Respiratory Symptoms in Workers at Three Commercial Kitchens

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The employer shall post a copy of this report for a period of 30 calendar days at or near the workplace(s) of affected employees. The employer shall take steps to insure that the posted determinations are not altered, defaced, or covered by other material during such period. [37 FR 23640, November 7, 1972, as amended at 45 FR 2653, January 14, 1980].

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ABBREVIATIONS

ATS	American Thoracic Society
BMI	body mass index
BO	bronchiolitis obliterans
BRFSS	Behavior Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CI	confidence interval
CMP	Chase Manhattan Plaza
CO	carbon monoxide
COPD	chronic obstructive pulmonary disease
ECRHS	European Community Respiratory Health Survey
°F	degrees Fahrenheit
FDA	Food & Drug Administration
FEV_1	forced expiratory volume in the first second of exhalation
FVC	forced vital capacity
GRAS	generally recognized as safe
HETA	hazard evaluation and technical assistance
HHE	health hazard evaluation
L	liter
l/min	liter per minute
mg	milligram
mg/m^3	milligrams per cubic meter of air
MSDS	material safety data sheet
NHLBI	National Heart, Lung, and Blood Institute
NCCDPHP	National Center for Chronic Disease Prevention and Health Promotion
NHANES III	Third National Health and Nutrition Examination Survey
NIOSH	National Institute for Occupational Safety and Health
NMAM	NIOSH Manual of Analytical Methods
NYCDHMH	New York City Department of Health and Mental Hygiene
NOx	oxides of nitrogen
NO_2	nitrogen dioxide
NTP	National Toxicology Program
NY	New York
NYP	New York Plaza
OR	odds ratio
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
Park	277 Park Avenue

ABBREVIATIONS (CONTINUED)

PEL	permissible exposure limit
PID	photoionization detector
PM	particulate matter
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PR	prevalence ratio
RDHETAP	Respiratory Disease Hazard Evaluation and Technical Assistance Program
REL	recommended exposure limit
SENSOR	Sentinel Event Notification System for Occupational Risks
SOB	shortness of breath
TD	thermal desorption
TWA	time-weighted average
VOC	volatile organic compound

Highlights of the NIOSH Health Hazard Evaluation

In February 2008, the UNITE HERE International Union requested Health Hazard Evaluations of respiratory health and inhalation exposures of food preparation workers at three New York City food service facilities managed by the Aramark Corporation. This request was prompted by concerns of exposure to artificial butter-flavored cooking oils, containing diacetyl. Exposure to diacetyl is associated with a severe lung disease, called bronchiolitis obliterans.

What NIOSH Did:

- Analyzed 19 bulk samples of cooking oils.
- Measured air concentrations of flavoring and other compounds from 20 samples.
- Evaluated local exhaust ventilation systems.
- Interviewed 116 workers (82%).
- Tested 104 workers' lung function.

What NIOSH Found:

- Bulk samples of Prep ZT (from the 1 Chase Manhattan Plaza Aramark location) and unsalted butter (from the 1 New York Plaza and 277 Park Avenue Aramark locations) had detectable diacetyl. However, diacetyl was not detected in the 13 personal and seven area air samples collected over two days. Acetoin was not detected in any of the bulk samples or air samples.
- Some employees handled cleaning agents without proper eye and skin protection as specified in Material Safety Data Sheets (MSDSs).
- Seventy-one (61%) participating workers reported nasal irritation, 54 (47%) reported eye irritation, and 26 (22%) reported post-hire skin problems.
- Participating Aramark workers at the three New York city food service facilities had a higher than expected prevalence of wheeze; symptoms of eye and nasal irritation; nasal allergies, including hay fever; and lung function restriction compared to the U.S. adult population.
- Respiratory symptoms were associated with cooking and cleaning job duties.
- No workers with airways obstruction on lung function tests had worked as cooks.

What Aramark Managers Can Do:

- Consider opportunities for substitution of cleaning chemicals with ones having fewer health hazards based on MSDSs.
- Follow MSDSs recommendations regarding personal protective equipment (PPE) for cleaning products.

- Ensure ventilation hoods are installed over all cooking areas.
- Train workers on the potential hazards in the food service industry and how to protect themselves, by providing all workers including temporary workers, with initial and annual safe work practices training.
- Encourage workers to report new or worsening respiratory symptoms to their supervisors and to their personal physicians or other healthcare providers.

What Aramark Workers Can Do:

- Use ventilation hoods when cooking.
- Follow MSDS recommendations regarding PPE. Use appropriate PPE for cooking and cleaning products.
- Participate in initial and annual safety training on safe work practices.
- Report any new or worsening respiratory symptoms to your supervisor and your personal physician.
- Workers with symptoms should provide their physician with a copy of this report.

Summary

NIOSH conducted industrial hygiene and medical evaluations at three New York City food service facilities managed by the Aramark Corporation. NIOSH found low levels of the flavoring chemical, diacetyl in some bulk oil samples. However, diacetyl or acetoin were not detected in air samples collected by NIOSH. Aramark workers had a higher than expected prevalence of wheeze; stuffy, itchy or runny nose; watery, itchy eyes; nasal allergies, including hay fever; and a restrictive pattern on spirometry tests compared to the U.S. adult population. Respiratory symptoms were more common in workers who reported cooking or cleaning as part of their job duties. We found no evidence of fixed obstruction suggestive of flavorings-related brochiolitis obliterans. NIOSH recommends reducing worker exposures to fumes generated from cooking and cleaning tasks by using engineering controls and personal protective equipment, and encourages workers to report symptoms to their supervisor and personal physician.

In February 2008, the UNITE HERE International Union requested Health Hazard Evaluations to evaluate both respiratory health and inhalation exposures of food preparation workers at three New York City food service facilities managed by the Aramark Corporation. This request was triggered by concerns of exposure to artificial butter-flavored cooking oils, containing diacetyl. Exposure to diacetyl is associated with a severe lung disease, called bronchiolitis obliterans.

At NIOSH's request, in February 2008, the New York City Department of Health and Mental Hygiene collected four bulk samples of current-use cooking oils at the 1 Chase Manhattan Plaza (CMP) Aramark facility. On March 11-12, 2008, we completed a walk-through visit of the three facilities where we performed limited air sampling, evaluated the cooking area ventilation systems, collected bulk samples of current-use cooking oils, and reviewed material safety data sheets (MSDSs) and Occupational Safety and Health Administration (OSHA) 300 logs. We visited the facilities again from March 31 to April 4, 2008 to perform a medical survey consisting of an interviewer-administered questionnaire and spirometry (lung function) testing.

We detected low levels of diacetyl in bulk samples of unsalted butter at the 277 Park Avenue (Park) and 1 New York Plaza (NYP) Aramark locations and in two bulk samples of Prep ZT, a butter-flavored cooking oil, from the CMP Aramark location. We did not detect acetoin, a ketone similar to diacetyl also found in many butter-flavored products, in any bulk samples. We did not detect diacetyl or acetoin in any area or personal air samples at the three facilities and have no evidence that workers are currently exposed to diacetyl or acetoin vapors while using these products during cooking or food preparation. We did not detect oxides of nitrogen (NOx) or nitrous dioxide (NO_2) at any of the locations. Carbon monoxide (CO) was not detected at the Park and NYP locations, but two separate one-minute readings of 6 and 3 parts per million (ppm) were detected at the CMP location during a cooking operation. These short-term concentrations were well below the OSHA Permissible Exposure Limit (8-hour time-weighted average of 50 ppm) and the NIOSH Recommended Exposure Limit (8-hour time-weighted average of 25 ppm) for CO. Real time monitoring for VOCs at all locations did not detect levels greater than 2 ppm, and real time particle measurements were generally below 1 mg/m^3; however, there are no applicable exposure guidelines for these measurements. We observed some

employees handling cleaning agents without the proper eye and skin protection recommended in the MSDSs.

NIOSH staff interviewed 116 workers (82%) about their health and job histories and obtained interpretable spirometry tests from 104 of these participants. Among the 116 participants, 71 (61%) reported nasal irritation; 54 (47%) eye irritation; and 26 (22%) reported a post-hire skin rash or skin problem. Aramark workers had higher than expected prevalence of wheeze (a symptom of asthma); stuffy, itchy or runny nose; watery, itchy eyes; nasal allergies, including hay fever; and shortness of breath on exertion compared to the U.S. adult population as reported in NHANES III [CDC 1996].

Workers who reported cooking as part of their job were twice as likely to report asthma-like symptoms, shortness of breath following exercise, and cough than those who did not report cooking among their job duties. Additionally, they were three to four times more likely to report work-relatedness of their respiratory symptoms. Participants who reported cleaning as part of their duties were also more likely to report lower respiratory symptoms, specifically, asthma-like symptoms and shortness of breath while walking uphill compared to those whose job duties did not involve cleaning. Workers who reported cleaning hot surfaces were more than three times more likely to report shortness of breath following exercise than those not reporting this exposure.

Aramark workers had a higher than expected prevalence of a restrictive pattern on spirometry tests (14%) compared to the U.S. adult population as reported in NHANES III; the prevalence of airways obstruction was not higher when compared to the U.S. adult population [CDC 1996]. We identified five workers (5%) with airways obstruction; of whom two had fixed obstruction which did not appear to be flavoring-related. These two workers started working at their current Aramark facility after artificial butter-flavored products were no longer in use. They, as well as the other three workers with airways obstruction, did not report any professional cooking experience in their current facility or in the food service industry outside of their current facility. Three of the workers reported cleaning experience. One worker with reversible airways obstruction reported no smoking history. The other four workers with airways obstruction reported past or current smoking. No cases of obstruction were observed at the CMP Aramark location where a diacetyl-containing butter-flavored cooking oil

was used at the time of the survey. Diacetyl and acetoin were not detected in any personal or area air samples at the three facilities collected by NIOSH at the time of the survey.

Keywords: NAICS 311930 (Flavoring Syrup and Concentrate Manufacturing), 722310 (Food service contractors, cafeteria and caterers), flavorings, diacetyl, engineering controls, bronchiolitis obliterans, asthma, respiratory symptoms, spirometry, airways restriction, airways obstruction, cooks, cleaners.

INTRODUCTION

In February 2008, the UNITE HERE International Union requested Health Hazard Evaluations to evaluate both respiratory health and inhalation exposures of food preparation workers at three New York City food service facilities located at 277 Park Avenue (Park), 1 New York Plaza (NYP), and 1 Chase Manhattan Plaza (CMP). These facilities were managed by the Aramark Corporation. These requests followed media attention about the possible hazard to commercial grill cooks who used artificial butter-flavored oils on hot grills which might result in inhalation exposure to diacetyl and other constituents of butter flavoring [Schneider 2007; SHARP 2008].

The requests specifically asked NIOSH to undertake the following tasks: 1) Measure personal exposure and area levels of diacetyl and other vapors released during cooking and other food preparations; 2) map levels of fine particles in the cooking and preparation areas; 3) consider exposure measurements for potentially carcinogenic polycyclic aromatic compounds in work area air; 4) characterize exposure controls such as general and local exhaust ventilation in these facilities; 5) evaluate symptoms and measurable effects on the respiratory health of workers in these areas; and 6) obtain and evaluate records of sick leave and medical reports of respiratory conditions over the past five years, including the identification of former workers with respiratory illness for testing.

Flavoring-related Lung Disease

Bronchiolitis obliterans is a rare, severe lung disease that has been described in workers in the microwave-popcorn industry [Kanwal et al. 2006] and flavor manufacturing industry [CDC 2007] who were exposed to flavoring chemicals, including diacetyl, a diketone which imparts buttery aroma and flavor to foods [NTP 2007]. Diacetyl is also found naturally in foods (e.g., beer and butter) and in starter cultures and distillates [NTP 2007]. The U.S Food and Drug Administration (FDA) approves flavorings for use in foods with the designation of "generally recognized as safe" (GRAS) [FDA 2006]. The GRAS designation only protects consumers ingesting flavoring in food products and is not designed to protect workers from adverse health effects associated with inhalation of flavoring chemicals. Exposure to diacetyl vapors, either alone or in combination with other flavoring chemicals, can cause severe respiratory epithelial injury in animals [Hubbs et al. 2002, 2004, 2008; Morgan et al. 2008].

Respiratory Symptoms and Diseases

Respiratory symptoms are common in food preparation workers. A study of 80 female cooks and cleaners found that these individuals were more likely to report phlegm and shortness of breath in the past year compared to 45 female office workers who served as a control population [Karadzinska-Bislimovska et al. 2007]. A study of 239 kitchen workers in Norway found that females were four times more likely to report shortness of breath and respiratory symptoms during work, and males were twice as likely to report these symptoms compared to a control population from the same area (n=762) [Svendsen et al. 2003]. However, the response rate for this study was only 61% leading the authors to concede that the results may not be truly reflective of workers in this industry.

Asthma has been linked to exposure to aerosolized food agents including egg proteins [Bernstein et al. 1987], crab [Beaudet et al. 2002; Bernstein et al. 1987], salmon proteins [Douglas et al. 1995; James and Crespo 2007], enzymes [Montanaro 1992], and organic dusts from tea, coffee, and spices [Zuskin et al. 1993; Chan et al. 1990]. Baker's asthma which results from sensitization to wheat, rye, or barley flour is one of the most common causes of occupational asthma worldwide [Aresery and Lehrer 2002]. European studies have shown an elevated risk of hospitalization for asthma among cooks [Li et al. 2008] and restaurant workers

[Hannerz et al. 2002].

An elevated risk of chronic bronchitis has been observed in the food service industry. Fishwick and colleagues found chronic bronchitis to be three times more likely in food processors and chronic bronchitis with airways obstruction to be 26 times more likely in bakers, compared to office workers [Fishwick et al. 1997]. Cigarette smoking is the most common cause of chronic bronchitis. However, a random population-based study of 20-44 year old workers demonstrated that current and former smokers in the food industry were two to three times more likely to report phlegm production compared to office workers who also were current or former smokers [Zock et al. 2001].

Lung function abnormalities, such as airflow obstruction, have been observed in the food service industry. Arbex and colleagues performed spirometry on 37 commercial cooks and found that each year of work as a cook corresponded to a decrease in predicted FEV_1 of 2.5% [Arbex et al. 2007]. Ng et al. found that housewife-cooks who reported higher frequency of exposure to fumes of cooking oils, had lower lung function results [Ng et al. 1993].

Exposures in Food Service Workers

Workers in the food service industry are exposed to multiple respiratory hazards including allergens and irritants. Nitrogen dioxide (NO_2) and particulate matter (PM) may affect the development or exacerbation of asthma [Belanger and Triche 2008]. Aldehydes and cooking oil fumes may irritate the mucous membranes during food preparation and are shown to be strong risk factors for allergic rhinitis [Ng and Tan 1994]. Exposure to NOx and cooking fumes has been associated with cough, shortness of breath, chest pain, and cancer [Ko et al. 2000; Svendsen et al. 2003; Lewtas 2007].

Frying and grilling are associated with generation of ultrafine PM of aerosol oil droplets and combustion products. Once inhaled, these particles may deposit deep in the lungs [Siegmann and Sattler; 1996; Svendsen et al. 2002; Wallace et al. 2004; Mitsakou et al. 2007]. Additionally, harmful products such as polycyclic aromatic hydrocarbons (PAH), fatty acids, aromatic amines, and aldehydes [Pan et al. 2008; To et al. 2006, Lund and Petersen 2006] may be generated. Some of these can cause cancer [Wu et al. 2001; Jansson et al. 2006], especially with increasing cooking temperature

[Overvik et al. 1990]. Fumes from heated peanut oil, soybean oil, sunflower oil, and lard have been shown to have mutagenic effects on lung cells in laboratory experiments [Wu and Yen 2004; Dung et al. 2006].

Cleaning agents

Over the years, cleaning has been identified as an occupational risk for asthma and asthma-like symptoms [Ng et al. 1994; Kogevinas et al. 1999; Medina-Ramon et al. 2003; Zock et al. 2001; Le Moual et al. 2004]. Rosenman et al. [2003] evaluated data from the California, Massachusetts, Michigan, and New Jersey state-based surveillance systems from 1993 to1997 to describe characteristics of individuals with work-related asthma associated with exposure to cleaning products. These four states conducted surveillance for work-related asthma as part of NIOSH's Sentinel Event Notification System for Occupational Risks (SENSOR) Program. Twelve percent of the confirmed cases of work-related asthma identified by these states were associated with cleaning products. Eighty percent of these cases were new-onset asthma while 20% were aggravation of pre-existing asthma. Cleaning often was not the usual primary task of many individuals exposed to cleaning products; however, janitors and cleaners were the most common occupations reported based on the California data. Nurses, nurse aides, and clerical staff were the next most common occupations. Often the specific cleaning agents were not identified during the interviews of individuals with work-related asthma; however, of the cleaning agents identified, the most common were irritants (such as acids, ammonia, or bleach) and disinfectants (such as formaldehyde, glutaraldehyde, and quaternary ammonium compounds).

Process Description

The Aramark Corporation is an international company specializing in food services and facilities management for businesses, healthcare institutions, stadiums and arenas, and universities and school districts. The processes described below are specific to the Aramark-managed facilities located at 277 Park Avenue, 1 Chase Manhattan Plaza, and 1 New York Plaza.

Park Aramark Location

The commercial kitchen located at 277 Park Avenue has been operated by Aramark since December 2004. On average, the facility serves approximately 600 breakfasts and 1,800 lunches daily. In general, eggs and bagels are the top breakfast items, while pizza, sandwiches and a variety of weekly international cuisine offerings are the top lunch items.

The facility was located on the 7th floor and consisted of a kitchen, serving area, and dining room. The kitchen was located adjacent to the serving and dining areas and equipped with several flat-top grills, ovens and heating vessels. The serving area consisted of a grill station with flat-top and ridged grills, a deep fryer, an omelet/sauté station, a pizza oven, a sandwich bar with panini press, grab-and-go cold station, and a hot buffet station. All heating surfaces were electric; no gas-fired heating elements were used in the facility. Ventilation hoods were located above grills, deep fryers, and electric burners. Catering offices, storage and dishwashing equipment were located on the sixth floor.

At the time of the industrial hygiene survey, salted and unsalted butter were used in cooking, and no artificial butter-flavored cooking oils, shortenings, or sprays were used at this location. Through a review of purchasing records from December 2004 to November 2007, no butter flavored products appeared to have been used with the exception of sweet cream or unsalted butter for cooking and margarine and butter in individual pats for customer use. Table 1 shows oil products in use at the time of the survey for all three facilities.

NYP Aramark Location

The commercial kitchen located at 1 New York Plaza has been operated by Aramark since October 2003. It serves approximately 1,200 meals daily with fruit, eggs, bacon, and sausage as popular breakfast items, while salads, deli items, and a changing menu of hot meals are the main lunch purchases.

The facility was located on the 43rd floor and consisted of a kitchen, serving area, and dining room. The kitchen consisted of storage rooms for cleaning supplies, plastics, dry and canned goods, and refrigerated items, two offices, a dishwashing area, several preparation stations, and a cooking area with several gas ovens and stoves, two electric steam kettles, a steamer, deep fryer, a gas braising pan, and an open-flame gas grill. A large canopy ventilation hood was located over the entire cooking area.

The serving area was made up of a grill and sandwich station, "action cooking" station, antipasta, soup and salad station, salad bar, drink coolers, and cashier stands. A gas stove was located at the "action cooking" station, and the grill and sandwich station contained a gas flat grill (griddle), open-flame grill, electric rotisserie chicken oven, deep fryer, and two electric panini presses. Canopy ventilation hoods were situated above all the cooking equipment, except the panini press at the sandwich station. The stove at the "action cooking" station was used to prepare omelets in pans during the breakfast hours, and at lunchtime it was covered and used to serve prepared foods. In the morning at the grill and sandwich station, eggs and grilled cheese sandwiches were cooked on the griddle and a panini press. At lunchtime, the open-flame grill, deep fryer, and other panini press were heavily used.

Aside from unsalted butter being used in cooking at this facility during our March 2008 visit, none of the cooking oils, shortenings, or sprays were butter-flavored. NIOSH obtained purchasing records from December 2004 to November 2007 which indicated these or similar products were used throughout that time, although a few containers of a butter-flavored oil were purchased during the first year.

CMP Aramark Location

The commercial kitchen located at 1 Chase Manhattan Plaza has been operated by Aramark since December 2004. Aramark also previously managed the facility from 1995 to 1999. On average, the facility serves approximately 1,500 customers daily. In general, eggs, oatmeal, and French toast are top breakfast items, while salads, deli sandwiches, and pizza are top lunch items.

The facility consisted of a kitchen, serving area, and dining room with a maximum capacity of 600 people. The kitchen was located on basement level 2 (2B), one level below the serving and dining area on level 1B. The kitchen consisted of a large room with two

flat-top grills and an open-flame ridged (or marked) grill. The kitchen also had stoves, ovens, a deep fryer, large stand-alone pots for cooking soups, a fruit and vegetable preparation area, and dishwashing area. Rooms off of the kitchen included a catering preparation room, cooler, pantry, office, and two storage rooms for cleaning items and disposable food and drink containers, respectively. The serving area on level 1B consisted of multiple stations including a utensil station, salad bar, sandwich bar, grab-and-go cold station, sauté station, hot-buffet station, grill station (with one flat-top grill, one ridged grill, and a deep fryer), cold and hot drink stations, and multiple cashier stations. Common foods cooked on the grills were French toast, eggs, home fries, chicken, meat, and fish. Generally, these foods were cooked in the kitchen on level 2B and brought up to the serving area on level 1B. Some foods such as omelets and hamburgers were cooked to order at the grill station in the serving area. All grills were electric except the open-flame gas grill on level 2B and were covered by canopy ventilation hoods.

At the time of this survey, we observed the use of butter and butter-flavored cooking oil (Prep ZT product #35077) at this location. A review of purchasing records from December 2004 through November 2007 indicated that two butter-flavored oils, Whirl product #35011 and Whirl product #35075, had also been used throughout the period; the former from December 2004 to June 2007 and the latter for the remaining period.

Industrial Hygiene Survey

On February 26, 2008 at the request of NIOSH, the New York City Department of Health and Mental Hygiene (NYCDHMH) collected four bulk samples of current-use cooking oils at the CMP Aramark facility and sent them to a NIOSH laboratory for analysis. During our March 11-12, 2008 visits to the three facilities, we collected an additional 15 bulk samples. At the laboratory, thermal detection (TD) tubes were used to collect air samples from the headspace above each sample, and the tubes were analyzed to identify volatile organic compounds (VOCs) using NIOSH method 2549 [NIOSH 2003]. This is a screening method that can identify a wide range of common compounds released during cooking, such as polycyclic aromatic compounds, aldehydes, and ketones (including diacetyl).

We collected personal air samples on grill cooks at the three facilities for diacetyl and acetoin using the modified OSHA method PV2118 [OSHA 2006; Ashley et al. 2008]. Additionally, we obtained area air samples for diacetyl and acetoin near the cooking operations at the three facilities. For area air sampling, we also conducted VOC screening using TD tubes (NIOSH method 2549); real-time sampling for total VOC concentrations using a pocket photo-ionization detector (ToxiRAE, RAE Systems Inc., San Jose, CA); carbon monoxide (CO) detection using a single gas monitor (T82, Industrial Scientific Corp., Oakdale. PA); and dust measurements using a particulate monitor (pDR-1000AN personalDataRAM, Thermo Scientific Corp., Franklin, MA). The optical configuration for this sampler responds to particles in the size range from 0.1 to 10 micrometers, achieving high correlation with standard gravimetric measures of respirable and thoracic dust fractions.

We used direct-reading indicator tubes to sample for nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x). We evaluated the ventilation systems with smoke tubes to visualize air currents above the cooking surfaces. We also measured air temperature and relative humidity. Table 2 summarizes industrial hygiene air sampling methods.

Medical Survey

We again visited the three facilities during March 31 to April 4, 2008, to perform medical tests. The standardized surveys consisted of an interviewer-administered questionnaire and spirometry (lung

function) testing.

Standardized Questionnaire

After obtaining informed consent from participants, we administered the standardized questionnaire with questions adapted from the European Community Respiratory Health Survey (ECRHS) [Grassi et al. 2003] and the American Thoracic Society (ATS) adult respiratory questionnaire (ATS-DLD-78) [Ferris 1978] (Appendices A and B). The questionnaire addressed demographic information, respiratory and dermatological symptoms, asthma and other diagnoses, smoking history, workplace exposures, and occupational history in the food service industry. Spanish-speaking participants for whom English was a second language had the option of using a translator in questionnaire administration.

Work History Determination

Participants were classified as having ever-cooked if they answered "yes" to one or more cooking-related questions regarding their work at their current Aramark facility (see Appendices A and B for details). Participants were classified as having ever-cleaned if they reported using cleaning agents such as soap or other detergents at their current Aramark facility.

Spirometry

We performed spirometry following the ATS guidelines [Miller et al. 2005]. Participants for whom English was a second language had the option of using a translator. We used a dry rolling-seal spirometer interfaced to a personal computer and compared spirometry results to reference values based on U.S. population data from the Third National Health and Nutrition Examination Survey (NHANES III) [Hankinson et al. 1999]. We selected each participating worker's largest forced vital capacity (FVC) and forced expiratory volume in the first second of exhalation (FEV_1) for analysis. We defined obstruction as an FEV_1/FVC ratio and an FEV_1 below their respective lower limits of normal. An obstructive abnormality indicates that air is exhaled from the lungs more slowly than normal. This can be seen in certain lung conditions such as asthma, bronchitis, emphysema, or bronchiolitis obliterans. We defined restriction as an FVC below the lower limit of normal with a normal FEV_1/FVC ratio. A restrictive abnormality indicates that the amount of air exhaled is smaller

than normal. This can be seen in certain lung conditions, such as lung scarring or inflammation, or in people who are considerably overweight. Restriction can also be seen in people who have a severe obstructive abnormality. We defined a mixed pattern (obstruction and restriction) as an FEV_1/FVC ratio, FEV_1, and FVC all below their respective lower limits of normal. Workers with evidence of airways obstruction were administered albuterol, a bronchodilator medication used to treat asthma, and were then re-tested after 10 minutes to see if the obstruction was reversible. We defined reversible obstruction (such as asthma) as an improvement in the FEV_1 of at least 12% and at least 200 milliliters after administration of albuterol. This percent change and absolute change in FEV_1 suggests a significant bronchodilation. We defined fixed obstruction (such as in bronchiolitis obliterans) as airways obstruction in which neither the FVC nor FEV_1 increased by 12% or more and at least 200 milliliters after bronchodilator administration.

Approximately four weeks after the medical surveys, we mailed each participant a report with his or her spirometry results, an interpretation, and recommendations for follow-up of abnormalities. We mailed Spanish speakers reports in both Spanish and English. In the cover letter accompanying the results, we recommended that each participant provide a copy of his or her spirometry results to his or her personal physician.

On May 23, 2008 we sent a letter regarding each Aramark facility (Appendices C, D, E) to the UNITE HERE International Union and the Aramark Corporation management providing them interim results and recommendations, and updating them on the progress of the health hazard evaluations.

Statistical Analyses

We used the lung function tests and the questionnaire responses to determine health conditions which included lung function restriction; lung function obstruction or mixed pattern of obstruction and restriction; current asthma (defined as physician-diagnosed asthma that was still present); shortness of breath walking uphill; shortness of breath following exercise; usual cough on most days for three consecutive months or more during the year; stuffy, itchy, or runny nose in the past 12 months; and itchy, watery eyes in the past 12 months. We calculated an asthma-like symptom score for each participant from the following outcomes:

wheezing or whistling in the chest in the past 12 months; being awoken at night by an attack of shortness of breath in the past 12 months; woken up with a feeling of chest tightness first thing in the morning in the past 12 months; and currently taking any medicine for asthma [Grassi et al. 2003]. In this validated method, each outcome was assigned a pre-set value (see Grassi et al. 2003, for details). Responses were summed and a score of greater than 1.0 was considered positive, i.e., suggestive of asthma.

We considered the following symptoms during the last 12 months work-related if the participant reported it was better away from the facility on days off or on vacation: wheezing or whistling in chest; feeling of tightness in chest first thing in the morning; attack of shortness of breath that came on after exercising; woken up at night by an attack of shortness of breath; stuffy, itchy, or runny nose; watery, itchy eyes; or post-hire skin rash or other skin problems.

We examined associations between health conditions and the following demographic and job-related variables: race/ethnicity (Hispanic versus other); gender; smoking status (ever versus never); body mass index (BMI); facility site; translator used in questionnaire administration; cooking at current facility; cleaning, overall, and hot surfaces, at current facility; both cooking and cleaning at current facility; employment tenure at current facility (categorized by tertile as greater than 95 months, 15 months to 95 months, and less than 15 months); total time spent in food service industry; and total time spent as a cook.

We used descriptive statistics to investigate the distribution of demographic, clinical, and job task variables. We calculated prevalence ratios (PRs) of diagnoses and respiratory symptoms from comparisons with the U.S. adult population prevalence reported in NHANES III [CDC 1996] using indirect standardization for race, sex, age (< 40 versus ≥ 40), and cigarette smoking status (ever or never), and with the 2007 data for New York from the Behavior Risk Factor Surveillance System (BRFSS) [National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) 2007], using standardization for sex. We used logistic regression techniques to examine associations between the outcomes and potential explanatory variables for the combined facilities. We estimated odds ratios (ORs) and 95% confidence intervals (CIs) using the likelihood ratio test. Univariate results are reported. Fisher's Exact Test methods were used to examine associations

where less than five participants reported the outcome. Given the limited number of participants with a particular outcome, when more than one explanatory variable was associated with an outcome of interest, we used stratification and the Cochran-Mantel-Haenszel test to further examine associations. A probability level of $p < 0.05$ was considered statistically significant. A probability level of $p \geq 0.05$ and $p < 0.10$ was considered marginally significant. We used SAS version 9.2 (SAS Institute, Cary, NC) for data analyses.

INDUSTRIAL HYGIENE SURVEY

Flavoring Chemicals, Diacetyl and Acetoin

Bulk Samples

One of the four bulk samples of cooking oils in current use (specifically, Prep ZT) collected by the New York City Department of Health and Mental Hygiene at the CMP location showed a detectable diacetyl peak. Four of the 15 bulk oil samples (specifically, Prep ZT and unsalted butter) collected from the three facilities by NIOSH showed detectable diacetyl peaks (Table 1). Acetoin was not detected in any of the 19 bulk oil samples.

Park Aramark Location
A bulk sample of unsalted butter had a detectable diacetyl peak. This was the largest diacetyl peak observed from bulk samples among the three facilities.

NYP Aramark Location
A bulk sample of unsalted butter had a detectable diacetyl peak.

CMP Aramark Location
Two bulk samples of the same product, Prep ZT, one from a previously opened container and the other freshly opened, had detectable diacetyl peaks.

Air Samples

Neither diacetyl nor acetoin was detected in the 13 personal and seven area air samples collected from the three facilities. The limits of detection were 0.02 and 0.07 parts per million (ppm), respectively. These compounds were also not detected on the 11 TD tubes used for VOC screening.

NOx and NO_2

No NOx or NO_2 were detected in any of the air samples taken at the three facilities; limits of detection were 0.5 and 0.5 ppm, respectively.

Carbon Monoxide (CO)

No CO was detected in any of the air samples taken at Park or NYP locations; limit of detection was 1.0 ppm. At the CMP location, we detected CO in two separate one-minute meter readings (6

ppm and 3 ppm) above a pan of butter cooking on a range inside a ventilated hood on level B2. The short-term concentrations were below the OSHA Permissible Exposure Limit (PEL) (8-hour time-weighted average of 50 ppm) and the NIOSH Recommended Exposure Limit (REL) (8-hour time-weighted average of 25 ppm) for CO.

Volatile Organic Compounds (VOCs)

Park Aramark Location

Airborne VOCs during real-time air sampling ranged from 0 to 785 parts per billion (ppb), with most levels under 100 ppb. The spike at 785 ppb lasted for one minute and occurred during an operation involving the sautéing of vegetables in oil with garlic and cayenne pepper flakes.

NYP Aramark Location

Throughout the 4.5-hour morning sampling period, the only airborne VOCs detected by the real-time air sampler in the back kitchen area was a 1-minute 200 ppb concentration. During a 15-minute sampling period, measurements of airborne VOCs at the action cooking and grill stations in the front public serving room were below detection limits. During the lunch cooking period, we placed real-time instruments in the front serving area adjacent to a panini press at the sandwiches station for approximately 3.25 hours. At this location, we measured an average VOC concentration of 100 ppb (maximum of 500 ppb).

CMP Aramark Location

We measured approximately 2 ppm VOCs while butter was heating in a cooking pan. We did not detect VOCs away from the range or during cooking of French toast with Prep product #35077 (Aramark #6040410) on a flattop grill inside a ventilated hood on level B2.

Real-time Airborne Particles

Park Aramark Location

Levels of airborne particle concentrations during real-time sampling ranged from 0.01 to 99.97 milligrams per cubic meter of air (mg/m^3), with most levels under 0.09 mg/m^3. The spike at 99.97 mg/m^3 occurred during a 12-minute interval when a worker used Scotch-Brite™ Quick Clean Griddle Liquid to clean a hot

griddle, creating large amounts of steam.

NYP Aramark Location

During the morning, all real-time particle concentrations remained below 0.08 mg/m^3. We measured an average particle concentration of 5.59 mg/m^3 (maximum of 13.32 mg/m^3) during the lunch cooking period in the front serving area adjacent to a panini press (see VOC section above). We observed a small amount of pan release oil being sprayed on the panini press surfaces prior to each sandwich being placed on the panini press, and occasionally noticed visible smoke while sandwiches were in the press, which was not located under a ventilation hood.

CMP Aramark Location

We measured 2.5 mg/m^3 airborne particles over the fryer on level B1. Most levels of airborne particles detected during real-time sampling ranged from below detection limits to 2.5 mg/m^3, with most levels under 1.0 mg/m^3.

During the walkthrough, numerous employees complained that smoke from the sauté station was irritating. The station was not operational during the industrial hygiene survey; we noted no exhaust hood at this location during our survey. We observed workers cleaning heated grills with cleaning agents; these workers were not using personal protective equipment.

Ventilation systems

At all three facilities, we evaluated the exhaust ventilation systems in the cooking areas. In general, all canopy hoods appeared to function appropriately by capturing the smoke generated from the smoke tubes at the cooking surface. However, at the NYP facility, smoke escaped capture by the island-type grill arrangements with no enclosed sides. This seemed to be due to competing room air currents.

Cleaning Agents

A large number of cleaning products were used at the facilities, including quaternary ammonium compounds, sanitizers, anti-bacterial cleaners, glass cleaners, metal polishers, degreasers, bleaches, and drain cleaners. At all three facilities, we observed some workers handling cleaning agents without the recommended eye and skin protection specified in the MSDSs. At the NYP Aramark location, a worker showed us a respirator with no

cartridges he wore while preparing and using the cleaning solutions. The worker reported he was not aware he needed cartridges. At the NYP location, we reviewed records of daily mixing concentrations of quaternary ammonium cleaning compounds. The records indicated that almost every mixture met the desired 200 ppm concentration.

MEDICAL SURVEY

Participation and Demographics

Characteristics for the entire group of participants and by each facility are detailed in Table 3. A total of 116 people completed a questionnaire out of 141 (82%). A translator was used to administer the questionnaire to 47 (41%) workers. Participants were primarily male (67%), non-smoking (90%), and Hispanic (68%), with a mean age of 45 years. The mean time employed at the facility was six years. Among those who had ever-cooked at their current facility (n=42), the mean time ever-cooked at their facility was also six years. Among those who had ever-cooked at any food service facility (n=48), the mean time as a cook was 12 years.

Work History

Among the 116 participants, 72 reported previously working at another food service facility. Thirty-six (31%) participants reported they cooked at another facility; 30 of these 36 workers also cooked at their current facility.

Among the 42 workers who reported cooking at their current facility (Table 4), 39 reported using cooking sprays; 34 used liquid cooking oils; 24 used margarine; and 31 used butter. Ninety-four (81%) workers reported ever using cleaning agents such as soap or other detergents at their current facility. Thirty-one workers reported using these products to clean hot cooking surfaces; 61 to clean preparation surfaces; 28 to clean floors; 42 to clean pots, pans, platters and/or dishes; and 32 to clean tea and/or coffee equipment.

Worker Symptoms

Table 5 has aggregate and facility-specific health information collected through questionnaire. Among the 116 participants, 71 (61%) reported stuffy, itchy or runny nose; 31 of those 71

participants reported the nasal symptoms were work-related. Fifty-four (47%) reported eye irritation of whom 21 reported that it was work-related, and 26 (22%) reported a post-hire skin rash or skin problem of whom 14 reported that it was work-related.

Six participants (5%) reported current asthma; 11 (9%) reported ever being diagnosed by a physician with asthma. Thirty-six (31%) reported nasal allergies including hay fever. Sixteen (14%) reported a usual cough of whom nine stated it was work-related.

National and State-based Respiratory Symptom and Diagnoses Rate Comparisons

The prevalence rates of wheeze; stuffy, itchy or runny nose; itchy, watery eyes; nasal allergies, including hay fever; and shortness of breath on exertion among Aramark workers were significantly higher than the prevalence rates for the U.S. adult population as reported in NHANES III. Aggregate and facility-specific results are detailed in Table 6. The prevalence rates of diagnoses among Aramark workers at all facilities were not significantly different than the prevalence rates for the New York adult populations participating in the 2007 BRFSS. Aggregate and facility-specific results are detailed in Table 7.

Pulmonary Function Testing

Of the 111 participants that attempted spirometry, 104 had valid spirometry tests (Table 8), and seven spirometry tests were not interpretable. The mean FEV_1 percent predicted was 92.4%, the mean FVC percent predicted was 93.2%, and the mean FEV_1/FVC was 80.4%.

Obstruction or mixed pattern of obstruction and restriction

Five (5%) participants had obstruction or a mixed pattern of obstruction and restriction. Their mean age was 50 years (range: 42 – 70 years). Three had mild obstruction; one had moderate obstruction, and another had a mixed pattern of obstruction and restriction. The worker with moderate obstruction was reversible with bronchodilator testing while two other workers, one with mild obstruction and the other with the mixed pattern, did not have a significant bronchodilator response. The other two workers, both with mild obstruction, did not undergo bronchodilator testing.

The worker with reversible moderate obstruction reported an asthma history and was currently on asthma medication. The

worker with mild fixed obstruction reported nasal allergies. During the last 12 months, he also reported wheezing or whistling in his chest, chest tightness upon waking in the morning, shortness of breath after exercise, and a stuffy, itchy, or runny nose (Table 9). He reported that his wheezing/whistling and chest tightness were work-related. The worker with a mixed pattern had a moderately severe FEV_1 reduction and did not report any respiratory symptoms. Of the other two workers with mild obstruction, one reported shortness of breath when hurrying on level ground or walking up a slight hill, and the other reported developing a new skin rash or skin problems since working at his current facility.

The worker with reversible obstruction reported no cigarette smoking history. Of the other four, one reported current cigarette smoking while the other three reported past cigarette smoking. These five workers did not report any professional cooking experience in their current facility or in the food service industry outside of their current facility. Three of the workers reported cleaning experience. The two workers with fixed obstruction started working at their current Aramark facility after artificial butter-flavored products were no longer in use. The prevalence rate of obstruction or mixed pattern of restriction and obstruction on spirometry, was not significantly higher for Aramark workers compared to the rate for the U.S. adult population as reported in NHANES III (PR=1.5).

Restrictive pattern

Fifteen participants exhibited a restrictive pattern (14%) on spirometry. They were predominantly male, Hispanic, with a mean age of 42 (range: 22-65 years). Four of these workers reported shortness of breath when hurrying on level ground or walking up a slight hill. Four reported having a usual cough, in each case, work-related in pattern. During the last 12 months, five workers reported trouble breathing; three reported being woken up at night by an attack of shortness of breath (all three reported as work-related), three reported an attack of shortness of breath that came on post exercise (two reported as work-related), two reported wheezing or whistling in their chest (one reported as work-related), six reported waking up with a feeling of tightness in their chest first thing in the morning (three reported as work-related), nine reported a stuffy, itchy, or runny nose (five reported as work-related), and 10 reported watery, itchy eyes (six reported as work-related). Five reported developing a new skin rash or skin problems since working at their current facility (three reported as work-related). Five workers with mild restriction had BMIs ≥ 30

(30.0, 30.2, 30.9, 33.8, and 35.9). The average BMI for workers with restriction was 27 (range: 21.5-35.9). The prevalence rate of restriction on spirometry, was significantly higher for Aramark workers compared to the rate for the U.S. adult population as reported in NHANES III (PR=2.0). Three of the 15 reported cooking experience; 13 reported cleaning experience.

Reduced FEV_1 without restriction or obstruction
Four (4%) participants had a reduced FEV_1 without restriction or obstruction. All four reported cooking and cleaning experience.

Risk Factors for Asthma and Lower Respiratory Symptoms

Female Aramark participants were more than 11 times more likely to report current asthma than males (OR=11.7). Participants who reported cooking among their job duties were twice as likely to report asthma-like symptoms (OR=2.17); and more than three times more likely to report shortness of breath following exercise (OR=3.25) and cough (OR=3.54) compared to workers who did not cook at work (Table 10). The odds of participants who reported cleaning among their job duties to report asthma-like symptoms or shortness of breath while hurrying on level ground or walking up a slight hill were more than three times greater than those who did not clean at work (OR=5.93, and OR=3.76, respectively). Participants who reported cleaning hot surfaces at work were more than three times more likely to report shortness of breath following exercise (OR=3.84) than those who had not cleaned hot surfaces at work. Participants who reported both cooking and cleaning as part of his or her job duties were more likely to report asthma-like symptoms (OR=3.21), cough (OR=3.48), shortness of breath while hurrying on level ground or walking up a slight hill (OR=2.11), and shortness of breath following exercise (OR=2.98) compared to those who reported these tasks in isolation or not at all. Increasing facility tenure was associated with shortness of breath when hurrying on level ground or walking up a slight hill. Participants who had worked more than 95 months were three times more likely (OR=3.91) and those that had worked 15 to 95 months were more than twice as likely (OR=2.59) to report this symptom compared to those who had worked at the facility less than 15 months. This association remained significant even after stratifying by cooking and cleaning job duties ($p<0.05$). Race/ethnicity, smoking status, translator-administered questionnaire, facility site, cooking tenure, and age

were not significantly associated with current asthma or lower respiratory outcomes.

Risk Factors for Work-related Lower Respiratory Symptoms

The odds of female Aramark participants to report work-related chest tightness were doubled compared to the odds for males (OR=2.71). Aramark workers who reported cooking among their job duties were three times more likely to report work-related wheezing (OR=3.25) and four times more likely to report work-related shortness of breath following exercise (OR=4.87) than those who did not cook. Participants who reported both cooking and cleaning as part of his or her job duties were more likely to report work-related wheezing (OR=4.29) and work-related shortness of breath following exercise (OR=6.29) compared to those who reported these tasks in isolation or not at all. Race/ethnicity, smoking status, translator-administered questionnaire, facility site, facility tenure, cooking tenure, cleaning (in isolation), cleaning hot surfaces, and age were not significantly associated with work-related lower respiratory outcomes. Results are detailed in Table 11.

Risk Factors for Upper Respiratory Symptoms

The odds of ever smokers to report nasal symptoms were more than doubled compared to the odds for never smokers (OR=2.56). Participants who reported both cooking and cleaning as part of his or her daily job duties were twice as likely to report nasal symptoms compared to those who reported these tasks in isolation or not at all (OR=2.46). This association remained marginally significant after stratifying by smoking status ($p<0.10$). The odds of participants who reported cleaning among their job duties to report watery, itchy eyes were more than doubled compared to those who did not clean (OR=2.78). Race/ethnicity, gender, translator-administered questionnaire, facility site, facility tenure, cooking tenure, cooking (in isolation), cleaning hot surfaces, and age were not significantly associated with upper respiratory outcomes. Results are detailed in Table 12.

Risk Factors for Work-related Upper Respiratory Symptoms

Hispanic participants were five times more likely to report work-related nasal symptoms (OR=5.37) and 11 times more likely to report work-related eye symptoms (OR=11.0) compared to those

from other racial/ethnic backgrounds. The odds of reporting work-related eye symptoms were more than six times greater among participants who used a translator to complete the questionnaire compared to those who did not use a translator (OR=6.61). Participants who reported work-related nasal symptoms were twice as likely to have cooking duties (OR=2.42) compared to those who did not cook. This association remained significant even after stratifying by translator ($p<0.05$) or Hispanic ethnicity ($p<0.05$). The odds of reporting work-related eye symptoms were five times greater among participants who cleaned as part of his or her job duties compared to than those who did not report cleaning duties (OR=5.68). This association however, was no longer significant when stratified by translator ($p>0.10$) or Hispanic ethnicity ($p>0.10$). Smoking status, gender, facility site, facility tenure, cooking tenure, both cooking and cleaning job duties, cleaning hot surfaces, and age were not significantly associated with upper respiratory outcomes that improve away from work. Results are detailed in Table 13.

Associations between Pulmonary Function Testing and Participant Characteristics or Questionnaire Responses

We were unable to examine associations between airways obstruction and questionnaire responses due to the limited number of individuals with that outcome. However, when we examined restriction, we did not observe significant associations between restriction and BMI or the following questionnaire responses: race/ethnicity, smoking status, gender, facility tenure, cooking tenure, age, and cooking and/or cleaning job duties.

Discussion

This HHE followed media attention about possible respiratory hazards to commercial grill cooks who used artificial butter-flavored oils that contained diacetyl [Schneider 2007; SHARP 2008]. We detected low levels of diacetyl in bulk samples of unsalted butter at the Park and NYP Aramark locations and in two bulk samples of Prep ZT, a butter-flavored cooking oil, from the CMP Aramark location. However, we did not detect diacetyl nor acetoin in any area or personal air samples at the three facilities and have no evidence that workers are currently exposed to diacetyl or acetoin vapors while using these products during cooking or food preparation. We reviewed Aramark purchasing records at the three locations and determined that other butter-flavored cooking products were used in the past at the CMP and NYP locations; however, we have no information on past levels of exposures.

The HHE requestor, the UNITE HERE International Union, was concerned that professional cooks might be at risk for bronchiolitis obliterans, a rare form of fixed obstructive lung disease, as a result of exposures to diacetyl-containing cooking products. During our medical survey, we identified five workers with airways obstruction. Two workers with fixed obstruction started working at their current Aramark facility after artificial butter-flavored products were no longer in use. Additionally, they, as well as the other three workers, with airways obstruction, did not report any professional cooking experience. One worker with reversible airways obstruction, consistent with asthma, reported no smoking history. The other four reported past or current smoking. Two were not tested with bronchodilators. No cases of obstruction were observed at the CMP Aramark location where a diacetyl-containing butter-flavored cooking oil was used at the time of the survey. We found no evidence of fixed obstruction suggestive of flavorings-related bronchiolitis obliterans.

We observed a higher than expected rate of restrictive pattern on spirometry among Aramark employees. Restrictive pattern on spirometry can occur in people with stiff lungs, such as found with pulmonary fibrosis (lung scarring); people with weak respiratory muscles; or in people considerably overweight. It has been reported that about 6.6% of adults in the United States have restrictive patterns on spirometry [Mannino et al. 2003]. In contrast, 14% of Aramark workers tested had restrictive patterns on spirometry, greater than two times the expected frequency. BMI was not statistically associated with restriction in the Aramark employees; however, five of 15 workers with restriction had BMIs

at 30 or above which is considered obese [NHLBI 2000; CDC 2009]. We did not measure waist circumference which may be a better determination of obesity than BMI [NHLBI 2000] and is associated with lower lung function in overweight and obese individuals [Chen et al. 2007]. We also did not perform any other physiologic testing of these workers to elucidate the nature of their abnormality.

Limited data exist on lung function in food service workers. We are unaware of reports of increased restrictive abnormalities among food service workers. However, spirometry findings are only suggestive of restrictive lung disease. Formal lung volume measurements are necessary to diagnose restrictive lung disease. Restrictive lung diseases are characterized by stiffening of the lungs that leads to decreased lung volumes. Examples of restrictive lung diseases are pulmonary fibrosis, pneumonia, sarcoidosis, and pneumoconiosis. Hypersensitivity pneumonitis is also typically a restrictive lung disease; however, obstruction can also be seen. Aaron and colleagues report a high false-positive rate for true decreased lung volumes among individuals classified with a restrictive pattern on spirometry [Aaron et al. 1999]. The investigators performed pulmonary function tests including spirometry and lung volume measurements on 1,831 white male adult patients and found only 41% of the 470 with low FVC on spirometry, had restriction confirmed by lung volume measurements. When the analysis was limited to the 264 patients with a restrictive pattern on spirometry (i.e., low FVC and normal or above normal FEV_1/FEV ratio), 153 (58%) had restriction confirmed by lung volume measurements.

We found that workers who participated in the NIOSH survey had significantly higher than expected rates of wheeze (a symptom of asthma); stuffy, itchy or runny nose; itchy, watery eyes; and nasal allergies, including hay fever; compared to the U.S. adult population in NHANES III, a nationally representative survey [CDC 1996]. We believe that comparisons to the national rates are more reliable than comparisons to the New York state rates because the BRFSS telephone survey has a smaller sample size and a response rate of 30-50% [NCCDPHP 2007].

Workers who reported cooking as part of their job were twice as likely to report asthma-like symptoms, shortness of breath following exercise, and cough than those who did not report cooking among their job duties. Additionally, they were three

to four times more likely to report that their lower respiratory symptoms, specifically wheeze and shortness of breath post-exercise, improved away from the workplace. This trend was also observed for upper respiratory symptoms. Workers who cooked were twice as likely to report that their nasal symptoms improved away from the workplace compared to those who did not cook at work. Our findings of excess upper and lower respiratory symptoms in cooks are consistent with European investigations [Svendsen et al. 2003; Karadzinska-Bislimovska et al. 2007] but are more robust in having a higher response rate [Swendsen et al. 2003] or greater numbers [Karadzinska-Bislimovska et al. 2007]. The frequent report that such symptoms improved away from work is consistent with the excess symptoms being attributable to cooking tasks in the work environment.

Svendsen and colleagues observed elevated respiratory symptom rates in 239 Norwegian kitchen workers compared to a large control population. However, the response rate for this study was only 61% leading the authors to concede that the results may not be truly reflective of workers in this industry. Karadzinska-Bislimovska et al. found in a study of 80 female cooks and cleaners an increase in reports of shortness of breath compared to 45 female office workers.

Participants who reported cleaning as part of their duties were also more likely to report lower respiratory symptoms, specifically, asthma-like symptoms and shortness of breath while walking uphill compared to those whose job duties did not involve cleaning. It is of note that a majority of the participants (81%) reported some type of cleaning history at their current facility. Workers who reported cleaning hot surfaces (27%) were more than three times more likely to report shortness of breath following exercise than those not reporting this exposure. Cleaning products have been associated with 12% of work-related asthma cases as recorded by NIOSH's Sentinel Event Notification System for Occupational Risks (SENSOR) Program [Rosenman et al. 2003], and 10% as recorded among 480 patients of a New York State Occupational Health Clinic Network from 1998 to 1999 [Fletcher et al. 2006]. This may be due to the content of both irritants (e.g. bleach, ammonia, hydrochloric acid) and sensitizers (quaternary ammonium compounds) in cleaning agents commonly used for cleaning food preparation areas (ammonia based), floors, and utensils [Rosenman et al. 2003]. Medina-Ramón and colleagues observed work-related lower respiratory symptoms in 43 domestic

cleaners that were associated with exposure to diluted bleach and degreasing sprays exposure, products routinely used at Aramark facilities [Medina-Ramón et al. 2006]. A large population study on asthma in 12 industrialized countries, identified cleaners as the occupational group with the fourth highest risk of asthma (OR 1.97; 95% CI 1.33-2.92) [Kogevinas et al. 1999].

We were unable to ascertain whether translators may have introduced bias in participant response or whether those participants using translators may have had different work experiences as a result of work tasks, safety training, or work practices. Additionally, the small number of workers prevented us from doing a more sophisticated statistical analysis of the questionnaire data. The small sample size may have limited our ability to detect associations, if they did exist. Additionally, if affected workers had been more likely than unaffected workers to have left employment at the facilities prior to our medical survey, this would have resulted in underestimation of health effects in the workforce because the remaining workers would be generally healthier [Li and Sung 1999].

As part of the HHEs, the requestor asked that NIOSH obtain and evaluate records of sick leave and medical reports of respiratory conditions over the last five years, including those for forever employees. NIOSH considered obtaining records related to health insurance claims from the Hotel and Restaurant Employees International Union Welfare Fund for UNITE HERE members who currently or formerly worked at Aramark facilities; however, we would have only been able to obtain the records from the three Aramark locations listed in the HHE requests and felt this would not provide enough statistical power to do an in-depth analysis. The HHE requestor also requested that NIOSH consider exposure measurements for potentially carcinogenic polycyclic aromatic compounds in worker area air. We defined the scope of the HHEs to address respiratory health outcomes in cooks in relation to flavoring exposures, since the small populations could not support studies of occupational cancers.

Conclusions

We did not find evidence of flavoring-related bronchiolitis obliterans in cooks, and food service workers do not currently have airborne exposure to diacetyl according to our limited sampling. On the other hand, we found evidence of excess respiratory symptoms suggestive of asthma and nasal and eye irritation and/or allergies that were associated with cooking and cleaning duties. These potential work health effects should be minimized by using engineering controls, PPE, and substitution of cleaning products.

RECOMMENDATIONS

Based on our findings, we recommend the actions listed below to create a more healthful work place. NIOSH encourages Aramark to use these recommendations to develop an action plan based, if possible, on the hierarchy of controls approach. This approach groups actions by their likely effectiveness in reducing or removing hazards. In most cases, the preferred approach is to eliminate hazardous materials or processes and install engineering controls to reduce exposure or shield employees. Until such controls are in place, or if they are not effective or feasible, administrative measures and/or personal protective equipment may be needed.

Some of the recommendations were provided to you in interim reports from NIOSH [Appendices c, d, e].

1. Substitution:

    1. Consider substituting cleaning products with those that have less adverse health effects and require lower levels of protection (per MSDSs).
    2. Diacetyl substitutes are being used by some food flavoring companies. These substitutes include acetoin, 2,3-pentanedione, starter distillate (which contains diacetyl), and diacetyl trimer (which decomposes to diacetyl). Until inhalation toxicity information is available, precautions should be taken such as those outlined below.

2. Engineering Controls:

    1. Consider opportunities for further use of engineering controls (e.g., ventilation hoods), versus respiratory protection, to reduce worker exposures to fumes from cooking and cleaning products.
    2. Use a ventilation hood for all cooking with an open-flame grill, flattop or ridged (marked) grill or griddle, panini press, or when sautéing or frying in a pan.

3. Work Practices:

    1. Review and follow MSDS recommendations regarding PPE for cleaning products.
    2. Develop standard operating procedures on safe handling, diluting procedures, and mixing of cleaning products. Train

employees on these procedures.

4. Personal Protective Equipment (PPE):

    1. PPE such as gloves, goggles, and/or a respirator may be required for chemical cleaning. Use of PPE is especially important when cleaning heated grills due to vaporization of heated chemicals and thus increased potential for inhalation exposure. Because of high numbers of reported work-related skin problems, make impervious gloves and goggles available and easy to access. Follow MSDS recommendations for the cleaning products. For example, Eco-Clean Elite Fast Foam Degreaser is a product used by Aramark facilities. The MSDS recommends the use of splash goggles; chemical-resistant, impervious gloves; synthetic apron; and proper exhaust ventilation or an appropriate respirator.

5. Respiratory Protection:

    1. If respirators are used, a formal respiratory protection program should be established that adheres to the requirements of the OSHA Respiratory Protection Standard (29 CFR 1910.134). The administrator for the program must have adequate training and experience to run it and regularly evaluate its effectiveness. The Respiratory Protection Program must include a (1) written policy, (2) change schedule for cartridges, (3) pre-use medical evaluation, (4) pre-use and annual fit-testing and training, and (5) the establishment and implementation of procedures for proper respirator use (such as, prohibiting use with facial hair, ensuring user seal check and inspection of respirators prior to each use, and ensuring proper storage of respirators to protect respirators from damage, contamination, dust, sunlight, and extreme temperatures). Information about respirators is available at the NIOSH website (http://www.cdc.gov/niosh/npptl/topics/respirators/). Details on the OSHA Respiratory Protection Standard and on how to set up a respiratory protection program are available on the OSHA website (http://www.osha.gov/SLTC/respiratoryprotection/index.html).
    2. If the facility uses cleaning products that are prepared and used in areas with adequate ventilation, an employee may

still choose to use a respirator. The OSHA respiratory protection standard permits the use of respirators when they are not required, such as for nuisance odors. The employer can provide voluntary use respirators at the request of employees, or employees can bring their own; however, the respirators must not create a hazard. Additionally, when respirators are voluntarily used, a written respiratory protection program is still required. The program must include elements that ensure that the respirators are cleaned, stored, and maintained properly. Wearers must be medically evaluated to verify that they are physically able to safely use the respirator. In addition, wearers must receive Appendix D of the OSHA respiratory protection standard.

4. Hazard Communication:

    1. Ensure workers understand the potential hazards in the food service industry and how to protect themselves. OSHA's Hazard Communication Standard, also known as the "Right to Know Law" (29 CFR 1910.1200) requires that employees are informed and trained of potential work hazards and associated safe practices, procedures, and protective measures. Details on the OSHA Standard and on how to set up a hazard communication program are available on the OSHA website (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10099).
    2. Ensure all workers including temporary workers receive initial and annual training on safe work practices. Training should be in Spanish for workers whose primary language is Spanish. The Washington State Department of Labor & Industries has restaurant safety materials available at http://www.lni.wa.gov/WorkplaceRights/TeenWorkers/JobSafety/RestaurantProgram/Resources/.

5. Medical Surveillance:

    1. Workers should report any new or worsening respiratory symptoms to their supervisor and personal physician or other healthcare provider.
    2. Workers with symptoms should provide their personal physician or other healthcare provider with a copy of this report.

3. Workers diagnosed with work-related asthma or allergies may need to be reassigned to a different work area to prevent further exposure to agents that worsen the condition.
4. Provide workers with asthma the option of using respiratory protection with a higher protection factor, such as a powered air-purifying respirator.

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Table 1. Bulk oil products in current use at time of Aramark surveys.

Products by Location	Bulk Sample Collection	Manufacturer	Manufacturer's Number	Diacetyl Detected
Park				
Arrezzio 90/10 canola and olive oil blend	NIOSH	Sysco	5655618	Undetermined*
Frymax Sun Supreme deep fry oil	NIOSH	ACH	35071	No
Prep Pan Release Spray	NIOSH	ACH	35041	No
Sweet cream butter	NIOSH	Land O Lakes	14640	No
Unsalted butter	NIOSH	G.A.F. Seelig	NA	**Yes**
NYP				
Frymax Sun Supreme deep fry oil	NIOSH	ACH	35071	No
Arrezzio 90/10 canola and olive oil blend	NIOSH	Sysco	5655618	No
Unsalted butter	NIOSH	Land O Lakes	14110	**Yes**
Prep Pan Release Spray	NIOSH	ACH	35041	No
CMP				
Soybean oil	NIOSH	ACH	35025	No
Prep ZT (freshly opened)	NIOSH	ACH	35077	**Yes**
Prep ZT (previously opened)	NIOSH	ACH	35077	**Yes**
Arrezzio 90/10 canola and olive oil blend	NIOSH	Sysco	5655618	No
Prep Pan Release Spray	NIOSH	ACH	35041	No
Frymax Sun Supreme deep fry oil	NIOSH	ACH	35071	No
Soybean oil	NYCDHMH	ACH	35025	No
Prep ZT (freshly opened)	NYCDHMH	ACH	35077	**Yes**
Prep Pan Release Spray	NYCDHMH	ACH	35041	No
Frymax Sun Supreme deep fry oil	NYCDHMH	ACH	35071	No

*NIOSH analytical laboratory reported that this sample possibly had oil contamination on the tube. Park: Aramark location at 277 Park Avenue; NYP: Aramark location at 1 New York Plaza; CMP: Aramark location at 1 Chase Manhattan Plaza; NYCDHMH: New York City Department of Health and Mental Hygiene; NIOSH: National Institute for Occupational Safety and Health; NA: not applicable.

Table 2. Air sampling methods for March 2008 industrial hygiene survey of three Aramark locations.

Analytes	Analysis Method	Media	Personal/ Area Samples	Objective	Flow Rate (L/min)	Sample Duration (minutes)	Facility
Ketone compounds (diacetyl, acetoin)	Modified OSHA PV2118	Sorbent tube (silica gel 200mg/400mg)	P, A	Breakfast and lunch shift TWA	0.05	2 x 240	all
Volatile organic compounds	NIOSH NMAM 2549	Thermal desorption tubes	P, A	Breakfast and lunch shift and task-based screening	0.02	Varied	all
Real-time volatile organic compounds	Direct-reading instrument (Rae Systems, Inc., Sunnyvale, CA)	ppbRAE Plus PID	P, A	TWA, continuous, and spot measurements	0.4	Varied	Park
Real-time volatile organic compounds	Direct-reading instrument (Rae Systems, Inc., Sunnyvale, CA)	ToxiRAE Plus PID	P, A	TWA, continuous, and spot measurements	0 (Passive)	Varied	NYP, CMP
Real-time particle concentrations	Direct-reading instrument (Thermo Electron Corporation, Franklin, MA)	Photometric meter, PersonalDataRAM® pDR-1000AN	A	TWA, continuous, and spot measurements	0 (Passive)	Varied	all
Real-time carbon monoxide (CO)	Direct-reading instrument (Industrial Scientific, Oakdale, PA)	T82 Gas monitor	A	TWA, continuous, and spot measurements	0 (Passive)	Varied	all
Nitrous fumes (NO_x) and nitrogen dioxide (NO_2)	Direct-reading tubes (Draeger, Pittsburgh, PA)	Colorimetric short-term detector tubes	A	Spot measurement	5 pumps per minute	1	all
Air temperature and relative humidity	Direct-reading instrument (Fisher Scientific, Pittsburgh, PA)	Thermo Hygro temperature and humidity monitor	A	Continuous measurements	NA	Varied	all
Surface temperature	Direct-reading instrument	Infrared detector	A	Spot measurements	NA	1	1 CMP
Ventilation flow	Direct-reading instrument (Alnor, Skokie, IL and SKC, Eighty Four, PA)	Smoke tubes	A	Spot measurements	NA	1	all

OSHA: Occupational Safety and Health Administration; NIOSH: National Institute for Occupational Safety and Health; NMAM: NIOSH Manual of Analytical Methods; A: area sample; P: personal sample; PID: photoionization detector; TWA: time-weighted average; NYP: Aramark location at 1 New York Plaza; CMP: Aramark location at 1 Chase Manhattan Plaza; Park: Aramark location at 277 Park Avenue; NA: not applicable.

Table 3. Characteristics of Aramark employees participating in the medical survey by location.

Variable	Park n=38	NYP n=45	CMP n=33	All Facilities N=116
Mean age (range), years	44.9 (22-70)	43.4 (19-70)	46.5 (26-73)	44.7 (19-73)
Mean years employed at facility (range)	3.7 (0.2-13.2)	5.0 (0.2-18.5)	10.0 (0.2-35.0)	6.0 (0.2-35.0)
Mean years ever-cook at this facility (range)	4.4 (0.2-15.9)	5.7 (0.3-18.5)	8.8 (0.3-35)	6.2 (0.2-35.0)
Female n, (%)	12 (32%)	15 (33%)	11 (33%)	38 (33%)
Mean BMI (range)	28.9 (20.9-40.4)	28.6 (19.6-41.9)	28.3 (21.4-45.8)	28.6 (19.6-45.8)
Hispanic† n, (%)	25 (66%)	37 (82%)	17 (51%)	79 (68%)
Black, non-Hispanic† n, (%)	8 (21%)	3 (7%)	11 (33%)	22 (19%)
Current smoker n, (%)	5 (13%)	5 (11%)	2 (6%)	12 (10%)
Former smoker n, (%)	10 (26%)	11 (24%)	7 (21%)	28 (24%)

†Race based on spirometry data; however, for six participants with no spirometry self-designation of race, we used questionnaire data to designate their race. NYP: Aramark location at 1 New York Plaza; CMP: Aramark location at 1 Chase Manhattan Plaza; Park: Aramark location at 277 Park Avenue.

Table 4. Cross-tabulation of participant cooking and cleaning job tasks at current facility

		Cook		
		Yes	**No**	*Row Total*
Clean	**Yes**	36	6	42
	No	58	16	74
Column Total		94	22	116

Table 5. Prevalence of symptoms and diagnoses among Aramark employees participating in the medical survey by location.

Health Outcome	Park n=38	NYP n=45	CMP n=33	Total N=116
Trouble breathing in last 12 months	5 (13%)	9 (20%)	6 (18%)	20 (17%)
-Rarely have trouble	3 (8%)	4 (9%)	2 (6%)	9 (8%)
-Always resolves	2 (5%)	5 (11%)	3 (9%)	10 (9%)
-Persists	0	0	1 (3%)	1 (1%)
Shortness of breath on exertion (hurrying on level ground or walking up hill)	11 (29%)	17 (38%)	10 (30%)	38 (33%)
Shortness of breath on exertion (walking with people of same age)	2 (5%)	2 (4%)	3 (9%)	7 (6%)
Awoken at night with shortness of breath	3 (8%)	4 (9%)	4 (12%)	11 (9%)
Shortness of breath after exercise	4 (11%)	6 (13%)	3 (9%)	13 (11%)
Wheeze last 12 months	6 (16%)	9 (20%)	7 (21%)	22 (19%)
Chest tightness in the morning (woken up with shortness of breath)	7 (18%)	11 (24%)	9 (27%)	27 (23%)
Usual cough	7 (18%)	7 (16%)	2 (6%)	16 (14%)
Chronic cough	3 (8%)	2 (4%)	2 (6%)	7 (6%)
Current asthma (physician-diagnosed)	3 (8%)	1 (2%)	2 (6%)	6 (5%)
Ever asthma (physician-diagnosed)	7 (18%)	1 (2%)	3 (9%)	11 (9%)
Chronic bronchitis (physician-diagnosed)	5 (13%)	0	0	5 (4%)
Emphysema (physician-diagnosed)	0	0	0	0
Nasal allergies including hay fever	10 (26%)	18 (40%)	8 (24%)	36 (31%)
Stuffy, itchy, or runny nose last 12 months	22 (58%)	31 (69%)	18 (55%)	71 (61%)
Watery, itchy eyes last 12 months	14 (37%)	22 (49%)	18 (55%)	54 (47%)
Post-hire skin rash / problem	10 (26%)	11 (24%)	5 (15%)	26 (22%)

Park: Aramark location at 277 Park Avenue; NYP: Aramark location at 1 New York Plaza; CMP: Aramark location at 1 Chase Manhattan Plaza.

Table 6. Comparison of respiratory symptoms and diagnoses among Aramark employees with U.S. adult population (NHANES III) by location.

Health Outcome	Park		NYP		CMP		All Facilities	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Wheeze last 12 months	1.1	0.5, 2.5	1.6	0.8, 3.0	1.8	0.9, 3.7	**1.5**	**1.0, 2.3**
Stuffy, itchy, or runny nose last 12 months	1.4	0.9, 2.2	**1.7**	**1.2, 2.4**	1.3	0.8, 2.2	**1.5**	**1.2, 1.9**
Watery, itchy eyes last 12 months	1.1	0.6, 1.9	1.4	1.0, 2.2	**1.6**	**1.0, 2.6**	**1.4**	**1.1, 1.8**
Cough most days for 3 consecutive months	1.5	0.5, 4.3	0.9	0.2, 3.2	1.1	0.3, 4.1	1.1	0.6, 2.4
Shortness of breath on exertion (walking with people of same age)	1.5	0.9, 2.7	**2.0**	**1.2, 3.2**	1.5	0.8, 2.8	**1.7**	**1.2, 2.3**
Nasal allergies, including hay fever	**3.5**	**1.8, 6.7**	**5.6**	**3.5, 8.8**	**3.1**	**1.6, 6.1**	**4.2**	**3.0, 5.8**
Chronic bronchitis (physician-diagnosed)	**4.2**	**1.8, 9.8**	0	0, 2.7	0	0, 3.3	1.3	0.6, 3.1
Ever asthma (physician-diagnosed)	**3.0**	**1.4, 6.6**	0.4	0.1, 2.3	1.6	0.6, 4.8	1.6	0.9, 2.9
Current asthma (physician-diagnosed)	1.6	0.4, 5.7	0.6	0.1, 3.5	1.6	0.4, 5.8	1.2	0.5, 2.9
Obstruction or mixed pattern of restriction and obstruction	2.5	0.9, 7.5	1.4	0.4, 5.3	0	0, 4.6	1.5	0.6, 3.5
Restriction	**2.3**	**1.0, 5.5**	2.0	0.8, 4.6	1.7	0.6, 5.0	**2.0**	**1.2, 3.4**

Park: Aramark location at 277 Park Avenue; NYP: Aramark location at 1 New York Plaza; CMP: Aramark location at 1 Chase Manhattan Plaza; PR: prevalence ratio; 95% CI: 95% confidence interval.

Table 7. Comparison of physician-diagnosed asthma among Aramark employees to the New York state population prevalence (2007 BRFSS) by location.

Health Outcome	Park		NYP		CMP		All Facilities	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
•Ever asthma								
Male	1.29	0.5, 3.3	0	0, 1.1	0.76	0.2, 2.8	0.65	0.30, 1.4
Female	1.57	0.5, 4.6	0.42	0.1, 2.4	0.57	0.1, 3.2	0.83	0.35, 1.9
Overall	1.40	0.7, 2.9	0.17	0.0, 0.9	0.69	0.23, 2.0	0.72	0.40, 1.3
•Current asthma								
Male	0	0, 2.3	0	0, 2.0	0.71	0.1, 4.0	0.20	0.04, 1.1
Female	2.29	0.8, 6.7	0.61	0.1, 3.5	0.83	0.1, 4.7	1.21	0.52, 2.8
Overall	1.0	0.3, 3.0	0.28	0.1, 1.6	0.77	0.2, 2.8	0.66	0.30, 1.4

Park: Aramark location at 277 Park Avenue; NYP: Aramark location at 1 New York Plaza; CMP: Aramark location at 1 Chase Manhattan Plaza; PR: prevalence ratio; 95% CI: 95% confidence interval.

Table 8. Pulmonary function test results among Aramark employees participating in the medical survey by location.

Variable	Park n=36	NYP n=41	CMP n=27	All Facilities N=104†
Mean FEV_1 % predicted (range)	90.9 (54.9-133)	92.7 (56.4-116)	94.1 (62.4-120)	92.4 (54.9-133)
Mean FVC % predicted (range)	94.2 (55.7-132)	92.6 (67.1-126)	92.8 (61.5-117)	93.2 (55.7-132)
Mean FEV_1/FVC % (range)	78.1 (50.1-93.4)	81.2 (60.8-94.3)	82.2 (71.2-91.5)	80.4 (50.1-94.3)
Obstruction or mixed pattern of obstruction and restriction (%)	3 (8)	2 (5)	0	5 (5)
Restriction (%)	6 (17)	5 (12)	4 (15)	15 (14)
Reduced FEV_1 as an isolated abnormality (%)	1 (3)	1 (2)	2 (7)	4 (4)

†Of the 111 participants that attempted spirometry, 104 had valid spirometry tests. Seven spirometry tests were not interpretable. One participant attempted spirometry but was unable to perform the test due to a physical limitation. Four participants could not perform spirometry because of a medical contraindication, and one participant refused. NYP: Aramark location at New York Plaza; CMP: Aramark location at 1 Chase Manhattan Plaza; Park: Aramark location at Park Avenue; FEV_1: forced expiratory volume in the first second of exhalation; FVC: forced vital capacity.

Table 9. Prevalence of symptoms and diagnoses among Aramark workers with obstruction/mixed or restrictive pattern on spirometry.

Health Outcome	Workers with obstruction or mixed n=5	Workers with restrictive pattern n=15
Trouble breathing in last 12 months	1 (20%)	5 (33%)
-Rarely have trouble	0	2 (13%)
-Always resolves	1 (20%)	3 (20%)
-Persists	0	0
Shortness of breath on exertion (hurrying on level ground or walking up hill)	1 (20%)	4 (27%)
Shortness of breath on exertion (walking with people of same age)	0	1 (7%)
Awoken at night with shortness of breath	0	3 (20%)
Shortness of breath after exercise	1 (20%)	3 (20%)
Wheeze last 12 months	1 (20%)	2 (13%)
Chest tightness in the morning (woken up with shortness of breath)	1 (20%)	6 (40%)
Usual cough	0	4 (27%)
Chronic cough	0	0
Current asthma (physician-diagnosed)	1 (20%)	2 (13%)
Ever asthma (physician-diagnosed)	1 (20%)	2 (13%)
Chronic bronchitis (physician-diagnosed)	1 (20%)	0
Emphysema (physician-diagnosed)	0	0
Nasal allergies including hay fever	2 (40%)	5 (33%)
Stuffy, itchy, or runny nose last 12 months	2 (40%)	9 (60%)
Watery, itchy eyes last 12 months	0	10 (67%)
Post-hire skin rash / problem	1 (40%)	5 (33%)

Table 10. Risk factors for asthma or lower respiratory symptoms at all locations (ORs and 95%CIs)+‡£

Varia	Current asthma Yes=6	Asthma-like symptoms Yes=37	Shortness of breath hurrying on level ground or walking up a slight hill Yes=38	Shortness of breath after exercise Yes=13	Usual cough Yes=16
Ever cook					
Yes	0.88 (0.15, 4.99)	**2.17 (0.97, 4.85)***	1.72 (0.77, 3.81)	**3.25 (0.99, 10.7)***	**3.54 (1.18, 10.6)****
No	1.0	1.0	1.0	1.0	1.0
Ever clean					
Yes	1.18 (0.18, 23.2)	**5.93 (1.60, 38.6)****	**3.76 (1.17, 16.8)***	0.75 (0.21, 3.60)	3.99 (0.74, 74.1)
No	1.0	1.0	1.0	1.0	1.0
Ever clean hot surfaces					
Yes	0.53 (0.03, 3.49)	1.52 (0.63, 3.57)	1.18 (0.49, 2.78)	**3.84 (1.17, 13.0)****	1.29 (0.38, 3.93)
No	1.0	1.0	1.0	1.0	1.0
Ever cook and clean					
Yes	1.12 (0.20, 6.40)	**3.21 (1.40, 7.38)****	**2.11 (0.93, 4.82)***	**2.98 (0.92, 9.98)***	**3.48 (1.18, 10.6)****
No	1.0	1.0	1.0	1.0	1.0
Female					
Yes	**11.7 (1.31, 104)****	1.66 (0.73, 3.76)	1.31 (0.58, 2.96)	0.58 (0.13, 2.05)	0.92 (0.30, 2.88)
No	1.0	1.0	1.0	1.0	1.0
Facility tenure (months)					
Greater than 95	0.92 (0.11, 8.00)	1.27 (0.48, 3.41)	**3.91 (1.38, 12.4)****	0.91 (0.20, 4.16)	0.91 (0.23, 3.57)
15 to 95	0.81 (0.09, 7.00)	0.85 (0.32, 2.26)	**2.59 (0.91, 8.14)***	1.02 (0.25, 4.43)	0.97 (0.27, 3.67)
Less than 15	1.0	1.0	1.0	1.0	1.0

+ Unadjusted odds ratios (ORs) and 95% likelihood confidence limits
‡ The reference category is identified by an OR of 1.0.
* Indicates p <0.10, **indicates p <0.05.
£ Race/ethnicity, smoking status, translator-administered questionnaire, facility site, cooking tenure, and age were not significantly associated with current asthma or lower respiratory outcomes in univariate analysis.

Table 11. Risk factors for work-related lower respiratory symptoms at all locations (ORs and 95% CIs)+‡£

Varia	Wheeze Yes=13	Awoken at night with shortness of breath Yes=6	Shortness of breath after exercise Yes=7	Chest tightness in the morning Yes=15	Usual cough Yes=9
Ever cook					
Yes	**3.25 (0.99, 10.7)***	1.82 (0.35,9.45)	**4.87 (0.90, 26.3)***	1.65 (0.55, 4.93)	2.36 (0.60, 9.34)
No	1.0	1.0	1.0	1.0	1.0
Ever cook and clean					
Yes	**4.29 (1.29, 14.2)****	2.33 (0.41, 13.2)	**6.29 (1.28, 45.5)****	2.17 (0.70, 6.60)	1.88 (0.44, 7.54)
No	1.0	1.0	1.0	1.0	1.0
Female					
Yes	1.90 (0.57, 6.17)	1.03 (0.14, 5.52)	0.81 (0.11, 3.97)	**2.71 (0.90, 8.37)***	1.72 (0.40, 6.89)
No	1.0	1.0	1.0	1.0	1.0

+ Unadjusted odds ratios (ORs) and 95% likelihood confidence limits.
‡ The reference category is identified by an OR of 1.0.
* Indicates p <0.10, **indicates p <0.05.
£ Race/ethnicity, smoking status, translator-administered questionnaire, facility site, facility tenure, cooking tenure, cleaning (in isolation), cleaning hot surfaces, and age were not significantly associated with work-related lower respiratory outcomes in univariate analysis.

Table 12. Risk factors for upper respiratory symptoms at all locations (ORs and 95% CIs)+‡£

Varia	Stuffy, itchy, or runny, nose last 12 months Yes=71	Watery, itchy eyes last 12 months Yes=54
Ever clean		
Yes	1.40 (0.54, 3.59)	**2.78 (1.05, 8.32)****
No	1.0	1.0
Ever cook and clean		
Yes	**2.46 (1.05, 6.14)****	1.44 (0.65, 3.19)
No	1.0	1.0
Smoke ever		
Yes	**2.56 (1.13, 6.19)****	1.68 (0.78, 3.67)
No	1.0	1.0

+ Unadjusted odds ratios (ORs) and 95% likelihood confidence limits.
‡ The reference category is identified by an OR of 1.0.
** Indicates p <0.05.**
£ Race/ethnicity, gender, translator-administered questionnaire, facility site, facility tenure, cooking tenure, cooking (in isolation), cleaning hot surfaces, and age were not significantly associated with upper respiratory outcomes in univariate analysis.

Table 13. Risk factors for work-related upper respiratory symptoms at all locations (ORs and 95% CIs)+‡£

Varia	Stuffy, itchy or runny, nose last 12 months Yes=31	Watery, itchy eyes last 12 months Yes=21
Ever cook		
Yes	**2.42 (1.04, 5.62)****	0.66 (0.23, 1.84)
No	1.0	1.0
Ever clean		
Yes	1.81 (0.61, 6.71)	**5.68 (1.08, 105)****
No	1.0	1.0
Translator used		
Yes	**2.23 (0.97, 5.20)***	**6.61 (2.35, 21.7)****
No	1.0	1.0
Race/Ethnicity		
Hispanic	**5.37 (1.71, 23.9)****	**11.0 (2.13, 202)****
Other	1.0	1.0

+ Unadjusted odds ratios (ORs) and 95% likelihood confidence limits.
‡ The reference category is identified by an OR of 1.0.
*** Indicates P <0.10. **indicates p <0.05.**
£ Smoking status, gender, facility site, facility tenure, cooking tenure, both cooking and cleaning job duties, cleaning hot surfaces, and age were not significantly associated with upper respiratory outcomes that improve away from work in univariate analysis.

ID:_________

RDHETA ______________________
HETA 2008-0125 (277 Park Ave.)
HETA 2008-0126 (1NYP)
HETA 2008-0127 (1CMP)

Interviewer: ____________ Interview Date: __ __ / __ __ / __ __ __ __
(Month) (Day) (Year)

Section I: Identification and Demographic Information

Name: ____________________________ ______________________ ____
(Last name) (First name) (MI)

Address: ____
(Number, Street, and/or Rural Route)

_____________________ ______________ __________
(City) (State) (Zip Code)

Home Telephone Number: ( ) _______ - __________

If you were to move, is there someone who would know how to contact you?

Name: ____________________________ ______________________ ____
(Last name) (First name) (MI)
Relationship to you:____________________

Address:____
(Number, Street, and/or Rural Route)

_____________________ ______________ __________
(City) (State) (Zip Code)

Home Telephone Number: ( ) _______ - __________
~~~~~~

1. Date of Birth: __ __ / __ __ / __ __ __ __
(Month) (Day) (Year)

2. Sex: 1. ____ Male 2. ____ Female

3. Are you Spanish, Hispanic, or Latino? 1.____Yes 2.____No.

4. Select one or more of the following categories to describe your race:
   1. ___ American Indian or Alaska Native
   2. ___ Asian
   3. ___ African-American or Black
   4. ___ Native Hawaiian or Other Pacific Islander
   5. ___ White

1
~~~~~~

ID:_____

Section II: Health Information

I'm going to ask you some questions about your health. The answer to many of these questions will be "Yes" or "No." If you are in doubt about whether to answer "Yes" or "No," then please answer "No."

5. Do you usually have a cough? 1. ___ Yes 0. ___ No
(Count cough with first smoke or on first going out-of-doors. Exclude clearing of throat.)

IF YES:

a) Do you usually cough on most days for 3 consecutive months or more during the year? 1. ___ Yes 0. ___ No

b) In what month and year did the cough begin? __ __ / __ __ __ __ (Month) (Year)

c) When you are away from this facility on days off or on vacation, is this cough:
1. ____ The same 2. ____Better 3. ____ Worse

6. Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill? 1. ___ Yes 0. ___ No

IF YES:

a) Do you get short of breath walking with people of your own age on level ground? 1. ___ Yes 0. ___ No

b) Do you ever have to stop for breath when walking at your own pace on level ground? 1. ___ Yes 0. ___ No

c) Do you ever have to stop for breath after walking about 100 yards (or after a few minutes) on level ground? 1. ___ Yes 0. ___ No

d) In what month and year did this breathlessness start? __ __ / __ __ __ __ (Month) (Year)

7. Have you had wheezing or whistling in your chest at any time in the last 12 months? 1. ___ Yes 0. ___ No

IF YES:

a) When you are away from this facility on days off or on vacation, is this wheezing or whistling
1. ____ The same 2. ____Better 3. ____ Worse

8. Have you woken up with a feeling of tightness in your chest first thing in the morning at any time in the last 12 months? 1. ___ Yes 0. ___ No

IF YES:

a) When you are away from this facility, on days off or on vacation, is this problem
1. ____ The same 2. ____Better 3. ____ Worse

ID:_____

9. Have you had an attack of shortness of breath that came on after you stopped exercising at any time in the last 12 months? 1. ___ Yes 0. ___ No

IF YES:

a) When you are away from this facility, on days off or on vacation, is this problem
1. ____ The same 2. ____Better 3. ____ Worse

10. Have you at any time in the last 12 months been woken up at night by an attack of shortness of breath? 1. ___ Yes 0. ___ No

IF YES:

a) When you are away from this facility, on days off or on vacation, is this problem
1. ____ The same 2. ____Better 3. ____ Worse

11. During the last 12 months, have you had any trouble with your breathing? 1. ___ Yes 0. ___ No

IF YES:

a) Which of the following statements best describes your breathing?
1._____I only rarely have trouble with my breathing.
2._____I have regular trouble with my breathing, but it always gets completely better.
3._____My breathing is never quite right.

12. Is there anything at this facility that brings on chest symptoms, such as cough, shortness of breath, chest tightness, or wheezing? 1.___ Yes 0.___ No

IF YES:

a) What brings on these chest symptoms?
_____
_____

13. Have you ever had to change your job, job duties, or work area at this facility because of breathing difficulties? 1. ___ Yes 0. ___ No

IF YES:

a) What month and year did you change your job, job duties, or work area? __ __ / __ __ __ __
(Month) (Year)

b) What was your job, job duties, and/or work area before the change?
Describe: _____
_____

c) How did your job, job duties, and/or work area differ after the change?
Describe:_____

d) Were your breathing problems after the change:
1. ____ The same 2. ____Better 3. ____ Worse

14. In the last 12 months, how many days have you missed work because of breathing problems?
_____Days

15. In the last 12 months, how many days have you missed work because of health problems other than breathing problems? _____Days

ID:_____

16. Are you currently taking any medicine (including inhalers, aerosols, or tablets) for asthma? 1. ___ Yes 0. ___ No

17. Has a doctor ever told you that you had asthma? 1. ___ Yes 0. ___ No

IF YES:

a) Do you still have it? 1. ___ Yes 0. ___ No

b) In what month and year were you first told that you had asthma__ __ / __ __ __ __
(Month) (Year)

18. Has a doctor ever told you that you had chronic bronchitis? 1. ___ Yes 0. ___ No

IF YES:

a) Do you still have it? 1. ___ Yes 0. ___ No

b) In what month and year were you first told that you had chronic bronchitis __ __ / __ __ __ __
(Month) (Year)

19. Has a doctor ever told you that you had emphysema? 1. ___ Yes 0. ___ No

IF YES:

a) Do you still have it? 1. ___ Yes 0. ___ No

b) In what month and year were you first told that you had emphysema __ __ / __ __ __ __
(Month) (Year)

20. Do you have any nasal allergies including hay fever? 1. ___ Yes 0. ___ No

21. During the last 12 months, have you had any episodes of stuffy, itchy, or runny nose? 1. ___ Yes 0. ___ No

IF YES:

a) Is there an exposure at work that brings on these nasal symptoms? 1. ___ Yes 0. ___ No 9. ___ Don't Know

IF YES:

b) Describe exposure(s):

_____

c) When you are away from work on days off or on vacation, are your nasal symptoms:
1. ____ The same 2. ____Better 3. ____ Worse

22. During the last 12 months, have you had episodes of watery, itchy eyes? 1. ___ Yes 0. ___ No

IF YES:

a) Is there an exposure at work that brings on these eye symptoms? 1. ___ Yes 0. ___ No 9. _____ Don't Know

IF YES:

b) Describe exposure(s):

_____

c) When you are away from work on days off or on vacation, are your eye symptoms:
1. ____ The same 2. ____Better 3. ____ Worse

ID:_____

23. Since you began working at this facility, have you developed any new skin rash or skin problems? 1. ___ Yes 0. ___ No

IF YES:

a) Is there an exposure at work that brings on this skin rash or skin problem?
1. ___ Yes 0. ___ No 9. ___ Don't Know

IF YES:

b) Describe exposure(s) and symptoms:
_____
_____

c) When you are away from work on days off or on vacation, are these skin problems:
1. ____ The same 2. ____Better 3. ____ Worse

Section III. Work Information

24. I am now going to ask you some questions about all the jobs that you have had in the food service industry <u>at this facility</u>. We will start with your current job at this facility and work back through time.

Job Number	Job Title	Start Date (MM/YYYY)	End Date (MM/YYYY)	Hour work(ed) per week
	Cashier			
	Catering			
	Cook			
	Prep cook			
	Executive chef			
	Sous chef			
	Conference dining attendant			
	General utility			
	Management			
	Pantry			
	Porter			
	Runner			
	Other			

25. I am now going to ask you some questions about all the jobs that you have had in the food service industry <u>outside of this facility</u>. We will start with your most recent job in the food service industry <u>outside of this facility</u> and work back through time.

Job Number	Job Title	Start Date (MM/YYYY)	End Date (MM/YYYY)	Hour per week work(ed)
	Cashier			
	Catering			
	Cook			
	Prep cook			
	Executive chef			
	Sous chef			
	Conference dining attendant			

ID:_____

	General utility			
	Management			
	Pantry			
	Porter			
	Runner			
	Other			

Additional questions for current job (at this facility and for second job if have one):

26. In your current job, do you ever cook? 1.____ Yes 0.___ No

IF YES:

a) Do you ever cook on an open-flame grill? 1.____ Yes 0.___ No

IF YES:

On an average day, how often do you cook with an open-flame grill?
1. _____Almost Always 2._____Sometimes 3._____Rarely

b) Do you ever cook on a flat-top, marked, or ridged grill or griddle? 1.____ Yes 0.___ No

IF YES:

On an average day, how often do you cook on a flat-top, marked, or ridged grill or griddle?
1. _____Almost Always 2._____Sometimes 3._____Rarely

c) Do you ever cook using a Panini press? 1.____ Yes 0.___ No

IF YES:

On an average day, how often do you cook with a Panini press?
1. _____Almost Always 2._____Sometimes 3._____Rarely

d) Do you ever sauté or fry in a pan? 1.____ Yes 0.___ No

IF YES:

On an average day, how often do you sauté or fry in a pan?
1. _____Almost Always 2._____Sometimes 3._____Rarely

e) Do you ever cook using a deep-fryer? 1.____ Yes 0.___ No

IF YES:

On an average day, how often do you cook with a deep-fryer?
1. _____Almost Always 2._____Sometimes 3._____Rarely

f) Do you ever cook using an oven? 1._____Yes 0._____No

IF YES:

On an average day, how often do you cook using an oven?
1. _____Almost Always 2._____Sometimes 3._____Rarely

g) In your current job, have you ever cooked with cooking sprays? 1.____ Yes 0.___ No

IF YES:

Have they ever been butter-flavored? 1.____ Yes 0.___ No 9.___ Don't Know

h) In your current job, have you ever cooked with liquid cooking oils? 1.____ Yes 0.___ No

IF YES:

Have they ever been butter-flavored? 1.____ Yes 0.___ No 9.___ Don't Know

ID:_____

i) In your current job, have you ever cooked with shortening? 1.____ Yes 0.___ No
IF YES:
Have they ever been butter-flavored? 1.____ Yes 0.___ No 9.___ Don't Know

j) In your current job, have you ever cook with margarine? 1.____ Yes 0.___ No

k) In your current job, have you ever cook with real butter? 1.____ Yes 0.___ No

27. In your current job, do you ever use cleaning agents such as soap or other detergents?
1.____ Yes 0.___ No

IF YES:

a) Do you ever use cleaning agents (such as soap or other detergents) to clean cooking surfaces (such as the grill, griddle, or Panini press)?
1._____Yes 0._____No

IF YES:

b) When you clean cooking surfaces with cleaning agents is the cooking surface
1. _____ Hot 2. _____ Cold 3. _____Both

c) Do you ever use cleaning agents (such as soap or detergents) to clean food preparation surfaces (such as stainless steel counters)? 1._____Yes 0._____No

d) Do you ever use cleaning agents (such as soap or other detergents) to clean the floors?
1._____Yes 0._____No

e) Do you ever use cleaning agents (such as soap or other detergents) to clean pots, pans, platters, and/or dishes? 1._____Yes 0._____No

f) Do you ever use cleaning agents (such as soap or other detergents) to clean tea and/or coffee equipment? 1._____Yes 0._____No

g) Do you ever use cleaning agents (such as soap or other detergents) to clean other items or areas
1._____Yes 0._____No
a) Describe the other items or areas:_____

h) For all your cleaning tasks with cleaning agents, how long do you spend cleaning on an average day? (*For answers that match the cut point, select the choice with the lower range.*)
1. ____ less than 1 hour 2. ___1-3 hours 3. ___ 3-5 hours 4. ___ 5-7 hours 5. ____greater than 7 hours

For past jobs (at this facility or other facilities) in food service industry:

28. In this job, did you ever cook? 1.____ Yes 0.___ No
IF YES:

a) Did you ever cook using an open-flame grill? 1.____ Yes 0.___ No
IF YES:
On an average day, how often did you cook with an open-flame grill?
1. _____Almost Always 2._____Sometimes 3._____Rarely

b) Did you ever cook using a flat-top, marked, or ridged grill or griddle? 1.____ Yes 0.___ No

ID:_____

IF YES:

On an average day, how often did you cook with a flat-top, marked, or ridged grill or griddle?
1. _____Almost Always 2._____Sometimes 3._____Rarely

c) Did you ever cook using a Panini press? 1.____ Yes 0.___ No

IF YES:

On an average day, how often did you cook with a Panini press?
1. _____Almost Always 2._____Sometimes 3._____Rarely

d) Did you ever sauté or fry in a pan? 1.____ Yes 0.___ No

IF YES:

On an average day, how often did you sauté or fry in a pan?
1. _____Almost Always 2._____Sometimes 3._____Rarely

e) Did you ever cook using a deep-fryer? 1.____ Yes 0.___ No

IF YES:

On an average day, how often did you cook with a deep-fryer?
1. _____Almost Always 2._____Sometimes 3._____Rarely

f) Did you ever cook using an oven? 1._____Yes 0._____No

IF YES:

On an average day, how often did you cook using an oven?
1. _____Almost Always 2._____Sometimes 3._____Rarely

g) In this job, did you ever cook with sprays? 1.____ Yes 0.___ No

IF YES:

Were they ever butter-flavored? 1.____ Yes 0.___ No 9.___ Don't Know

h) In this job, did you ever cook with liquid cooking oils? 1.____ Yes 0.___ No

IF YES:

Were they ever butter-flavored? 1.____ Yes 0.___ No 9.___ Don't Know

i) In this job, did you ever cook with shortening? 1.____ Yes 0.___ No

IF YES:

Were they ever butter-flavored? 1.____ Yes 0.___ No 9.___ Don't Know

j) In this job, did you ever cook with margarine? 1.____ Yes 0.___ No

k) In this job, did you ever cook with real butter? 1.____ Yes 0.___ No

29. In this job, did you ever use cleaning agents such as soap or other detergents?
1.___ Yes 0.___ No

IF YES:

a) Did you ever use cleaning agents (such as soap or other detergents) to clean cooking surfaces (such as the grill, griddle, or Panini press)?
1._____Yes 0._____No

b) IF YES:

ID:_____

When you cleaned the cooking surfaces with cleaning agents was the cooking surface
1._____ Hot 2. _____ Cold 3._____Both

c) Did you ever use cleaning agents (such as soap or other detergents) to clean food preparation surfaces (such as stainless steel counters)? 1._____Yes 0._____No

d) Did you ever use cleaning agents (such as soap or other detergents) to clean the floors? 1._____Yes 0._____No

e) Did you ever use cleaning agents (such as soap or other detergents) to clean pots, pans, platters, and/or dishes? 1._____Yes 0._____No

f) Did you ever use cleaning agents (such as soap or other detergents) to clean tea and/or coffee equipment? 1._____Yes 0._____No

g) Did you ever use cleaning agents (such as soap or other detergents) to clean other items or areas 1._____Yes 0._____No

h) Describe the other items or areas:_____

i) For all your cleaning tasks with cleaning agents, how long did you spend cleaning on an average day? (*For answers that match the cut point, select the choice with the lower range.*)
1.___ less than 1 hour 2.___1-3 hours 3._____3-5 hours 4._____5-7 hours 5._____ greater than 7 hours

Section IV: Tobacco Use Information

I'm now going to ask you a few questions about tobacco use.

30. Have you ever smoked cigarettes? 1. ___ Yes 0. ___ No
(*NO if less than 20 packs of cigarettes in a lifetime or less than 1 cigarette a day for 1 year.*)

IF YES:

a) How old were you when you first started smoking regularly? _____ Years old

b) Over the entire time that you have smoked, what is the average number of cigarettes that you smoked per day? _____ Cigarettes/day

c) Do you still smoke cigarettes? 1. ___ Yes 0. ___ No
IF NO:

d) How old were you when you stopped smoking cigarettes regularly? _____ Years old

Thank you for participating in this survey!

ID:_____

RDHETA _____
HETA 2008-0125 (277 Park Ave)
HETA 2008-0126 (1NYP)
HETA 2008-0127 (1CMP)

Entrevistador: _____ Fecha entrevista: __ __ / __ __ / __ __ __ __
(Mes) (Día) (Año)

Sección I: Identificación e información demográfica

Nombre: _____ _____ _____
(Apellido) (Nombre) (Inicial)

Dirección: _____
(Número, calle, y/o ruta rural)

_____ _____ _____
(Ciudad) (Estado) (Código postal)

Número teléfono casa: ( ) _____ - _____

Si Ud. se trasladara, ¿hay alguien que mantendría contato con Ud.?

Nombre: _____ _____ _____
(Apellido) (Nombre) (Inicial)

Relación con Ud.:_____

Dirección:_____
(Número, calle y/ o ruta rural)

_____ _____ _____
(Ciudad) (Estado) (Código postal)

Número teléfono casa: ( ) _____ - _____

~~~~~~

1. Fecha de nacimiento: __ __ / __ __ / __ __ __ __
(Mes) (Día) (Año)

2. Sexo: 1. ____ Masculino 2. ____ Femenino

3. Es Ud. español, hispano o latino? 1. ____Sí 2. ____No.

4. Seleccione una o más de las siguientes categorías para describir su raza:
1. ___ Indio americano o Nativo de Alaska
2. ___ Asiático
3. ___ Africano-Americano o Negro
4. ___ Nativo de Hawaii o Isleño del Pacífico
5. ___ Blanco
~~~~~~

ID:_____

Sección II: Información de salud

Le voy a hacer algunas preguntas acerca de su salud. La respuesta a muchas de estas preguntas puede ser "Sí" o "No". Si Ud. tiene dudas acerca de si responder "sí" o "no", por favor conteste "No".

5. ¿Tose Ud. habitualmente? 1. ___ Sí 0. ___ No
(Cuenta la tos con el primer cigarrillo o al salir al exterior. Excluye el carraspeo.)

SI CONTESTÓ SÍ:

a) ¿Tose Ud. habitualmente la mayoría de los días durante tres meses consecutivos o más durante el año? 1. ___ Sí 0. ___ No

b) ¿En qué mes y año empezó la tos? __ __ / __ __ __ __
(Mes) (Año)

c) Cuando Ud. no está en este establecimiento por vacaciones o días libres, la tos es:
1. ____ Igual 2. ____Mejor 3. ____ Peor

6. ¿ Se cansa por falta de aire cuando camina rápido en terreno llano o sube una pendiente suave?
1. ___ Sí 0. ___ No

SI CONTESTÓ SÍ:

a) ¿Le falta el aire al caminar en terreno llano con gente de su misma edad?
1. ___ Sí 0. ___ No

b) ¿ Tiene que parar a respirar cuando camina a su propio paso en terreno llano?
1. ___ Sí 0. ___ No

c) ¿Tiene que parar a respirar después de caminar unas 100 yardas (o después de unos pocos minutos) en terreno llano?
1. ___ Yes 0. ___ No

d) ¿En qué mes y año comenzó la falta de aire? __ __ / __ __ __ __
(Mes) (Año)

7. ¿Ha tenido silbidos o pitos en el pecho alguna vez en los últimos 12 meses?
1. ___ Sí 0. ___ No

SI CONTESTÓ SÍ:

a) Cuando Ud. no está en este establecimiento por vacaciones o días libres, el silbido y/o el pito en el pecho es:
1. ____ Igual 2. ____Mejor 3. ____ Peor

8. ¿Se ha despertado con una sensación de opresión o tirantez en el pecho al levantarse por la mañana alguna vez en los últimos 12 meses? 1. ___ Sí 0. ___ No

SI CONTESTÓ SÍ:

a) Cuando Ud. no está en este establecimiento, por vacaciones o días libres, el problema es:
1. ____ Igual 2. ____Mejor 3. ____ Peor

ID:_____

9. ¿ Ha tenido algún ataque de falta de aire después de dejar de hacer ejercicio físico en los últimos 12 meses? 1. ___ Sí 0. ___ No

SI CONTESTÓ SÍ:

a) Cuando Ud. no está en este establecimiento, por vacaciones o días libres, el problema es:
1. ____ Igual 2. ____Mejor 3. ____ Peor

10. ¿Se ha despertado por la noche a causa de un ataque de falta de aire alguna vez en los últimos 12 meses? 1. ___ Sí 0. ___ No

SI CONTESTÓ SÍ:

a) Cuando Ud. no está en este establecimiento por vacaciones o días libres, el problema es:
1. ____ Igual 2. ____Mejor 3. ____ Peor

11. ¿Ha tenido problemas con la respiración en los últimos 12 meses? 1. ___ Sí 0. ___ No

SI CONTESTÓ SÍ:

a) ¿Cuál de los siguientes enunciados describe mejor su respiración?
1._____Sólo de vez en cuando tengo problemas con la respiración.
2._____Tengo problemas de respiración habitualmente, pero siempre me recupero completamente.
3._____ Nunca respiro totalmente bien.

12. ¿Hay algo en este establecimiento que le provoque problemas en el pecho, como por ejemplo tos, falta de aire, opresión o tirantez en el pecho, o silbidos o pitos en el pecho? 1.___ Sí 0.___ No

SI CONTESTÓ SÍ:

a) ¿Qué le provoca estos síntomas?
_____
_____

13. ¿Ha tenido que cambiar de trabajo, de puesto y/o de sección en este establecimiento por problemas con su respiración? 1. ___ Sí 0. ___ No

SI CONTESTÓ SÍ:

a) ¿En qué mes y año Ud. cambió de trabajo, puesto o sección?
__ __ / __ __ __ __
(Mes) (Año)

b) ¿Cuál era su trabajo, puesto o sección antes del cambio?
Describa: _____
_____

c) ¿Cómo se diferencia su trabajo, puesto o sección después del cambio?
Describa:_____

d) Después del cambio sus problemas de respiración han sido:
1. ____ Iguales 2. ____Mejores 3. ____ Peores

ID:_____

14. ¿Cuántos días de trabajo ha perdido en los últimos 12 meses por problemas respiratorios?
_____ Días

15. ¿Cuántos días de trabajo ha perdido en los últimos 12 meses por otros problemas de salud aparte de los problemas respiratorios? _____Días

16. ¿Está tomando actualmente algún remedio -ya sea inhaladores, aerosoles o tabletas- para el asma?
1. ___ Sí 0. ___ No

17. ¿Alguna vez le ha dicho su médico que Ud. tiene asma? 1. ___ Sí 0. ___ No
SI CONTESTÓ SÍ:

a) ¿Todavía tiene asma? 1. ___ Sí 0. ___ No
b) ¿Cuándo se le dijo por primera vez que Ud. tenía asma? __ __ / __ __ __ __
(Mes) (Año)

18. ¿Alguna vez le ha dicho su médico que Ud. tenía bronquitis crónica? 1. ___ Sí 0. ___ No
SI CONTESTÓ SÍ:

a) ¿Todavía tiene bronquitis crónica? 1. ___ Sí 0. ___ No
b) ¿Cuándo se le dijo por primera vez que Ud. tenía bronquitis crónica __ __ / __ __ __ __
(Mes) (Año)

19. ¿Alguna vez le ha dicho su médico que Ud. tenía enfisema? 1. ___ Sí 0. ___ No
SI CONTESTÓ SÍ:

a) ¿Todavía tiene enfisema? 1. ___ Sí 0. ___ No
b) ¿Cuándo se le dijo por primera vez que Ud. tenía enfisema? __ __ / __ __ __ __
(Mes) (Año)

20. ¿Tiene Ud. alguna alergia nasal, incluyendo rinitis? 1. ___ Sí 0. ___ No

21. ¿Ha tenido algún episodio de congestión nasal, secreción nasal, o picazón de la nariz en los últimos 12 meses? 1. ___ Sí 0. ___ No
SI CONTESTÓ SÍ:

a) ¿Hay algo en su lugar de trabajo que le provoque estos problemas nasales?
1.___ Sí 0. ___ No 9. ___ No sabe
SI CONTESTÓ SÍ:

b) Describa qué le provoca estos problemas y los síntomas:
_____

c) Cuando Ud. está de vacaciones o tiene días libres, estos síntomas nasales son:
1. ____ Iguales 2. ____Mejores 3. ____ Peores

22. ¿Ha tenido episodios de ojos lagrimosos o picazón de los ojos en los últimos 12 meses?
1. ___ Sí 0. ___ No
SI CONTESTÓ SÍ:

a) ¿Hay algo en el lugar donde trabaja que le provoque estos problemas en los ojos?
1. ___ Sí 0. ___ No 9. _____ No sabe

SI CONTESTÓ SÍ:

ID:_____

b) Describa qué es lo que le provoca estos problemas y los síntomas que tiene:
_____

c) Cuando Ud tiene vacaciones o días libres, sus problemas en los ojos son:
1. ____ Iguales 2. ____Mejores 3. ____ Peores

23. ¿Ha tenido salpullido nuevo, erupción cutánea nueva, u otros problemas nuevos de piel desde que empezó a trabajar en este establecimiento? 1. ___ Sí 0. ___ No

SI CONTESTÓ SÍ:

a) ¿Hay algo en el lugar de trabajo que le provoque estos problemas de piel?
1. ___ Sí 0. ___ No 9. ___ No sabe

SI CONTESTÓ SÍ:

b) Describa qué es lo que le provoca los problemas y los síntomas que tiene:
_____

c) Cuando Ud. está de vacaciones o tiene días libres, sus problemas de piel son:
1. ____ Iguales 2. ____Mejores 3. ____ Peores

Sección III. Información laboral

24. A continuación le voy a preguntar acerca de los puestos de trabajo que ha tenido en la industria del servicio de comida en este establecimiento. Comenzaremos con su puesto actual y repasaremos los otros puestos que ha tenido anteriormente.

Trabajo número	Puesto	Fecha inicio (Mes/Año)	Fecha terminación (Mes/ Año)	Horas de trabajo por semana
	Cajero			
	Traslado/ servicio de comida (catering)			
	Cocinero (cook)			
	Preparador de cocina (prep cook)			
	Chef ejecutivo			
	Sous chef			
	Mozo de sala (conference dining attendant)			
	Servicio general (general utility)			
	Administración (management)			
	Despensa (pantry)			
	Portero			
	Mozo (runner)			
	Otro			

ID:_____

25. A continuación le voy a preguntar acerca de todos los puestos de trabajo que ha tenido en la industria del servicio de comidas fuera de este establecimiento. Comenzaremos con su puesto más reciente en la industria del servicio de comidas fuera de este establecimiento e iremos hacia los puestos más antiguos.

Trabajo número	Puesto	Fecha inicio (mes/año)	Fecha terminación (mes/año)	Horas de trabajo por semana
	Cajero			
	Traslado/ servicio de comida (catering)			
	Cocinero (cook)			
	Preparador de cocina (prep cook)			
	Chef ejecutivo			
	Sous chef			
	Mozo de sala (conference dining attendant)			
	Servicio general (general utility)			
	Administración (management)			
	Despensa (pantry)			
	Portero			
	Mozo (runner)			
	Otro			

Preguntas adicionales respecto al trabajo actual (en este establecimiento y en un segundo trabajo si Ud. lo tiene):

26. En su trabajo actual, ¿ha cocinado Ud. alguna vez? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

a) ¿Ha cocinado Ud. alguna vez en una parrilla / asador abierto / grill abierto? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia cocina en una parrilla / asador / grill abierto?
1. _____Casi siempre 2._____A veces 3._____Raramente

b) ¿Ha cocinado Ud. alguna vez en una plancha o parrilla plana, marcada o con aristas?
1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia cocina en una plancha o parrilla plana o marcada?
1. _____Casi siempre 2._____A veces 3._____Raramente

c) ¿Ha cocinado Ud. alguna vez en una prensa tipo Panini? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia cocina en una prensa tipo Panini?
1. _____Casi siempre 2._____A veces 3._____Raramente

ID:_____

d) ¿Ha salteado o frito Ud. alguna vez en una sartén? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia saltea o fríe en una sartén?
1. _____Casi siempre 2._____A veces 3._____Raramente

e) ¿Ha usado Ud. alguna vez una freidora (*deep fryer*)? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia usa una freidora?
1. _____Casi siempre 2._____A veces 3._____Raramente

f) ¿Ha cocinado Ud. alguna vez en un horno? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia cocina en un horno?
1. _____Casi siempre 2._____A veces 3._____Raramente

g) En su trabajo actual, ¿ha cocinado Ud. alguna vez con aceites en aerosol (*cooking sprays*)? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

¿Alguna vez han sido con sabor a mantequilla? 1.____ Sí 0.___ No 9.___ No sabe

h) En su trabajo actual, ¿ha cocinado Ud. alguna vez con aceites líquidos? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

¿Alguna vez han sido con sabor a mantequilla? 1.____ Sí 0.___ No 9.___ No sabe

i) En su trabajo actual, ¿ha cocinado Ud. alguna vez con aceite hidrogenado (*shortening*)? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

¿Alguna vez han sido con sabor a mantequilla? 1.____ Sí 0.___ No 9.___ No sabe

j) En su trabajo actual, ¿ha cocinado Ud. alguna vez con margarina? 1.____ Sí 0.___ No

k) En su trabajo actual, ¿ha cocinado Ud. alguna vez con mantequilla? 1.____ Sí 0.___ No

27. En su trabajo actual, ¿ha usado Ud. alguna vez agentes limpiadores como jabón u otros detergentes? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

a) ¿Ha usado Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar superficies elementos de cocción (tales como la parrilla, la plancha o la prensa tipo Panini)? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

b) Cuando Ud. limpia los elementos de cocción, estos están:
1._____ Calientes 2. _____ Fríos 3. _____Ambos

c) ¿Ha usado Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar superficies de preparación de comidas (tales como mesadas de acero inoxidable)? 1.____ Sí 0.___ No

ID:_____

d) ¿Ha usado Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar los pisos? 1.____ Sí 0.___ No

e) ¿Ha usado Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar fuentes, ollas, sartenes y/o platos? 1.____ Sí 0.___ No

f) ¿Ha usado Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar equipo para preparar té o café? 1.____ Sí 0.___ No

g) ¿Ha usado Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar otros elementos o áreas? 1.____ Sí 0.___ No

h) Describa los otros elementos o áreas:_____

i) Considerando todas sus tareas de limpieza, ¿cuánto tiempo pasa Ud. limpiando en un día promedio? (*Para respuestas que cayan al borde de los límites, escoja la opción con límites menores*.)

1.____ menos de 1 hora 2. ____1-3 horas 3.____ 3-5 horas 4.____ 5-7 horas 5._____más de 7 horas

En trabajos pasados (en este establecimiento o otros establecimientos) en la industria de servicio de comidas:

28. En este trabajo, ¿Ud. cocinaba alguna vez? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

a) ¿Cocinaba Ud. alguna vez en una parrilla / asador abierto / grill abierto? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia cocinaba en una parrilla / asador grill abierto?
1. _____Casi siempre 2._____A veces 3._____Raramente

b) ¿Cocinaba Ud. alguna vez en una plancha o parrilla plana, marcada o con aristas? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia cocinaba en una plancha o parrilla plana o marcada?
1. _____Casi siempre 2._____A veces 3._____Raramente

c) ¿Cocinaba Ud. alguna vez en una prensa tipo Panini? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia cocinaba en una prensa tipo Panini?
1. _____Casi siempre 2._____A veces 3._____Raramente

d) ¿Salteaba o freía Ud. alguna vez en una sartén? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia salteaba o freía en una sartén?
1. _____Casi siempre 2._____A veces 3._____Raramente

e) ¿Usaba Ud. alguna vez una freidora? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia usaba una freidora?
1._____Casi siempre 2._____A veces 3._____Raramente

ID:_____

f) ¿Cocinaba Ud. alguna vez en un horno? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

En un día promedio, ¿con qué frecuencia cocinaba en un horno?
1. _____Casi siempre 2._____A veces 3._____Raramente

g) En este trabajo, ¿cocinaba Ud. alguna vez con aceites en aerosol (*cooking sprays*)?1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

¿Alguna vez fueron con sabor a mantequilla? 1.____ Sí 0.___ No 9.___ No sabe

h) En este trabajo, ¿cocinaba Ud. alguna vez con aceites líquidos? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

¿Alguna vez fueron con sabor a mantequilla? 1.____ Sí 0.___ No 9.___ No sabe

i) En este trabajo, ¿cocinaba Ud. alguna vez con aceite hidrogenado (*shortening*)? 1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

¿Alguna vez fueron con sabor a mantequilla? 1.____ Sí 0.___ No 9.___ No sabe

j) En este trabajo, ¿cocinaba Ud. alguna vez con margarina? 1.____ Sí 0.___ No

k) En este trabajo, ¿cocinaba Ud. alguna vez con mantequilla? 1.____ Sí 0.___ No

29. En este trabajo, ¿usaba Ud. alguna vez agentes limpiadores como jabón u otros detergentes?
1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

a) ¿Usaba Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar superficies elementos de cocción (tales como la parrilla, la plancha o la prensa tipo Panini)?
1.____ Sí 0.___ No

SI CONTESTÓ SÍ:

b) Cuando Ud. limpiaba los elementos de cocción, estos estaban:
1._____ Calientes 2._____ Fríos 3._____Ambos

c) ¿Usaba Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar superficies de preparación de comidas (tales como mesadas de acero inoxidable)?
1.____ Sí 0.___ No

d) ¿Usaba Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar los pisos? 1.____ Sí 0.___ No

e) ¿Usaba Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar fuentes, ollas, sartenes y/o platos? 1.____ Sí 0.___ No

f) ¿Usaba Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar equipo para preparar té o café? 1.____ Sí 0.___ No

g) ¿Usaba Ud. alguna vez agentes limpiadores (como jabón u otros detergentes) para limpiar otros elementos o áreas? 1.____ Sí 0.___ No

ID:_____

h) Describa los otros elementos o áreas:_____

i) Considerando todas sus tareas de limpieza, ¿cuánto tiempo pasaba limpiando en un día promedio? (*Para respuestas que cayan al borde de los límites, escoja la opcíon con límites menores*.)

1. ___menos de 1 hora 2.___1 -3 horas 3. ___3-5 horas 4. ___5-7 horas 5.___ más de 7 horas

Sección IV: Información sobre el uso de tabaco

A continuación le voy a preguntar sobre el uso de tabaco.

30. ¿Ha fumado alguna vez cigarillos? 1. ___ Sí 0. ___ No

(*NO si ha fumado menos de 20 paquetes de cigarrillos en su vida o menos de un cigarrillo por día por un año*).

SI CONTESTÓ SÍ:

a) ¿Cuántos años tenía cuando empezó a fumar regularmente? _____ años.

b) A lo largo de todo el tiempo que ha fumado, ¿cuál es el promedio de cigarrillos por día? _____ Cigarrillos/día

c) ¿Todavía fuma? 1. ___ Sí 0. ___ No

SI CONTESTÓ NO:

d) ¿Cuántos años tenía cuando dejó de fumar cigarrillos? _____ años.

¡GRACIAS POR PARTICIPAR EN ESTA ENCUESTA!

DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service

Phone: (304) 285-5751
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Centers for Disease Control
and Prevention (CDC)
National Institute for Occupational
Safety and Health (NIOSH)
1095 Willowdale Road
Morgantown, WV 26505-2888

May 23, 2008
HETA 2008-0125
Interim Letter I

Mr. Eric Frumin
UNITE HERE
275 Seventh Avenue
New York, NY 10001

Dear Mr. Frumin:

In February 2008, the National Institute for Occupational Safety and Health (NIOSH) received a Health Hazard Evaluation request from the international union UNITE HERE to evaluate both the respiratory health and inhalation exposures of food preparation workers at Aramark – JP Morgan Chase, 277 Park Avenue, New York, NY. The purpose of this letter is to report on the preliminary analysis of the data.

On February 26, 2008, the New York City Department of Health and Mental Hygiene upon NIOSH's request collected bulk samples of current-use cooking oils at another Aramark facility in New York City and sent them to NIOSH for analysis. Of the bulks collected, two were reportedly currently in use at the 277 Park Avenue location: Frymax product #35071 (Aramark #3185345), and Prep product #35041 (Aramark #8007759). We did not detect diacetyl using gas chromatography with mass spectrometry in these two bulk samples.

On March 11-12, 2008, we completed a walk-through visit of this location where they interviewed current workers about their exposures and job duties, conducted air sampling, evaluated the cooking area ventilation systems, collected bulk samples of cooking oils currently in use, and reviewed the material safety data sheets (MSDS) and the Occupational Safety and Health Administration (OSHA) 300 logs. We collected personal and area air samples for diacetyl and acetoin using the modified OSHA method PV2118 and general-area air samples for volatile organic compounds (VOCs) using NIOSH method 2549. We also performed real-time air sampling for total VOC concentrations using a programmable pocket photo-ionization detector (ppbRAE, Rae Systems Inc., San Jose, CA); for airborne particle concentrations in the respirable size range using a particulate monitor (pDR-1000AN *personal* DataRAM, Thermo Scientific Corp., Franklin, MA); and for carbon monoxide (CO) concentrations using a single gas monitor (T82 Industrial Scientific Corp., Oakdale, PA). We used direct reading indicator tubes to sample for nitrous fumes (NO_x) and nitrogen dioxide (NO_2). Additionally, we measured ventilation air flow, air temperature, and relative humidity levels.

We did not detect diacetyl, acetoin, NO_x, NO_2, or CO in any of the air samples taken; limits of detection were 0.02, 0.07, 0.5, 0.5, and 1.0 parts per million (ppm), respectively. We detected levels of airborne VOCs during real time air sampling ranged from 0 to 785 parts per billion (ppb), with most levels under 100 ppb. The spike at 785 ppb lasted for only one minute and occurred during an operation involving the sautéing of vegetables in oil with garlic and cayenne pepper flakes. General-area air samples (using NIOSH method 2549) and bulk oil samples for VOC screening collected during the survey are undergoing laboratory analysis and are not currently available.

We detected levels of airborne particle concentrations (in the respirable size range) during real-time sampling ranging from 0.01 to 99.97 mg/m^3 , with most levels under 0.09 mg/m^3. The spike at 99.97 mg/m^3 occurred during a 12-minute interval when a worker used Scotch-Brite™ Quick Clean Griddle Liquid to clean a hot griddle, creating large amounts of steam.

A medical survey, consisting of an interviewer-administered questionnaire and spirometry (lung function) testing, was conducted April 3-4, 2008. We performed spirometry following the American Thoracic Society guidelines. We used a dry rolling-seal spirometer interfaced to a personal computer and compared spirometry results to reference values based on U.S. population data from the Third National Health and Nutrition Examination Survey. We selected each participating worker's largest forced vital capacity (FVC) and forced expiratory volume in the first second of exhalation (FEV_1) for analysis. We defined obstruction as an FEV_1/FVC ratio and an FEV_1 below their respective lower limits of normal. An obstructive abnormality indicates that air is exhaled from the lungs more slowly than normal. This can be seen in certain lung conditions such as asthma, bronchitis, emphysema, or bronchiolitis obliterans. We defined borderline obstruction as an FEV_1/FVC ratio below the lower limit of normal with normal FEV_1 and FVC. A borderline obstructive abnormality may indicate early evidence of obstruction, which also requires a low FEV_1. We defined restriction as an FVC below the lower limit of normal with a normal FEV_1/FVC ratio. A restrictive abnormality indicates that the amount of air exhaled is smaller than normal. This can be seen in certain lung conditions, such as lung scarring or fibrosis, or in people who are considerably overweight. Restriction can also be seen in people who have a severe obstructive abnormality. We defined a mixed pattern (obstruction and restriction) as an FEV_1/FVC ratio, FEV_1, and FVC all below their respective lower limits of normal. Workers with evidence of airways obstruction were administered albuterol, a bronchodilator medication used to treat obstructive lung diseases such as asthma, and were then re-tested after 10 minutes to see if the obstruction was reversible. We defined reversible obstruction (such as asthma) as an improvement in the FEV_1 of at least 12% and at least 200 milliliters after administration of albuterol. We defined fixed obstruction (such as bronchiolitis obliterans) as airways obstruction in which neither the FVC nor FEV_1 increased by 12% or more and at least 200 milliliters after the administration of albuterol.

Thirty-eight of the 50 current employees participated in this medical survey. Of the 38 participants, 36 performed spirometry testing. Two participants did not perform the breathing tests due to meidcal contraindications. The results of the spirometry testing were within normal limits for 22 participants. There were 14 breathing tests with results below the range of normal, of which four demonstrated borderline obstruction, six had restriction, three had a mixed pattern, and one individual had a reduction in the FEV_1 without clear obstruction or restriction. We sent

individual test results to each participant on May 1, 2008. In the cover letter accompanying the results, we recommended that each participant provide a copy of his or her spirometry results to his or her personal physician.

Interim Recommendations for Aramark Facility at 277 Park Avenue:

1. Use a ventilation hood for all cooking with an open-flame grill, flattop or ridged (marked) grill or griddle, panini press, or when sautéing or frying in a pan.

2. Personal protective equipment (PPE) such as gloves, goggles, and/or a respirator may be required for chemical cleaning of heated grills. Review and follow MSDS recommendations regarding PPE for cooking and cleaning products.

3. Ensure all workers, including temporary workers, receive initial and annual safety training regarding safe work practices. OSHA's Hazard Communication Standard, also known as the "Right to Know Law" (29 CFR 1910.1200 available at http://www.osha.gov), requires that employees are informed and trained of potential work hazards and associated safe practices, procedures, and protective measures. Training should be in Spanish for workers whose primary language is Spanish.

We appreciate the cooperation of UNITE HERE, Aramark, and employees during our surveys. We will continue to analyze the data from this facility and will provide you with a final report, including final recommendations, in the future. If you have any questions or concerns, please feel free to contact Denise Gaughan at (304) 285-6262 or Randy Boylstein at (304) 285-6062.

Sincerely,

Denise Gaughan, MPH
Lieutenant, U.S. Public Health Service
Respiratory Disease Hazard Evaluation and
Technical Assistance Program
Field Studies Branch
Division of Respiratory Disease Studies

Randy Boylstein, MS, REHS
Lieutenant Commander, U.S. Public Health Service
Respiratory Disease Hazard Evaluation and
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cc:
Charles Butler, Aramark, 277 Park Ave
Michael Keffer, Aramark
Susan Eisma, Aramark
Lisa Olmo, UNITE HERE Local 100
New York State Department of Health
OSHA, Region 2

DEPARTMENT OF HEALTH & HUMAN SERVICES **Public Health Service**

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May 23, 2008
HETA 2008-0126
Interim Letter I

Mr. Eric Frumin
UNITE HERE
275 Seventh Avenue
New York, NY 10001

Dear Mr. Frumin:

In February 2008, the National Institute for Occupational Safety and Health (NIOSH) received a Health Hazard Evaluation request from the international union UNITE HERE to evaluate both the respiratory health and inhalation exposures of food preparation workers at Aramark – Goldman Sachs, 1 New York Plaza, New York, NY. The purpose of this letter is to report on the preliminary analysis of the data.

On February 26, 2008, the New York City Department of Health and Mental Hygiene upon NIOSH's request collected bulk samples of current-use cooking oils at another Aramark facility in New York City and sent them to NIOSH for analysis. Of the bulk samples collected, three were reported currently in use at 1 NY Plaza Aramark location: Sterling product #35025 (Aramark #6359566), Frymax product #35071 (Aramark #3185345), and Prep product #35041 (Aramark #8007759). We did not detect diacetyl using gas chromatography with mass spectrometry in these three bulk samples.

On March 11-12, 2008, we completed a walk-through visit of the 1 NY Plaza Aramark location where we interviewed current workers about their exposures and job duties, performed air sampling, evaluated the cooking area ventilation systems, collected bulk samples of current-use cooking oils, and reviewed material safety data sheets (MSDSs) and the Occupational Safety and Health Administration (OSHA) 300 log. We collected personal and general-area air samples for diacetyl and acetoin using the modified OSHA method PV2118 and general-area air samples for volatile organic compounds (VOCs) using NIOSH method 2549. We also performed real-time air sampling for total VOC concentrations using a programmable pocket photo-ionization detector (ToxiRAE, RAE Systems Inc., San Jose, CA); for airborne particle concentrations in the respirable size range using a particulate monitor (pDR-1000AN *personal*DataRAM, Thermo Scientific Corp., Franklin, MA); and for carbon monoxide (CO) concentrations using a single gas monitor (T82, Industrial Scientific Corp., Oakdale, PA). We used direct-reading indicator tubes to sample for nitrous fumes (NO_x) and nitrogen dioxide (NO_2). Additionally, we measured ventilation air flow, air temperature, and relative humidity.

We did not detect diacetyl, acetoin, NO_x, NO_2, or CO in any of the air samples; limits of detection were 0.02, 0.07, 0.5, 0.5, and 1.0 parts per million (ppm), respectively. General-area air samples (using NIOSH method 2549) and bulk oil samples for VOC screening collected during the survey are undergoing laboratory analysis and are not currently available.

Throughout the 4.5-hour morning sampling period, the only airborne VOCs detected by the real- time air sampler in the back kitchen area was a 1-minute 200 parts per billion (ppb) concentration. During a 15-minute sampling period, measurements of airborne VOCs at the action cooking and grill stations in the front public serving room were below detection limits. During the morning, all real-time particle concentrations (in the respirable size range) remained below 0.08 milligrams per cubic meter of air (mg/m^3).

During the lunch cooking period, we placed real-time instruments in the front serving area adjacent to a panini press at the sandwiches station for approximately 3.25 hours. At this location we measured an average particle concentration of 5.59 mg/m^3 (maximum of 13.32 mg/m^3) and an average VOC concentration of 100 ppb (maximum of 500 ppb).

We observed a small amount of pan release oil being sprayed on the panini press surfaces prior to each sandwich being placed on the panini press, and occasionally noticed visible smoke while sandwiches were in the press, which was not located under a ventilation hood. We observed some employees handling cleaning agents without the proper eye and skin protection recommended in the MSDSs. Although we were shown boxes of gloves and goggles, they were not kept in an employee-accessible place, but rather have to be requested from the chef. Evidence of safety training being administered to employees (i.e., signed sheets of participation) was not available.

We visited again on March 31 and April 1, 2008, to perform a medical survey consisting of an interviewer-administered questionnaire and spirometry (lung function) testing. We performed spirometry following the American Thoracic Society guidelines. We used a dry rolling-seal spirometer interfaced to a personal computer and compared spirometry results to reference values based on U.S. population data from the Third National Health and Nutrition Examination Survey. We selected each participating worker's largest forced vital capacity (FVC) and forced expiratory volume in the first second of exhalation (FEV_1) for analysis. We defined obstruction as an FEV_1/FVC ratio and an FEV_1 below their respective lower limits of normal. An obstructive abnormality indicates that air is exhaled from the lungs more slowly than normal. This can be seen in certain lung conditions such as asthma, bronchitis, emphysema, or bronchiolitis obliterans. We defined borderline obstruction as an FEV_1/FVC ratio below the lower limit of normal with normal FEV_1 and FVC. A borderline obstructive abnormality may indicate early evidence of obstruction, which also requires a low FEV_1. We defined restriction as an FVC below the lower limit of normal with a normal FEV_1/FVC ratio. A restrictive abnormality indicates that the amount of air exhaled is smaller than normal. This can be seen in certain lung conditions, such as lung scarring or fibrosis, or in people who are considerably overweight. Restriction can also be seen in people who have a severe obstructive abnormality. We defined a mixed pattern (obstruction and restriction) as an FEV_1/FVC ratio, FEV_1, and FVC all below their respective lower limits of normal. Workers with evidence of airways obstruction were administered albuterol, a bronchodilator medication used to treat obstructive lung diseases

such as asthma, and were then re-tested after 10 minutes to see if the obstruction was reversible. We defined reversible obstruction (such as asthma) as an improvement in the FEV_1 of at least 12% and at least 200 milliliters after administration of albuterol. We defined fixed obstruction (such as bronchiolitis obliterans) as airways obstruction in which neither the FVC nor FEV_1 increased by 12% or more and at least 200 milliliters after the administration of albuterol.

Forty-five of 51 current employees participated in the medical survey. Of the 45 participants, 44 performed spirometry testing. One participant had medical contraindications and did not perform the spirometry testing. Thirty-three participants had spirometry test results within normal limits. Eight participants had breathing tests below the range of normal, of which five demonstrated a restrictive abnormality, one had an obstruction, one had a mixed pattern with moderately severe reduction in the FEV_1, and one had reduction in FEV_1 without clear cut restriction or obstruction. Three participants' tests were not entirely interpretable, but obstruction was ruled out. On May 1, 2008, we sent individual spirometry test results to each participant. In the cover letter accompanying the results, we recommended that each participant provide a copy of his/her spirometry results to his/her personal physician.

Interim Recommendations for Aramark Facility at 1 New York Plaza:

1. Use a ventilation hood for all cooking with an open-flame grill, flattop or ridged (marked) grill or griddle, panini press, or when sautéing or frying in a pan.

2. Personal protective equipment (PPE) such as gloves, goggles, and/or a respirator may be required for chemical cleaning of heated grills. Review and follow MSDS recommendations regarding PPE for cooking and cleaning products.

3. Ensure all workers, including temporary workers, receive initial and annual safety training regarding safe work practices. OSHA's Hazard Communication Standard, also known as the "Right to Know Law" (29 CFR 1910.1200 available at http://www.osha.gov), requires that employees are informed and trained of potential work hazards and associated safe practices, procedures, and protective measures. Training should be in Spanish for workers whose primary language is Spanish.

We appreciate the cooperation of UNITE HERE, Aramark, and employees during our surveys. We will continue to analyze the data from this facility and will provide you with a final report, including final recommendations, in the future. If you have any questions or concerns, please feel free to contact Dr.Yulia Iossifova at (304) 285-5778 or Chris Piacitelli at (304) 285-5835.

Sincerely,

Yulia Iossifova, MD, PhD
Respiratory Disease Hazard Evaluation and
Technical Assistance Program
Field Studies Branch
Division of Respiratory Disease Studies

Chris Piacitelli, MS, CIH
Commander, U.S. Public Health Service
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cc:
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May 23, 2008
HETA 2008-0127
Interim Letter I

Mr. Eric Frumin
UNITE HERE
275 Seventh Avenue
New York, NY 10001

Dear Mr. Frumin:

In February 2008, the National Institute for Occupational Safety and Health (NIOSH) received a Health Hazard Evaluation request from the international union UNITE HERE to evaluate both respiratory health and inhalation exposures of food preparation workers at Aramark – JP Morgan Chase, 1 Chase Manhattan Plaza, New York, NY. The purpose of this letter is to report on the preliminary analysis of the data.

On February 26, 2008, the New York City Department of Health and Mental Hygiene upon NIOSH's request collected bulk samples at 1 Chase Manhattan Plaza of four current-use cooking oils: Sterling product #35025 (Aramark #6359566), Frymax product #35071 (Aramark #3185345), Prep product #35041 (Aramark #8007759), and Prep product #35077 (Aramark #6040410). The samples were sent to NIOSH for analysis where we detected trace amounts of diacetyl in the Prep product #35077 using gas chromatography with mass spectrometry. We did not detect diacetyl in the other three bulk samples.

On March 11-12, 2008, we completed a walk-through visit of this location where we interviewed current workers about their exposures and job duties, performed air sampling, evaluated the cooking area ventilation systems, collected bulk samples of current-use cooking oils, and reviewed material safety data sheets (MSDSs) and the Occupational Safety and Health Administration (OSHA) 300 Log. We collected personal and general area air samples for diacetyl and acetoin using the modified OSHA method PV2118 and general-area air samples for volatile organic compounds (VOCs) using NIOSH method 2549. We also performed real-time air sampling for total VOC concentrations using a programmable pocket photo-ionization detector (ToxiRAE, RAE Systems Inc., San Jose, CA); for airborne particle concentrations in the respirable size range using a particulate monitor (pDR-1000AN *personal*DataRAM, Thermo Scientific Corp., Franklin, MA); and for carbon monoxide (CO) concentrations using a single gas monitor (T82, Industrial Scientific Corp., Oakdale, PA). We used direct-reading indicator tubes to sample for nitrous fumes (NO_x) and nitrogen dioxide (NO_2). Additionally, we measured ventilation air flow, air temperature, and relative humidity.

We did not detect diacetyl, acetoin, NO_x, or NO_2 in any air samples; limits of detection were 0.02, 0.07, 0.5, and 0.5 parts per million (ppm), respectively. We detected CO in two separate one-minute meter readings (6 ppm and 3 ppm) above a pan of butter cooking on a range inside a ventilated hood on level B2. Note that these short-term concentrations are well below the OSHA

Permissible Exposure Limit (8-hour time-weighted average of 50 ppm) and the NIOSH Recommended Exposure Limit (8-hour time-weighted average of 25 ppm) for CO. All other CO measures were below detectable levels in air, less than 1 ppm.

We also measured approximately 2 ppm VOCs while the butter was cooking. We did not detect VOCs away from the range or during cooking of French toast with Prep product #35077 (Aramark #6040410) on a flattop grill inside a ventilated hood on level B2. General-area air samples (using NIOSH method 2549) and bulk oil samples for VOC screening done during the survey are undergoing laboratory analysis and are not currently available.

We measured 2.5 milligrams per cubic meter (mg/m^3) airborne particles (in the respirable size range) over the fryer on level B1. Most levels of airborne particles detected during real-time sampling ranged from below detection limits to 2.5 mg/m^3, with most levels under 1.0 mg/m^3.

During our walk-through visit, numerous employees complained that smoke from the sauté station was irritating. The station was not operational during the industrial hygiene survey; we noted no exhaust hood at this location during our survey. We observed workers cleaning heated grills with cleaning agents; these workers were not using personal protective equipment (PPE).

We visited again on April 1-2, 2008, to perform a medical survey consisting of an interviewer-administered questionnaire and spirometry (lung function) testing. We performed spirometry following the American Thoracic Society guidelines. We used a dry rolling-seal spirometer interfaced to a personal computer and compared spirometry results to reference values based on U.S. population data from the Third National Health and Nutrition Examination Survey. We selected each participating worker's largest forced vital capacity (FVC) and forced expiratory volume in the first second of exhalation (FEV_1) for analysis. We defined obstruction as an FEV_1/FVC ratio and an FEV_1 below their respective lower limits of normal. An obstructive abnormality indicates that air is exhaled from the lungs more slowly than normal. This can be seen in certain lung conditions such as asthma, bronchitis, emphysema, or bronchiolitis obliterans. We defined borderline obstruction as an FEV_1/FVC ratio below the lower limit of normal with normal FEV_1 and FVC. A borderline obstructive abnormality may indicate early evidence of obstruction, which also requires a low FEV_1. We defined restriction as an FVC below the lower limit of normal with a normal FEV_1/FVC ratio. A restrictive abnormality indicates that the amount of air exhaled is smaller than normal. This can be seen in certain lung conditions, such as lung scarring or fibrosis, or in people who are considerably overweight. Restriction can also be seen in people who have a severe obstructive abnormality. We defined a mixed pattern (obstruction and restriction) as an FEV_1/FVC ratio, FEV_1, and FVC all below their respective lower limits of normal. Workers with evidence of airways obstruction were administered albuterol, a bronchodilator medication used to treat obstructive lung diseases such as asthma, and were then re-tested after 10 minutes to see if the obstruction was reversible. We defined reversible obstruction (such as asthma) as an improvement in the FEV_1 of at least 12% and at least 200 milliliters after administration of albuterol. We defined fixed obstruction (such as bronchiolitis obliterans) as airways obstruction in which neither the FVC nor FEV_1 increased by 12% or more and at least 200 milliliters after the administration of albuterol.

Thirty-three of 40 current employees participated in the medical survey. Of the 33 participants, 31 performed spirometry testing. Two participants with medical contraindications did not perform the spirometry testing. Twenty-one participants had spirometry test results within normal limits. Six participants had breathing tests below the range of normal, of which four demonstrated a restrictive abnormality, and two had a reduction in the FEV_1 without clear restriction or obstruction. Four participants' tests were not entirely interpretable, but obstruction was ruled out in two of the tests. On May 1, 2008, we sent individual spirometry test results to each participant. In the cover letter accompanying the results, we recommended that each participant provide a copy of his or her spirometry results to his or her personal physician.

Interim Recommendations for Aramark Facility at 1 Chase Manhattan Plaza:

1. Use a ventilation hood for all cooking with an open-flame grill, flattop or ridged (marked) grill or griddle, panini press, or when sautéing or frying in a pan.

2. Personal protective equipment (PPE) such as gloves, goggles, and/or a respirator may be required for chemical cleaning of heated grills. Review and follow MSDS recommendations regarding PPE for cooking and cleaning products.

3. Ensure all workers, including temporary workers, receive initial and annual safety training regarding safe work practices. OSHA's Hazard Communication Standard, also known as the "Right to Know Law" (29 CFR 1910.1200 available at http://www.osha.gov), requires that employees are informed and trained of potential work hazards and associated safe practices, procedures, and protective measures. Training should be in Spanish for workers whose primary language is Spanish.

We appreciate the cooperation of UNITE HERE, Aramark, and employees during our surveys. We will continue to analyze the data from this facility and will provide you with a final report, including final recommendations, in the future. If you have any questions or concerns, please feel free to contact Dr. Rachel Bailey at (304) 285-5757 or Dr. Gregory Day at (304) 285-6387.

Sincerely,

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Michael Keffer, Aramark
Susan Eisma, Aramark
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Acknowledgements and Availability of Report

The Respiratory Disease Hazard Evaluation and Technical Assistance Program (RDHETAP) of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health (OSH) Act of 1970, 29 U.S.C. 669(a)(6), or Section 501(a)(11) of the Federal Mine Safety and Health Act of 1977, 30 U.S.C. 951(a)(11), which authorizes the Secretary of Health and Human Services, following a written request from any employers or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found. RDHETAP also provides, upon request, technical and consultative assistance to federal, state, and local agencies; labor; industry; and other groups or individuals to control occupational health hazards and to prevent related trauma and disease. Mention of any company or product does not constitute endorsement by the National Institute for Occupational Safety and Health (NIOSH).

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This report was prepared by Rachel Bailey, Randy Boylstein, Gregory Day, Denise Gaughan, Yulia Iossifova, and Chris Piacitelli of RDHETAP, Division of Respiratory Disease Studies (DRDS). Field assistance was provided by Kristin Cummings, Nicole Edwards, Diana Freeland, Kathleen Kreiss, Greg Kullman, David Spainhour, and Brian Tift of DRDS. Analytical support was provided by Nicole Edwards, Kathy Fedan, Brian Tift, and Sandra White, of DRDS. Desktop publishing was performed by Tia McClelland of DRDS. We would like to thank the New York City Department of Health and Mental Hygiene for collection of bulk samples and Jean Cox-Ganser and Greg Kullman of DRDS for their input and assistance in designing the survey. Kathleen Kreiss and Jean Cox-Ganser assisted with data analysis plans and editing

of the report.

Copies of this report have been sent to employee and management representatives at Aramark, and to the international union UNITE HERE, Local 100, New York State Department of Health, and OSHA. This report is not copyrighted and may be freely reproduced. The report may be viewed and printed from the following internet address: http://www.cdc.gov/niosh/hhe. Copies may be purchased from the National Technical Information Service (NTIS) at 5825 Port Royal Road, Springfield, Virginia 22161. Information regarding the NTIS stock number may be obtained from the NIOSH Publications Office at the Cincinnati address.

Below is a recommended citation for this report:
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