The World Trade Center Medical Monitoring and Treatment Program
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World Trade Center Medical Monitoring and Treatment Program

Queens Clinical Center

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Final Report

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Abstract

Over 50,000 men and women worked at Ground Zero, the former site of the World Trade Center (WTC) in New York City, and at the Staten Island landfill, the principal depository for WTC debris. Firefighters, law enforcement officers, paramedics, construction workers, utility workers, volunteers, and others carried out rescue-and-recovery operations, restored essential services, cleaned up massive amounts of debris. Within weeks of September 11, workers began noting symptoms, most commonly involving the aero-digestive tract, i.e. - upper and lower respiratory tract and gastro-esophageal reflux symptoms. Mental symptoms, especially associated with trauma-related stress were also reported.

In 2002, the Federal Government established the WTC Worker and Volunteer Medical Screening Program (MSP) was established in the summer of 2002 in order to identify possible WTC-related health effects in WTC responders. The MSP was a multi-center clinical screening program that provided free standardized examinations to responders between July 2002 and April2004. Examinations included medical, mental health, and exposure assessment questionnaires, physical examination, spirometry, both pre- and post-bronchodilator, and chest X-ray. CBNS of Queens College undertook WTC MSP screening examinations between April 2003 and June 2004. With direct funding from NIOSH, CBNS established the WTC Medical Monitoring Program (MMP), beginning on June 1, 2004. In October of 2006, the Queens Clinical Center received supplemental funding from NIOSH to provide treatment services for participants with WTC-related mental and/or physical health conditions under a program that was entitled the WTC Medical Monitoring and Treatment Program (WTCMMTP).

The aims of the WTC Medical Monitoring and Treatment Program were to:

A. Provide comprehensive and integrated health monitoring and treatment services to eligible WTC responders;
B. Provide clinical data to contribute to the health surveillance of WTC responders
C. Characterize the evolution of existing WTC-related health conditions, as well as determine new and emerging health consequences;
D. Assist WTC responders and their families with essential services, including public benefits, workers' compensation and LODI and other support services as needed.

Queens College was one of five clinical sites in the New York metropolitan area providing monitoring and treatment under the WTCMMTP. All sites fed monitoring results data to the Data and Coordinating Center at Mount Sinai for data analysis. From 2003 to June 30, 2011, Queens College enrolled 2,875 participants in the WTCMMTP total monitoring cohort of the Queens Clinical Center. As of June 30, 2011, there were 454 active patients receiving treatment for WTC-related conditions. Of these patients, 358 were receiving care for physical health conditions, 210 were receiving care for mental health conditions, and 114 were receiving care for both physical and mental WTC-related health conditions.

Queens WTC clinical data contributed to published research studies from 2003 to the present that have documented the prevalence, incidence, and persistence of numerous respiratory, gastrointestinal, and mental health conditions that were caused or aggravated by WTC-related exposures.

Section I

I. **Significant (Key Findings)**

1. Persistence of multiple illnesses in World Trade Center rescue and recovery workers

In a longitudinal study of a large cohort of WTC rescue and recovery workers, we gathered data from 27,449 participants in the WTC Screening, Monitoring, and Treatment Program. The study population included police officers, firefighters, construction workers, and municipal workers. We used the Kaplan-Meier procedure to estimate cumulative and annual incidence of physical disorders (asthma, sinusitis, and gastro-oesophageal reflux disease), mental health disorders (depression, post-traumatic stress disorder [PTSD], and panic disorder), and spirometric abnormalities. Incidence rates were assessed also by level of exposure (days worked at the WTC site and exposure to the dust cloud).

9-year cumulative incidence of asthma was 27·6% (number at risk: 7027), sinusitis 42·3% (5870), and gastro-oesophageal reflux disease 39·3% (5650). In police officers, cumulative incidence of depression was 7·0% (number at risk: 3648), PTSD 9·3% (3761), and panic disorder 8-4% (3780). In other rescue and recovery workers, cumulative incidence of depression was 27·5% (number at risk: 4200), PTSD 31·9% (4342), and panic disorder 21·2% (4953). 9-year cumulative incidence for spirometric abnormalities was 41·8% (number at risk: 5769); three-quarters of these abnormalities were low forced vital capacity. Incidence of most disorders was highest in workers with greatest WTC exposure. Extensive comorbidity was reported within and between physical and mental health disorders.

2. "Sarcoid like" granulomatous pulmonary disease in World Trade Center disaster responders.

More than 20,000 responders have been examined through the World Trade Center (WTC) Medical Monitoring and Treatment Program since September 11, 2001. Studies on WTC firefighters have shown elevated rates of sarcoidosis. The main objective of this study was to report the incidence of "sarcoid like" granulomatous pulmonary disease in other WTC responders.

Cases of sarcoid like granulomatous pulmonary disease were identified by: patient self-report, physician report and ICD-9 codes. Each case was evaluated by three pulmonologists using the ACCESS criteria and only "definite" cases are reported. Thirty-eight patients were classified as "definite" cases. Six-year incidence was 192/100,000. The peak annual incidence of 54 per 100,000 person-years occurred between 9/11/2003 and 9/11/2004. Incidence in black responders was nearly double that of white responders. Low FVC was the most common spirometric abnormality. Sarcoid like granulomatous pulmonary disease is present among the WTC responders. While the incidence is lower than that reported among firefighters, it is higher than expected.

3. Multiple myeloma in World Trade Center responders: a case series.

We report on cases of multiple myeloma (MM) observed in World Trade Center (WTC) responders registered in the WTC Medical Program. Possible cases of MM diagnosed between September 11, 2001, and September 10, 2007, in responders were confirmed if they met the World Health Organization and Mayo Clinic diagnostic criteria.

Among 28,252 responders of known sex and age, eight cases of MM were observed (6.8 expected). Four of these cases were observed in responders younger than 45 years at the time of diagnosis (1.2 expected). A slight deficit of MM cases was observed in responders older than 45 years (4 observed, 5.6 expected). In this case series, we observe an unusual number of MM cases in WTC responders under 45 years. This finding underscores the importance of

maintaining surveillance for cancer and other emerging diseases in this highly exposed population.

4. Longitudinal assessment of spirometry in the World Trade Center Medical Monitoring Program.

Multiple studies have demonstrated an initial high prevalence of spirometric abnormalities following World Trade Center (WTC) disaster exposure. We assessed prevalence of spirometric abnormalities and changes in spirometry between baseline and first follo"Y-UP evaluation in participants in the WTC Worker and Volunteer Medical Monitoring Program. We also determined the predictors of spirometric change between the two examinations.

Pre-bronchodilator and post-bronchodilator spirometry, demographics, occupational history, smoking status, and respiratory symptoms and exposure onset were obtained at both examinations (about 3 years apart).

At the second examination, 24.1% of individuals had abnormal spirometry findings. The predominant defect was a low FVC without obstruction (16.1%). Between examinations, the majority of individuals did not have a greater-than-expected decline in lung function. The mean declines in prebronchodilator FEV(1) and FVC were 13 mllyr and 2 mUyr, respectively (postbronchodilator results were similar and not reported). Significant predictors of greater average decline between examinations were lack of bronchodilator responsiveness at examination 1 and weight gain [corrected].

Elevated rates of spirometric abnormalities were present at both examinations, with reduced FVC most common. Although the majority had a normal decline in lung function, lack of bronchodilator response at examination 1 and weight gain were significantly associated with greater-than-normal lung function declines [corrected]. Due to the presence of spirometric abnormalities> 5 years after the disaster in many exposed individuals, longer-term monitoring of WTC responders is essential.

5. Enduring mental health morbidity and social function impairment in world trade center rescue, recovery, and cleanup workers: the psychological dimension of an environmental health disaster.

Our objective in this study was to describe mental health outcomes, social function impairment, and psychiatric comorbidity in the WTC worker cohort, as well as perceived symptomatology in workers' children. Ten to 61 months after the WTC attack, 10,132 WTC workers completed a self-administered mental health questionnaire.

Of the workers who completed the questionnaire, 11.1% met criteria for probable post-traumatic stress disorder (PTSD), 8.8% met criteria for probable depression, 5.0% met criteria for probable panic disorder, and 62% met criteria for substantial stress reaction. PTSD prevalence was comparable to that seen in returning Afghanistan war veterans and was much higher than in the U.S. general population. Point prevalence declined from 13.5% to 9.7% over the 5 years of observation. Comorbidity was extensive and included extremely high risks for impairment of social function. PTSD was significantly associated with loss of family members and friends, disruption of family, work, and social life, and higher rates of behavioral symptoms in children of workers.

Working in 9/11 recovery operations is associated with chronic impairment of mental health and social functioning. Psychological distress and psychopathology in WTC workers greatly exceed population norms. Surveillance and treatment programs continue to be needed.

6. The World Trade Center disaster and the health of workers: five-year assessment of a unique medical screening program.

To characterize WTC-related health effects, the VVTC Worker and Volunteer Medical Screening Program was established. This multicenter clinical program provides free standardized examinations to responders. Examinations include medical, mental health, and exposure assessment questionnaires; physical examinations; spirometry; and chest X rays.

Of 9,442 responders examined between July 2002 and April 2004, 69% reported new or worsened respiratory symptoms while performing WTC work. Symptoms persisted to the time of examination in 59% of these workers. Among those who had been asymptomatic before September 11, 61% developed respiratory symptoms while performing WTC work. Twenty-eight percent had abnormal spirometry; forced vital capacity (FVC) was low in 21%; and obstruction was present in 5%. Among nonsmokers, 27% had abnormal spirometry compared with 13% in the general U.S. population. Prevalence of low FVC among nonsmokers was 5-fold greater than in the U.S. population (20% vs. 4%). Respiratory symptoms and spirometry abnormalities were significantly associated with early arrival at the site.

II. Translation of Findings

The findings to date of WTC health studies, including those summarized above and others have important implications:

1. Protection in the face of uncertainty- When the nature and degree of hazard is uncertain, err on the side of protection. The toxicity of WTC exposures were unknown at the time of the clean-up of the WTC site, September through June 2011. Protection against inhalation of toxins in such urgent settings requires an assumption that hazrads exits and must be controlled through respiratory protection proper communication, shortened work shifts, rotation of workers and other measures.
2. Establish medical monitoring as soon as possible- Elaboration of protocols, planning a medical program, determining how to enlist providers, and other considerations should be established prior to environmental catastrophes.
3. Instituting research as soon as possible -There is no contradiction between protection, monitoring, and research. Registering participants and establishing baseline health and risk facor status is crucuial fro understanding how health problems might evolve.

III. Outcomes/Impacts

The WTCMMTP had the following outcomes:

1. Useful research on WTC health effects was completed.
2. Health care was provided to may WTC responders for WTC-related conditions.
3. A monitoring system was established to detect future health conditions that might be WTC-related.
4. WTCMMTP participants were provided with advice for social service benefits, WTC-related and otherwise.
5. Participants and their representatives were involved in overseeing the WTCMMTP and thus instrumental in assuring that the program met their needs.

Section II Scientific Report

Background

Need for the WTC Medical Monitoring & Treatment Program

WTC Exposures

An estimated 50,000 men and women worked at Ground Zero, the former site of the World Trade Center (WTC) in New York City, and at the Staten Island landfill, the principal depository for WTC debris (Levin et al., 2004). Firefighters, law enforcement officers, paramedics, construction workers, utility workers, volunteers, and others carried out rescue-and-recovery operations, restored essential services, cleaned up massive amounts of debris and, in a time period far shorter than anticipated, deconstructed and removed remains of buildings. The diverse worker and volunteer group included operating engineers, laborers, ironworkers, transit workers, telecommunications workers, office building clean-up workers, and workers at the landfill and the Office of the Chief Medical Examiner. Many had no training in response to civil disaster. The highly diverse nature of this workforce, evolving working conditions, and the psychological significance of WTC work posed unprecedented challenges for worker protection.

Workers were exposed to a complex mix of toxic chemicals and extreme psychological trauma that varied over time and by location (Landrigan et al., 2004; Lioy et al., 2002). Combustion of 90,000 L of jet fuel created a dense plume of black smoke containing volatile organic compounds (VOCs, including benzene), metals, and polycyclic aromatic hydrocarbons (PAHs). The collapse of the "twin towers" (WTC 1 and WTC 2) and then of a third building (WTC 7) produced an enormous dust cloud containing thousands of tons of coarse and fine particulate matter (PM), cement dust, glass fibers, asbestos, lead, hydrochloric acid, polychlorinated biphenyls (PCBs), organochlorine pesticides, and polychlorinated dioxins and furans (Clark et al. 2003; Landrigan et al. 2004; Lioy et al. 2002; McGee et al. 2003). EPA estimates of airborne dust ranged from 1,000 $1Jg/m^3$ to over 100,000 $1Jg/m^3$ (U.S. EPA 2002). The high content of pulverized cement made the dust highly caustic (pH 10-11) (Lioy et al., 2002; Landrigan et al., 2004).

Dust and debris gradually settled, and rains on 9/14 diminished the intensity of outdoor ambient dust exposure. However, rubble removal processes repeatedly re-entrained the dust, leading to continuing intermittent exposure for many months. Fires burned both above and under ground until December 2001 (Banauch et al. 2003; Chen and Thurston 2002; US EPA 2003). Levels of certain contaminants remained high well into 2002, with spikes in both benzene and asbestos levels, for example, as late as March and May 2002 respectively (US EPA 2003).

WTC Health Effects

Workers began noting symptoms soon after September 11, most commonly involving the aero-digestive tract, i.e. - upper and lower respiratory tract and gastroesophageal reflux symptoms (Banauch et al., 2006). Firefighters experienced persistent and severe cough, termed the "World Trade Center cough," accompanied by respiratory distress and bronchial hyperreactivity (Prezant et al., 2002). A sample of FDNY firefighters who had sustained extreme exposures on September 11 was nearly 8 times more likely to manifest bronchial hyperreactivity than firefighters with lower exposures when examined after six months (Banauch et al., 2003). Laborers and ironworkers manifested new-onset cough, wheeze, and sputum production (Geyh et al., 2005; Skloot et al., 2004), likely attributable to respiratory inflammation caused by the highly alkaline dust (Chen and Thurston 2002). Immigrant workers who cleaned heavy dust burdens from indoor surfaces of office buildings near the WTC site also experienced high rates of respiratory and other symptoms (Maleivskaia et al, 2002).

Other reported pulmonary effects included cough, asthma, and RADS (Banauch et al., 2006; Balmes et al., 2006). Chronic rhinosinusitis, vocal cord inflammation, and laryngitis (de la Hoz et al., 2004) and case reports of eosinophilic pneumonia (Rom et al. 2002), granulomatous pneumonia, and bronchiolitis obliterans (Safirstein et al. 2003; Mann et al. 2005) were also reported.

Queens College WTC Health Programs

1. Ground Zero Workers Health Watch

The Center for the Biology of Natural Systems (CBNS) established one of the first organized medical screening programs of WTC workers (Maleivskaia et al, 2002). This program began six months prior to the inception of the World Trade Center Worker and Volunteer Medical Screening Program described below. In early 2002, through a mobile medical unit placed adjacent to Ground Zero, we conducted occupational health screening examinations of 418 day laborers and others who had been hired on a short-term basis by cleanup companies specifically for the purpose of cleaning skyscrapers that were adjacent to Ground Zero. Medical examination consisted of a medical and occupational history, physical examination, spirometry, complete blood count, routine blood chemistries, blood lead and zinc protoporphyrin, and urine mercury. As a service, participants were offered respiratory fit-testing and free double cartridge respirators.

Nearly all screening program participants were Hispanic immigrants, and very few (<10%) had health insurance or personal physicians. Participants showed a high prevalence (>50%) of respiratory, gastrointestinal, and neuropsychiatric symptoms. Symptoms remained prevalent despite cessation of work usually 4 to 8 weeks prior to examination in January or February, 2002. Physical examination and pulmonary function testing were normal for most participants. Blood lead, zinc protoporphyrin, and urinary mercury results showed no elevations that suggested significant exposure to lead or mercury as a result of working near the World Trade Center. We performed a six-month telephone interview follow-up of the examined population and reach approximately one-third of examinees by telephone. The majority of re-interviewed participants reported persistent respiratory and neuropsychiatric symptoms. Initial study findings have been published (Malievskaia, et al 2002).

2. NIOSH Sponsored WTC Health Programs

The WTC Worker and Volunteer Medical Screening Program (MSP) was established in the summer of 2002 in order to identify possible WTC-related health effects in WTC responders. The MSP was a multi-center clinical screening program that provided free standardized examinations to responders between July 2002 and April 2004. Examinations included medical, mental health, and exposure assessment questionnaires, physical examination, spirometry both pre- and post-bronchodilator, and chest X-ray.

CBNS of Queens College initiated WTC MSP screening examinations under a sub-contract to Mount Sinai in April 2003 and screened workers through May 2004, when the baseline screening program ended.

In April 2004 funding was obtained from NIOSH to establish the WTC Medical Monitoring Program (MMP). After a successful peer-reviewed application, CBNS received a 5 year grant directly from NIOSH, beginning on June 1, 2004, to serve as a clinical facility in the WTC Medical Monitoring Program.

In October of 2006, the Queens Clinical Center received supplemental funding from NIOSH to provide treatment services for participants with WTC-related mental and/or physical health conditions. This last iteration of the grant funded program was called the WTC Medical Monitoring and Treatment Program.

Specific Aims of the WTC Medical Monitoring & Treatment Program

The Queens Clinical Center had the following aims to accomplish throughout the funding cycle of the World Trade Center Medical Monitoring and Treatment Program (WTCMMTP):

A. Provide comprehensive and integrated health monitoring and treatment services to eligible WTC responders;

B. Provide clinical data to contribute to the health surveillance of WTC responders

C. Characterize the evolution of existing WTC-related health conditions, as well as determine new and emerging health consequences;

D. Assist WTC responders and their families with essential services, including public benefits, workers' compensation and LOOI and other support services as needed; and

Results

The Queens Clinical Center (QCC) was largely successful in achieving each of the aims enumerated above. The QCC was the third largest clinic in the NY/NJ Consortium and had the following strengths: 1) convenient, accessible community-based health care for the large number of responders residing in the boroughs of Queens; 2) expert staff with long-term experience on occupational medicine and with WTC-related care; and 3) proven track record of maintaining stable WTC cohort with excellent consortium-leading program retention; and 4) active involvement in WTCMMTP program-wide operation and assessment.

A.1. Monitoring Component

As of June 30, 2011, there were 2,875 participants in the total monitoring cohort of the Queens Clinical Center. This cohort number consisted of participants who had undergone an examination at the QCC and those participants who had selected Queens as their clinical site, but had not yet had an exam in our Center. We have deleted deceased and patients those who have transferred to another clinical center from our cohort count.

Table 1: **Screening and Monitoring Examinations by Year, Queens Clinical Center, 2003-2011**

Year	Visit 1	Visit 2	Visit3	Visit4	Visit 5	Visit6	Total
2003	393	0	0	0	0	0	393
2004	274	0	0	0	0	0	274
2005	78	80	0	0	0	0	158
2006	311	199	0	0	0	0	510
2007	447	191	25	0	0	0	663
2008	289	309	183	13	0	0	794
2009	238	537	373	157	7	0	1312
2010	217	219	248	216	116	2	1018
1/1/11-6/30/11	118	77	117	123	73	26	534
Totals	**2365**	**1612**	**946**	**509**	**196**	**28**	**5656**

In addition to tracking numbers of enrolled participants and numbers of examinations administered, it is important to assess patient retention and quality of care over the past seven years of operation.

Patient Retention: The Queens Clinical Center made great efforts to increase retention rates over the past several years and achieved a major improvement in the overall rate of retention. In addition, we have achieved a significant reduction in the time interval between periodic monitoring exams. In the Queens Clinical Center, the average time between a Visit 1 and Visit 2 exam is 28 month, while the average time between a Visit 2 and a Visit 3 exam drops to a 20 month interval. The average time between a Visit 3 and a Visit 4 exam has been reduced to 15 months and the average time between Visit 4, Visit 5 and Visit 6 exams hits the program's overall target of a 12 month average. The long lag time between baseline and Visit 2 exams is due in large part to the number of participants in our cohort who, for various reasons, were never scheduled for an examination.

As of June 30, 2010, there were 340 participants who had chosen the Queens Clinical Center as their preferred clinic for a baseline exam. Of those, we consider 207 of those participants as active members of our overall cohort. The remaining 133 participants are those who chose the Queens Clinical Center between 2002 and 2005 and have become nearly impossible to reach. In addition, there were transfer patients that were never successfully scheduled for follow-up exams. Under the new WTC Health Program contract, the QCC will continue its ongoing effort to reach out to these members and re-activate their participation in the new program.

Quality of Care: In an effort to better understand and improve our patients' experience within our clinic, we have started to disseminate a voluntary patient satisfaction survey following their mohitoring or treatment exams. We have consistently received exemplary marks on the following elements: ease of scheduling an appointment, wait time for a monitoring appointment, wait time for a treatment appointment, treatment by staff members, quality care received and overall experience. The only element that received a constant negative score from our patients was the amount of paperwork they must complete.

Our administrator and clinical staff meet with Dr. Steven Markowitz and Medical Director, Dr. Wajdy Hailoo, on a bi-weekly basis to discuss clinical cases and review medical decision making. Through these encounters, we are able to identify program strengths and limitations and rectify the latter.

A.2. Treatment Component

The Queens Clinical Center initiated treatment services for program participants, in April of Program Year 4. As of June 30, 2011 there were 454 active patients receiving treatment. Of these patients, 358 were receiving care for physical health conditions, 210 were receiving care for mental health conditions, and 114 were receiving care for both physical and mental WTC-related health conditions.

Patient Retention: A total of 93 patients have been withdrawn from the overall treatment program since its initiation. Of these patients, 9 were in the physical health component of treatment, 83 were receiving mental health treatment and 1 patient was receiving both types of care. Patients were withdrawn for the following reasons: discharged by WTC physicians for ineligibility or because their health conditions resolved; voluntarily withdrawal from the program, most opting to receive care from their private physicians or mental health professionals; transferring to another consortium clinic and 1 patient passed away in June of 2009.

Quality of Care: Weekly clinical staff meetings contribute to our understanding and improvement of our performance in providing a best standard of care for our patients receiving treatment within the Queens Clinical Center.

An equally important aspect to providing a best standard of care in treatment rests in the quality of our healthcare provider network. Since April 2007 we have expanded our network of healthcare providers, specifically in mental health. The Queens Clinical Center continues to build upon our referral network as need or opportunities arise. We are still endeavoring to identify a Queens based psychiatrist to provide easy access to medication management for our patients needing this service. In addition to building relationships with external providers and establishing the necessary subcontracts with them, we are continuously educating providers in our referral network regarding the parameters of the treatment program. Our current list of providers and their services appears in Table 2 below.

B. Provide clinical data to contribute to the health surveillance of WTC responders

The Queens Clinical Center was charged with providing clinical data to the WTC Data Coordinating Center at the Mount Sinai School of Medicine. This data was transmitted through two methods. The first was TriaiDB, a Yale University designed web-based clinical trials database system used for the storage and management of clinical data. The second data collection tool is a web-based Microsoft Access database called the Data and Coordination Web Application ("Web Application").

The TriaiDB program was designed to collect various data points that were captured throughout the course of the medical monitoring examination. These components included clinical data from the Interviewer Administered Medical Questionnaire (IAMQ), the Exposure Assessment Questionnaire (EAQ), the physical examination, the Self Administered Mental Health Questionnaire (SAMHQ) and the pertinent Mental Health Interview components. Additionally, the program collected data related to patients' HIPAA authorization status, administration of informed consent, alternate contact information and basic demographic information.

The Web Application system collected data for both the Medical Monitoring component and Treatment component of the WTC Health Program. The data required by the Medical Monitoring component included the visit date of the annual monitoring examination, basic participant demographic information and healthcare data. The member demographic data requested information regarding members' employment status, type of occupation, insurance status, workers' compensation, and line of duty status. Clinical data collected for the Monitoring component included diagnostic codes for any suspected or diagnosed WTC-related health conditions, participant co-morbidities, and referrals to the Treatment component of the program.

The data collection within Treatment component of the Web Application data system was similar to, but more comprehensive than the Monitoring component. Data points included the same participant demographic information, visit type, (i.e., initial/follow up), type of provider (i.e., physical/mental health), any referrals made, categories of medication ordered, diagnostic codes for WTC-related health conditions, participant co-morbidities, and procedure codes for diagnostics ordered and services rendered.

Both clinical and administrative staff was responsible for the completion of all data entry into the TriaiDB and Web application systems. All data that was not entered at the time of encounter with a participant was completed within 2-3 business days.

Prior to the development of these web-based data collection applications, the staff of the Queens Clinical Center provided paper copies of all lab and spirometry results, chest x-rays, program protocol questionnaires and informed consent documents for each Queens program participant to the Data Coordinating Center at Mount Sinai.

Throughout the course of the World Trade Center Medical Monitoring and Treatment Program, the Queens Clinical Center has successfully provided clinical and administrative data to the Data Coordinating Center at Mount Sinai in a thorough and timely manner. The data

culled from Queens Clinical Center participants contributed to the aggregate data utilized in several health surveillance publications regarding the WTC responder population.

C. Characterize the evolution of existing WTC-related health conditions, as well as determine new and emerging health consequences

The Queens WTCMMTP contributed to the scientific data generated by the program that led to numerous publications that are listed in a later section of this report (See Results Section).

D. Communicate WTC health information to patients, the community, policy makers and the general public

Some outreach activities of note during 2003-2011 have included:

- Peer Outreach by WTC Responders: Using Red Cross funds, we hired two former Ground Zero workers to telephone monitoring program participants to urge their return for a second monitoring program visit. Efficacy was principally limited by inability to contact over one-third of participants due to incorrect or outdated telephone numbers.

- Grant to Unions and Community Organizations: With funds from the American Red Cross, we have sponsored a small grants program to fund non-personnel WTC medical monitoring outreach expenses (e.g. -mailings, brochures, meeting expenses) of unions and community organizations involved with September 11 services.

- Partnership with Latin American Integration Center, an immigrant service and advocacy organization in the Latino section of Queens (Woodside, Elmhurst, Corona, Jackson Heights). Up until September of 2006 funds supported an outreach worker to disseminate information about the overall WTC MMP. Between June 2006 through September 2006, she presented at 25 workshops, health fairs, expos, and other cultural events attended by 1,736 people.

RESULTS

The principal scientific findings of the over WTCMMTP to which the Queens Center contributed include:

1. Persistence of multiple illnesses in World Trade Center rescue and recovery workers

In a longitudinal study of a large cohort of WTC rescue and recovery workers, we gathered data from 27,449 participants in the WTC Screening, Monitoring, and Treatment Program. The study population included police officers, firefighters, construction workers, and municipal workers. We used the Kaplan-Meier procedure to estimate cumulative and annual incidence of physical disorders (asthma, sinusitis, and gastro-esophageal reflux disease), mental health disorders (depression, post-traumatic stress disorder [PTSD], and panic disorder), and spirometric abnormalities. Incidence rates were assessed also by level of exposure (days worked at the WTC site and exposure to the dust cloud).

9-year cumulative incidence of asthma was 27·6% (number at risk: 7027), sinusitis 42·3% (5870}, and gastro-esophageal reflux disease 39·3% (5650). In police officers, cumulative incidence of depression was 7·0% (number at risk: 3648), PTSD 9·3% (3761), and panic disorder 8-4% (3780). In other rescue and recovery workers. cumulative incidence of depression was 27·5% (number at risk: 4200), PTSD 31·9% (4342), and panic disorder 21·2% (4953). 9-year cumulative incidence for spirometric abnormalities was 41·8% (number at risk: 5769); three-quarters of these abnormalities were low forced vital capacity. Incidence of most disorders

was highest in workers with greatest WTC exposure. Extensive comorbidity was reported within and between physical and mental health disorders.

2. "Sarcoid-like" granulomatous pulmonary disease in World Trade Center disaster responders.

More than 20,000 responders have been examined through the World Trade Center 0NfC) Medical Monitoring and Treatment Program since September 11, 2001. Studies on WTC firefighters have shown elevated rates of sarcoidosis. The main objective of this study was to report the incidence of "sarcoid-like" granulomatous pulmonary disease in other WTC responders.

Cases of sarcoid-like granulomatous pulmonary disease were identified by: patient self-report, physician report and ICD-9 codes. Each case was evaluated by three pulmonologists using the ACCESS criteria and only "definite" cases are reported. Thirty-eight patients were classified as "definite" cases. Six-year incidence was 192/100,000. The peak annual incidence of 54 per 100,000 person-years occurred between 9/11/2003 and 9/11/2004. Incidence in black responders was nearly double that of white responders. Low FVC was the most common spirometric abnormality. Sarcoid-like granulomatous pulmonary disease is present among the WTC responders. While the incidence is lower than that reported among firefighters, it is higher than expected.

3. Multiple myeloma in World Trade Center responders: a case series.

We report on cases of multiple myeloma (MM) observed in World Trade Center 0NfC) responders registered in the WTC Medical Program. Possible cases of MM diagnosed between September 11, 2001, and September 10, 2007, in responders were confirmed if they met the World Health Organization and Mayo Clinic diagnostic criteria.

Among 28,252 responders of known sex and age, eight cases of MM were observed (6.8 expected). Four of these cases were observed in responders younger than 45 years at the time of diagnosis (1.2 expected). A slight deficit of MM cases was observed in responders older than 45 years (4 observed, 5.6 expected). In this case series, we observe an unusual number of MM cases in WTC responders under 45 years. This finding underscores the importance of maintaining surveillance for cancer and other emerging diseases in this highly exposed population.

4. Longitudinal assessment of spirometry in the World Trade Center Medical Monitoring Program.

Multiple studies have demonstrated an initial high prevalence of spirometric abnormalities following World Trade Center 0NfC) disaster exposure. We assessed prevalence of spirometric abnormalities and changes in spirometry between baseline and first follow-up evaluation in participants in the WTC Worker and Volunteer Medical Monitoring Program. We also determined the predictors of spirometric change between the two examinations. Pre-bronchodilator and post-bronchodilator spirometry, demographics, occupational history, smoking status, and respiratory symptoms and exposure onset were obtained at both examinations (about 3 years apart).

At the second examination, 24.1% of individuals had abnormal spirometry findings. The predominant defect was a low FVC without obstruction (16.1%). Between examinations, the majority of individuals did not have a greater-than-expected decline in lung function. The mean declines in prebronchodilator FEV(1) and FVC were 13 ml/yr and 2 mUyr, respectively (postbronchodilator results were similar and not reported). Significant predictors of greater

average decline between examinations were lack of bronchodilator responsiveness at examination 1 and weight gain [corrected].

Elevated rates of spirometric abnormalities were present at both examinations, with reduced FVC most common. Although the majority had a normal decline in lung function, lack of bronchodilator response at examination 1 and weight gain were significantly associated with greater-than-normal lung function declines [corrected]. Due to the presence of spirometric abnormalities > 5 years after the disaster in many exposed individuals, longer-term monitoring of WTC responders is essential.

5. Enduring mental health morbidity and social function impairment in world trade center rescue, recovery, and cleanup workers: the psychological dimension of an environmental health disaster.

Our objective in this study was to describe mental health outcomes, social function impairment, and psychiatric comorbidity in the WTC worker cohort, as well as perceived symptomatology in workers' children. Ten to 61 months after the WTC attack, 10,132 WTC workers completed a self-administered mental health questionnaire.

Of the workers who completed the questionnaire, 11.1% met criteria for probable post-traumatic stress disorder (PTSD), 8.8% met criteria for probable depression, 5.0% met criteria for probable panic disorder, and 62% met criteria for substantial stress reaction. PTSD prevalence was comparable to that seen in returning Afghanistan war veterans and was much higher than in the U.S. general population. Point prevalence declined from 13.5% to 9.7% over the 5 years of observation. Comorbidity was extensive and included extremely high risks for impairment of social function. PTSD was significantly associated with loss of family members and friends, disruption of family, work, and social life, and higher rates of behavioral symptoms in children of workers.

Working in 9/11 recovery operations is associated with chronic impairment of mental health and social functioning. Psychological distress and psychopathology in WTC workers greatly exceed population norms. Surveillance and treatment programs continue to be needed.

6. The World Trade Center disaster and the health of workers: five-year assessment of a unique medical screening program.

To characterize WTC-related health effects, the WTC Worker and Volunteer Medical Screening Program was established. This multicenter clinical program provides free standardized examinations to responders. Examinations include medical, mental health, and exposure assessment questionnaires; physical examinations; spirometry; and chest X rays.

Of 9,442 responders examined between July 2002 and April 2004, 69% reported new or worsened respiratory symptoms while performing WTC work. Symptoms persisted to the time of examination in 59% of these workers. Among those who had been asymptomatic before September 11, 61% developed respiratory symptoms while performing WTC work. Twenty-eight percent had abnormal spirometry; forced vital capacity (FVC) was low in 21%; and obstruction was present in 5%. Among nonsmokers, 27% had abnormal spirometry compared with 13% in the general U.S. population. Prevalence of low FVC among nonsmokers was 5-fold greater than in the U.S. population (20% vs. 4%). Respiratory symptoms and spirometry abnormalities were significantly associated with early arrival at the site.

CONCLUSION:

The findings to date of WTC health studies, including those summarized above of the WTCMMTP and others have important implications:

1. Protection in the face of uncertainty -When the nature and degree of hazard is uncertain, err on the side of protection. The toxicity of WTC exposures were unknown at the time of the clean-up of the WTC site, September through June 2011. Protection against inhalation of toxins in such urgent settings requires an assumption that hazrads exits and must be controlled through respiratory protection proper communication, shortened work shifts, rotation of workers and other measures.

2. Establish medical monitoring as soon as possible – Elaboration of protocols, planning a medical program, determining how to enlist providers, and other considerations should be established prior to environmental catastrophes.

3. Instituting research as soon as possible – There is no contradiction between protection, monitoring, and research. Registering participants and establishing baseline health and risk factor status is crucial for understanding how health problems might evolve.

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CDC Procurement & Grants Office – Branch V

Equipment Inventory Listing

Report Date:	September 30, 2011	Grant Number:	U10 OH008275-05W1
Project Title:	Queens Ground Zero Workers Health Watch	Project Period:	06/01/2004 06/30/2011
Grantee Name:	Research Foundation CUNY/Queens College	Project Officer:	Roy M. Fleming, Sc.D.
Grants Management Officer:	Ruben Cruz	Grant Specialist:	Ruben Cruz

Description of Item	Manufacturer	Serial Number	Quantity	Condition	location	Cost	Date Received
Computer	Dell	2UAOOS01DW	1	Good	Front Desk	$1,102.63	
Copier/Scanner	Xerox	084K36220	1	Good	Front Desk	$17,364.80	
Copier/Scanner	Epson	I3AZ033529	1	New	Front Desk	$339.07	
Computer	Dell	1WF4KM1	1	Good	Nurse 1	$1,102.63	
Printer	HP	CNB9F38946	1	New	Nurse 1	$224.99	
Blood Pressure Monitor	WelchAllyn		1	Good	Nurse 1	$872.00	
Scale	Detecto	E105080241	1	Good	Nurse 1		
Computer	Dell	D761S61	1	Good	Nurse 2	$1,102.63	
Blood Pressure Monitor	WelchAllyn	20070K3000001338	1	Poor	Nurse 2	$579.50	
Scale	Detecto		1	Good	Nurse 2		
Computer	Dell	B761561	1	Good	Exam Room 1	$1.102.63	
XRay Ught	Physician Sales & Service		1	Good	Exam Room 1		
Exam Table	El Dorado		1	Good	Exam Room 1		
Blood Pressure Monitor	WelchAilyn	20070K3000001900	1	Poor	Exam Room 1	$S79.SO	
Automated External Defibrillator	Cardiac Science	4215359	1	Good	Exam Room 1		
Electrocardiogram	Astria	A3100002438	1	Good	Exam Room 1	$3,486.37	

Description of Item	Manufacturer	SerialNumber	Quantity	Condition	location	Cost	Date Received
Small Refrigerator	Summit	VB0050000078HQ4 Z2020281	1	Fair	Exam Room 1	$241.00	
Otoscope/ Ophthalmoscope	WelchAiyn		1	Good	Exam Room 1	$281.08	
Wheelchair	Tracer	07BM014289	1	New	Exam Storage		
02Tank	Puritan Medical	IN10X293P	1	Good	Exam Storage		
Computer	Dell	CDN9PD1	1	Good	Exam Room 2	$1,102.63	
Otoscope/ Ophthalmoscope	WelchAiyn		1	Good	Exam Room 2	$281.08	
ExamTable	ElDorado		1	Good	Exam Room 2		
Scale	Detector		1	Good	Exam Room 2		
Computer	HP	2UA9160MG6	1	Good	SocialWork	$728.01	
Full Refrigerator	Avanti	DA6800259B	1	Good	Admin Storage		
Computer	Dell	23997940309	1	Poor	Benefits	$1,102.63	
Color Printer	Xerox	WYP040885	1	Good	Office		
Shredder	Fellowes		1	Fair	Office	$144.49	
Fax Machine	Brother	U6163 9M6J590851	1	Fair	Office	$299.98	
Computer	Dell	FN755DI	1	Good	Office	$1,102.63	
Printer/Copier	Brother	U61278B6J823666	1	Poor	Office		
PistolLocker	Precision Locker		1	New	Office	$350.00	
FeNo Meter	Aerocrine	0009362	1	Good	Procedure Room	$3,759.00	
Spirometer	Easy One	4936212004	1	Fair	Procedure Room	$247.20	
Spirometer	Easy One	0004541312002	1	Fair	Procedure Room	$247.20	
Spirometry Calibration Syringe	ndd Medical Technologies		2	Good	Procedure Room		
Scale	Detecto	E237080236	1	Good	Procedure Room		
Computer	Dell	CLVTZC1	1	Good	Procedure Room	$1,102.63	

Description of Item	Manufacturer	Serial Number	Quantity	Condition	Location	Cost	Date Received
Otoscope/ Ophthalmoscope	WelchAiyn		1	Good	Procedure Room	$28108	
Exam Table	Winco	857C02647	1	Good	Procedure Room		
Exam Chair	Winco	573A100343	1	Fair	Procedure Room		
Pulse Oximeter	Mind Ray	AY89114397	1	Good	Procedure Room	$399.00	
Microwave	Sanyo	10016SMOS864A	1	Good	Kitchen		
Small Refrigerator	Sanyo	051112412	1	Good	Kitchen	$2,414.00	
Computer	Dell	1WF3KM1	1	Good	MD Office	$1,102.63	
Computer	Dell	98YSWD1	1	Good	MD Office	$1,102.63	
Printer	Canon	QC19029DB0102	1	Good	MD Office		
Printer	Brother	V61230K6J971782	1	Good	MD Office	$149.98	
Computer	HP	2UA01911M4	1	Good	Administration	$728.00	
Computer	HP	2UA01911MS	1	Good	Administration	$728.00	
Computer	HP	2UA01911M2	1	Good	Administration	$728.00	
Computer	HP	2UA01911M3	1	Good	Administration	$728.00	
Printer/Copier	HP	CNB9BCOC3T	1	Good	Administration	$270.99	
Printer	HP	CNGXB66965	1	Good	Administration	$1124.98	
Printer	HP	CNRXK64506	1	Good	Administration	$1,249.98	

tMfr.(Manufacturer)

>Condition:(Excellent) (Good) (Fair) (Poor) (Inoperable)

Location: complete physical address

For Government Use Only, not to be completed by the Grantee

Property Administrator & PO Disposition Recommendation and Instructions:

Description of Item	Disposition!	Address2
[Copy from above)	Transfer ntle	Attn: [Project Officer]
	Retain and Compensate Awarding Agency	CDC/ NIOSH
	Return to Program Office	1600Ciifton Road, NE MS E-74
	Other (explain)	Atlanta,GA 30329-4018
[Copy from above]	Transfer Title	
	Retain and Compensate Awarding Agency	
	Return to Program Office	
	Other (explain)	

.check the appropriate disposition

2CDC Warehouse Is the central receiving point for delivery of all non-hazardous and non-perishable supplies and equipment, CDC-AM-2004-03, update 2010