developed a questionnaire to interview Fraser workers who may have been exposed to lead. The goal of the questionnaire was to characterize routes of exposure (e.g., work tasks, lead sources) as well as to gather information about family members who could also have been exposed through take-home lead.

Local public health agencies (LPHAs) in Wisconsin were also involved in the investigation. As Wisconsin is a home-rule state, it was important for these local agencies to be as involved as they chose to be in the investigation. Of Wisconsin's 72 counties, 34 had at least one resident who worked at Fraser during the time of interest. Minnesota's web-based system allowed both states and all LPHAs to interview workers.

Worker interviews were concluded in the summer of 2016. Data from the questionnaire have been analyzed and a manuscript will be submitted to a peer-reviewed journal. After concluding the data analysis, Bureau staff created a survey for all public health partners who participated in the Fraser Shipyard investigation. Additionally, key informant interviews were conducted among a subset of those involved to gather more detailed information. Results from this survey and key informant interviews form the core of this report.

Overall, participants were positive about the way the ICS worked, though some requested standardized training to prepare Bureau staff for future incident command needs. Those involved in the investigation found the web-based system for collecting data useful , but future investigations should begin interviewing as soon as possible to capture the most relevant

information and reduce recall bias. However, the challenge of having a large number of interviewers working in different agencies was noted. It would be beneficial to have a designated group of staff members trained to do interviews that could be called upon for future incidents. This would improve efficiency and timeliness.

Improvement of systems to track the time that staff members spend on the investigation would be of use. Overall, participants viewed the collaborations between Wisconsin, Minnesota, and the LPHAs positively. Some participants expressed desire for faster communication from the Wisconsin Department of Health Services to the LPHAs in future incidents. However, by and large, local public health found the staff of the Wisconsin Department of Health Services to be responsive and timely.

About this Report

This report contains details on the Fraser Shipyard investigation as well as the follow-up survey and key informant interviews that were used to understand what went well and what could be improved. The Fraser Shipyard investigation was generally seen as successful; however, areas for improvement in future incidents were noted and are included here along with actions for consideration.

The core of this after action report (AAR) is contained in the section titled “Analyses and Actions for Consideration.” The after action team identified common themes from the surveys, key informant interviews, and supporting documentation. They noted both positive comments as well as constructive criticism from staff and partners. Themes from the quantitative and qualitative analyses are presented in separate sections below, and actions for consideration are included in the “Qualitative Analysis” section. It should be noted, however, that suggested actions incorporate both the quantitative and qualitative perspectives. Topics are presented as observations written to capture the opinions and data collected by the team. Supporting information and context for each observation is then discussed, followed by actions for consideration. Each issue is tagged with one or more action levels: 1) create, 2) maintain, or 3) modify. Appendices follow at the end of the document to supply additional information and documents for review.

Introduction

Occupational lead exposure is an important health concern in the U.S. It is estimated that over 1.5 million workers in the U.S. are at risk for lead exposure annually.[1] Exposure to lead can cause acute and chronic adverse health effects in persons of all ages.[2] It is estimated that the annual social costs of adverse effects associated with occupational lead exposures are approximately $141 million and the combined direct and indirect costs are over $392 million.[3]

Exposure to lead is a well-known hazard in the shipbuilding and shipbreaking industry and has previously been reported to result in increased blood lead levels (BLLs) among shipyard workers.[4, 5] In the U.S., marine paints can contain 50%-90% lead by weight, as opposed to household paints that are permitted to contain no more than 0.009% lead.[6] Lead is used extensively in marine paints as an anticorrosive agent.[1] Inhalation is the most common route of occupational exposure to lead[7] and shipyard workers are at greatest risk of exposure during the application or removal of lead-based paint.[8] Overhaul operations of ships involve paint removal (chipping, grinding), welding, fitting, and repainting surfaces, and can result in the inhalation of aerosolized lead.[9]

Lead Exposure at Fraser Shipyard

On March 28, 2016, the Wisconsin Department of Health Services (DHS) received laboratory reports regarding two workers from the same shipyard with BLLs greater than 40 micrograms per deciliter (µg/dL). The National Institute for Occupational Safety and Health (NIOSH) defines an elevated BLL as greater than or equal to 5 µg/dL.[10] These two workers had been retrofitting the engine room of a 690-foot vessel in dry-dock since January 4, 2016. Concurrently, the Minnesota Poison Control System (MPCS) was consulted by an emergency department provider regarding clinical management of a worker at a shipyard in Superior, Wisconsin, with a BLL

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[1] U.S. Department of Labor. OSHA. Safety and Health Topics. Lead. 2016 https://www.osha.gov/SLTC/lead/
[2] National Toxicology Program. NTP Monograph. Health Effects of Low-Levels Lead. 2012 http://ntp.niehs.nih.gov/ntp/ohat/lead/final/monographhealtheffectslowlevellead_newissn_508.pdf
[3] Levin R. The attributable annual health costs of U.S. occupational lead poisoning. *Int J Occup Environ Health*. 2016;22:107–120.
[4] Hall FX. Lead in a Baltimore shipyard. *Mil Med.* 2006;171:1220–1222.
[5] Landrigan PJ, Straub WE. Occupational lead exposure aboard a tall ship. *Am J Ind Med.* 1985;8:233–239.
[6] United States Consumer Product Safety Commission. Lead in Paint. 2016. https://www.cpsc.gov/Business--Manufacturing/Business-Education/Lead/Lead-in-Paint
[7] Landrigan PJ, Todd AC. Lead poisoning. *West J Med.* 1994;161:153–159.
[8] Rieke FE. Lead intoxication in shipbuilding and shipscrapping, 1941 to 1968. *Arch Environ Health.* 1969;19:521–539.
[9] Virji MA, Woskie SR, Pepper LD. Task-based lead exposures and work site characteristics of bridge surface preparation and painting contractors. J *Occup Environ Hyg.* 2009;6:99–112.
[10] National Institute for Occupational Safety and Health. NIOSH. Engineering controls.2016.https://www.cdc.gov/niosh/engcontrols/

greater than 60 µg/dL. Subsequently, MPCS notified the Minnesota Department of Health (MDH).

Work was suspended from March 29 to April 4 in the vessel's engine room, the presumptive primary source of lead exposure. On March 29, the shipyard partnered with a local occupational health clinic to provide testing for workers. Some workers and their household members also sought testing from their own health care providers. The shipyard hired sanitation crews for lead cleanup and abatement, and provided additional personal protective equipment (PPE) for its employees. On April 1, DHS and MDH issued advisories to alert regional health care organizations, local public health agencies (LPHAs), and tribal health departments of the situation.

THE INVESTIGATION

On April 4, DHS and MDH launched a joint investigation. The overall goal of the investigation was to minimize lead exposure-associated health risks to workers and the public and to identify measures to prevent future events of this nature. Specific objectives of the epidemiological investigation were to:

1. Determine the extent and severity of lead exposure in shipyard workers.
2. Determine the risk factors that resulted in lead poisoning (i.e., BLL ≥ 5 µg/dL).
3. Collect and review BLL test results to determine the number of shipyard workers with lead poisoning.
4. Conduct worker interviews to identify work-related factors (adequacy of PPE, ventilation, etc.) that contributed to the occurrence of lead poisoning.
5. Assess residences, household members, and personal vehicles for lead exposure, as needed, and identify potential routes of lead exposure.

Due to the shipyard's location near the Wisconsin/Minnesota border and the seasonal and project-based nature of shipbuilding work, individuals from all over Wisconsin, as well as Minnesota and a handful of other states, worked on this engine refitting project. As a result, the success of this investigation hinged on the combined efforts of DHS, MDH, a number of Wisconsin LPHAs, and DHS Division of Public Health (DPH) regional office staff.

The investigation plan, worker interview instrument, data analysis plan, and communications materials were developed jointly by DHS and MDH. Recognizing the complex nature of this response, DHS activated an incident command system (ICS) on April 4 to better coordinate decisions, staff resources, and communications. DPH staff from the Bureau of Environmental

and Occupational Health (BEOH) and the Office of Preparedness and Emergency Health Care (OPEHC) served in ICS roles. Additional staff from BEOH, DPH regional offices, and 20 LPHAs assisted with administration of worker interviews and with conveying health messages about lead exposure to workers.

Weekly situation reports communicated the progress of the investigation. These reports were provided to DHS management, all LPHAs in Wisconsin, and other partners. In addition, with workers residing in 34 Wisconsin counties, DHS ensured that information about potentially affected individuals (i.e., workers and household members) was provided to the appropriate LPHAs in a timely manner. Table 1 presents a timeline of key events during the investigation.

Table 1. Timeline of Key Events

03/28/16	• DHS learns that workers were exposed to high levels of lead at the Fraser Shipyards, Superior, Wisconsin. • DHS begins collecting information on affected workers.
04/01/16	• DHS and MHD, along with LPHAs and other government agencies, launch a joint investigation. • DHS releases talking points about this situation to LPHAs.
04/04/16	• DHS activates incident command system (ICS).
04/06/16	• First DHS weekly situation report is released.
04/07/16	• DHS begins regularly sending blood lead test reports for workers and household members to appropriate LPHAs.
04/08/16	• DHS identifies noncertified lead clean-up crews have reported elevated BLLs in their own workers. • The Wisconsin Department of Natural Resources (DNR) office in Superior reports to DHS anonymous complaints of potential contamination at the site.
04/11/16	• DHS and MDH finalize the investigation plan and worker interview.
04/15/16	• DHS hosts Fraser Shipyard Lead Response webinar for LPHAs and invites their participation in investigation by helping with administration of worker interviews.
04/20/16	• DNR conducts shipyard site visit. • DHS holds worker interview tool training webinar for interested LPHAs, DPH regional office staff, and other DHS staff.
04/21/16	• DNR and DHS visit the *Herbert C Jackson* in dry dock at the shipyard.
04/25/16	• DHS and LPHAs begin administering worker interviews.
05/03/16	• In response to requests from staff administering the worker interview, DHS provides message maps, answers to frequently asked questions, and a phone call flowchart to collaborating LPHAs.
05/04/16	• DHS sends a Fraser update to all Wisconsin LPHAs.
05/11/16	• DHS develops an environmental sampling checklist/worksheet should further investigation of vehicles or residences be warranted.
05/18/16	• DHS and MDH attend an in-person lead briefing for LPHAs held in Douglas County.

	• DHS provides collaborating LPHAs with a letter, fact sheet, and shortened paper questionnaire that they can send to workers who could not be reached by phone or who indicated a preference for filling out a short paper survey.
05/19/16	• DHS provides the Wisconsin Poison Control Center with messaging so they can address any calls regarding this situation.
05/20/16	• DHS and MDH finalize data analysis plan.
05/24/16	• DHS updates Fraser shipyard on status of activities. • The health officer from the Douglas County Health Department meets with workers to encourage them to have their blood tested for lead and to participate in the worker interviews.
05/26/16	• A welder who worked on-site files a lawsuit against the company; this lawsuit is picked up by the media. The ICS Public Information Officer provides assistance to the health officer from Douglas County Health Department with handling incoming media inquiries.
06/01/16	• DHS develops and provides a fact sheet with lead information for primary care providers to Douglas County Health Department and a local health care system.
06/03/16	• DHS provides collaborating LPHAs with a worker survey phone script and Spanish versions of nonresponse letters.
07/01/16	• Data collection is complete.
08/03/16	• Final situation report sent.
01/13/17	• MMWR “Notes from the Field” publication is released.
02/03/17	• Fraser AAR process initiated.
05/05/17	• DHS and MDH complete data analysis.
06/17/17	• After action key informant interviews and surveys begin.
06/29/17	• After action surveys and interviews conclude. • DHS and MDH manuscript completed for submission to peer-reviewed journal.
08/01/17	• DHS sends a letter, summary report, and fact sheets to workers, Fraser Shipyard, and contracting companies.
08/14/17	• DHS finalizes draft of Fraser AAR.
TBD	• DHS deactivates ICS.

AAR and Supporting Information Collection

Scope and Purpose

This AAR is intended to provide information about best practices and process improvements that should be considered when preparing for and responding to large-scale events of public health concern. This report summarizes perceptions of the Fraser Shipyard response from staff who were involved in the investigation. The observations presented here are intended to generate improvements in DHS's plans, policies, and procedures that will enhance and improve future responses.

Following distribution of this report, the AAR team recommends that DPH develop an improvement plan. This plan should be based on the contents of this report and include concrete steps to enhance DPH's response to large-scale public health events. Because this was a multi-jurisdictional response that involved collaboration from MDH, multiple LPHAs, NIOSH, and the Occupational Safety and Health Administration (OSHA), as well as DHS, feedback was gathered from all involved entities. Summarized findings take into account perspectives from multiple jurisdictions.

Background

After action reporting is a standard and vital part of the quality improvement process for emergency response exercises and actual events. This AAR is designed to be applicable to a wide set of audiences. Because the ICS is a standard approach to dealing with an incident such as the Fraser Shipyard investigation, it is not considered to be specialized knowledge and familiarity with ICS is assumed. Key concepts are explained, where applicable.

Data Collection

The AAR team produced and distributed a voluntary survey to partners involved in the Fraser response. AAR team members developed survey questions specific to the response. These questions (see Appendix A) captured the views and experiences of response members. The survey was organized with a series of skip patterns; therefore, not all survey questions were answered by all respondents. Based on respondents' involvement with the investigation, they answered only the questions that were relevant to their roles. The survey was distributed electronically to 107 internal and external partners and was available for two weeks. The survey was conducted on the platform Survey Gizmo and received 47 complete responses and 11

partial responses. The responses represented the views of all personnel who participated in the response, including DHS, MDH, and LPHAs.

In addition to the voluntary survey, the AAR team conducted key informant interviews. These interviews were conducted in person or over the phone. Individuals selected for these interviews were chosen in order to reflect a cross-section of roles and subject matter expertise or exposure to specific aspects of the response. Key informant interviews represented the views of members from ICS leadership, DPH, LPHAs, and our partners from Minnesota. One member of the AAR team conducted each interview and used a standard script. The questions were the same as the voluntary survey. However, the interviewer was instructed to ask interviewees to elaborate on high or low ratings. Interviewees were encouraged to be frank and speak at length, providing both quantitative as well as qualitative data. In total, 11 key informant interviews were completed.

Figure 1 shows the organizations where respondents worked during the Fraser Shipyard investigation. The majority of respondents (56%) worked at an LPHA. The second largest group (35%) worked at DHS.

Figure 1. Organization Respondent Worked at During the Fraser Shipyard investigation

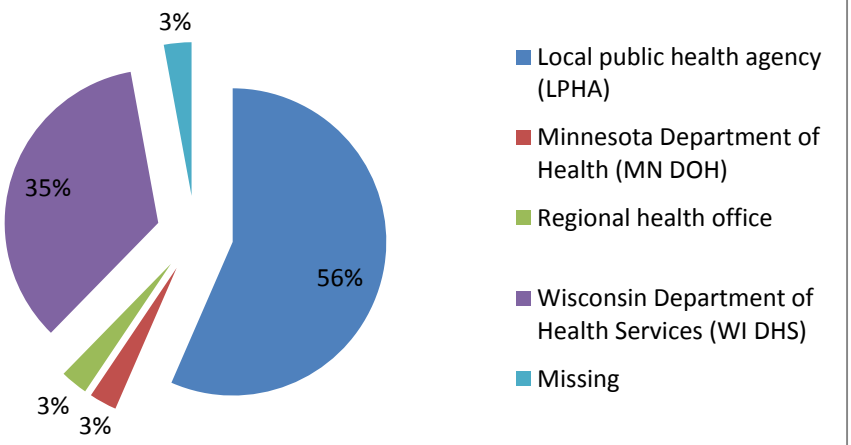
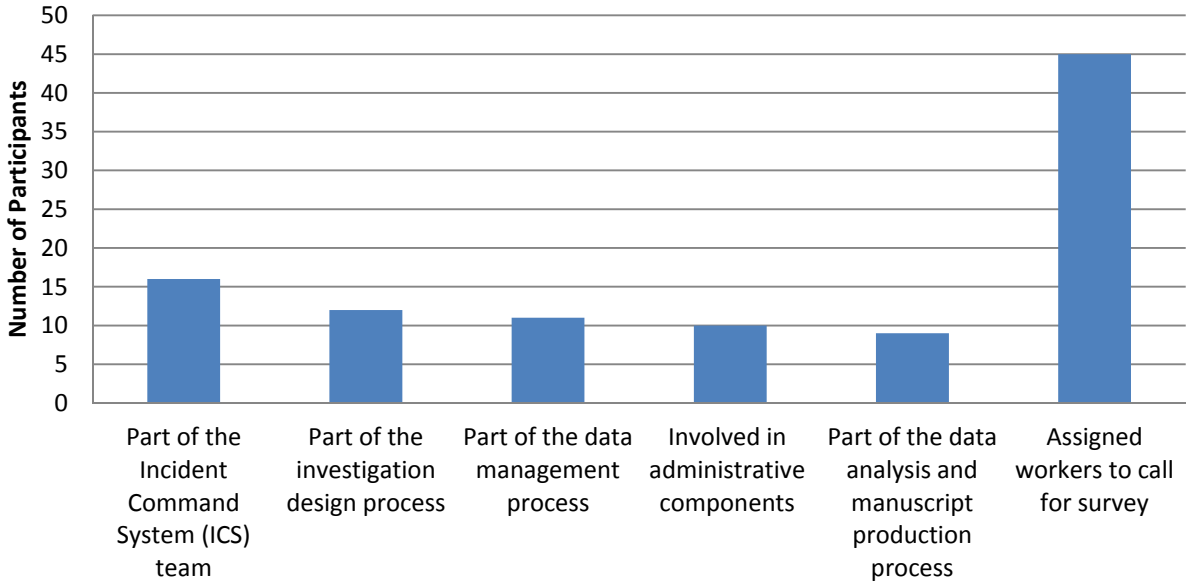


Figure 2 illustrates the roles that respondents to our AAR survey had, or that key informants had, during the Fraser Shipyard investigation. Note that the roles are not mutually exclusive. Any individual could serve in any or all of these roles.

Figure 2. Roles of Respondents to AAR Survey or Key Informant Interviews



Analyses and Actions for Consideration

The following section of the report discusses common observations about the response that emerged during the AAR team's assessment of Wisconsin's response to lead exposure at Fraser Shipyard, and individual input from surveys and interviews. Observations are presented within two sections: quantitative and qualitative analyses. Within each, observations are organized under shared headings, but narrowly defined in order to lend themselves to specific actions for consideration that could enhance the effectiveness and efficiency of future responses. Appendix B includes results from the quantitative analysis only; qualitative question responses are not presented here, but rather discussed under the qualitative analysis section.

Quantitative Analysis

ICS Structure

Sixteen DHS staff members participated in the ICS structure. Among those, 75% believed that the frequency of the ICS meetings was "about right." One participant thought that ICS meetings were "too infrequent" while three thought they were "too frequent." The majority (86%) of ICS participants reported that the ICS roles were "mostly clear" or "clear" and 81% said the same of their personal role on the ICS team (i.e., "mostly clear" or "clear"). The majority (81%) agreed that the ICS staffing level was adequate. Fifteen of 16 (94%) ICS participants believed that the ICS was "effective" or "very effective" in addressing the Fraser Shipyard incident. Overall, ICS participants were positive in their ratings of the ICS structure.

Design, Interstate Collaboration, and Documentation

Among those who were involved in the design and analyses for the Fraser Shipyard investigation, 92% rated the design as "acceptable," but none of the participants rated it "good" or "very good." This suggests some specific inadequacies in the design process. However, all those involved in the interstate collaboration with MDH rated that experience as "good" or "very good." Intra-office communication was also rated positively. Of those involved, 91% rated it as "good" or "very good." While better than half (54%) of participants rated the documents for protocols and procedures as "adequate," the remaining 46% did not find them so. Overall the design of the investigation and documentation processes represent areas for improvement in future investigations.

Data Collection and Data Management

To conduct the interviews with the shipyard workers, DHS, MDH, and LPHAs all used a secure cloud-based interview tool known as REDCap (Research Electronic Data Capture). Onboarding LPHAs to the REDCap tool was done using a webinar during which LPHAs could participate and ask questions of DHS staff. Among respondents with awareness of the onboarding process, slightly more than half (57%) believed this process was "efficient" while the remaining 43% believed it was "inefficient." This suggests that the onboarding process could be improved in the future. However, the use of REDCap received a more positive response. Eighty-one percent of respondents reported that the data sharing process between all groups was "adequate" or "optimal." Among those who conducted interviews with Fraser employees, 89% were "satisfied" or "very satisfied" with REDCap. Moreover, 94% of those who attended the REDCap webinar reported that the training was "somewhat helpful" or "very helpful," with two-thirds reporting the latter designation.

Similarly, data management appeared to present some difficulties for people. Just over half (55%) reported that the data management process was "mostly clear" or "clear" with the remaining neutral or finding the process "unclear." Part of the data management process included a spreadsheet called the "line list," which contained information on workers and their families. This list needed regular updating by BEOH epidemiologists to reconcile the information coming in from the labs with information reported by the participants. The need for multiple users of the same spreadsheet created a need for a division of labor to maintain version control. Of those respondents who worked with the line list, 72% reported that this division of labor was "mostly clear" or "clear." Moreover, 81% of those involved with the line list and other documents were "satisfied" or "very satisfied" with their access.

Meeting Notes and Task/Time Tracking

Tracking time spent by DHS staff on the Fraser Shipyard investigation was important. To this end, a spreadsheet called "time-tracker" was developed and saved in a shared drive. Half (50%) of participants who reported their time on the time-tracker found that it was an "adequate" tool. The remaining participants were less enthusiastic, rating the time-tracker's adequacy as "neutral" or "not quite adequate." One individual reported never using the time-tracker. Meeting notes were taken at all ICS meetings and also saved on a shared drive. Half (50%) of participants who responded on the usefulness of the meeting notes found them "somewhat useful" or "very useful." At least 20% never accessed the meeting notes. Finally, a "task-tracker" was created to keep abreast of investigation-related tasks and the person(s) responsible for those tasks. Of those who reported using the task-tracker, 100% thought it was "somewhat useful" or "very useful."

Manuscript Production

Respondents who rated the interstate collaboration with regard to data analysis and manuscript production by and large found it to be “acceptable” or “good” (88%). The rating for intra-office communication with regard to data analysis and manuscript production was somewhat more positive with 86% rating it “good” or “very useful.” Moreover, respondents did not report substantial barriers to data analysis and manuscript production. Only 25% mentioned that there were “some barriers” where the rest said there were “few barriers,” “no barriers,” or found the question not applicable. Finally, with regard to the division of labor for data analysis and manuscript production, 88% reported it was “mostly fair” or “very fair.”

Fraser Interviews

Among those who reported being assigned interviews, 22% completed six or more interviews with Fraser employees, 39% completed between two and five interviews, 27% completed one interview, and 12% completed zero interviews. Roughly 73% of respondents who conducted interviews of Fraser employees found that the distribution of interview assignments was “mostly fair” or “very fair.” The remaining respondents were “neutral” on fairness of assignments, while one said distribution was “somewhat unfair.” Respondents were also asked about the adequacy of communication between agencies during the interview process. Among those who were involved in interagency communication, 79% reported that communication was “adequate” or “optimal.” Moreover, 88% of those who conducted interviews with Fraser employees reported that the protocol for surveying workers was “mostly clear” or “clear.” The protocol for following up with workers who were difficult to reach was rated as somewhat less clear with only 77% rating that protocol as “mostly clear” or “clear.”

Partner Communications

The majority of respondents (58%) found the weekly situation reports (Sit Reps) “somewhat useful” or “useful.” However, 19% were “neutral” or found the Sit Reps “not very useful.” An additional 23% reported not being aware of the Sit Reps. Respondents rated contact with DHS very positively. Ninety-seven percent reported that responses from DHS were “somewhat helpful” or “very helpful,” with the latter designation accounting for 90%. Moreover, respondents rated the timeliness of the responses from DHS positively. Ninety-four percent reported that DHS responses were “very timely.” With regard to how clear it was for partners to contact DHS with questions or concerns, 90% found that it was “fairly clear” or “totally clear.” In the end, 90% of respondents felt that the overall DHS response to the Fraser Shipyard incident met their needs.

QUALITATIVE ANALYSIS

1. BEOH Internal Processes

The observations and associated actions for consideration found in this section address the internal processes that support BEOH's response efforts.

Observation 1.1: ICS structure enabled a more rapid and effective response to the Fraser outbreak; however, awareness level training for all staff would improve future responses.

Discussion: One theme that emerged out of both the key informant interviews and the survey of all staff involved was that the incident command structure enabled a more effective response to this outbreak. One respondent noted, "I was very impressed with how well the ICS structure functioned to address all aspects of the investigation."

Despite the fact that most of the BEOH staff had limited experience with the ICS structure, feedback indicated that the ICS functioned well during this response, although there were suggestions for areas of improvement. For example, multiple responses indicated that there should have been more staff trained for incident command and response prior to the outbreak and investigation or that all BEOH staff should have received this training as part of onboarding. Consequently, a limited number of individuals in the BEOH were available for the ICS lead roles, with few backups to share the work. In addition, many staff members from OPEHC had been assigned ICS roles in response to the agency's Elizabethkingia response and were not more broadly available to assist with the Fraser response.

Because this response required hundreds of hours of staff time over an extended period of time, it reduced the availability of staff to perform their routine programmatic duties. Furthermore, there is no specific funding available for ICS or emergency situations, so funding was appropriated from regular funding streams of those involved in the response.

Action Level: Modify

Actions for Consideration:

- Provide training to all BEOH staff in incident command, based on their existing skill sets and potential positions within the structure during future events.
- Provide additional in-depth training of ICS, including functions and examples, for staff members who are likely to be called upon to assist in a similar situation.
- Generate basic ICS organizational chart for environmental emergencies to include subject matter expertise in each area. Revisit and revise annually.

Observation 1.2: Clearly defined roles within the ICS structure would enable staff to be more effective in their roles.

Discussion: Although the roles in the response were relatively clear for ICS section leads, other members attending the ICS meetings felt that they were not provided instruction as to their roles. Similarly, there was some general confusion among other ICS non-lead staff attending ICS meetings as to their roles in the response. Other feedback indicated that advance scheduling of back-ups instead of impromptu day-of decisions was needed during the response to provide a solid infrastructure.

Many BEOH staff involved in the response found it difficult to remember to enter hours in the "time-tracker" spreadsheet. However, tracking staff time is critical to documenting time away from programmatic work and helping to justify the provision of funding for emergency responses.

Action Level: Create

Actions for Consideration:

- Incident commander should establish clearly defined roles and delegation of work among ICS leads and supporting staff at the initiation of the response.
- A standing agenda item on the ICS meetings would provide an opportunity for persons involved in the response to indicate planned out-of-office occurrences and to request back-up assistance.
- A regularly scheduled reminder email (weekly or twice weekly) sent to all persons involved in the response might trigger regular entry of hours that staff allotted to the response and investigation.

Observation 1.3: Pre-developed materials and protocols could assist in the timeliness and effectiveness of future responses.

Discussion: Another theme that emerged was the lack of advanced planning or dedicated systems for responding to this type of environmental outbreak. For instance, there were no fact sheets or written information templates available at the time of the incident that could expedite the response time. For the worker interview portion of the response, there wasn't a questionnaire template for responding to an environmental exposure, Spanish translation resources in place, or a protocol for establishing a general email inbox or handling incoming questions. Furthermore, BEOH didn't have pre-designated interviewers, which reduced the timeliness of response and interviews (discussed under Observation 3.1) and may have affected the quality of the data as well, due to recall bias.

Action Level: Create

Actions for Consideration:

- Develop environmental emergency response shared folder containing worker interview template; Spanish translation resources; situation report and talking points templates; line list, time-tracker, and task tracker templates, and a protocol for establishing and managing the DHSEnvHealth mailbox.
- Provide training to all BEOH staff about the environmental emergency response shared folder and resources/tools in it to increase overall understanding of availability of materials.
- Seek examples—e.g., from other bureaus or states—of other tools and resources that would be helpful to have on hand and prepared for a similar response. These tools and resources might include checklists, additional templates, more effective time-tracker tools, etc.

Observation 1.4: Rapid external information approval (EIA) review facilitated more timely communication to partners, although feedback from partners suggested they wanted more real-time communication.

Discussion: The streamlined communication process with rapid EIA approval facilitated more timely communication to partners. BEOH received feedback from multiple partners that there was appropriate information flow but that the lag time was still too long. Pre-developed materials (Observation 1.3) would help facilitate more expedited communication to partners.

Action Level: Modify

Actions for Consideration:

- Development of materials, as suggested in observation 1.3, would assist to communicate with partners in a more timely way.
- A point person from the DHS Communications Office should be assigned at the start of ICS to serve as a liaison between ICS and the parties that grant approval to expedite the communication approval process.

2. Communication with Partners

During responses, one of our primary functions is to serve as a coordinating and guiding resource for frontline partners at the local level, including LPHAs. In this case, the response crossed state borders, necessitating communication and collaboration with Minnesota Department of Health. Observations in this section focus on the development and substance of guidance offered by DHS during this response, as well as how the guidance was shared with partners. Areas in which staff and partners expressed frustration are also discussed and

alternative approaches to address those challenges are offered. Overall communications during Wisconsin's response to the lead exposure at Fraser Shipyard received praise from both internal and external sources.

Observation 2.1: Webinar to LPHAs on investigation and REDCap use was an effective way to share information.

Discussion: The DHS webinar with LPHAs on the investigation and REDCap use received praise from both internal and external sources. Of the partners who attended the webinar training for REDCap, over 94% found it somewhat or very helpful (see "Quantitative Analysis" section).

For example, one respondent reported: "The ability to do a webinar on REDCap, send an e-mail right after, and for all of the health departments to respond one way or another right away. This went really well. We didn't have to track down a whole lot paperwork which would have taken a lot of time."

Action Level: Maintain

Actions for Consideration:

- Hold a webinar with LPHAs as early as possible in the response to update them on the response and plans for investigation. In addition, if a survey tool is in place prior to the response (as the go-to), then training on this can occur at the same time.
- Assign a point person to coordinate collection of survey tool agreements to streamline those specific efforts. This person would be part of the "Liaison team," but not the lead.
- Use of REDCap or a similar tool by DHS was useful for collaborative communication with partners – including Minnesota.

Observation 2.2: Written messages (e.g., Sit Reps, Talking Points, and emails) were appreciated by partners but often delayed by review.

Discussion: DHS written materials—including situation reports, talking points, and emails—helped facilitate timely and accurate information dissemination to local partners. One partner commented, "Updates were important as this was the only way our local health department was connected to the investigation." When partners were asked to share at least one thing they believe went well during the investigation, some respondents indicated, "the talking points we received" and "the frequent updates and templates for phone calls."

While partners reported high satisfaction with communications (see "Quantitative Analysis" section), some respondents reported that LPHAs would have liked earlier or, perhaps, timelier

communication. For instance, outreach efforts with shipyard workers were potentially limited by delayed communication with the employer. Issues pertaining to timeliness of response have been discussed in Observations 1.3 and 1.4, with actions for consideration provided.

One other comment from LPHA partners was that there was a lack of communication regarding who was responsible for sending letters to cases and that LPHAs and DHS were sending the same letters multiple times.

Action Level: Modify

Actions for Consideration:

- Develop protocols prior to a response so there is clarity on what entity handles what task. (For example, if an LPHA is handling X number of cases, the expectation is that they will see each of those cases fully through, including sending of letters, documenting of follow-up, consistent recording in survey tool, etc.)
- Use a survey tool (or SharePoint) to house a checklist where DHS, LPHAs, and other partners can access a document indicating what has been done and on what date. This would be a place where all (approved) users could visit to see what had been done (i.e., interview scheduled, interview completed, letter sent).

Observation 2.3: Intra-agency (BEOH) and interagency communication (DHS-MN and DHS-LPHAs) was successful overall.

Discussion: Most feedback indicated that communication among DHS staff and with outside agencies, including MDH and Wisconsin LPHAs, was successful. Specific feedback included:

- "Communication and coordination amongst staff at DHS was fantastic. As someone who had a small role in the investigation I still felt involved and included in the process."
- "Communication was good between DHS and local public health department. I knew exactly what my role was."
- "Staff across BEOH, Preparedness, and Minnesota Department of Health worked very well together as a team."

Most partners were satisfied with the timeliness of response communication and felt this helped to prevent continued exposures to elevated lead. Some partners wanted more frequent and local in-person meetings in the highest affected areas of the state. There were several partners who provided feedback that there is a great need for more local information and resources for workers, including outreach materials and coordination of medical services at the local level. It was suggested that a "hotline" for affected workers and families would have been a welcome resource.

Action Level: Maintain

Actions for Consideration:

- Early in the response, establish a "hotline" and a general email address for workers with questions.
- Coordinate with LPHAs located nearest to the site of interest to institute coordination of medical services and outreach/education.
- Connect with local health care providers directly to offer outreach materials that are available as workers visit health care providers.
- Encourage LPHA staff to reach out to workers to provide general information on the health risk at issue.

3. Data Collection and Management

Design of the worker interview and data collection and management are important aspects of any emergency response. Observations in this section focus on the collection of blood lead data associated with the investigation; the development of the interview for workers, and its administration using the REDCap tool; as well as the management of internal data using the line list of associated workers and families and their blood lead test results. Areas in which staff and partners expressed frustration are also discussed and alternative approaches to those challenges are offered.

Observation 3.1: Online survey tool REDCap worked well for the investigation.

Discussion: REDCap software worked well as a survey platform for collecting confidential data, with several partners commenting on this aspect of the response:

- "I thought the REDCap system was a better way for confidential data collection from worker interviews."
- "The ability to enter interview information into REDCap during the interview alleviated the need for data entry."
- "REDCap was easy to use."

Some mentioned that the timeliness of worker interviews could have been improved. Specifically, it was suggested that response to the worker interview—as well as the completeness of the data—was somewhat hampered by the timeliness of the DHS response. The interview process in Wisconsin lagged Minnesota for a number of reasons. First, unlike MDH, the DHS team did not have an established team of interviewers. Second, in the spirit of local control of public health, DHS sought to support LPHAs in conducting the interviews

themselves, as they were able and interested. This involved obtaining multiple signed agreements between agencies and individuals in order to use the REDCap system and required additional communication clarifying roles and responsibilities.

Feedback from staff involved in conducting worker interviews indicated the need for pilot testing the interview to identify best questions and a more concise questionnaire. There was no input from affected workers into the development of the interview, which would have helped with clarity of questions, properly phrased terminology, etc. Several staff who conducted REDCap interviews wanted advanced training on occupational health terminology and how to address frequently asked questions, as well as training on how to record data (e.g., call attempts) consistently in REDCap.

Action Level: Modify

Actions for Consideration:

- Identify potential staff within DPH who would be available to conduct interviews given a future emergency response. Provide these staff with training on administering interviews. Alternatively the Surveillance and Outbreak (SOS) Team from the Bureau of Communicable Disease (BCD) may be utilized for interviews.
- In future interview development, pilot test with appropriate subject matter experts and key recipients of the questionnaire.
- Hold training for staff members who would perform interviews to complete a mock interview with finalized interview questions. This would assist with understanding and using correct language related to the topic area.
- Consider an online questionnaire for workers that they could access at any time of day.
- Develop a protocol for consistently recording data in questionnaire tool (i.e., call attempts [day/time], where in REDCap to document).

Observation 3.2: There was overall satisfaction with the internal organization of and access to investigation data.

Discussion: The investigation was complex and required multiple individuals to have access to the shared folders, line list, and statistical software (SAS) programs. Most staff members who required access to investigation data were satisfied with the internal organization of and ability to access the data (see “Quantitative Analysis” section). One suggestion was that a more formal process be established for line list maintenance and interview completion tracking. One relevant response to this point was:

"It would have been helpful to have something written up about how to manage the line list (e.g., when to "save as" and change the date, what to do when someone else has it open and you need to enter something, clarity on who has access, what things should not be changed, where to put notes). These things were all kind of figured out as we went along, but having a clear protocol detailing this would have been more helpful. Also, tracking completion of the interviews was a bit tricky and this is another situation where a more formal process would have been helpful.")

Action Level: Modify

Actions for Consideration:

- Establish a formal process for maintaining the line list of cases and tracking of interviewed workers during the initial phase of the response.
- Explore other software or databases, beyond Microsoft Excel (which was used in the investigation), that could more effectively maintain this information for a possible future event.

Observation 3.3: There was a need to assess and address gaps continuously through the data collection and analysis phase of the response.

Discussion: Because this interstate emergency response was the first for most BEOH staff, there wasn't a pre-established process for collecting and analyzing data across state borders. One overarching theme from the response was that there was a need to continuously assess and address gaps throughout the data collection and analysis phase of the response. Survey feedback suggested that dialogue between state agencies during the analysis phase could have been better. Initially, Minnesota sent staff to Wisconsin for three days to code survey data. During the entire data collection and analysis phase, Wisconsin hosted multiple calls with Minnesota, often on a weekly basis. However, because Wisconsin took the lead on analysis and maintained the active SAS data files, it was difficult to keep Minnesota updated with current progress and analysis plans. Minnesota indicated that they would have preferred an update or revision of data analysis plans following the exploratory descriptive analysis.

Action Level: Modify

Actions for Consideration:

- Establish a shared cloud-based document home where Minnesota and Wisconsin staff could both access relevant data analysis files.
- Set up a standing call between interstate entities to relay information on a regular basis.

Conclusion

Those who responded to the AAR key informant interview and survey were generally positive about the way the ICS worked. Training for ICS would be beneficial to BEOH and DHS staff in anticipation of future needs. The REDCap system for collecting data was well liked by those involved in the investigation and helped to coordinate data collection efforts among the various partners. However, the difficulty of having a large number of interviewers working in different agencies was noted. It would be beneficial to have a designated group of staff members trained to do interviews that could be called upon for future incidents. This would improve efficiency and timeliness. Moreover, in future investigations interviewing should begin as soon as possible to capture the most relevant information. Some improvement of systems to track the time that staff members are spending on the investigation would be of use. Overall, the collaboration between DHS, MDH, and LPHAs was viewed positively. Some desire was expressed for faster communication from the DHS to the LPHAs in future incidents. By and large, LPHAs found DHS staff to be responsive and timely, and respondents viewed the Fraser Shipyard response and investigation as a success.

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Appendices

Appendix A: After Action Survey: Fraser Shipyard Investigation, F-02085

1) At what organization did you work at the time of the Fraser Shipyard investigation?
   ( ) Wisconsin Department of Health Services (WI DHS)
   ( ) Minnesota Department of Health (MN DPH)
   ( ) Local public health agency (LPHA)
   ( ) Regional health office
   ( ) OSHA
   ( ) Other (please specify)

2) Which roles were you involved with in the Fraser Shipyard investigation (select all that apply):
   ( ) Part of the Incident Command System (ICS) team or attended ICS meetings (Wisconsin only)
   ( ) Part of the investigation design process
   ( ) Part of the data management process
   ( ) Involved in administrative components (i.e., used the time-tracker, meeting notes, etc.)
   ( ) Part of the data analysis and manuscript production process
   ( ) Assigned workers to call for survey

3) Please indicate your perception of the ICS meeting frequency [note scale]:
   1=Far too infrequent
   2=Too infrequent
   3=About right
   4=Too frequent
   5=Far too frequent
   6=NA (Was on ICS team, but did not attend meetings)

4) How clear were the ICS roles, generally?
   1=Unclear
   2=Not clear enough
   3=Neutral
   4=Mostly clear

5=Clear

5) How clear was your role on the ICS team?
   1=Totally unclear
   2=Unclear
   3=Neutral
   4=Mostly clear
   5=Clear
   6=NA (I did not have a role)

6) How effective was the ICS in addressing the Fraser incident?
   1=Not at all effective
   2=Ineffective
   3=Neutral
   4=Effective
   5=Very effective

7) How adequate was the level of staffing on the ICS team?
   1=Wholly inadequate
   2=Inadequate
   3=Neutral
   4=Adequate
   5=Optimal

8) Who, or what, was missing from the ICS process that would have been helpful?

_____

9) How would you rate the design of the Fraser investigation?
   1=Very poor
   2=Poor
   3= Acceptable
   4=Good
   5=Very good

10) How would you rate the interstate collaboration with regards to the design of the investigation?

1=Very poor

2=Poor

3= Acceptable

4=Good

5=Very good

6=NA (I was not involved with the inter-state collaboration)

11) How would you rate the intra-office communication during the design of the Fraser investigation?

1=Very poor

2=Poor

3= Acceptable

4=Good

5=Very good

6=NA (I was not involved with intra-office communication)

12) How adequate was the documentation (i.e., protocols and procedures) for the Fraser investigation?

1=Inadequate

2=Not quite adequate

3=Neutral

4=Adequate

5=Optimal

6=NA (I was not aware of the protocols and procedures)

13) How efficient was the process for onboarding LPHAs to REDCap?

1=Totally inefficient

2=Inefficient

3=Neutral

4=Efficient

5=Extremely efficient

6=NA (I was not involved with the onboarding process)

14) Who, or what, was missing from the process of designing the Fraser investigation?

_____

15) How clear was the data management process during the Fraser investigation?

1=Totally unclear

2=Unclear

3=Neutral

4=Mostly clear

5=Clear

16) How clear was the division of labor with regards to the line lists and data entry?

1=Totally unclear

2=Unclear

3=Neutral

4=Mostly clear

5=Clear

6=NA (I was not aware of the division of labor)

17) Were the processes used for data sharing (within BEOH; with LPHAs and MN) adequate?

1=Inadequate

2=Not quite adequate

3=Neutral

4=Adequate

5=Optimal

6=NA (I was not involved with data sharing)

18) How satisfied were you with access (i.e., version control, shared access) to data and documents (e.g., the line list)?

1=Very dissatisfied

2=Dissatisfied

3=Neutral

4=Satisfied

5=Very satisfied

19) What could have been done to improve the data management process?

_____

20) How adequate was the time-tracker?

1=Inadequate

2=Not quite adequate

3=Neutral

4=Adequate

5=Optimal

6=NA (I never used the time tracker)

21) How useful were the meeting notes?

1=Useless

2=Not very useful

3=Neutral

4=Somewhat useful

5=Very useful

6=NA (I never used the notes)

22) How useful was the task-tracker/task-list?

1=Useless

2=Not very useful

3=Neutral

4= Somewhat useful

5=Very useful

6=NA (I never used the task-tracker/task-list)

23) What could have been done to improve the administrative aspects of the Fraser investigation?

_____

24) How would you rate the interstate collaboration with regards to data analysis and manuscript production?

1=Very poor

2=Poor

3=Acceptable

4=Good

5=Very good

25) How would you rate the intra-office communication for the data analysis and manuscript production?

1=Very poor

2=Poor

3= Acceptable

4=Good

5=Very good

26) Were there structural barriers to data analysis and manuscript production?

1=Many barriers

2=Some barriers

3=Few Barriers

4=No barriers

27) How fair was the division of labor with regards to data analysis and manuscript production?

1=Very unfair

2=Somewhat unfair

3=Neutral

4=Mostly fair

5=Very fair

28) What could have been done to improve the data analysis and manuscript production process?

_____

29) Approximately how many interviews did you complete?

( ) 0

( ) 1

( ) 2-5

( ) 6 or more

30) How fair was the distribution of call assignments for the worker surveys?

1=Very unfair

2=Somewhat unfair

3=Neutral

4=Mostly fair

5=Very fair

31) Was communication between agencies adequate during the interview process?

1=Inadequate

2=Not quite adequate

3=Neutral

4=Adequate

5=Optimal

6=NA (I was not involved with between agency communications)

32) How adequate were the translation services provided for conducting worker surveys?

1=Inadequate

2=Not quite adequate

3=Neutral

4=Adequate

5=Optimal

6=NA (I did not use the translation services)

33) How satisfied were you with REDCap as a tool for collecting worker survey responses?

1=Very dissatisfied

2=Dissatisfied

3=Neutral

4=Satisfied

5=Very satisfied

6=NA (I did not use the REDCap tool)

34) How clear was the protocol for surveying workers?

1=Unclear

2=Somewhat unclear

3=Neutral

4=Mostly clear

5=Clear

6=NA (I was not aware of the protocol)

35) How clear was the protocol for following up with workers who were difficult to reach?

1=Unclear

2=Somewhat unclear

3=Neutral

4=Mostly clear

5=Clear

6=NA (I was not aware of the protocol)

36) How helpful was the webinar training for REDCap?

1=Not at all helpful

2=Not very helpful

3=Neutral

4=Somewhat helpful

5=Very helpful

6=NA (I did not attend the webinar training for REDCap)

37) What could have been done to improve the process of conducting the worker survey?

_____

38) How useful were the weekly situation reports (Sit Reps)?

1=Useless

2=Not very useful

3=Neutral

4=Somewhat useful

5=Very useful

6=NA (I was not aware of the weekly Sit Reps)

39) If you had to contact DHS during the Fraser investigation, was the response helpful?

1=Not at all helpful

2=Not very helpful

3=Neutral

4=Somewhat helpful

5=Very helpful

6=NA (I did not have to contact DHS)

40) If you had to contact DHS during the Fraser investigation, was the response timely?

1=Not at all timely

2=Not very timely

3=Neutral

4=Reasonably timely

5=Very timely

6=NA (I did not have to contact DHS)

41) Was it clear how you should contact DHS with questions or concerns?

1=Unclear

2=Not clear enough

3=Neutral

4=Fairly clear

5=Totally Clear

42) Did the overall DHS response to the Fraser Shipyard lead exposures meet your needs?

( ) Yes

( ) No

43) Please share at least one thing you believe went well during the investigation.

_____

44) Please share at least one thing you believe could be improved in the event of a similar investigation

_____

45) Do you have additional comments regarding the Fraser Shipyard investigation overall?

_____

APPENDIX B: QUANTITATIVE SURVEY RESPONSES

Status	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Complete	47	81.03	47	81.03
Partial	11	18.97	58	100.00
Frequency Missing = 11				

1) At what organization did you work at the time of the Fraser Shipyard investigation?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Local public health agency (LPHA)	39	58.21	39	58.21
Minnesota Department of Health (MN DPH)	2	2.99	41	61.19
Regional health office	2	2.99	43	64.18
Wisconsin Department of Health Services (WI DHS)	24	35.82	67	100.00
Frequency Missing = 2				

2) Which roles were you involved with in the Fraser Shipyard investigation (select all that apply)	
	Frequency
Part of the Incident Command System (ICS) team or attended ICS meetings (Wisconsin only)	16
Part of the investigation design process	12
Part of the data management process	11
Involved in administrative components (i.e., used the time-tracker, meeting notes, etc.)	10
Part of the data analysis and manuscript production process	9
Assigned workers to call for survey	45

3) Please indicate your perception of the ICS meeting frequency [note scale]:				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Too infrequent	1	6.25	1	6.25
About right	12	75.00	13	81.25
Too frequent	3	18.75	16	100.00
Frequency Missing = 53				

4) How clear were the ICS roles, generally?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not clear enough	1	7.14	1	7.14
Neutral	1	7.14	2	14.29
Mostly clear	4	28.57	6	42.86
Clear	8	57.14	14	100.00
Frequency Missing = 55				

5) How clear was your role on the ICS team?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Unclear	1	6.25	1	6.25
Neutral	1	6.25	2	12.50
Mostly clear	7	43.75	9	56.25
Clear	6	37.50	15	93.75
NA (I did not have a role)	1	6.25	16	100.00
Frequency Missing = 53				

6) How effective was the ICS in addressing the Fraser incident?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Neutral	1	6.25	1	6.25
Effective	9	56.25	10	62.50
Very effective	6	37.50	16	100.00
Frequency Missing = 53				

7) How adequate was the level of staffing on the ICS team?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Inadequate	1	6.25	1	6.25
Neutral	2	12.50	3	18.75
Adequate	13	81.25	16	100.00
Frequency Missing = 53				

9) How would you rate the design of the Fraser investigation?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Poor	1	7.69	1	7.69
Acceptable	12	92.31	13	100.00
Frequency Missing = 56				

10) How would you rate the interstate collaboration with regards to the design of the investigation?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Good	8	61.54	8	61.54
Very good	4	30.77	12	92.31
NA (I was not involved with the inter-state collaboration)	1	7.69	13	100.00
Frequency Missing = 56				

11) How would you rate the intra-office communication during the design of the Fraser investigation?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Acceptable	1	7.69	1	7.69
Good	7	53.85	8	61.54
Very good	3	23.08	11	84.62
NA (I was not involved with intra-office communication)	2	15.38	13	100.00
Frequency Missing = 56				

12) How adequate was the documentation (i.e., protocols and procedures) for the Fraser investigation?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not quite adequate	1	7.69	1	7.69
Neutral	3	23.08	4	30.77
Adequate	7	53.85	11	84.62
NA (I was not aware of the protocols and procedures)	2	15.38	13	100.00
Frequency Missing = 56				

13) How efficient was the process for onboarding LPHAs to REDCap?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Inefficient	3	23.08	3	23.08
Efficient	4	30.77	7	53.85
NA (I was not involved with the onboarding process)	6	46.15	13	100.00

15) How clear was the data management process during the Fraser investigation?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Unclear	1	9.09	1	9.09
Neutral	4	36.36	5	45.45
Mostly clear	3	27.27	8	72.73
Clear	3	27.27	11	100.00
Frequency Missing = 58				

16) How clear was the division of labor with regards to the line lists and data entry?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Neutral	2	18.18	2	18.18
Mostly clear	3	27.27	5	45.45
Clear	5	45.45	10	90.91
NA (I was not aware of the division of labor)	1	9.09	11	100.00
Frequency Missing = 58				

17) Were the processes used for data sharing (within BEOH; with LPHAs and MN) adequate?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Neutral	1	9.09	1	9.09
Adequate	8	72.73	9	81.82
Optimal	1	9.09	10	90.91
6=NA (I was not involved with data sharing)	1	9.09	11	100.00
Frequency Missing = 58				

18) How satisfied were you with access (i.e., version control, shared access) to data and documents (e.g., the line list)?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Neutral	2	18.18	2	18.18
Satisfied	6	54.55	8	72.73
Very satisfied	3	27.27	11	100.00
Frequency Missing = 58				

20) How adequate was the time-tracker?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not quite adequate	1	10.00	1	10.00
Neutral	3	30.00	4	40.00
Adequate	5	50.00	9	90.00
NA (I never used the time tracker)	1	10.00	10	100.00
Frequency Missing = 59				

21) How useful were the meeting notes?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not very useful	1	10.00	1	10.00
Neutral	2	20.00	3	30.00
Somewhat useful	4	40.00	7	70.00
Very useful	1	10.00	8	80.00
NA (I never used the notes)	2	20.00	10	100.00
Frequency Missing = 59				

22) How useful was the task-tracker/task-list?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Somewhat useful	5	50.00	5	50.00
Very useful	3	30.00	8	80.00
NA (I never used the task-tracker/task-list)	2	20.00	10	100.00
Frequency Missing = 59				

24) How would you rate the interstate collaboration with regards to data analysis and manuscript production?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Poor	1	12.50	1	12.50
Acceptable	1	12.50	2	25.00
Good	6	75.00	8	100.00
Frequency Missing = 61				

25) How would you rate the intra-office communication for the data analysis and manuscript production?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Good	3	42.86	3	42.86
Very useful	3	42.86	6	85.71
NA	1	14.29	7	100.00
Frequency Missing = 62				

26) Were there structural barriers to data analysis and manuscript production?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Some barriers	2	25.00	2	25.00
Few Barriers	4	50.00	6	75.00
No barriers	1	12.50	7	87.50
NA	1	12.50	8	100.00
Frequency Missing = 61				

27) How fair was the division of labor with regards to data analysis and manuscript production?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly fair	5	62.50	5	62.50
Very fair	2	25.00	7	87.50
NA	1	12.50	8	100.00
Frequency Missing = 61				

29) Approximately how many interviews did you complete?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	5	12.20	5	12.20
1	11	26.83	16	39.02
2-5	16	39.02	32	78.05
6+	9	21.95	41	100.00
Frequency Missing = 28				

30) How fair was the distribution of call assignments for the worker surveys?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Somewhat unfair	1	2.44	1	2.44
Neutral	9	21.95	10	24.39
Mostly fair	9	21.95	19	46.34
Very fair	22	53.66	41	100.00
Frequency Missing = 28				

31) Was communication between agencies adequate during the interview process?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not quite adequate	3	7.50	3	7.50
Neutral	3	7.50	6	15.00
Adequate	21	52.50	27	67.50
Optimal	1	2.50	28	70.00
NA (I was not involved with between agency communications)	12	30.00	40	100.00
Frequency Missing = 29				

32) How adequate were the translation services provided for conducting worker surveys?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
6=NA (I did not use the translation services)	40	100.00	40	100.00
Frequency Missing = 29				

33) How satisfied were you with REDCap as a tool for collecting worker survey responses?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Neutral	4	10.26	4	10.26
Satisfied	8	20.51	12	30.77
Very satisfied	23	58.97	35	89.74
NA (I did not use the REDCap tool)	4	10.26	39	100.00
Frequency Missing = 30				

34) How clear was the protocol for surveying workers?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Somewhat unclear	1	2.50	1	2.50
Neutral	3	7.50	4	10.00
Mostly clear	14	35.00	18	45.00
Clear	21	52.50	39	97.50
NA (I was not aware of the protocol)	1	2.50	40	100.00
Frequency Missing = 29				

35) How clear was the protocol for following up with workers who were difficult to reach?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Somewhat unclear	3	7.69	3	7.69
Neutral	6	15.38	9	23.08
Mostly clear	8	20.51	17	43.59
Clear	22	56.41	39	100.00
Frequency Missing = 30				

36) How helpful was the webinar training for REDCap?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Neutral	2	5.00	2	5.00
Somewhat helpful	10	25.00	12	30.00
Very helpful	20	50.00	32	80.00
NA (I did not attend the webinar training for REDCap)	8	20.00	40	100.00
Frequency Missing = 29				

38) How useful were the weekly situation reports (Sit Reps)?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not very useful	1	3.23	1	3.23
Neutral	5	16.13	6	19.35
Somewhat useful	12	38.71	18	58.06
Very useful	6	19.35	24	77.42
NA (I was not aware of the weekly Sit Reps)	7	22.58	31	100.00
Frequency Missing = 38				

39) If you had to contact DHS during the Fraser investigation, was the response helpful?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Neutral	1	3.23	1	3.23
Somewhat helpful	2	6.45	3	9.68
Very helpful	28	90.32	31	100.00
Frequency Missing = 38				

40) If you had to contact DHS during the Fraser investigation, was the response timely?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not very timely	1	3.23	1	3.23
Reasonably timely	1	3.23	2	6.45
Very timely	29	93.55	31	100.00
Frequency Missing = 38				

41) Was it clear how you should contact DHS with questions or concerns?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not clear enough	1	3.33	1	3.33
Neutral	2	6.67	3	10.00
Fairly clear	10	33.33	13	43.33
Totally Clear	17	56.67	30	100.00
Frequency Missing = 39				

42) Did the overall DHS response to the Fraser Shipyard lead exposures meet your needs?				
	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	3	9.68	3	9.68
Yes	28	90.32	31	100.00
Frequency Missing = 38				