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Aimee E. Eberly

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An Evaluation of Personal Protective Equipment Used with Local Public Health Employees

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An Evaluation of Personal Protective Equipment Used with Local Public Health Employees

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Executive Summary

Local public health employees dedicate their lives helping residents of their communities live and work in a safe environment. To that end, they often enter situations that put their own personal health and wellbeing at risk. At various times, the media attempts to heighten the public’s awareness about acts of bio-terrorism, the potential for flu pandemics, and the harmful effects of exposure to airborne and skin contaminants. Public health workers face the potential to be exposed without necessarily having specific personal protective equipment (PPE) that relates to the situation they face. The definitions of personal protective equipment vary, but include not just respirators but also gloves, goggles, protective clothing, hats and hearing protection. Without proper training and fitting, personal protective equipment may not fit the employee properly and could potentially cause more harm than good through a false sense of security. Public health administrators need to take steps that ensure not only the wellbeing of the public, but also take measures that ensure the protection of their employees. Personal protective equipment presents limitations that often prevent a public worker from using the devices that were intended to keep them safe. Without proper planning and use, there could be serious ramifications for the affected employee.

The purpose of this study was to survey whether or not local public health departments possessed personal protective equipment, trained employees in the uses of personal protective equipment and followed policy regarding training and use at a local level in the State of Connecticut.

There were three objectives of the questionnaire. The first objective was to
evaluate whether or not local health departments offer training sessions that pertain to employee safety and the adequacy of the training sessions for personal protective equipment. The second objective was to determine the types of personal protective equipment used at the local health department level and the purposes of the intended use. Types of personal protective equipment can vary, possibly leaving public health workers with uncertainty regarding which equipment to use for a specific public health circumstance. The third objective focused on whether or not local health departments had model language policy on personal protective equipment as it related to employee safety.

A questionnaire was developed, mailed and distributed to 82 local health departments. Thirty-two (39%) were returned to the researcher for analysis. In Connecticut there are 49 health departments, which have full time Directors of Health, and 33 health departments, which have part time Directors of Health. The addresses for the local health departments were obtained from the Connecticut Department of Public Health website. (1)

Conclusions from the questionnaire indicate that local health departments within Connecticut need to provide employee education, continued training, and expand on when and how to use personal protective equipment for their public health workers. Results of this survey will be provided to the Connecticut Department of Public Health office of Workforce and Professional Development, supporting the needs for improved policies and procedures by local health departments with respect to personal protective equipment. The following are conclusions and recommendations.

- Define when to use personal protective equipment and what situations
would entail the use of such equipment;

- Implement training programs including refresher training on the use of personal protective equipment.

- Technological changes in equipment need to be reviewed by local health departments regularly to stay current with new regulations and standards as set by government agencies;
Chapter 1
Background

Introduction

Historically, many local health departments have focused much of their resources on environmental health. Environmental health is a broad term, which encompasses areas such as toxicology, epidemiology, food, energy, and disasters.

The Connecticut Department of Public Health began in 1878 when the Connecticut Board of Health was first established. It was not until 1957 that a statute was passed allowing the department to evaluate and monitor for radiation exposure levels, something new to many public health workers.\(^{(2)}\)

With the current focus of many local health departments on disaster response/bio-terrorism several issues were raised based upon interactions with emergency responders that have comprehensive personal protective equipment policies and training:

- lack of money to buy equipment and to replace outdated poorly fitted equipment;
- lack of standardized training;
- accessibility of equipment;
- unified standards regarding what each local health department shall have on hand;
- lack of public policies governing training.
**Personal Protective Equipment (PPE)**

There are many types of personal protective equipment designed for specific hazards and exposure. According to Canada’s National Occupational Health & Safety Resource, “PPE is equipment worn by a worker to minimize exposure to specific occupational hazards. Examples of PPE are respirators, gloves, aprons, fall protection, and full body suits, as well as head, eye and foot protection.”(3)

**Disaster Response**

In the age of bio-terrorism local health workers are one of many stakeholders that contribute to emergency response. Local health departments participate with other town officials in preparation of emergencies and pandemics. Based upon the researcher’s job profession as a Sanitarian in a local health department it has been observed that the primary purpose of purchasing personal protective equipment is for bio-terrorism drills and not for individual public health use and/or for other environmental exposures. The equipment most often purchased for bio-terrorism grants is often limited to gloves, gowns and paper masks. Any skills that public health workers acquire regarding equipment use, usually comes from previous medical professions or schooling. Examples include Registered Nurses, or public health workers who successfully completed an American Red Cross class.

Public health workers face a potential dilemma: either refuse to perform the job duties, or perform the job duties unprotected when no personal protective equipment is available. Instances where personal protective equipment has been provided to public health workers, the devices may not fit properly therefore resulting in the need for fit testing. The Center of Disease Control believes, “the use of any
type of personal protection equipment requires adequate training. The overall goals of training are to protect the wearer from physical hazards (biological, chemical, radioactive) and to prevent injury from improper use or equipment malfunction.\textsuperscript{(4)}

Many agencies who participate in local drills such as fire departments and police are first responders who received training on how to use specific equipment. For example, the Connecticut State Police has trained officers on how to use their field protective masks. Additionally, officers learn how to change the canisters for different types of exposures.\textsuperscript{(5)}

Availability of proper safety equipment has implications for ensuring adequate staffing in disaster situations, such as with sudden acute respiratory distress syndrome (SARS) outbreak\textsuperscript{(19)} Qureshi, Gershon, et al, found, in relation to the public health response to an unconventional missile attack, that although 42\% of respondents were willing to report to work, the percentage would increase to 86\% if personal safety measures were provided.\textsuperscript{19} The uncertainty of public health workers in reporting to work during a hazardous situation can be a concern for not only supervisors or Directors of Health, but for the public. The public relies on protection and guidance during a hazardous event from public health workers and local health departments. Recommendations made by Qureshi, Gershon et al note, “the most effective method to allay fears and concerns for personal safety revolve around health care workers education, provision of appropriate PPE, and assurance of effective environmental controls.”\textsuperscript{(19)}

\textit{Environmental Health}

Public health workers may find themselves in circumstances such as
emergency drills or environmental and public situations. For example, public health workers may perform site visits to detect mold or respond to a housing complaint and are asked to determine if a home is unsanitary, perhaps necessitating use of respirators. The New York Committee for Occupational Safety and Health explain that, based on OSHA standards “when PPE is used the employer must train workers who use PPE and that training must cover the following:

- When PPE is necessary;
- Which PPE is necessary;
- How to know if it fits properly;
- How to put on, remove, adjust and wear PPE;
- How to dispose of PPE;
- The limitations of using PPE.”

“PPE is used to reduce or minimize the exposure or contact to injurious physical, chemical, or biological agents. A hazard cannot be eliminated by PPE, but the risk of injury can be eliminated or greatly reduced.” Training should be done prior to deployment of any equipment. Burke, Sarpy et al explain that most training interventions lead to positive effects on safety knowledge, adoption of safe work behaviors and practices, and safety and health outcomes. They further explain safety and health training strategies and inclusion criteria for training programs. The more engaging training programs on worker safety, the more effective the outcome. The National Institute for Occupational Safety and Health states: “Respirators have been used for many years in the workplace, where employers have programs to make sure the proper masks are selected and that the respirator fits. The goal is to
avoid unintended problems that might occur through lack of understanding or a false sense of security.” (8) Policy and procedures regarding training programs on personal protective equipment for local health departments need implementation and documented consistency throughout each local health departments throughout the State of Connecticut.

Occupational Safety and Health Administration

“Section 5(a)(1) of the OSHA Act, often referred to as the General Duty Clause, requires employers to “furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.” (9) Section 1910.32(a) states “protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.” (9)

Respirators

Given the regular use of respirators for diverse public health situations, standards and policies need to be developed so that all workers remain safe. Alfano-Sobsey, Kennedy et al note that local health department employees have been restricted on what or how respirators could be utilized. Many respirators used
at the local health department level were for the prevention of tuberculosis cases. "Historically, local health departments have not had extensively developed respiratory-protection. For most local health departments, either no such programs were in place or the programs focused only on protection of tuberculosis." (10) A training program that was created by the North Carolina Public Health Preparedness and Response team along with industrial hygienists, in the Alfano-Sobsey, Kennedy et al study focused on the development of a program that would implement the use of respiratory protection for local health departments.

"To date, more than 1,400 North Carolina health department employees have been tested for respirator use and have received training in all aspects of respiratory protection." (10)

Standardized policy would enable public health workers from one local health department to work collaboratively with another in either an emergency circumstance, or even a regular work day. New public health workers employed by local health departments would need to acquire and successfully complete the training program prior to commencing any fieldwork.

Definition of Terms

- Director of Health- a leader of a local health department or regional health district in Connecticut who has been approved by the Connecticut Commissioner of Public Health.

- Local Health Departments (LHD) - a "governmental agency, which is in whole or in part responsible to a sub-state governmental entity or entities (e.g., a city, county, borough, township). A local health department employs one or
more full-time professional public health employees (e.g., public health nurse, sanitarian), delivers public health services (e.g., immunization, food inspection), serves a definable geographic area, and has identifiable expenditures and/or budgets in the political subdivision(s) it serves.” (11)

- Personal Protective Equipment (PPE) - "equipment worn by a worker to minimize exposure to specific occupational hazards. Examples are respirators, gloves, aprons, fall protection and full body suits, as well as head, eye and foot protection. Using personal protective equipment is only one element in a complete safety program that would use a variety of strategies to maintain a safe and healthy occupational environment. Personal protective equipment does not reduce the hazard itself nor does it guarantee permanent or total protection.” (3)

- Public Health Worker- employee of a local health department who works for the betterment of the community and environment and specializes in public health.

- Respirator- “any device designed to provide the wearer with respiratory protection from inhalation of a potentially hazardous atmosphere”. (12)
Chapter II
Literature Review

Historical and General Background

"Historically, local health departments have not had extensively developed respiratory-protection. For most local health departments, either no such programs were in place or the programs focused only on protection against to tuberculosis. New respiratory threats have surfaced, which could affect the health of LHD employees." (10)

Infectious Diseases and Terrorism

As new environmental hazards emerge such as SARS, aerosolization of bio-terrorism agents, small pox, or even anthrax, public health workers need sufficient protection and training on personal protective equipment. As Homeland Security mandates continue to emerge, Directors of Health face important challenges in keeping not only their selected communities safe, but also their public health workers and staff safe from created hazards. "A hazardous material is any substance that is potentially toxic to a biologic system. This definition not only includes chemicals, but also biologic and disease-causing agents. (OSHA), which requires employers to implement safety policies and to provide training and personal protective equipment to all employees potentially exposed." (14) "Much has been published on the general principles of questionnaire development and qualitative evaluations of the questionnaires; however, little information is available that specifically addresses questionnaires focusing on occupation." (17) Many research studies present data on
public health workers' ability to respond to public health emergencies and the reasons why respondents might not answer to a hazardous circumstance. Research suggests that most public health workers would not report to work if a hazardous event such as a pandemic were to occur even in extreme scenarios. \(^{(18)}\) This creates a problem for Directors of Health when a staff shortage occurs and public health workers are needed for a pandemic or other emergency. Additionally, with the possible shortage of public health services, responses to community needs become compromised. “Local health departments are considered the backbone of public health response plans for any and all infectious disease outbreaks.

OSHA makes available educational resources to assist in hazards and solutions in the workplace, which could be applied to local health departments. Statistics show that “Everyday an estimated 1,000 eye injuries occur in American workplaces. The financial cost of these injuries is enormous-more than $300 million per year in lost production time, medical expenses, and workers compensation.” \(^{(15)}\)

“Any worker required to wear PPE shall receive training in the proper use and care of PPE. Periodic retraining shall be offered by OSHA to both the employees and the supervisors, as needed.” \(^{(16)}\) General training on the use of PPE is the responsibility of the employer under OSHA 29 CFR 1910.132, “the employer must train the employee who is required to use PPE so that he or she knows

- When PPE is necessary;
- What PPE is necessary;
- How to on, off, adjust, and wear PPE properly;
- The limitations of PPE;
- The proper care, maintenance, useful life, and disposal of PPE.\textsuperscript{(12)}

\textit{Construction Hazards}

Public health workers are responsible for enforcement of codes such as the Connecticut Public Health Code. Given enforcement responsibilities public health workers are obligated to inspect and perform duties on many construction sites. “Head protection will be furnished to and used by, all employees and contractors engaged in construction and other miscellaneous work. Head protection is also required to be worn by engineers, inspectors, and visitors at construction sites when hazards from falling or fixed objects or electrical shock are present.”\textsuperscript{(16)} Having the correct types of personal protective equipment available and maintaining the equipment is important for the safety of the public health worker and environment. “It is important that all PPE be kept clean and properly maintained. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision. PPE should be inspected, cleaned, and maintained at regular intervals so that PPE provides the requisite protection.”\textsuperscript{(16)} Noise, smoke, slips and falls represent other public health worker hazards associated with construction sites, such as evaluating soil conditions in test pits for sanitary systems (Public Health Code section 19-13-B103e (d)).\textsuperscript{(21)} Although OSHA regulations require that Registered Sanitarians only go down to a depth no more than four feet, the potential exists for trench undermining, objects such as rocks and boulders to tumble into the trench. Such hazards may indicate the need for hard hats and proper foot protection.

\textit{Lead}
Lead exposure for many public health workers is usually associated with lead paint. Homes built prior to 1978 are potentially likely to contain lead based paint and public health workers are responsible for enforcement of the required abatement. Many local health departments employ a lead inspector who has the responsibility of providing community education as well as perform follow up on elevated blood levels found in children. Personal protective equipment most likely to be worn would be gloves, masks and boots.

Pesticides, Fertilizers and Tickborne Disease

Trichloronate a pesticide used in farming and feed additives could be a potential occupational exposure to public health workers. Regardless of where pesticides appear, in water or on land, the public health worker has the potential for exposure. Water sampling and testing for these types of contaminants would give the public health worker the potential for exposure during testing. Soil sampling on a field that has been farmed over the centuries during a Phase II Assessment might show a historical use of pesticide and fertilizer containment. Personal protective equipment that could be used to minimize exposure would be boots and gloves.

A public health worker whose primary job is performing field inspections has the potential for exposure to tickborne disease. While precautionary measures typically involve approaches other than personal protective equipment such as using deet spray, wearing light color clothing and checking arms and legs for ticks, appropriate forms of personal protective equipment such as boots and long pants can also be useful.
Influenza Pandemics

An influenza pandemic is considered increasingly likely, and is now considered one of the most significant and urgent threats to the nation’s public health preparedness infrastructure.” (18) Balicer et al, recommends that “efforts must be directed at ensuring that all local public health workers, but most notably non-clinical professional staff, understand in advance the importance of their role during an influenza pandemic-otherwise they will fail to show up when they are most needed.” (18) Preparedness drills for public health emergencies are an important aspect in preparing public health workers for situations that would require the use of personal protective equipment. Training programs must occur prior to preparedness drills and public health workers need to participate allowing for sufficient preparation for the use of personal protective equipment. (18) Essential types of personal protective equipment for influenza pandemics includes respirators and, potentially, safety goggles, smocks, and safety boots.

Dangers of Public Health

Public health workers’ have wide-ranging responsibilities and duties, which are extensive and can include anything from providing inspections and working out in the field to dealing with local housing complaints. According to researchers “violence was declared a public health emergency in 1992 and we have found that violent threats and incidents are commonly made by clients to public health field workers” (20) which can be a Sanitarian. While there is a wide range of hazards and a variety of approaches for protecting public health workers, personal protective equipment is not always a preferred method. Personal protective equipment will
assist public health workers in protecting themselves, but other safety concerns are preferred to avoid or engineer out hazards, and related policy and procedures. Some hazards, such as violence, are significant hazards (for example, a Texas study found 139 (38%) public health workers reported 611 violent incidents, an average of 4.4 incidents per worker exposed to violence.\(^{(20)}\), but solutions are more procedure based rather than PPE.

On the date of hire for each new employee, a statement regarding worker safety and the necessity of all field work to be evaluated individually for hazardous circumstances should be written by the Director of Health then presented to the public health worker for signature. According to authors Cox and Borgias “The employer must verify that each affected employee has received and understood the required training through a written certification that

- Lists the name of each employee trained;
- Indicates the date(s) of training;
- Identifies the subject of the certification.”\(^{(13)}\)

For an effective plan on safety in the workplace and the use of PPE, authors Cox and Borgias suggest the following;

- “A risk assessment methodology for selecting the PPE;
- An evaluation of other control options to protect the worker;
- PPE selection criteria and procedures;
- PPE performance criteria;
- User training requirements;
- PPE storage, maintenance, and decontamination requirements;
- Auditing or program re-evaluation procedures”\(^{(13)}\)
**Climate Exposure**

Public health workers need to protect themselves from weather conditions. "Extreme environmental temperatures can cause heat or cold stress. Common heat disorders may include heat cramps, heat exhaustion, and heat stroke. Cold stress can cause hypothermia and frostbite." (13) Many public health workers are not provided protective clothing for the climate or for climate changes in which they work. The responsibility is left to the public health worker to purchase the protective clothing for the exposure and can be costly depending on the type of thermal protection that might be needed. Foot protection is often a requirement of local health departments when working out in the field to protect the worker from falling objects, and or sharp surfaces such as on a construction site. "OSHA 29 CFR 1910.132 has general requirements for the employer to protect workers from hazards that have a potential for causing injury to the foot. OSHA 1910.136 has detailed requirements regarding occupational foot protection." (13) Again, the responsibility is left to the public health worker to purchase the equipment not the local health department.

**Nosocomial Infections**

Gamage, Moore et al found that "failure to implement appropriate barrier precautions is responsible for most nosocomial transmissions. However, the possibility of a gradation of infectious particles generated by aerosolizing procedures suggests that traditional droplet transmission prevention measures may be inadequate in some settings. Further research is needed in this area." (25) Using
personal protective equipment, as an infection control measures would lessen the exposure and transmission of infectious diseases.\textsuperscript{(24)} The study asked participants to choose from a list of personal protective equipment that would be needed for different exposures. Gamage, Moore et al found “surgical masks versus respirators was a subject of much controversy during the SARS crisis and several articles describing outcomes with these protective items were published.”\textsuperscript{(25)} “Mask usage was significant in the multivariate analysis (P=.0001); however, there was no difference in risk of infection whether health care workers were using surgical masks or N95 respirators.”\textsuperscript{(25)}

\textit{Mold and Bioaerosols}

Public health workers assist many agencies with public health emergencies such as with the aftermath of hurricanes Katrina and Rita. The outcomes led many public health agencies to assess their action plans for public health emergencies. Health outcomes relating to mold and exposure levels were evaluated by researchers and found to be a concern. Visual inspections and moisture assessments were completed after both hurricanes. Brandt, Brown, et al state “a visual inspection is the most important step in identifying possible mold contamination. The extent of any water damage and mold growth should be visually assessed. This assessment is particularly important in determining remedial strategies and the need for personal protective equipment for persons in the contaminated area.”\textsuperscript{(26)} In this study the researcher evaluated the need for personal protective equipment with exposure to mold and the type of personal protective equipment that is often chosen by public health workers.
Types of personal protective equipment that are used among respondents vary with access to the personal protective equipment, exposure to hazardous conditions, and training. Interpretation of which personal protective equipment would best be used in an emergency circumstance may lead public health workers to misuse equipment or not utilize the most appropriate equipment. Guidelines and standards from OSHA and NIOSH recommend that personal protective equipment should be worn in spite of control measures implemented by other agencies.

"Workers should wear PPE regardless of the engineering controls used, especially for skin and eye protection. Primary functions of PPE in a mold-contaminated environment are prevention of the inhalation and ingestion of mold and mold spores and prevention of mold contact with skin or eyes."

A survey completed by an assessment team from the Center for Disease Control evaluated the type of PPE that was used among residents after hurricanes Katrina and Rita. With the types of PPE that were evaluated the team also assessed the reasons why PPE were not used and the accessibility of the PPE among local health departments. 159 residents were interviewed by the Center for Disease Control and found that "reasons for not using respirators included discomfort (10 [21.7%] respondents) and lack of availability (10 [21.7%])."
Research Methodology

The primary focus of this study was to describe the proportion of public health worker and access to personal protective equipment and adequate training with mandatory updates on equipment and techniques. To evaluate the need for personal protective equipment researchers found that “Questionnaires are increasingly being used in the workplace to assess exposures to chemicals and other agents.” (23) Questionnaires can be used to evaluate various types of working conditions as well as health effects from possible exposures in the work environment.

Eighty-two local health departments from Connecticut were asked to participate in this study. The eighty two local health departments were identified by a list obtained from the Connecticut Department of Public Health’s website which provides the names of all Directors of Health, names and their respective towns or districts in Connecticut. In the current research study, participants consisted of public health workers who have a degree in public health or who had training in public health and who work for a local health department or district in Connecticut. Directors of Health who are part time, or who work in more than one town in Connecticut were sent a questionnaire for each town he or she represents.

The questionnaire asked for the occupation of the respondent completing the survey to allow comparison between occupations. The purpose of the study was to evaluate the responses of the person completing the questionnaire and compare
their responses from one occupational category to another, for example, a Director of Health completing a questionnaire verse an Administrative Assistant, as well as to evaluate the need for personal protective equipment within local health departments.

A Public Health Staff Safety and Health Questionnaire was developed and contained nine questions focused on personal protective equipment, hazards that would require its use, training opportunities, and policy and procedures at the local health department level. For each given exposure the same types of personal protective equipment were listed for consistency. It should be noted that respondents of the questionnaire were able to answer more than one type of personal protective equipment for each exposure.

The questionnaire was sent to the Directors of Health on October 13, 2006 and was made available until November 13, 2006. This questionnaire can be found in Appendix 2. An email was sent on November 7, 2006 to Directors of Health as a prompt that the questionnaire was due on November 13, 2006. Participants of the questionnaire were asked to respond to categories of potential exposures such as the following:

- Lead;
- Pesticides & Fertilizers;
- Mold;
- Tickborne Disease;
- Infectious Diseases;
- Noise;
- Smoke;
- Slips and Falls;
• Chemical Hazards;
• Radiation;
• Pests & Rodents;
• Tuberculosis

Respondents were then asked to check a box for the type of personal protective equipment that would be needed for the potential exposure, if training on the personal protective equipment for the exposure had been given, and the local health department had the personal protective equipment.

The researcher developed questions similar to “Survey on Respiratory-Protection Preparedness Training” (13) and evaluated submitted responses. An introductory letter included in Appendix 1 was attached with the questionnaire describing requirements for completion.

Data analysis was conducted utilizing Microsoft Excel. The questionnaire and questionnaire cover letter were approved by application to the University of Connecticut Institutional Review Board. Data results were kept secure for research integrity purposes.

**Questionnaire Development**

Since an established and tested questionnaire on the topic of interest was not available, the questionnaire was developed by the author. The questionnaire went through expert review and pilot testing from four University of Connecticut advisors, one Department of Public Health epidemiologist, one staff member from the Connecticut Association of Directors of Health, and one Sanitarian from the Farmington Valley Health District to ensure face validity and interpretability.
Chapter IV

Results

Response Rates

Eighty-two questionnaires were sent out to local Directors of Health and 32 were returned for an overall response rate was 39%. Respondents consisted of 17 Directors of Health (53%), 8 Sanitarians (25%), 4 other (13%) and 3 (9%) who did not respond to the question. Responses from the “Other” category consisted of Bio-Terrorism Coordinator, Assistant Director of Health and Public Health Emergency Response Coordinator. Bio-Terrorism Coordinator or Public Health Emergency Response Coordinator created position, which can be found in many local health departments since September 11th.

Fig. 1. Respondents job titles (n=32)
Data Findings

The first objective was to evaluate whether or not local health departments offered training sessions that pertained to employee safety and the adequacy of the training sessions for personal protective equipment. (Questions three and six) Question three states, "does the local health department have regular on going training opportunities for staff on personal protective equipment with periodic refresher courses?" Sixteen respondents (47%) reported some training and 12 (35%) reported no training.

![Fig. 2 Availability of training on personal protective equipment (n=34).](image)

In reference to whether or not the local health department encourages staff to attend personal protective equipment training opportunities, 1 (3%) responded that their local health department provided incentives for additional training. Twelve (35%) of respondents reported paid time off for training opportunities, while 4 (12%) receive
only recognition for completing a training program. Nine (26%) of the respondents reported their local health department provided no material support. Eight (24%) mentioned other incentives including the following:

- Part of the work day or overtime is offered if after hours;
- If included in other training opportunities;
- Town sponsored only;
- If onsite of employment;
- Attended only during normal work hours;
- We do not have a need;
- Local health department oversees town-wide employee health and safety program;
- Staff has not been universally trained.

The results from question three also indicate that out of the 47% (16) respondents who answered “some training” also received paid time off for the training on personal protective equipment. The number of respondents who felt that there was no encouragement of staff to attend personal protective equipment training opportunities and that personal protective equipment training is included in other trainings at the local health department provided these responses in the “other category”.
Question nine asked, “is the Local Health Department staff trained and have they been fit tested if respirators are to be used?” Question nine pertained to objective one, where as objective three addresses question eight. Question eight reads, in the event of an emergency or outbreak is the local health department prepared with enough quantities of personal protective equipment? Objective three focused on the development of model language for local health departments and policy on personal protective equipment as it related to employee safety.
Fig. 4. Percentages prepared for an emergency or outbreak (n=35).

Forty three percent (15) of the response felt that local health departments were prepared in an emergency situation or outbreak and that their respective departments possessed enough personal protective equipment. Forty six percent (16) replied that they did not have enough quantities of personal protective equipment and 11% (4) responded that they were unsure.
Sixty five percent (11) of respondents reported they were trained on personal protective equipment and have been fit tested for respirators. Twenty four percent (4) have not been trained in the event of an emergency or outbreak for personal protective equipment. Twelve percent (2) of respondents were not sure. Results from question 9 were determined based upon the entire sample.

The second objective of the study was to determine the types of personal protective equipment used at the local health department level and the purposes of the intended use. Question five approached exposures that respondents would possibly be exposed to at their place of employment and the type of personal protective equipment that might be used with the exposure as well as if the local health department provided necessary personal protective equipment. Figure 6 displays the number of responses for the types of hazards listed in the questionnaire.
that might cause a public health worker to need personal protective equipment. The three most common hazards reported were lead (25), mold (21) and tickborne disease (20).
| Lead Infectious Diseases Tuberculosis Tickborne Disease Slips and Falls Mold Noises Pests and Rodents Pesticides and Fertilizers Smoke Chemical Hazards Radiation |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 16 | 12 | 12 | 12 | 8 | 6 | 6 | 6 | 6 | 4 |

*Fig. 6. Personal protection equipment training.*
Respondents were asked to describe the type of personal protective equipment they would utilize in an exposure scenario. The following were the given types of personal protective equipment:

- Gloves;
- Respirators;
- Safety goggles;
- Smocks;
- Safety boots;
- Hearing protectors;
- None of the above;
- Other

For exposure to mold, 15 (71%) of respondents felt that they would use respirators while 14 (67%) would use gloves.

![Bar chart showing types of PPE used by respondents for mold exposures (n=21).]

Fig. 7. Types of PPE that are used by respondents for mold exposures (n=21).
The questionnaire results indicated that (92%) 23 of respondents would use gloves as a type of personal protective equipment for lead exposure, (48%) 12 would use a type of respirator for protection, (28%) 7 would use safety goggles and (20%) 5 of respondents would use some other type of personal protective equipment. The “Other” category included hand washing, protective clothing, radiation badges (radiation badges are used for monitoring exposure to radiation from using a measuring device such as an XRF unit to determine if lead based paint exists, although they are not a type of personal protective equipment) and coveralls.

![Fig. 8. Lead Exposure Data, (n=25) respondents reported the following use of PPE.](image)

Four respondents (100%) felt that gloves would be used for pesticide and fertilizer exposure. Two (50%) responded that they would use safety goggles, safety boots and other forms of personal protective equipment.
Twenty (100%) of respondents chose the “none of the above” category for the type of personal protective equipment that would be used for tickborne disease. Twelve (75%) chose the “Other” category and respondents used deet spray, repellents, and instruments for handling the ticks, protective clothing, visual inspections and tick spray as a form of personal protective equipment. An assumption could be made in which gloves at 6 (30%), as a type of personal protective equipment would be used for removing the tick from the located area. One (14%) of respondents believed smocks would be a type of protective clothing utilized.
Infectious disease exposure had a significantly high response from respondents in which various types of personal protective equipment would be utilized. With respect to exposure of infectious diseases, respondents would use the following:

- gloves: 14 (87%);
- respirators: 15 (94%);
- safety goggles: 8 (50%);
- smocks: 7 (44%);
- safety boots: 3 (19%).

Only 2 (6%) of respondents answered the category none of the above. A few respondents provided comments on this exposure. Some stated that the exposure was broad and that types of personal protective equipment that were listed in the
questionnaire would depend upon the type of infectious disease.

![Bar chart showing PPE use for different reasons.](chart)

**Fig. 11. Infectious Disease Data, (n=16) respondents reported the following use of PPE.**

On construction sites public health workers are frequently exposed to excessive noise by equipment usage. Five (71%) of respondents would use hearing protection and 1 (14%) would use safety boots. Two (29%) respondents would use “none of the above” for noise exposure at the site of investigation. Data showed that 1 (14%) of respondents would use safety boots. This was of a curiosity to the researcher and feedback would be needed on why respondents would use safety boots as personal protective equipment for noise exposure. An assumption could be made that noise exposure occurs on construction sites and other job settings where respondents would wear safety boots.
This researcher as a possible exposure selected smoke exposure for a public health worker who might participate in a terrorism event or drill. Smoke exposure might consist of a limited occurrence for many respondents compared to slips and falls, as Figure 14, shows which might occur more frequently. Five (71%) of respondents would use respirators while four (57%) would also use safety goggles. Three (43%) of respondents would use safety boots and gloves for smoke exposure. This researcher anticipated a high percentage of respirators, but did not anticipate (29%) 2 for smocks. An explanation of this percentage could possibly suggest that protective clothing would be more appropriate as a classification of personal protective equipment.
Fig. 13. Smoke exposure data, (n=7) respondents reported the following use of PPE.

Public health workers are susceptible to slips and falls while in a test pit, or surrounding work area. Seven (54%) of respondents felt that safety boots would be used as a type of personal protective equipment in the field. Three (23%) answered that they would use none of the above.
Figure 15 illustrates that 7 (87%) of respondents felt that respirators would be used for a chemical hazard exposure. Similar to smoke exposure, Figure 14 shows a higher percentage in respirator use. This analysis would indicate that respondents felt that a chemical exposure would be more likely due to an inhalation of a chemical pathway verses an absorption pathway. Results show 5 (62%) respondents would use gloves and 4 (50%) would also use safety goggles and safety boots for personal protective equipment. A majority of respondents felt that they would use either a N95/P100 disposable respirator or a cartridge respirator depending on the type of chemical exposure.
Radiation exposure, which was not specified in the questionnaire as to the type, left responses open for interpretation. Three respondents (75%) felt that they would use another form of personal protective equipment than what was listed in the questionnaire. The “Other” category, several respondents indicated a radiation badge would be used. It should be noted that this was a response in the “Other” category for lead exposure. Figure 8 represents lead exposure.
Pest and rodent exposure might be more frequent in health departments that are located in urban areas compared to health departments located in suburban areas. Ten (62%) respondents felt that they would use gloves, while 6 (37%) responded that they would use safety boots. The assumption could be made that respondents might use gloves as personal protective equipment from the pest and or rodent and safety boots as foot protection.
Public health workers might experience an exposure to tuberculosis when providing community health programs targeted at a specific population that has been exposed or when conducting a follow up from a communicable disease report form. Data from respondents indicated that 14 (87%) would use respirators and 12 (75%) would use gloves. Results varied from respondents on the type of respirator that would be used.
Fig. 18. Tuberculosis data, (n=16) respondents reported the following use of PPE.

For each exposure given in the questionnaire respondents were asked the following questions:

- Have you been trained on personal protective equipment for this exposure?
- Does the local health department have the personal protective equipment?

Nineteen percent of respondents for lead stated that they had the personal protective equipment, which would have a positive correlation with lead being the highest exposure. Thirteen percent of respondents answered that they had personal protective equipment for exposures of tickborne disease and tuberculosis. In response to tuberculosis only 16 of the respondents completed that they were exposed but yet percentages indicate that 13% have the necessary personal
protective equipment. For radiation exposure, 0% showed that local health departments failed to provide the necessary personal protective equipment. The researcher found these percentages of personal protective equipment within the local health department to generate concern given the percentages of exposures varied.
Figure 19: Availability of Personal Protective Equipment by exposure.
As Figure 19 shows the percentage of personal protective equipment that local health department's posses, while Figure 21 indicates the training on the personal protective equipment for the given exposure. It should be noted that not all exposures have responses for training on personal protective equipment. Lead exposure had the highest percentage for respondents who answered yes to being trained on personal protective equipment.

Question four targeted local health departments that respond to more than site investigations. Lead paint abatement projects, Brownfield or Superfund sites were examples that were used to determine the type of exposure that some public health workers might experience at their place of employment. “Does the local health department staff assist in any type of abatement and or cleanup investigations?” Fourteen (39%) of respondents answered yes to participating in abatement and or cleanup investigations, while 22 (61%) respondents answered no.
The third objective of this study focused on the development of model language for local health departments and policy on personal protective equipment as it relates to employee safety. Question two asked, “does the local health department have written policy or procedures for staff on using personal protective equipment such as what equipment to use and when it is to be used?” Ten (30%) respondents answered yes and 23 (70%) responded no when asked about written policy and procedures for personal protective equipment.
Question seven stated, “do you feel that personal protective equipment works?” Four respondents (12%) felt that personal protective equipment worked all of the time, 10 (29%) felt that some of the time personal protective equipment works, 16 (47%) said that it depends on what type of personal protective equipment is being used and 4 (12%) were not sure. The conclusion could be made that respondents felt that personal protective equipment works only with adequate training.

Additional comments and feedback from the questionnaire consisted of the following from respondents:

- job description for sanitarians are needed;
- questions only pertained to environmental exposures;
• ancillary supplies for an emergency clinic have been purchased but needed quantity may cause rapid depletion of supplies prior to receipt of "push pack";
• part time health departments need to join a district due to few assets;
• a specific health department completed written worker safety program, training for blood borne pathogens, airborne pathogens, basic first aid, CPR, AED and renewed annually because Director of Health is a trained instructor;
• survey appears to be geared towards communicable disease not field sanitarians;
• local health departments do not provide adequate or any safety training using personal protective equipment, and do not have adequate personal protective equipment for exposures in safety hazards;
• staff need training on personal protective equipment but most of what we do and how we respond will not put staff in harm's way, with exception of a small proportion of staff;
• routine involvements with knowledge of work practices for type of involvement generally don't require personal protective equipment exposure. We have and are trained for the unusual, but in routine operations use mostly gloves;
• one concern has been providing personal protective equipment may give someone the impression that they are protected and should place himself/herself in a situation when the best response is to go to
Chapter V
Summary, Conclusions, Recommendations

Summary

The field of public health changes frequently with new emerging infectious diseases and bio-terrorism concerns. Public health worker responsibilities need to be adjusted to the new concerns and require changes in personal protective equipment. Proper use of personal protective equipment requires the proper equipment, proper fit, proper training and updated polices.

Public health workers often do not participate in the actual hands on abatement project for example with mold, but do provide an inspection of completion of work for the abatement; however prior to the abatement an inspection is conducted to determine if mold spores are present. In order to ascertain the nature and extent of the contamination, respondents consider the following: location of mold growth, the time in which mold has been present, and the presenting environment which supports the growth, all are criteria that are used by respondents in evaluating circumstances, therefore determining a public health nuisance.

Public health workers possess first hand knowledge of potential exposures in which they work. Of the hazards surveyed, the areas that respondents thought were most prevalent were lead exposure, infectious diseases, tickborne disease and mold and the least prevalent were radiation, smoke and pesticides and fertilizers.

Twenty-five (25) respondents felt that lead was a hazard. Out of the 25
respondents, 23 felt that gloves were a type of personal protective equipment that would be utilized and 12 respondents felt that respirators would be used. Although gloves are used as a type of personal protective equipment, they are also used during sampling to prevent contamination of the sample. Twenty respondents felt that local health departments had the appropriate personal protective equipment why 5 respondents answered no.

Sixteen (16) respondents reported using personal protective equipment for infectious diseases. Fourteen (14) respondents would use gloves and 15 respondents would use a respirator. The questionnaire did not specify the types of infectious disease therefore respondents had to assume any type. Thirteen (13) respondents stated that the local health department had the personal protective equipment for infectious disease exposure while 2 did not.

Twenty (20) respondents felt that exposure to tickborne disease was a hazard. Out of the 20 respondents 12 reported that they would use another type of personal protective equipment that was not provided in the questionnaire. Most responses in this category were the use of deet spray, which would not be defined as a type of PPE, although it does reduce the hazard. Six (6) respondents would use gloves as a form of personal protective equipment for this hazard. Glove use may be in reference to removing a tick, not necessarily as a form of personal protective equipment for the hazard. Thirteen respondents stated that the local health department had the personal protective equipment for the hazard and 5 did not.

As in lead exposure, glove and respirator use are the types of personal
protective equipment that would be used for mold. Twenty-one respondents felt that mold was a hazard and 12 felt that the local health department had the personal protective equipment.

As radiation exposure was not as prevalent, only 4 respondents felt that radiation was a hazard. Three respondents would use another form of personal protective equipment. Five respondents felt that the local health department did not have the personal protective equipment for radiation and none felt that the local health department had personal protective equipment.

Only 5 respondents would use a respirator as a type of personal protective equipment for smoke exposure. Public health workers do not typically respond to fires as one of their job responsibilities, but smoke exposure might occur on construction sites, restaurants, or other situations. Four respondents felt that the local health department had the personal protective equipment available while 3 did not.

Another low-prevalence hazard was pesticides and fertilizer exposure, showing only 4 responses. Four respondents would utilize gloves as a form of personal protective equipment. Four respondents felt that local health departments had the appropriate personal protective equipment while 3 did not.

Training was most commonly available for lead, tickborne disease and infectious disease, which was similar to responses for personal protective equipment. Of the low-prevalence hazards, respondents reported that they had no training for pests and rodents, mold, and slips and falls. Although tuberculosis and lead had a high number of respondents who reported having training on
personal protective equipment (10 and 18 respectively), it should be noted that there were still 25% and 37% respectively who reported those were hazards but did not have training. We can conclude that there remain training gaps even for well-known hazards.

Knowledge of these results could assist local health departments and Directors of Heath in policy development at a local level in which worker involvement is important. Funding for training opportunities must become a part of annual town and agency budgets, with exploration of sources for grant money.

The purpose of this survey was to explore whether or not there was a need for training on personal protective equipment at local health departments and if currently public health workers were correctly utilizing personal protective equipment for hazardous conditions. Given the results of this study local health departments could implement more training on personal protective equipment as well as create standardized policies and procedures.

Conclusions

The data reviewed by the researcher on responses submitted from the questionnaires indicated that there is a need for increased personal protective equipment and training on exposures in local health departments. The questionnaire showed a need for clarification on the types of personal protective equipment that would be required for an identified exposure. Radiation badges as a type of personal protective equipment for lead and radiation exposure are an excellent example of the need for clarification and education between prevention and protection. Radiation badges are not a type of personal protective equipment.
Standardizing policy and procedures among local health departments on personal protective equipment require more attention and development.

During the research and collection of data, the researcher assumed that many local health departments had created policy and procedures regarding personal protective equipment as a result of September 11th. Local health departments have been required to develop small pox plans as well as pandemic plans and even collaborate with other agencies on public health drills. Training opportunities have been provided from governmental agencies and even state agencies, but limited opportunities have been provided to public health workers on the proper use and maintenance of personal protective equipment. The perception that public health workers had training on personal protective equipment due to the requirement for planning of bio-terrorism events was not supported. Closer examination of data indicated that training on personal protective equipment within local health departments is necessary, and the questionnaire results support these findings.

**Recommendations**

Should the local health department require public health workers to be trained on personal protective equipment for specific exposures? Data revealed that local health departments should develop policy and procedures for public health workers when exposures to hazards exist. The researcher makes the following recommendations:

- Educating public health workers prior to the exposure on when to use
personal protective equipment rather than after would lessen or possibly reduce the chances of an unwanted exposure from occurring;

- Given that personal protective equipment is universal, Directors of Health should develop policy and procedure for the use and type of personal protective equipment at their health department;

- Routine training opportunities should be available for public health workers to attend and offered by a state agencies or companies who manufacture purchased equipment;

- Purchasing personal protective equipment in bulk to possibly reduce costs;

- Investigate grant opportunities and funding opportunities;

- Collaborative training programs between local health departments;

- Evaluate current programs on exposures and hazards.

- Provide opportunities for updates of any pending certifications.

- Allow public health workers to renew basic classes such as first aid and safety.

Findings suggest that regulation development is needed at the local level. There is little regulation on when to use safety equipment for public health workers; OSHA regulations dictate the employer's responsibility to provide equipment where hazards exist, but the regulation is performance-based and so does not address specific scenarios or when to use personal protective equipment. This is a disadvantage for public health workers who are subjected to hazardous situations requiring personal protective equipment. This study found that 70% of respondents felt that local health departments did not have policy and procedures on when to use personal protective
equipment. If the local health department has no policy or regulation public health worker safety can be jeopardized.

Generalizability is limited due to the response rate of 39%, and that this survey was limited to Connecticut. A comparison of data in an area in the United States that has recently experienced disaster response such as New York, Mississippi, Florida, and Louisiana might be useful to see if previously affected areas have more complete policies and procedures. It is unknown whether non-respondents would have a higher or lower perception of personal protective equipment need and use. It is not uncommon for surveys to be more likely to be answered by organizations that are the most prepared; if true, overall results may give a perception that communities are more prepared than they actually are. However the gaps identified by the respondents were extensive enough to warrant concern, even if all non-respondents had perfect personal protective equipment programs. Directors of Health might have responded to questions based upon assumptions instead of first hand knowledge of realities in the field. If true, Directors of Health might not be planning appropriately for funding opportunities, staffing, and equipment. Also, the researcher should have clarified within the directions of the questionnaire that only one response to each question was permitted. Another possible gap within the study was that respondents might not consider hazards listed in the survey as hazards in which personal protective equipment is needed.

This study was not an extensive national study, but rather a state-based pilot to examine personal protective equipment among local health departments. Dissimilarity in interpretation of data and response rates would be a possible limitation. Survey questions were developed by the researcher and did not have
extensive testing for reliability and validity.

Exploring new options for funding should be a priority of local health departments. With an increase in quantities and protection against exposures and hazards the response to whether or not personal protective equipment works might increase from 12%.

Given the changing tasks and challenges for local health departments, it may be useful to have test questions on the registered sanitarian exam that relate to hazardous situations that public health workers and appropriate protective measures. This might push for better training for new workers entering the field.

Additional subsequent research should be completed to determine if results have changed with time and additional funding. Exposure analysis may possibly change with new hazardous agents, but, the opposite might occur and exposures listed in the questionnaire might not exist. Future research on OSHA investigations at local health departments might be explored to examine what hazards are noted by OSHA.
References


Appendix 1

October 14, 2006

Dear Participant:

My name is Aimee Eberly. Currently, I am a graduate student at the University of Connecticut who is conducting research as part of the Masters in Public Health Program.

In this research project, I am in search of your responses on the use of personal protective equipment, safety training of employees, and policy in your health department.

This questionnaire will require approximately ten minutes or less to complete. There is no compensation for responding, nor is there any known risk. This questionnaire is voluntary. I have included a postage paid envelope for the return of the survey; please respond by November 13, 2006. Any questions that might make you uncomfortable in answering may be skipped. After questionnaires have been received, only the researcher can access the results and prepare the findings.

Thank you for taking the time to assist me in my research. If you require additional information or have questions, please contact me at the number listed below.

Sincerely,

Aimee Eberly

Phone: 860-944-3654
Fax: 860-844-8590
Email: aimee_eberly@yahoo.com
Appendix 2
Public Health Staff Safety and Health Questionnaire

Return completed surveys to: Tim Morse, PhD, CPE, Attention: Aimee Eberly, Ergo Center and Occupational and Environmental Health Center, MC 6210, UCONN Health Center, Farmington, CT 06030-6210.
Contact information:
Aimee Eberly
Phone: 860-944-3654
Fax: 860-844-8590
Email: aimee_eberly@yahoo.com

Participation is voluntary. Any questions may be skipped that may make you feel uncomfortable in answering. Completion and return of this survey implies consent.

1. What is your position at the local health department?
   - Director of Health
   - Administrative Assistant
   - Sanitarian
   - Other

2. Does the Local Health Department have written policy or procedure for staff on using personal protective equipment such as what equipment to use and when it is to be used?
   - Yes
   - No
3. Does the Local Health Department have regular ongoing training opportunities for staff on personal protective equipment with periodic refresher courses?

- ☐ Complete training
- ☐ Some training
- ☐ Complete training with no refresher courses
- ☐ No training

4. Does the Local Health Department staff assist in any type of abatement and or cleanup investigations? (lead paint abatement, Brownfield or Superfund sites)

- Yes ☐
- No ☐
- Not Sure ☐

5. Which of the following potential exposures apply to Local Health Department staff? Please check the following if applies. You only need to answer the other columns if you check the exposure box for that hazard. Check the PPE that you believe is needed for all checked exposures; answer the last two columns for any checked PPE.

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Pests □ Gloves  Yes □ No □  Yes □ No □
and □ Respirators
Rodents □ N95/P100 disposable respirator
   □ Cartridge respirator
   □ Safety goggles
   □ Smocks
   □ Safety boots
   □ Hearing protectors
   □ None of the above
   □ Other _____________

Tuberculosis □ Gloves  Yes □ No □  Yes □ No □
   □ Respirators
      □ N95/P100 disposable respirator
         □ Cartridge respirator
   □ Safety goggles
   □ Smocks
   □ Safety boots
   □ Hearing protectors
   □ None of the above
   □ Other _____________

6. Does the Local Health Department encourage staff to attend personal protective equipment training opportunities? If yes, how?

   □ Incentives for additional training
   □ Provides paid time off for training
   □ Recognition
   □ No material support
   □ Other ______________________________
7. Do you feel that personal protective equipment works?

- All the time
- Some of the time
- Depends on what type of personal protective equipment is being used
- Not sure

8. In the event of an emergency or outbreak is the Local Health Department prepared with enough quantities of personal protective equipment?

- Yes
- No
- Not Sure

9. If you answered Yes to question number 8, is the Local Health Department staff trained and have they been fit tested if Respirators are to be used?

- Yes
- No
- Not Sure

Please provide any additional comments or feedback:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
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________________________________________________________________________