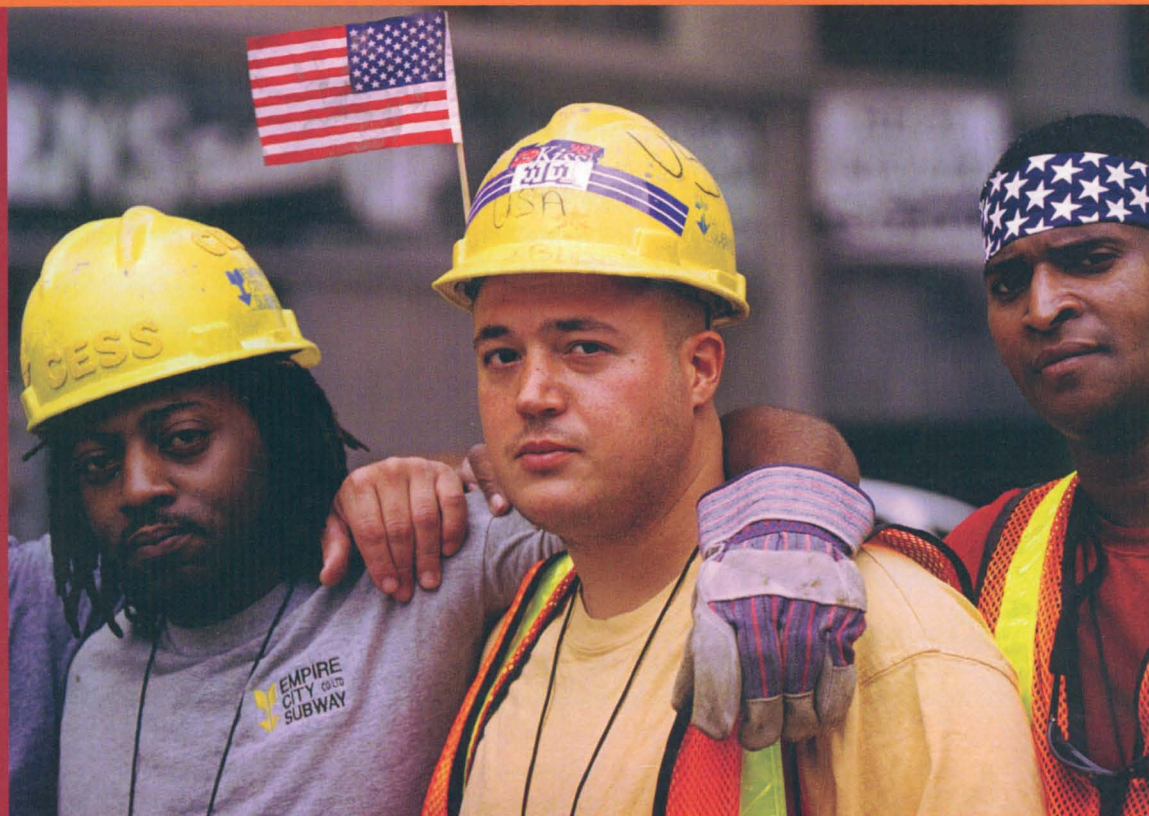




New York Committee for Occupational Safety and Health (NYCOSH)



Protecting Worker and Community Health:

# Are We Prepared for the Next 9/11?

This report was prepared for the  
New York Committee for Occupational Safety and Health  
by NYCOSH industrial hygienist David M. Newman, M.A., M.S.

This project was funded in part by  
the New York City Health and Hospitals Corporation  
and the New York State Department of Labor (contract #120388).

*We thank them for their support.*

December 30, 2013



PROTECTING WORKER AND COMMUNITY HEALTH:  
ARE WE PREPARED FOR THE NEXT 9/11?

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ERRATA

The listing for one source in the reference section is out of alphabetical order. As a result, there are errors in some citation numbers in the text and some source numbers in the reference section. A revised document with corrected citation numbers and corrected reference numbers is posted at <http://tinyurl.com/n6d3z85>.

*Unless otherwise noted, photos by Earl Dotter.*

*NYCOSH thanks NIEHS and MDB for providing the document design and layout.*

FOREWORD

I wish to thank the New York Committee for Occupational Safety and Health (NYCOSH) for the opportunity to provide this Foreword. The conference that NYCOSH sponsored on the tenth anniversary of the terrorist attacks of September 11, 2001, provided an opportunity for dialogue among government officials, labor leaders, and, as a vital feature of the meeting, volunteers and workers whose health was adversely affected by their exposure to the contaminants that blanketed Lower Manhattan and Brooklyn from the destruction of the Twin Towers of the World Trade Center.

The NYCOSH publication that you are reading summarizes the proceedings of that conference. It identifies public policy questions that confront decision-makers who are tasked to protect the health of responders and the health of the public in large-scale emergencies, and offers policy recommendations. It reminds us that the 9/11 attacks were a defining moment in placing emergency preparedness and response in the first tier of our responsibilities in occupational safety and health in the 21st Century.

The recommendations in this publication are those of NYCOSH and do not represent recommendations by the National Institute for Occupational Safety and Health (NIOSH). However, for all of us in the public and private sectors who have a role in preventing injuries, illnesses, and deaths associated with disasters on an immense scale, the recommendations are pertinent to issues that are vital for us to consider.

The NYCOSH conference asked, "If 9/11 were to happen tomorrow, would we be better prepared?" I believe the answer to that question is "Yes," in terms of many areas of fundamental progress. In its magnitude of devastation as a hostile action in the midst of a densely populated U.S. urban area, the destruction of the World Trade Center was an unprecedented event in the history of our nation. The lessons learned from the response to the attacks have led to many advancements in the ways that we prepare responders and clean-up workers before a disaster, protect their safety and health while they perform their duties, and monitor their health to identify effects over time after the disaster is over.

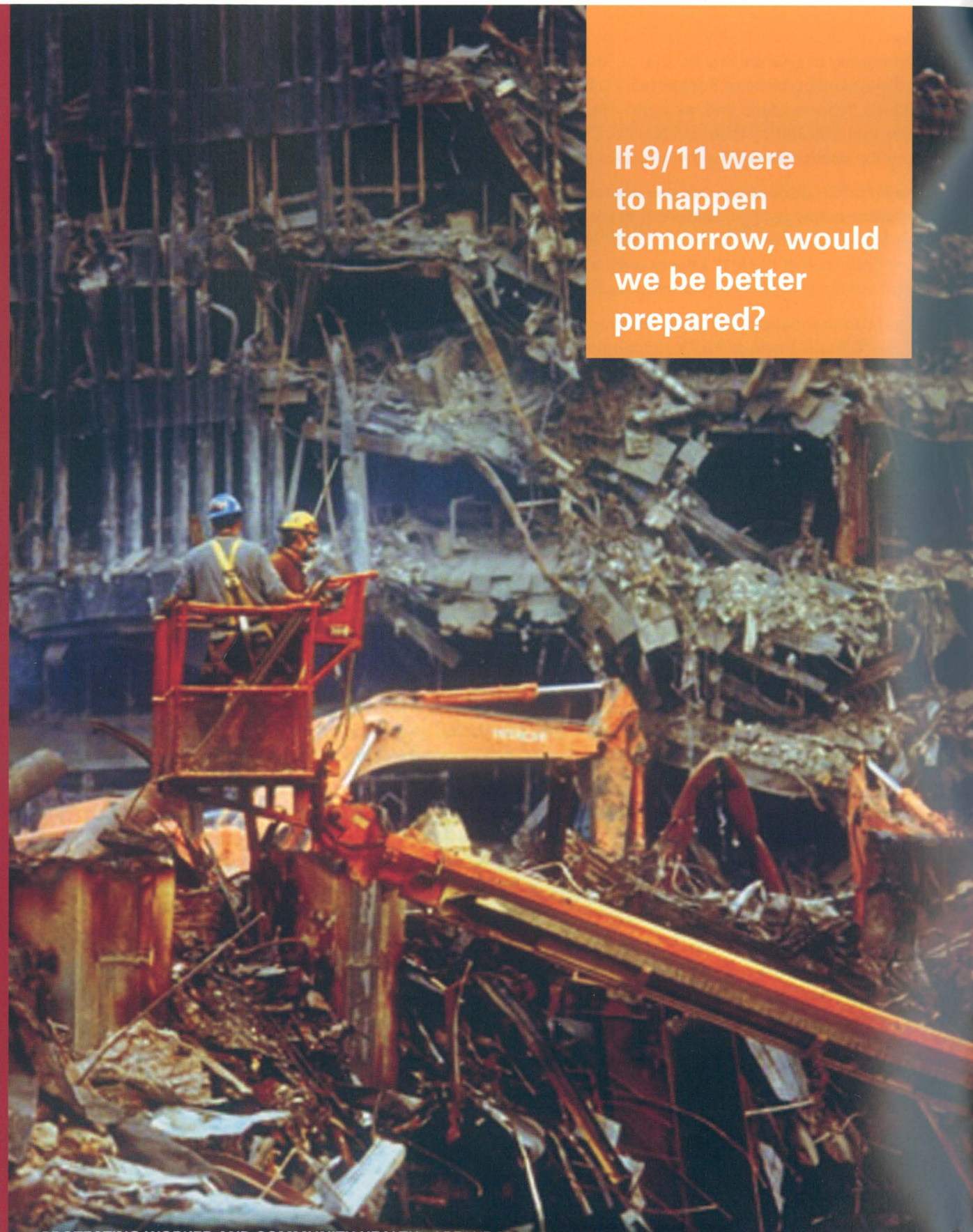
Those lessons informed the deployment of workers and volunteers in response, recovery, and clean-up following the disasters that have occurred since September 11, 2001, including Hurricane Katrina, the Deepwater Horizon response in the Gulf of Mexico in 2010, and Superstorm Sandy. For example, from 9/11, we learned that it is critical to roster responders so that clear records exist to identify those who served, and when and where they served. Such records are essential for providing strategic health monitoring and treatment for individuals in the months and years after exposure to physical hazards in a disaster area, exposure to toxic air contaminants, and physical and emotional stress.

At the same time, NIOSH continues to work with NYCOSH and other partners to identify and address unmet needs, and to provide services to those who suffered injury and illness from the attacks of 9/11. The James Zadroga 9/11 Health and Compensation Act of 2010 assigned to NIOSH the mission of administering a program of health monitoring and treatment for responders and survivors who meet eligibility criteria. NIOSH is committed to working with all agencies, organizations, and individuals in the public and private sectors who can help us carry out those responsibilities.

Among the most compelling first-hand accounts from 9/11 are the testimonies of the workers, volunteers, and community residents who became injured or ill as a result of the 9/11 attacks. These accounts remind us that the challenges we address are not abstract concepts. Rather, behind every need we address is the story of a man or a woman who continues to be affected every day by the life-altering events that occurred more than a decade ago. We honor their service and bravery, and the courage of their brothers and sisters who died on September 11, 2001, by continuing our efforts to improve emergency preparedness and response.

John Howard, M.D.  
*Director, National Institute for Occupational Safety and Health (NIOSH)*  
*Administrator, World Trade Center Health Program*





**If 9/11 were  
to happen  
tomorrow, would  
we be better  
prepared?**

## EXECUTIVE SUMMARY

The almost 3,000 innocent people who tragically lost their lives in the 2001 World Trade Center attacks were not the only victims. The emergency response to the WTC attacks and their aftermath produced widespread and persistent adverse health impacts among responders, cleanup workers, volunteers, and area workers, residents, and students. Responses to subsequent disasters such as the Deepwater Horizon oil leak and Hurricanes Rita, Katrina, and Sandy indicate the continuing need for improvement in protecting responder and community health and safety.

Ten years after the WTC attacks, the New York Committee for Occupational Safety and Health (NYCOSH) convened a national conference entitled "Protecting Worker and Community Health: Are We Prepared for the Next 9/11?" Responders, clean-up workers, volunteers, area workers, residents, and community and union activists, physicians, academics, and government representatives participated. The theme of the conference was "If 9/11 were to occur again tomorrow, how would our response be different?"

This report draws on presentations and discussions at the NYCOSH conference. It considers the environmental and occupational health impacts of the WTC attacks. It identifies and examines challenges and short-comings in preparation and response efforts. Finally, it offers recommendations for improvements in emergency preparedness and response planning to prevent or reduce avoidable health impacts in future disasters.

Recommendations address the following issues:

- Federal responsibilities in disaster response.
- The basic principles of public health that should drive disaster response.
- The necessity of avoiding additional health harm in disaster response.
- The need for adherence to the Precautionary Principle – "when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."
- Comprehensive exposure and risk assessment.
- Increased reliance on the hierarchy of controls of hazards to reduce the risk of additional injury or illness as rapidly as is technically feasible.
- Improvements in respiratory protection through training, enforcement, and redesign of equipment.
- The need for updated and more protective exposure limits for chronic inhalational exposures as well as for acute, sub-chronic, and synergistic inhalational exposures.
- Enforcement – responders and residents have a right to expect that their health and safety will be ensured by adequately protective occupational and environmental legal requirements.
- Training content and methods for traditional first responders and skilled support personnel, as well as for non-traditional responders.
- Limits on extended work shifts.
- A realistic duration of the rescue phase of disaster response, informed by science and determined by site-specific conditions and the nature of the disaster event.
- Focused attention to the protection of the health and the rights of immigrant workers.
- A transparent, participatory process for risk communication and public engagement.
- Uniform, transparent standards for re-occupancy that are adequately protective of public health.
- Access to expert medical care for responders and other impacted populations and reform of the workers' compensation system to streamline access to medical care for responders, workers, and volunteers.



## PROTECTING WORKER AND COMMUNITY HEALTH: ARE WE PREPARED FOR THE NEXT 9/11?



### Introduction

**"We will never know how many people would not have gotten sick if the government had acted honestly and taken appropriate measures to respond to the environmental health concerns."**

—Congressperson Jerrold Nadler

**"The major question still is 'Will occupational safety and health and environmental safety and health really be included in disaster response plans and disaster response in a meaningful way?'"**

—James Melius, M.D., Administrator, New York State Laborers Health and Safety Trust Fund

**"Heroes are workers too and they need to be protected."**

—Bruce Lippy, The Lippy Group LLC, former International Union of Operating Engineers industrial hygienist

Following the World Trade Center attacks in 2001, concerns were raised regarding the ability of the emergency response community to ensure the safety and health of all workers involved in a large scale, complex emergency response. More recent disasters, such as Hurricane Katrina and the Deepwater Horizon Oil Spill, continue to reveal the gaps which exist in the safety and health programs utilized during large scale emergency events [62].

On September 16, 2011, ten years after the destruction of the World Trade Center (WTC), the New York Committee for Occupational Safety and Health (NYCOSH) convened a national conference entitled "Protecting Worker and Community Health: Are We Prepared for the Next 9/11?" Approximately 200 WTC responders, clean-up workers, volunteers, area workers, residents, and community and union activists, physicians, academics, and government representatives participated. The conference focused on regulatory policy reform aimed at improving protection of occupational and environmental health during disaster planning and response.

**"This is a conference about preparedness and prevention. It is not a conference about disaster response per se but rather a conference about protecting occupational and environmental health during disaster response. This conference is not simply about looking back over the last ten years but about doing so in a way that empowers us to more effectively address the challenges that we continue to face as we try to move forward together - labor, community, and government."**

—David Newman, NYCOSH industrial hygienist

The conference was addressed by, among others, high-level federal officials from the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the National Institute of Environmental Health Sciences (NIEHS), and the Environmental Protection Agency (EPA).

Representatives of government agencies were asked "If 9/11 were to occur again tomorrow, how would the response of your agency be different?" Representatives of impacted populations, including rescue and recovery workers, volunteers, and area workers and residents, assessed the government response and discussed grassroots efforts. Congresspersons Jerrold Nadler and Carolyn Maloney evaluated the current state of disaster preparedness. Linda Rae Murray, president of the American Public Health Association, addressed the application of public health principles to disaster response.

This report draws on presentations and discussions at the NYCOSH conference. It considers the environmental and occupational health impacts of the WTC attacks. It identifies and examines challenges and short-comings in preparation and response efforts. Finally, it offers recommendations for improvements in emergency preparedness and response planning to prevent or reduce avoidable health impacts in future disasters.

**"Our real goal is to engage the government right now in a dialog so that we can prevent all of the mistakes that the government made in the aftermath of 9/11 from happening again."**

—Kimberly Flynn, 9/11 Environmental Action



## Disaster and Aftermath

The destruction of the World Trade Center produced “arguably the worst environmental disaster in the history of New York City” [106]. A broad array of hazards and multifaceted exposure scenarios provided complex challenges to safe and effective disaster response.

The almost 3,000 innocent people who tragically lost their lives in the WTC attack were not the only victims. First responders, rescue workers, recovery workers, volunteers, area workers, residents, students, and bystanders were exposed to toxic WTC dust and combustion byproducts in a variety of exposure scenarios on and long after 9/11/01. For many, the experience caused profound physical or psychological harm.

**“For 6 months I performed cleanup work in skyscrapers surrounding the pit. My job duty was to clean the air vent systems and air conditioning units inside these skyscrapers - 10 buildings, 7 days a week, 12- to 14-hour days, with a mere coffee-filter mask around my face.”**

*—Alex Sanchez, cleanup worker, United We Stand*

As many as 90,000 responders, workers, and volunteers responded on “the pile” and at associated waste transfer sites and forensic search operations [31]. All were potentially exposed to WTC-derived contaminants. Additional thousands of building maintenance workers and day laborer cleanup workers removed debris and contaminants on a regular basis from impacted commercial, institutional, and residential buildings and in outdoor spaces such as parks and playgrounds.



NYPD photo

The thousands of immigrant day laborers who “shaped up” to remove contaminated dust and debris from properties adjacent to Ground Zero were the workers least likely to receive proper training, respiratory protection, and personal protective equipment. (A shape-up system is one in which workers must solicit employment on a daily basis while competing against each other for jobs for that day.) Immigrant day laborers incurred rates of illness similar to those of Ground Zero workers but typically lacked access to medical surveillance and treatment [19, 50]. In addition, they were often the victims of wage and hour crimes by their employers [99].

Additional worker populations with potential exposure included the hundreds of construction workers demolishing highly contaminated high rise buildings and the thousands of electrical, telecommunications, and other infrastructure and service workers who worked to restore essential services. These workers regularly disturbed dust in indoor or underground spaces that may have been contaminated but had not been tested or cleaned.

The full gamut of hazardous occupational and environmental exposures that occurred has not been, and cannot ever be, adequately identified or assessed.

Thousands of people present in lower Manhattan on the morning of September 11, 2001, as well as emergency personnel responding to the WTC site, were caught in the “optically dense” dust cloud that was generated and propelled with explosive force by the collapse of the twin towers. Many experienced acute inhalational exposure to a heterogeneous mixture of carcinogenic and toxic substances, including but not limited to asbestos, dioxins, polycyclic aromatic hydrocarbons (PAHs), heavy metals such as lead and mercury, respirable particulates, highly alkaline concrete dust, volatile organic compounds, silica, pulverized glass shards, and man-made vitreous fibers [49].

**“The question was not really ‘Do the air levels meet OSHA standards?’ That’s the wrong question. The question people want to know is ‘What is this air going to do to me?’”**

*—Linda Rae Murray, President, American Public Health Association*

The high volume, concentration, and force of the dust cloud may have “overwhelm[ed] or impair[ed] nasal and upper airway clearance mechanisms resulting in large particle penetration to the depth of the small airways and alveoli” [34]. That is, particulates that under normal circumstances would be trapped and expelled by the defense mechanisms of the upper respiratory system were able in this situation to bypass these defense mechanisms and deposit deep in the lungs, with adverse health outcomes.

In a similar fashion, the volume, concentration, and force of the dust cloud is likely to have resulted in significantly greater particulate infiltration into indoor spaces, achieving entry, for example, not only through blown out or open windows and

via mechanical ventilation system intakes but also through intact closed windows and other penetrations in building envelopes.

Primary sources of environmental contamination included the dust cloud produced by the WTC collapse and the plume of airborne combustion byproducts from the fires that burned above and below ground for 3 to 5 months. Secondary sources of contamination included particulates disturbed and made airborne by rescue and recovery operations, particulates released along the paths and at the sites of debris and waste transfer operations, and particulates that infiltrated and persisted in occupied indoor spaces [75].

Contaminants were dispersed over a wide area of lower Manhattan and Brooklyn, and for “miles beyond.” Over 400 WTC-derived contaminants have been identified in air, dust, and bulk samples [11, 34, 41, 52, 87].

**“We have to acknowledge that no one is exposed to any single compound. The real exposures are all about mixtures.”**

*—Richard Woychik, Deputy Director, National Institute of Environmental Health Sciences*

WTC-contaminated outdoor air was largely cleansed over time by wind and rain. However, particulate contaminants that infiltrated indoors may have persisted over time if not targeted for technical environmental remediation (as distinct from routine housekeeping cleanup). Gases, vapors, and fumes are less persistent indoors, but may have lingered by adsorbing (attaching) onto particulates.

The vast majority of the hundreds of thousands of outdoor and indoor environmental samples collected were reassuringly non-detect or showed only minimal elevation. However, the usefulness



of these data is undercut by the breadth and persistence of illness incurred by populations exposed to the sampled conditions. These health impacts are consistent with the smaller body of results from governmental and independent sampling efforts that indicate the possibility of wide geographic dispersion, outdoors and indoors, of 9/11-derived toxic substances at levels of concern.

EPA test results for dioxins in outdoor samples collected at and near Ground Zero ranged from 37 to 1100 times urban background levels and from 5 to 170 times the highest concentration previously reported in the U.S. These elevated concentrations persisted for 3 months in areas that government agencies declared safe for re-occupancy [109].

Benzene was detected in 57 of 96 Ground Zero air samples at concentrations up to 86 times OSHA's permissible exposure limit (PEL) [112]. Some samples collected months after September 11 remained significantly elevated - 180 times the PEL on November 8 and 5 times the PEL on January 7. (Since the samples were not collected within workers' breathing zones, workers' actual exposures are unknown.)

Twelve of 21 personal air samples obtained by the U.S. Public Health Service from workers sifting WTC debris at the Staten Island landfill exceeded the OSHA PEL for asbestos [25]. Twenty-seven percent of 177 bulk samples collected by EPA and OSHA at Ground Zero were greater than 1% asbestos by weight, the legal definition of asbestos-containing material (ACM) [46]. Sixty percent of asbestos air samples collected at Ground Zero by the International Union of Operating Engineers exceeded the Asbestos Hazard Emergency Response Act (AHERA) clearance level of 70 structures per square millimeter (s/mm<sup>2</sup>), the clearance level EPA opted to employ [60].

Independent indoor air monitoring commissioned by Congressperson Jerrold Nadler and other elected officials found asbestos concentrations ranging from 2 to 5 times the EPA clearance level in one apartment and from 90 to 152 times the clearance level in another apartment [12].

### Health Harm

A mayoral task force estimated that up to 400,000 people may have been occupationally and/or environmentally exposed to WTC contaminants [117]. Approximately 60,000 first responders, recovery workers, volunteers, and area workers, residents, and students are currently being treated and/or monitored by the WTC Health Program established by the 9/11 Health and Compensation Act of 2010 [119].

Significant respiratory and other health impacts among the diverse exposure populations are well documented. For a substantial proportion of those who health was impacted, adverse health conditions persisted for years. In many cases, illness persists more than ten years after the attack.



NYCOSH photo by David M. Newman

**"How do we document the extent of harm in the context of an environmental disaster? We did not ask right off the bat 'Is there potential for harm? How do we look to document that?'"**

—Joan Reibman, M.D., Director, New York City Health and Hospitals Corporation World Trade Center Environmental Health Center, Bellevue/New York University

Respiratory illness has been extensively documented among response workers and area workers, including among rescue and recovery personnel [2, 6, 20, 21, 29, 30, 38, 115], firefighters [6, 90, 115], police [39], transit workers [105], volunteers [20, 22], and immigrant day laborer cleanup workers [19, 50]. Comparable respiratory impacts have also been documented among community residents, students, and workers [10, 26, 44, 51, 93, 94].

Effects include "irritant-induced asthma, chronic nonspecific bronchitis, chronic bronchiolitis/small airway disease, and aggravated preexistent chronic obstructive lung disease (most frequently chronic obstructive pulmonary disease, but also asthma)" [21, 38]. Increased rates of childhood asthma and clinical deterioration in pediatric patients with pre-existing asthma occurred in Chinatown near the WTC after September 11, 2001 [103, 104]. Working on the WTC debris pile was associated with an elevated risk of post-9/11 sarcoidosis [37]; sarcoid-like granulomatous pulmonary disease is present among WTC responders [17].

Exposure to a WTC-derived dust cloud may be a risk factor for heart disease [36] and has been associated with persistent skin rash among rescue and recovery personnel and area workers and residents [32].

Decreases in birth weight and length were found in infants born at full term to women who were pregnant on September 11, 2001 and who were living within a 2-mile radius of the WTC [42].

Adverse mental health conditions have manifested in diverse impacted populations [1, 7, 13, 18, 88].

A study of 9,853 male NYC firefighters found a 19% excess incidence for all cancer sites combined among WTC-exposed firefighters compared with unexposed firefighters, mostly due to increases in prostate and thyroid cancers, non-Hodgkin lymphomas, and melanomas [120]. An elevated number of multiple myeloma cases has been found in WTC responders under 45 years of age [56]. An observational study of 55,778 New York State residents enrolled in the World Trade Center Health Registry in 2003-2004 found an excess risk for prostate cancer, thyroid cancer, and myeloma in 2007-2008 for exposed compared to non-exposed individuals. Intensity of WTC exposure was not significantly associated with cancer of the lung, prostate, thyroid, non-Hodgkin lymphoma, or hematological cancer [35].

Another study of 20,984 participants in the WTC Health Program found increases above expected rates for all cancer sites combined, thyroid cancer, prostate cancer, combined hematopoietic and lymphoid cancers, and soft tissue cancers, particularly among those exposed to significant amounts of dust when compared with responders who reported lower levels of exposure. The authors emphasize that results should be interpreted with caution given the short follow-up and long latency period for most cancers, the intensive medical surveillance of the cohort, and the small numbers of cancers at specific sites [101].

In September 2012 NIOSH identified 50 types of cancers (later expanded) to be added to the list of WTC-related health conditions covered under the



James Zadroga 9/11 Health and Compensation Act of 2010 [61], per the recommendation of the World Trade Center Health Program Scientific and Technical Advisory Committee (STAC):

Exposures resulting from the collapse of the buildings and high-temperature fires are likely to increase the probability of developing some or all cancers. This conclusion is based primarily on the presence of approximately 70 known and potential carcinogens in the smoke, dust, volatile and semi-volatile organic contaminants identified at the World Trade Center site. Fifteen of these substances are classified by the International Agency for Research on Cancer (IARC) as known to cause cancer in humans, and 37 are classified by the National Toxicology Program (NTP) as reasonably anticipated to cause cancer in humans; others are classified by IARC as probable and possible carcinogens. Many of these carcinogens are genotoxic and it is therefore assumed that any level of exposure carries some risk...

Arguments in favor of listing cancer as a WTC-related condition include the presence of multiple exposures and mixtures with the potential to act synergistically and to produce unexpected health effects, the major gaps in the data with respect to the range and levels of carcinogens, the potential for heterogeneous exposures and hot spots representing exceptionally high or unique exposures both on the WTC site and in surrounding communities, the potential for bioaccumulation of some of the compounds, ...and the large volume of toxic materials present in the WTC towers [118].

**"Nobody told any of us to stop dying on September 12."**

—Patrick Bahnken, President, Uniformed EMS, Paramedics and Fire Inspectors, FDNY, Local 2507, AFSCME

## Disaster Response



Despite the shock of the 9/11 attacks, the massive loss of life, the immense scope of destruction, and the disruption of the social fabric, there was no panic.

The rapid, orderly, and effective evacuation of the immediate impact area – a response that was initiated and managed largely by evacuees themselves, with a virtual absence of panic – saved numerous lives. Assisted by emergency workers, occupants of the World Trade Center and people in the surrounding area helped one another to safety, even at great risk to themselves... [106].

**"EPA and other disaster response agencies should retire the false notion that the public is prone to panic."**

—Kimberly Flynn, 9/11 Environmental Action

The Fire Department of New York (FDNY) initiated its response immediately ("within five seconds" of the attack), joined by the New York Police Department (NYPD), the Port Authority Police Department (PAPD), and the Mayor's Office of Emergency Management (OEM) [63]. Additional responses were undertaken by a broad array of federal agencies, including EPA, OSHA, FEMA, Centers for Disease Control, Health and Human Services, and others [62]. Additional thousands of other public and private sector responders were dispatched by their employers or "self-dispatched."

**"Putting these volunteers under the incident command system is a real challenge and is something we really have to work on, because volunteers deserve the same protections."**

—David Michaels, Assistant Secretary of Labor for OSHA

**"You have to know who participates in your response. You have to broaden the concept of responder."**

—John Howard, Director, National Institute for Occupational Safety and Health

Because the City of New York led the initial response, Mayor Giuliani was the nominal incident commander [62]. Responsibility for WTC site safety was assumed by the New York City

Department of Design and Construction (DDC). DDC had extensive construction experience, with units responsible for site engineering and environmental health and safety [68]. However, it lacked expertise and experience in disaster response. DDC did not implement any "contractual mechanism to enforce safety requirements with the four prime contractors at the site [Tully, Bovis, Turner, and AMEC]" [47].

A site health and safety plan (HASP) was not implemented until almost seven weeks after the attack [47]. (A HASP is a written program that delineates the measures to be used to identify, evaluate, and control safety and health hazards and thereby eliminate or reduce fatalities, injuries, and illnesses.) As a result, there was a lack of clarity as to "which occupational safety and health standards were applicable, whether enforcement agencies indeed had enforcement jurisdiction, and at what point in time the WTC Disaster Site Safety and Health Plan would become effective and operative" [62].

EPA declined to designate the WTC site as either a hazardous waste site per the Resource Conservation and Recovery Act or a Superfund site per the Comprehensive Environmental Response, Compensation, and Liability Act. EPA's decision facilitated OSHA's subsequent determination that the strong training requirements and worker protection provisions of the Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) would not be applied. Worker training requirements under 1910.120 as well as 1910.1200 (Hazard Communication) would have mandated comprehensive training on hazard identification, risk assessment, recognition of signs and symptoms of overexposure, hazard monitoring and control methods, personal protective equipment and safe work practices, and regulatory requirements and worker rights. Formal



on-site training (in abbreviated format) was not implemented until November 29 [47].

OSHA's decision that 1910.120 was not applicable was characterized as "inappropriate" by on-site experts:

[T]he Site is in clear need of [1910.120] based upon the nature of the activities..., the ... hazardous materials ... present..., the fact that the nature of the collapse and resulting debris pile makes it nearly impossible to determine when increased exposures... will occur..., and the presence of many of these materials in the bulk/area/personal monitoring data. [62].

The Federal Response Plan (FRP) then in place ignored enforcement, emphasizing OSHA's role as one of consultation, guidance, and technical assistance. The FRP specified how emergency response agencies and organizations would coordinate their work and the measures to be implemented during emergency response operations. (The 2013 version of the FRP is the National Response Framework.) However, the FRP's collaborative approach did not exclude enforcement, except perhaps in the earliest hours and days when rescue of live victims was theoretically possible. The consultation program was problematic not simply because it ignored enforcement but because it was ineffective. OSHA opted to use its prosecutorial discretion to implement a zero enforcement policy which ultimately fostered rapid removal of debris rather than protection of worker health. [76].

OSHA asserted that enforcement would result in delays in correcting hazards, because employers who are cited by OSHA have the right to appeal and are not required to abate violations until the conclusion of the appeals process [53]. However, 88% of cited employers do not contest their citations. OSHA offers employers significant

incentives for prompt abatement, including a 15% penalty reduction if the hazard is abated while the inspector is present or within 24 hours. Most violations "are corrected immediately" or within the 15 day time period preceding an informal conference with an OSHA area director [57].

The Public Employee Safety and Health Bureau (PESH) of the New York State Department of Labor, charged under the NYS PESH Act with protecting the safety and health of public sector workers, responded in a similar manner to OSHA. It sent "a significant number of people to Ground Zero, handing out respirators and maintaining a presence at the command center. They weren't doing enforcement" [95]. There was "absolutely no enforcement by OSHA or PESH" [14].



NYPD photo

OSHA did not commence personal sampling of workers at Ground Zero until September 20, even though the WTC site was clearly the locus of greatest exposure and risk [47, 78, 89]. This delay was consistent with the effort of the Bush administration to achieve the appearance of a return to normalcy as rapidly as possible, in part by ignoring or de-emphasizing risk [96]. It was also consistent with the expressed goals of downtown real estate

and banking interests, as reflected in internal discussions within the Giuliani administration:

**The Mayor's office is under pressure from building owners and business owners to open more of the city to occupancy. According to OEM [NYC Office of Emergency Management], some city blocks north and south of ground zero are suitable for reoccupancy. DEP [NYC Department of Environmental Protection] believes the air quality is not yet suitable for reoccupancy [71].**

OSHA and other agencies eventually provided tens of thousands of respirators to workers and volunteers at Ground Zero. Respirator training was limited and initially excluded the fit tests and medical qualifications required by the OSHA Respiratory Protection Standard. Three weeks after 9/11, fewer than 20% of the construction workers at the site had been medically certified to wear respiratory protection or had received respiratory training [62]. Almost 1,000 reports of respiratory injuries were filed at the WTC site during the first 9 weeks [91].

WTC site documents obtained by NYCOSH via Freedom of Information requests indicate that OSHA was well aware of significant lapses in respiratory protection. The issue was documented in agency memoranda and emails at least 34 times between September 18 and November 14, 2001. The New York City Department of Health, calling it "a critical issue," requested on at least 11 occasions that OSHA enforce the Respiratory Protection Standard at the WTC site. The Federal Emergency Management Agency (FEMA) and the International Brotherhood of Teamsters also requested enforcement, and Liberty Mutual Insurance and contractors AMEC and Bechtel complained to OSHA about inconsistent use of respiratory protection. OSHA later acknowledged that "PPE compliance rates fluctuated from day to

day" but insisted that "respiratory protection was worn by employees when conducting operations with potential exposure to contaminants at or near OSHA PELs" [24, 86].

**"Safety got lost in the rush... The implementation of critical safety elements just took way too long... We did not offer fit-tests until about 36 days into the event... The safety and health plan [was not implemented for] 48 days, ...formal training [not until] 78 days... By then the culture was set and there was no changing it. Consequently, respiratory compliance was terrible."**

*—Bruce Lippy, The Lippy Group LLC, former International Union of Operating Engineers industrial hygienist*

During at least the first 4 weeks of operations at the WTC site,

there was no evidence or even suggestion that any safety and health program was operative...indeed the very opposite seemed to be the case. The lack of an operating safety and health program was confirmed by various support personnel, workers, and various government officials... [62].

Although OSHA reported an impressively low rate of injuries among responders at Ground Zero, its data excluded firefighters and police personnel. When NIEHS investigators examined more inclusive data from the New York City Department of Health, they were able to document 995 injuries and illnesses from September 14 through September 25, 2001. They noted that the criteria for these data did not necessarily correspond to OSHA criteria for reportable injuries and illnesses.



"However, if only 10% are 'reportable' it is evident that the injury and illness rate... is far above the national average for construction" [47, 62, 79]. A National Response Team document notes more generally that the longer shifts and longer work weeks typical during disaster response may result in higher risk of injury [67].

**"In the years since 9/11, OSHA has worked very closely with the Department of Homeland Security to ensure that worker protection is included in emergency preparedness and response programs. Ten years ago, at 9/11, worker protection was barely mentioned in the Federal Response Plan. Today we have the Worker Safety and Health Support Annex under the National Response Framework."**

—David Michaels, Assistant Secretary of Labor for OSHA

When a disaster occurs, the initial focus is ... rescuing people, saving lives, ensuring that the injured receive treatment, and providing shelter and food for the victims. During initial response operations, decisions and actions are time sensitive because site conditions often are uncontrolled and can change rapidly, as in the cases of fires, explosions, or hazardous substance releases. The availability of responders and response equipment may be limited, and options for controlling emergency responder exposures may be restricted. During this phase of an operation, the risks to emergency responders from higher and more hazardous exposure levels and longer work shifts must be balanced against the very real need to save lives, protect the public, and control the emergency... Once the initial rescue activities have been accomplished, however, the pace of operations and opera-

**tional objectives stabilize, and decisions about acceptable risks, exposure controls, and work shifts should be re-evaluated and revised [66].**

At the WTC site, the "rescue phase" was extended through June 2002. Its initial aim of retrieving live victims morphed into recovery of body parts. In fact, the last victim to be removed alive from the WTC collapse debris was rescued on September 12, less than 24 hours after the attacks [15]. This time frame is consistent with data from earlier disasters. The survival rate of victims who are not extracted from building collapse debris within 2 days is very low, diminishing to virtually zero in 4 days [9, 28]. Regardless, post-9/11 politics and emotions resulted in the rescue phase at Ground Zero being extended for the entire 9 months of debris removal operations.

The extended rescue phase presented a significant obstacle to implementation of safe work practices, compliance with regulatory requirements, and enforcement. Adherence to health and safety standards was seen as a potential impediment not only to rescue of live victims but also to retrieval of body parts.



*Extending rescue extends risk for response workers.*

**Figure 1.** Phases of response: Impact on safety. *Graphic developed by Dr. Bruce Lippy. Used with permission.*

No government agency acknowledged responsibility for assessing or remediating potentially contaminated indoor spaces. Indoor environmental testing and cleanup were initially left to building owners and to commercial and residential tenants [45, 55, 59, 110].

There were no government standards or guidelines for re-occupancy of potentially contaminated indoor spaces. EPA and OSHA statements that "the air is safe to breathe" provided strong disincentives to employers and property owners to test or clean habitable indoor spaces [108]. Most property owners, employers, and tenants lacked the technical expertise and financial resources to engage in environmental sampling and remediation. Consequently, private environmental sampling and remediation efforts occurred only on a haphazard, limited, and frequently ineffectual basis.

Despite EPA testimony to Congress that it had "lead responsibility for cleaning up buildings and other sites contaminated by chemical or biological agents as a result of an act of terrorism" [113], the agency asserted that it had no legal obligation to assess or remediate indoor environmental contamination in the wake of the WTC attacks [58, 59, 110]. (After coming under intense public pressure, EPA reversed its position in May 2002 and acknowledged responsibility for indoor environmental quality [111].)

**"You are supposed to be Environmental Protection, not Environmental Deception."**

—Lee Clarke, Director, Safety and Health, District Council 37, American Federation of State, County, and Municipal Employees

Clean-up guidance offered by government agencies was minimal and contradicted safe work practices and regulatory requirements. NYCDOH advised tenants to clean up WTC dust (i.e., asbestos and other toxic substances, in many cases) with wet rags. Respiratory protection was not necessary [72]. OSHA and EPA advised to "avoid inhaling" while cleaning up WTC dust [79].

The EPA Inspector General found that such advice "may have increased the long-term health risks for those [tenants] who cleaned WTC dust" [110].

The EPA Inspector General determined that EPA's public statements mischaracterized sampling results and were altered in response to political directives from the Bush White House. The September 18 announcement that the "air is safe to breathe" was not supported by evidence [108, 110]. "Guidance for cleaning indoor spaces and information about the potential health effects from WTC debris were not included in EPA's issued press releases...Reassuring information was added ...and cautionary information was deleted" [59, 110]. Similarly, OSHA announced "it is safe for New Yorkers to go back to work" even as it was detecting elevated concentrations (2.1 to 3.3%) asbestos in bulk samples on streets outside workplaces, double and triple the concentrations that would trigger requirements for abatement indoors [83]. As late as 2007, EPA continued to insist that, other than those caught in the dust cloud on 9/11, people present in lower Manhattan after 9/11 were "unlikely to suffer short-term or long-term health effects from inhalation exposures" [49].

Government agencies withheld or delayed release of some environmental sampling results that indicated the presence of contaminants at concentrations of concern. In one example, NYC DEP in November 2006 posted data indicating elevated outdoor levels of asbestos in September 2001 at locations several blocks from Ground Zero, stating these data had been "inadvertently" omitted from its website for the prior 5 years [70]. In another example, EPA shared its dioxin sampling results with OSHA in October 2001, noting, according to an internal OSHA email, that these were "the highest levels they have ever seen." Emails on this issue were exchanged between the OSHA Regional Administrator and the



Assistant Secretary of Labor for OSHA. There is no indication that the dioxin data affected EPA or OSHA hazard assessment or risk communication. A year later, EPA acknowledged publicly for the first time that one year earlier dioxin levels had reached “the highest ambient concentrations that have ever been reported” [23, 109]. As a result of governmental mischaracterizations of risk, workers and volunteers were less likely to use respiratory protection and property owners and employers were less likely to engage in environmental testing or remediation.

**“We need to do a lot more to present information in a way that’s useful to the public and to enable the public to hold EPA and the federal government accountable.”**

—Richard Woychik, Deputy Director, National Institute of Environmental Health Sciences

Major gaps in the regulatory framework also contributed to unnecessary and avoidable health risk. OSHA’s permissible exposure limits (PELs) for chronic inhalational exposure are largely based on outdated 1960s science. Although many of the approximately 470 substances subject to PELs are known or presumed carcinogens, their regulatory limits are based only their less hazardous, non-cancer health effects. Many known carcinogens, such as dioxins and diesel exhaust, as well as other substances known to be hazardous, have no regulatory limits at all.

In addition,

**Disasters like the World Trade Center, where many different agents are mixing in the workers’ breathing zone, pose great challenges for establishing acceptable exposure criteria, given the real possibility of synergistic effects. All**

of the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values are established for single chemical exposures with an underlying assumption that employees will recover for 16 hours before being re-exposed. This assumption normally is not representative of the conditions at a disaster site [67].

There are no OSHA standards that address extended or unsafe work schedules. In disaster response, “strenuous work schedules combine with the unique hazards and exposures associated with disaster operations to impact worker fatigue” [66] For 9 months at the WTC site, 12-hour shifts and 7-day weeks resulted in prolonged periods of toil and exposure, with additional physical and mental health consequences.

### Medical Response



Photo by Ruth Fremson, NYTimes

Despite early and extensive indications of illness among the exposed populations, workers, volunteers, and residents encountered numerous barriers to access to appropriate medical care.

The existing market-based, fee-for-service health care model was not effective at providing access, screening, or treatment for the adverse health outcomes associated with 9/11 environmental exposures. Health care providers in general do not have the expertise to identify occupationally- or environmentally-induced symptoms and illnesses, to associate them with disaster-related

exposures, or to render effective treatment or appropriate referrals [77]. Nationally, few primary care or emergency physicians believe they or their local health care systems are “well prepared” to respond to the medical consequences of acts of terrorism [3]. FDNY Chief Medical Officer Dr. David Prezant has noted that reliance on market-based health care for responder needs provides “no outreach to get people into treatment, ... fragmented treatment by non-experts, and ... no data collection for policy or to inform other physicians how to treat” [48]. In addition, catastrophic disasters may rapidly exhaust the medical or financial resources of union- or employer-funded medical insurance plans or clinics.

New York City was fortunate to have several medical “centers of excellence” associated with the New York State Occupational Health Clinic Network (OHCN), the nation’s only state-based occupational health clinic network. With minimal federal funding for screening of workers who were exposed to contaminants, and virtually no funding for the treatment of corresponding health impacts, these institutions provided the foundation for the World Trade Center Medical Monitoring and Treatment Program, the World Trade Center Environmental Health Center, and ultimately the NIOSH-run and federally funded WTC Health Program.

At the same time, the workers’ compensation system was not able to adequately cover injured workers’ medical costs nor ensure expert and timely medical care for workers who suffered delayed-onset illnesses. When benefits were awarded, they were limited by the then NYS maximum weekly benefit of \$400 – an amount below the federal poverty level for a family of four.

WTC claimants faced a wide array of challenges, including lack of access to medical care for non-

acute injuries and illnesses, legal rules that barred claims due to time limitations, and “extraordinarily high rates” of challenge by employers and insurers. The degree to which responder claims for benefits were contested was due to multiple factors, including “the potential applicability of time limitations, disputes regarding the identity of the liable employer, and poor system recognition of the causal connection between exposure and illness” [27]. In some cases, medical conditions were exacerbated as treatment was delayed.

Forty percent of the 11,627 WTC-related claims submitted were filed by rescue, recovery, and cleanup workers. Nearly 90% of these non-fatality claims involved respiratory diseases such as asthma and reactive airways dysfunction syndrome. Greater than 55% of all WTC claims were challenged (“controverted”) by the insurer or the employer, more than seven times the usual rate. Controverted claims took more than three times as long as non-controverted claims to establish [73].

In general, workers compensation systems tend to reimburse less than one third of the total cost of occupational injury and illness, shifting the balance from employers and their insurers to individual workers, their families, private medical insurance, and taxpayers [40]. Workers’ compensation systems may miss greater than 91% of occupational disease fatalities [43].



AP Photo by Mark Lennihan



AP Photo by Beth Keiser



## The Response to the Response



Any assessment of the successes and challenges in protecting WTC occupational and environmental health must acknowledge the contribution of the “response to the response” by impacted populations, including professional and volunteer responders and skilled support personnel, recovery and cleanup workers, and area workers and residents. The aggressive and persistent intervention, over a twelve year period and still ongoing, of broad-based coalitions composed of labor and community organizations and activists garnered increased attention to public health issues and challenged and ultimately strengthened government response efforts. These coalitions included labor, community, tenant, environmental, public health, immigrant rights, disability rights,

and faith-based organizations, parent and student groups, and elected officials. Significant contributions to these efforts were made by, among many others, the World Trade Center Community Labor Coalition, Beyond Ground Zero, the New York Committee for Occupational Safety and Health, 9/11 Environmental Action, Congressperson Jerrold Nadler, the NYC chapter of the Sierra Club, the FealGood Foundation, and many unions. Working separately and together, these groups and activists surmounted the artificial barriers that traditionally separate the occupational, environmental, and public health communities.

Overcoming years of denial by government agencies and prolonged silence in the mainstream media, activists achieved public acceptance of the concept that exposure to WTC-derived contaminants could and did cause harm to human health for rescue and recovery workers as well as area workers, residents, and students.

They gained public agreement that the federal government should be responsible for outdoor and indoor abatement of WTC-derived environmental contaminants because effective remediation was beyond the financial and technical capabilities of property owners, employers, and tenants.

They were able to propose and implement a transparent public process that formalized labor and community participation in informing and overseeing major aspects of disaster response operations. This process included public hearings at the city, state, and federal levels as well as meetings with EPA and OSHA. It also included labor and community representation on the EPA World Trade Center Expert Technical Review Panel and on the advisory boards for the WTC clinics and for the demolitions of heavily contaminated high-rise buildings.

**“We learned that we have to engage the communities - it’s not just about the scientists. The communities must be at the table to affect our decision-making in a very core way.”**

—Richard Woychik, Deputy Director, National Institute of Environmental Health Sciences

Activists also succeeded in enacting legislation to fund the medical centers of excellence and to ensure access to expert medical care for all impacted populations.

Activists did not prevail, however, in efforts to prevent additional harm from occurring. They were unable to bring adequate public and governmental attention to protection of rescue, recovery, and cleanup workers against additional exposure to inhalational hazards. Nor were they successful in their advocacy of enforcement of applicable OSHA/PESH standards, such as the Respiratory Protection Standard and the Hazardous Waste Operations and Emergency Response Standard, or applicable EPA standards such as the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) or the Resource Conservation and Recovery Act.

They were not able to achieve the implementation of re-occupancy protocols or rigorous assessment and remediation of contaminated workplaces and residences [77].

**“There are still no health-based standards for indoor contaminants that would trigger clean-up and emergency protocols of the kind of environmental contamination we saw after 9/11.”**

—Congressperson Jerrold Nadler

The experience of the World Trade Center Community Labor Coalition and other groups demonstrates that diverse labor, community, and environmental organizations and constituencies can effectively unite around common environmental health concerns for a sustained period of time. It shows that local activists can achieve a high degree of expertise on technical and policy issues and are capable of successful intervention with elected officials, government agencies, medical institutions, and contractors to effectuate concrete results in disaster response [75].<sup>1</sup>



AP Photo



AP Photo by Quyen Tran

<sup>1</sup> Detailed treatment of the WTC “response to the response” is beyond the scope of this report. For more on these grassroots efforts, see Newman [75] and Vanderlinden [114]. For an example of a technical policy document resulting from grassroots efforts, see World Trade Center Community Labor Coalition [116].



# RECOMMENDATIONS



Photographer Unknown

## 1. Federal Responsibility

An overarching aim in disaster response is to protect worker and community health. The WTC experience demonstrates that although state and local agencies can and do play key roles in disaster response, they may lack expertise and capacity in protecting worker and community health.

The federal government should assume clear responsibility for the direct administration of vital public health functions during catastrophic disaster response, including environmental and occupational health and effective remediation and safe re-occupancy of homes and workplaces. These responsibilities should not be relegated to state or local agencies or to private sector organizations.

## 2. Public Health Principles

Disaster response policies and implementation should be driven by public health principles and not by political imperatives. In the 9/11 response, direct intervention by the White House and the Council on Environmental Quality resulted in mischaracterization of risk and delays in and misdirection of occupational and environmental health efforts [24, 59, 96, 110].

"The mission of public health is to promote physical and mental health, prevent disease,

injury, and disability, and protect the public from environmental hazards" [92]. Public health is "distinct from health care in that public health focuses on the prevention of disease within populations, while health care focuses on the treatment of disease in individuals" [97]. Among the public health principles that should guide disaster response efforts are the following:

- Diagnose and investigate health problems and health hazards in the community
- Inform, educate, and empower people about health issues
- Mobilize community partnerships to identify and solve health problems
- Develop policies and plans that support individual and community health efforts
- Enforce laws and regulations that protect health and ensure safety
- Link people to needed personal health services and assure the provision of health care when otherwise unavailable [92].

Disregard of fundamental principles of public health policy has been facilitated by a "serious and systematic" de-funding of the public health infrastructure over decades [5]. "Public health is seen as a relatively easy target for cuts and for some legislators to demonstrate their opposition to growth in the public sector as against private enterprise." The 2010 Affordable Care Act (ACA) sought to begin to remedy this deficit by allocating \$15 billion between FY2010 and FY2019 and an additional \$2 billion each subsequent year. However, since actual funding amounts are set through the annual Congressional appropriations process, ACA funding will remain vulnerable [4, 8].

## 3. Do No Additional Harm

After the attacks, the quest for the appearance of a return to normalcy took precedence over prevention of additional harm to responders, workers and residents

[96]. The premature reopening of Wall Street, the unwarranted extension of the rescue phase, the failure to implement and enforce timely and effective worker respiratory protection, and the non-implementation of risk assessment and environmental remediation in potentially contaminated workplaces and residences all contributed to unnecessary and avoidable health harm.

Protection of the health and safety of rescue, recovery, and cleanup workers and volunteers and impacted communities must be an integral component of disaster response. Effective conduct of rescue operations should not entail unnecessary or avoidable risk to rescue workers or other impacted populations [100].

## 4. The Precautionary Principle

The Precautionary Principle should drive occupational safety and health efforts during disaster response:

**When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically..." [98].**

When confronted with a potentially evolving sequence of exposures to unidentified substances at unknown concentrations, efforts to protect occupational or environmental health should not be postponed due to scientific uncertainty. Given that disaster response workers, volunteers, and nearby residents may be exposed to a wide range of toxic contaminants, many of which may be unregulated, disaster-impacted sites and communities should be assumed to be contaminated and precautionary measures should be utilized until site characterization and risk assessment provide adequate evidence that protective measures may be rolled back.

## 5. Comprehensive Exposure and Risk Assessment

The WTC experience demonstrates that virtually exclusive reliance on environmental sampling results may not provide adequate information for risk assessment and can result in unnecessary and avoidable exposures and adverse health impacts to site workers and nearby communities.

Sampling data are best evaluated in the context of comprehensive *qualitative* exposure and hazard assessments. Holistic industrial hygiene assessments that consider site conditions, work activities, and exposure scenarios, including both typical and worst-case scenarios, should be utilized in addition to targeted sample collection and analysis. Exposure assessments should be thorough "narratives informed by data" rather than simply characterization of sampling results [100]. They should identify substances of concern and their hazards, tasks performed, equipment and tools utilized, disturbance activities and exposure scenarios, and protective measures to be utilized, as feasible, through the entire hierarchy of controls of hazards [77].

## 6. The Hierarchy of Controls of Hazards

Controlling exposures to occupational hazards is the fundamental method of protecting workers. Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective controls. Control measures at the top of the hierarchy are understood to be the most effective, with decreasing effectiveness moving toward the bottom:

- Elimination
- Substitution
- Engineering controls
- Administrative controls
- Personal protective equipment.



Following the hierarchy normally leads to the implementation of inherently safer systems, ones where the risk of illness or injury has been eliminated or substantially reduced [65]. Both OSHA and NIOSH emphasize the desirability of utilizing hazard controls at the top of the hierarchy, because they do "not depend to any marked degree on human behavior, and [are] not as vulnerable to human error as is the use of personal protective equipment" [85].

In disaster response "the control strategy hierarchy is identical to any general industry or construction hierarchy of controls. *However, because of the nature of an emergency incident, the predicted use is reversed*" (emphasis added) [64].

A virtually exclusive reliance on personal protective equipment in the rescue phase of disaster response may be all that is initially possible. However, PPE is the least effective line of defense for protection against hazards and should not remain the only strategy for worker protection. As response efforts evolve from rescue to recovery, the incident command system should emphasize hazard elimination and hazard reduction, where technically feasible, by moving up more rapidly toward the high end of the hierarchy of controls.

## 7. Respiratory Protection

"The respiratory system is commonly known as the primary pathway for hazardous exposures" [91].

Personal protective equipment, including respiratory protection, is the least effective component of the hierarchy of controls of hazards. Because the hazard remains in place and because the potential for human error, which could compromise protection, is high, PPE generally should constitute the defense of last resort. In addition, premature or unilateral use of PPE may inappropriately

or disproportionately shift the burden of responsibility for health and safety protection from the employer to the employee. PPE is appropriately used only when it is not technically feasible to eliminate the hazard or to reduce it to an "acceptable" level. However, in the rescue phase of emergency response, it is typically not possible to eliminate or reduce the hazard and respirators must be utilized for worker protection.

Reliance on respirators is the weak link in responder protection. In the initial chaos of a rescue effort, site characterization and job hazard assessments may not yet have been conducted, proper utilization of the hierarchy of controls of hazards may not yet be possible, appropriate respirators may not be available, and responders may not have been trained about the necessity, proper use, and limitations of respirators. Unwarranted extensions of the rescue phase and delays in the implementation of an incident command system may further contribute to a lack of use of respirators or to an over-reliance on their use to the exclusion of possible feasible controls higher up the hierarchy of controls of hazards.

Respirator use (or misuse or non-use) during the WTC response occurred during heavy exertion, prolonged work shifts, and simultaneous exposure to multiple contaminants, some of which were not identified. Respiratory protection may not be adequately effective under such physically demanding conditions. Discomfort and sweating may result in respirator slippage, compromising the seal and endangering the wearer. In addition, poor respirator design can cause communication difficulties. These disincentives to respirator use can provoke deliberate removal of the respirator by the user.

OSHA and NIOSH should foster research into the redesign of tight-fitting respirators to enhance comfort, fit optimization, and

communication capability, in addition to improving protection factors. We also need to establish rapidly accessible regional caches of respirators and other PPE to eliminate reliance on last minute donations from manufacturers.

## 8. Exposure Limits

WTC rescue and recovery workers and volunteers, area workers, and community residents were exposed or potentially exposed to hundreds of toxic substances, some of which have not been identified. Significantly, some of the known contaminants, such as dioxins, polycyclic aromatic hydrocarbons (PAHs), and diesel exhaust, are known carcinogens and lack regulatory inhalational limits. Further, many existing exposure limits are out-of-date and are insufficiently protective.

Government exposure standards should be updated and strengthened. It is imperative to revise the OSHA permissible exposure limits (PELs) for chronic inhalational exposure as well as to develop acute, sub-chronic, and synergistic inhalational exposure guidelines. Until this can occur, we should increase reliance on other more current and more protective science-based occupational exposure limits (OELs).

OSHA has begun to move in this direction:

**Most ... PELs are outdated and inadequate measures of worker safety. ... In characterizing worker exposure OSHA instead relies on more up-to-date recommended protective limits set by organizations such as NIOSH, the American Conference of Governmental Industrial Hygienists (ACGIH), and the American Industrial Hygiene Association (AIHA)... Results of air monitoring are compared to the lowest known Occupational Exposure Limit for the listed**

**contaminant for purposes of risk assessment and protective equipment recommendations [80].**

## 9. Enforcement

OSHA opted not to apply or enforce applicable protective standards such as the Respiratory Protection Standard and the Hazardous Waste Operations and Emergency Response Standard (Hazwoper) at the WTC site. EPA declined to utilize the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund). Non-enforcement ultimately facilitated rapid debris removal at the expense of worker health.

Responders have a right to expect that their health and safety will be ensured by the strong worker protection and employer responsibility requirements of applicable OSHA and EPA standards. However, OSHA's policy of reliance on voluntary compliance to the exclusion of enforcement, which was implemented after the Exxon Valdez oil spill and formalized after 9/11, is still in place today:

**any decision to discontinue consultation and assistance in favor of enforcement, including at what point during an incident this transition should occur, if at all, will be made by the Regional Administrator in consultation with the Assistant Secretary, Deputy Assistant Secretary, or designee [82].**

A more effective strategy would be to have OSHA mirror the function of the "competent person" in construction (29 CFR 1926.32(f)):

**one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.**



OSHA's role in disaster response should be expanded and proactive, utilizing consultation and technical assistance when it is effective and enforcement when it is necessary. The right of workers to file complaints with OSHA must remain intact.

In addition, the OSH Act should be changed to permit the agency to require employers to immediately abate serious, willful, and repeat hazards (i.e., when preliminary evidence indicates a substantial probability of death or serious harm to workers), even if employers appeal the citations. Current law allows employers to postpone addressing cited hazards until after the appeals process is concluded. A recent OSHA analysis found that over the 10 year period ending in FY 2009 there were 33 fatalities in cited workplaces during the period when abatement was postponed while employers appealed citations. "The only situation worse than a worker being injured or killed on the job by a senseless and preventable hazard is having a second worker felled by the same hazard" [54].

## 10. Training

Training should be provided to a redefined and expanded population of rescue and recovery workers, including not only traditional first responders and skilled support personnel but also non-traditional responders such as area workers, day laborers, and volunteers. Appropriate training about hazards, work procedures, protective measures, and available resources is "critical for the preparedness of the responder" [64].

Pre-deployment and periodic refresher "readiness" training should equip workers with the ability to understand and evaluate site-specific assessments conducted by occupational safety and health or environmental professionals. Emphasis should be placed on the hierarchy of controls of

hazards. Training should emphasize precaution – i.e., assumption of and protection against worst case exposure scenarios, to be scaled back as assessments permit.

Training should emphasize worker rights and employer responsibilities under applicable OSHA standards such as the Hazardous Waste Operations and Emergency Response standard, the Hazard Communication standard, the Respiratory Protection standard, the Access to Employee Exposure and Medical Records standard, and others. Last-minute deployment training should cover site-specific hazards and controls and should reinforce concepts already learned.

Training must be conducted in a language and at a literacy level understandable to the workers involved, using proven participatory, activity-based, adult learning techniques.

OSHA has begun to move in this direction with the establishment of its Disaster Site Worker Outreach Training Program, a training program for skilled support personnel (e.g., utility, demolition, debris removal, or heavy equipment operation) and site clean-up workers. OSHA has also clarified that

**an employer must instruct its employees using both a language and vocabulary that the employees can understand. For example, if an employee does not speak or comprehend English, instruction must be provided in a language the employee can understand. Similarly, if the employee's vocabulary is limited, the training must account for that limitation [84].**

## 11. Work Shifts

At the WTC site, 12-hour work shifts and extended work weeks, by definition, resulted in extended periods of exposure, with additional potential physical and mental health consequences.

Work shifts should be limited in length and number to minimize fatigue and stress, promote safe work practices, and increase productivity, as well as to reduce exposures. Possible controls include: setting a maximum work shift duration or minimum amount of time off during a 24-hour period (e.g., 10 hours rest time in a 24-hour time period, with as much of that in consecutive hours as possible); time off between work rotations (e.g., 48 hours off after a given number of consecutive days of work.); rest breaks throughout a work shift to address fatigue, PPE limitations, and/or temperature extremes; and, rotation of personnel during extended shifts or during shifts that require strenuous and/or detailed tasks [66].

## 12. The Rescue Phase

There is no scientific or regulatory basis for extending the rescue phase beyond the time frame necessary for retrieval of live victims and implementation of site control, an incident command system, and protective health and safety measures. At the WTC site, "significant risk-taking behavior became somewhat regularized ... and continued long after the urgency from which it had stemmed had passed" [91]. The effective conduct of rescue operations should not preclude feasible and assertive efforts to protect the health and safety of rescue workers. While efforts to protect occupational health during disaster response should not impede immediate rescue efforts, these efforts should be conducted with responder risk minimized to the extent possible.

The duration of the rescue phase must have a realistic time limit, informed by science and determined by site-specific conditions and the nature of the disaster event, rather than by politics or passions [75].

## 13. Immigrant Workers

The thousands of immigrant day laborers who "shaped up" to remove contaminated dust and debris from Lower Manhattan buildings comprised the least protected and most exploited work population.

Protection of the health and rights of immigrant day laborers engaged in cleanup operations during disaster response, including wage and hour issues, health and safety training, and medical monitoring and treatment, warrants targeted attention from government agencies [77].

## 14. Risk Communication and Public Process

The World Trade Center experience demonstrates that impacted communities, including rescue and recovery workers and area workers, residents, and students, are capable of building broad-based, politically effective coalitions and of achieving exceptionally high levels of technical proficiency. They will seek to partner with government agencies and will expect honest, timely, and accessible risk assessment and two-way communication. Government agencies involved in response efforts must be prepared to formalize a participatory, transparent public process for the active involvement of impacted communities, including but not limited to labor, business, and community- and faith-based organizations and environmental and tenant groups.

Such a process may include regular, open, participatory public meetings, oversight panels, advisory boards, or task forces, with experts and representatives chosen by or from impacted communities, as well as public hearings hosted by government agencies or elected officials [77]. This process should be informed by the principle of community-based participatory research (CBPR) - "an approach



that promotes active community involvement in the processes that shape research and intervention strategies" [65].

All data should be made publicly available without restriction. Unfiltered data should be posted on the web in a timely manner. Characterization should supplement data, not substitute for it. Workers and unions must retain their legal rights to access to all sampling data per 29 CFR 1910.1020, regardless of partnership agreements or off-shore jurisdictional issues [77].

Risk communication should follow the principles enumerated in EPA's Seven Cardinal Rules of Risk Communication, including:

- People and communities have a right to participate in decisions that affect their lives...
- The goal of risk communication in a democracy should be to produce an informed public that is involved, interested, reasonable, thoughtful, solution-oriented, and collaborative; it should not be to defuse concerns or replace public action...[16]

### 15. Re-occupancy Standards

In the aftermath of the WTC disaster, potentially contaminated workplaces and residences were re-occupied without sampling, assessment, remediation, or technical guidance.

Federal agencies should work with local governments to ensure that re-occupancy occurs according to uniform standards that are adequately protective of public health. Re-occupancy standards should be driven by local site characterization and hazard assessment, with both expert and public input.

### 16. Access to Medical Care

The WTC experience demonstrates that, in addition to initial fatalities, thousands of exposed

responders, workers, volunteers, and residents may experience persistent adverse physical or mental health outcomes. Many workers, especially immigrant day laborers, may be under-insured or uninsured, and may have little or no effective access to medical care.

Responders and other impacted populations must be afforded access to expert and long-term medical care, if necessary. There is a need, in catastrophic disaster situations, for clinic- or hospital-based centers of excellence to engage in targeted outreach and public health education, appropriate medical monitoring and treatment, identification of late-emerging disease, and collection and sharing of data to inform clinical practice and public health policy [77].

Additional support from elected officials is needed to fund and sustain over the long term the World Trade Center Health Program, established on a federal level by the James Zadroga 9/11 Health and Compensation Act of 2010. The WTC Health program provides medical monitoring and treatment for responders at the World Trade Center and related sites in New York City, the Pentagon, and Shanksville, PA. It also provides medical monitoring and treatment for area workers and residents whose health was adversely impacted by exposure to WTC-derived contaminants.

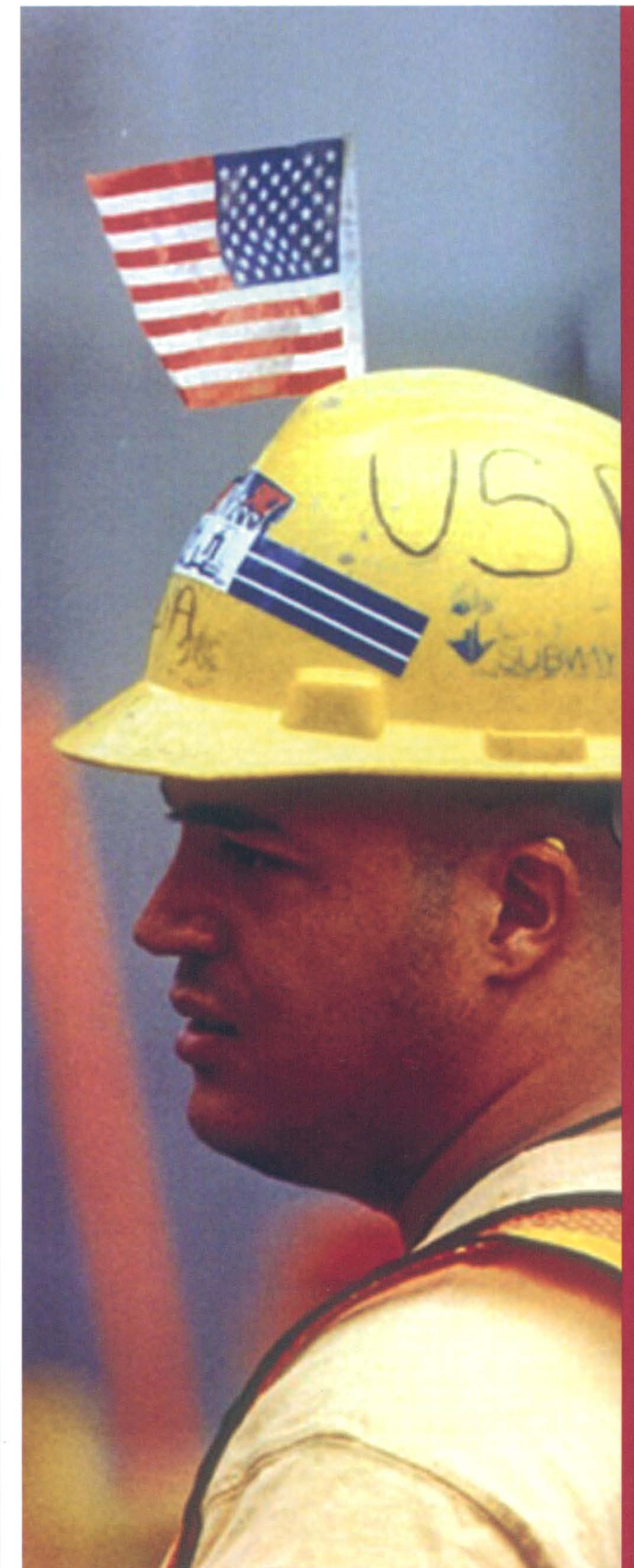
### 17. Workers' Compensation

Workers' compensation needs to be reformed to address compensation rates which drive injured workers and their families into poverty and to reduce delays which prevent workers from obtaining necessary and timely medical treatment.

In catastrophic disasters like the WTC, workers' compensation reform to improve delivery of benefits to impacted disaster

workers (and volunteers) should include "the creation of presumptions [regarding] causal connection between exposure and illness" as well as "greatly expanded time frames for claim filing [and] rules permitting... awards against any potentially liable employer (subject to later reimbursement from the employer ultimately found to be responsible) [27].

*The author wishes to thank the many reviewers of this report, including Joseph "Chip" Hughes, Max Lum, Jim Melius, Terry Myles, Joel Shufro, Deborah Weinstock, and Matt Witt, for their invaluable assistance. Any remaining errors are the sole responsibility of the author.*





## APPENDIX 1: CONFERENCE AGENDA



**PROGRAM**

9:00 a.m. **Introductions and Welcome**  
**Bill Henning**, Chair, New York Committee for Occupational Safety and Health  
**Michael Mulgrew**, President, United Federation of Teachers

9:15 a.m. **Individual Testimony: Volunteers, Denise and Rhonda Villamia**

9:20 a.m. **Panel 1: Documenting the Extent of Harm**  
**MODERATOR: Steven Markowitz, M.D.**, Director, Center for the Biology of Natural Systems & Queens World Trade Center Clinical Center of Excellence at Long Island Jewish Medical Center/Queens College  
 • **Joan Reisman, M.D.**, Director, NYC Health and Hospitals Corporation World Trade Center Environmental Health Center Bellevue/NYU  
 • **Laura Crowley, M.D.**, Assistant Professor, Preventive Medicine, Mount Sinai School of Medicine  
 • **David Proust, M.D.**, Chief Medical Officer, Office of Medical Affairs, New York City Fire Department (FDNY)  
 • **Lee Clarke**, Director, Safety and Health, District Council 37, American Federation of State, County & Municipal Employees

10:20 a.m. **Individual Testimony: Area Worker, Lainie Kitt**

10:25 a.m. **Panel 2: How and Why Did Harm Occur**  
**MODERATOR: Rob Spencer**, Director of Media Service, Organization of Staff Analysts  
 • **Micki Siegel de Hernandez**, Director, Safety and Health, District 1, Communications Workers of America (CWA)  
 • **Catherine McVay Hughes**, Manhattan Community Board 1, Vice Chair and World Trade Center Redevelopment Committee Chair  
 • **Stanley Mark**, Senior Staff Attorney, Asian American Legal Defense and Education Fund  
 • **Bruce Lippy**, C.H., The Lippy Group, LLC, former Industrial Hygienist for Operating Engineers International Union  
 • **Reverend Dr. Martha Jacobs**, BCC, United Church of Christ, National Disaster Ministries

11:00 a.m. **Coffee**

11:15 a.m. **Individual Testimony: Immigrant Worker, Alex Sanchez**

11:20 a.m. **Panel 3: Government Response: How Would Things Be Different Now? What Have We Learned?**  
**MODERATOR: Bill Henning**, Chair, NYCOSH  
 • **David Michaels**, Assistant Secretary of Labor for OSHA  
 • **John Howard M.D.**, Director, National Institute for Occupational Safety and Health  
 • **Richard Woychik**, Deputy Director, National Institute of Environmental Health Sciences  
 • **Matthys Stanislaus**, Assistant Administrator, EPA Office of Solid Waste and Emergency Response

11:30 p.m. **Lunch**

12:00 p.m. **Individual Testimony: Resident, Mariama James**

12:05 p.m. **Panel 4: How Will Plans Play Out in Real Life: Views from the Ground**  
**MODERATOR: Micki Siegel de Hernandez**, Director of Safety and Health, District 1, CWA  
 • **Kimberly Flynn**, Director, 9/11 Environmental Action  
 • **James Melius, M.D.**, Administrator, NYS Laborers Health & Safety Trust Fund  
 • **David Newman**, Industrial Hygienist, New York Committee for Occupational Safety and Health  
 • **Joseph "Chip" Hughes**, Director, Worker Education and Training Program, National Institute of Environmental Health Sciences

3:30 p.m. **Individual Testimony: First Responder, Patrick Bahriken**, President, Uniformed EMS, Paramedics and Fire Inspectors F.D.N.Y., Local 2507, DC 37, AFSCME

3:35 p.m. **Panel 5: Are We Ready for the Next Crisis?**  
**MODERATOR: Suzy Ballantyne**, Assistant to the President, New York State AFL-CIO  
 • **Member of Congress Jerrold Nadler**  
 • **Member of Congress Carolyn Maloney**

4:25 p.m. **Individual Testimony: Construction Worker, Daniel Arriago**, Local 79, Laborers International Union of North America

4:30 p.m. **Closing Remarks**  
**MODERATOR: Joel Shufro**, Executive Director, NYCOSH  
 • **Linda Rae Murray, M.D.**, President, American Public Health Association

**REGISTRATION** — Registration deadline is September 13, 2011  
☐ Yes, I will attend the conference.  
 Enclosed is \_\_\_\_\_ for \_\_\_\_\_ tickets  
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**On-Line Registration Encouraged at [www.NYCOSH.org](http://www.NYCOSH.org)**  
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**Are We Prepared for the Next 9/11?**

SEPTEMBER 16, 2011 • 9 AM – 5 PM  
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 United Federation of Teachers  
 52 Broadway, New York City

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- 9/11 Environmental Action
- AFM, Local 802
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- AFSCME, District Council 37
- AFSCME, Local 1930, District Council 37
- AFSCME, Local 2507, DC 37, Uniformed EMS, Paramedics & Fire Inspectors F.D.N.Y.
- BlueGreen Alliance
- Center for Health, Environment and Justice
- Center for the Biology of Natural Systems, Queens College CUNY
- CSEA
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- TWU, Local 100
- UMDNJ-School of Public Health, Office of Public Health Practice
- United Church of Christ, National Disaster Ministries

Unless otherwise noted, photos by Earl Dotter

## APPENDIX 2

### NYCOSH's Role in WTC Response

The New York Committee for Occupational Safety and Health is a non-governmental, independent, non-profit educational and advocacy organization. NYCOSH has provided technical assistance and comprehensive training in occupational safety and health to unions, employers, government agencies, and community organizations for over 30 years. NYCOSH members include over 150 local unions in the New York City metropolitan area as well as several hundred safety and health professionals, attorneys, physicians, and rank and file workers.

Beginning with the tragic events of September 11, 2001 and continuing to the present day, NYCOSH has worked extensively on World Trade Center-related occupational and environmental health issues. We have collaborated closely on these issues with unions and employers and with non-profit, immigrant, faith-based, and community and tenant organizations at Ground Zero and throughout lower Manhattan.

Our work has included outdoor and indoor environmental sampling, identification and assessment of exposure scenarios, risk assessment of mass transit facilities under and around Ground Zero, evaluation of the safety and healthfulness of affected workplaces and residences, and technical assistance with the design and assessment of sampling, cleanup, and re-occupancy protocols and with building ventilation and filtration issues.

NYCOSH, in collaboration with the Queens College Center for the Biology of Natural Systems and the Latin American Workers Project, operated a mobile medical unit near Ground Zero which provided medical screenings to hundreds of immigrant day laborers engaged in the cleanup of contaminated offices and residences. We also provided

respirators to these cleanup workers, along with change-out filter cartridges, fit-testing, and training in proper respirator use. NYCOSH trained additional hundreds of lower Manhattan workers about 9/11-related occupational and environmental health issues.

NYCOSH was the first organization to advise responders, workers, and residents of the inhalational hazards of exposure to WTC dust and combustion byproducts. Within days of 9/11, NYCOSH produced and distributed a series of fact sheets about respiratory protection and safe work and cleanup procedures.

NYCOSH advocated for the applicability of the OSHA Hazardous Waste Operations and Emergency Response Standard and for enforcement of the OSHA Respiratory Protection Standard. We argued for comprehensive outdoor and indoor environmental sampling, holistic risk assessment, and honest and accurate risk communication at Ground Zero and throughout lower Manhattan. NYCOSH advocated for a rigorous federal outdoor and indoor sampling and cleanup program for impacted workplaces, residences, and schools.

NYCOSH advocated for the creation and long-term support of the WTC medical centers of excellence (now the WTC Health Program). We worked closely with health care providers and with unions, employers, tenant and community organizations, and elected representatives to ensure that their constituents are informed about and have access to appropriate medical care for 9/11 health conditions.

NYCOSH was instrumental in the creation of the broad-based World Trade Center Community Labor Coalition. NYCOSH arranged face-to-face meetings for union and community representatives with OSHA and EPA.



NYCOSH representatives served in the following capacities, among others:

- EPA WTC Expert Technical Review Panel
- Board of the WTC Medical Monitoring and Treatment Program
- Exposure Assessment Working Group of the WTC Worker and Volunteer Medical Screening Program
- Community Advisory Committee of the New York City Health and Hospital Corporation WTC Environmental Health Center
- Labor Advisory Committee of the New York City Department of Health and Mental Hygiene WTC Health Registry
- Community Advisory Committees for the Deutschebank and Fiterman Hall demolitions
- Advisory Board of Columbia University Mailman School of Public Health WTC Evacuation Study
- WTC Community Labor Coalition Working Group (steering committee).

NYCOSH's World Trade Center-related work has been supported through generous funding from the United Church of Christ Disaster Response Ministries, the New York Community Trust, the American Red Cross, and the New York City Health and Hospitals Corporation.

NYCOSH is a union shop: Local 4-149 United Steelworkers.

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