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## **NIOSH HEALTH HAZARD EVALUATION REPORT**

**HETA #1999-0199-3053  
Cincinnati Police Department  
Police Communication Section  
Cincinnati, Ohio**

**November 2007**

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**DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health**



## PREFACE

The Hazard Evaluation and Technical Assistance Branch (HETAB) of the National Institute for Occupational Safety and Health (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 (OSHA) Act of 1970, 29 U.S.C. 669(a)(6) 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.

HETAB 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 company names or products does not constitute endorsement by NIOSH.

## ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Richard J. Driscoll and Randy L. Tubbs of HETAB, Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS). Field assistance was provided by Joseph Hurrell, Mitchell Singal, Marian Coleman, Jenise Brassell, Pam Shumacher, Carol Goetz, Patricia Lovell, Larry Mazzuckelli, and Tamara Wise. Statistical support was provided by Charles Mueller. Desktop publishing was performed by Robin Smith. Editorial assistance was provided by Ellen Galloway.

Copies of this report have been sent to employee and management representatives at the Cincinnati Police Department, AFSCME Local 1543, and the OSHA Regional Office. 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.

**For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.**

## Highlights of the NIOSH Health Hazard Evaluation

NIOSH received a request from both the Cincinnati, Ohio, Police Department management and AFSCME Local 1543 to evaluate work stress among 911 emergency response operators and police dispatchers. NIOSH conducted an investigation in May 1999.

### What NIOSH Did

- We collected symptom questionnaires to evaluate work stress among dispatchers and emergency phone operators.
- We collected saliva samples to measure cortisol, an indicator of work stress.
- We evaluated noise exposures.

### What NIOSH Found

- Of the 72 workers who participated in this evaluation:
- 67% were very satisfied or somewhat satisfied with their job.
- 38% reported symptoms consistent with major depression.
- 25% reported symptoms consistent with anxiety.
- 87% reported muscle or joint pain that had lasted at least a week during the year.
- Salivary cortisol levels were not associated with self-reported stressors at work.
- Noise levels were found to comply with recommendations for office settings.

### What Cincinnati Police Department Managers Can Do

- Identify ways to increase the concept of team and foster trust among supervisors and employees.
- Seek ways to improve social support among departmental personnel.
- Provide continuing education for employees to improve skills and continue to improve service at the call center.
- Involve employees in decision making processes and solicit input from employees to improve working conditions.
- Evaluate sources of low job satisfaction and involve employees in the process of identifying and improving job satisfaction.
- Encourage workers to use their accumulated leave.
- Acknowledge the contributions made by the 911 operators and police dispatchers, through special recognition and awards.
- Limit non-work related conversations in the call room to minimize distractions.

### What Cincinnati Police Department Employees Can Do

- Join with management in seeking innovative solutions to routine problems.
- Participate in safety committee meetings.
- Keep extra conversations to a minimum (reduce background noise).

#### What To Do For More Information:

We encourage you to read the full report. If you would like a copy, either ask your health and safety representative to make you a copy or call 1-513-841-4252 and ask for HETA Report #HETA 1999-0199-3053



# **Health Hazard Evaluation Report 1999-0199-3053 Cincinnati Police Department Cincinnati, Ohio November 2007**

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## **SUMMARY**

On April 30, 1999, the Superintendent, City of Cincinnati Police Communication Section, contacted the National Institute for Occupational Safety and Health (NIOSH) to request a health hazard evaluation (HHE) at the Cincinnati Police Department's (CPD) 911 Communication Section (Call Center), located at 310 Ezzard Charles Drive, Cincinnati, Ohio. In addition, an HHE request was submitted by the President of American Federation of State, County, and Municipal Employees (AFSCME), Local 1543. Both management and union representatives were concerned that work within the 911 Call Center was highly stressful, that workers were experiencing high psychological demands, potentially hostile interactions with the public, difficulty overcoming distressing call-related memories, increased tension and irritability, and chronic musculoskeletal discomfort because of improperly designed work stations.

NIOSH investigators conducted a series of interviews with managers and employees at the CPD 911 Call Center. Following these meetings, NIOSH investigators developed a study protocol to evaluate each of the concerns expressed in the HHE request and subsequently returned to the 911 Call Center to carry out the evaluation.

Participants completed a 200-item self-administered questionnaire designed to examine a range of workplace stressors and health-related outcomes (depression, anxiety, lost work days, musculoskeletal injury). Participants submitted saliva samples four times daily for 5 days to assess physiologic reactions to stress. In addition, a comprehensive area noise assessment consisting of noise levels and octave band noise measurements was made at the active dispatch consoles and 911 operator telephone consoles.

Of the estimated 115 on-duty 911 operators and police dispatchers, 72 participated in this study for a participation rate of 63%. Participants were predominately female (75%), had an average age of 40 years (range 19-57 years), and had worked for the City for an average of 11 years (range 1-26 years).

Twenty one workers (29%) reported experiencing symptoms that were consistent with major depression according to the Centers for Epidemiologic Studies Depression Scale (CES-D). Predictors of depressive symptoms in this workforce included low supervisory social support, anxiety, low job satisfaction, greater than 6 months since last vacation, increasing age, lower levels of social contact, and increasing years working for the City.

Symptoms consistent with anxiety were reported by 18 participants (25%), 40% of whom also had symptoms consistent with major depression. Predictors of anxiety were increasing age, low job satisfaction, more than 6 months since last vacation, and increasing years worked for the City.

The annual work absentee rate for participants in this evaluation was approximately three times the rate reported by workers nationwide (Cincinnati 911 workers 19.6 days vs. 6.2 days nationally).

Musculoskeletal symptoms were most commonly reported for the low back (53%), shoulder (40-43% right/left shoulder respectively), wrists (43%), and upper back (40%).

According to ANSI S12.2 Criteria for Evaluating Room Noise, ambient noise levels measured in the work area were found to be appropriate for moderately fair listening or just acceptable speech and telephone communication conditions.

NIOSH investigators conclude that stressors at the Cincinnati Police Communication Section 911 Emergency Response Center contributed to the increased reporting (above that found in the general public) of depressive symptoms and symptoms consistent with anxiety. The high prevalence of depressive symptoms and symptoms associated with anxiety were related to factors found on the job (supervisory social support, years employed by the city, and low job satisfaction). Ambient noise levels within the call center were within acceptable criteria for office environments. Recommendations have been made in this report to help improve conditions at this worksite.

Keywords: NAICS 922120 (Police Department), work stress, work organization, psychosocial, noise, ergonomics, depression

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## INTRODUCTION

On April 30, 1999, the Superintendent of the Cincinnati Police Communication Section contacted the National Institute for Occupational Safety and Health (NIOSH) to request a health hazard evaluation (HHE) at the 911 Call Center. Also, a request was filed by the American Federation of State, County, and Municipal Employees (AFSCME) Local 1543 president on behalf of the same workers. The HHE request detailed concerns that work within the Police Communication Section was highly stressful and that workers experienced distressing call-related memories, increased tension and irritability, and chronic musculoskeletal discomfort.

On May 26, 1999, NIOSH investigators held an opening conference at 310 Ezzard Charles Drive in Cincinnati, Ohio, with representatives from the Cincinnati Police Department (CPD) and AFSCME Local 1543 to discuss the HHE requests, the types of health concerns expressed by employees, and the steps that NIOSH investigators would propose to evaluate these concerns. Following this opening conference, employees at the Police Communication Section were randomly selected for confidential interviews. Employees who participated in the confidential interviews were asked to describe working conditions within the Police Communication Section and how these working conditions may have been affecting their health.

As a result of meetings with management, workers, and union representatives, NIOSH investigators proposed to the CPD that a survey be conducted to evaluate potential work stressors, ergonomic hazards, and noise levels at the 911 Call Center. NIOSH investigators developed an evaluation protocol that included a self-administered questionnaire to ascertain work history, work load, employee and supervisory interactions, and health outcomes related to work stress such as depression, anxiety, and lost work days. Furthermore, NIOSH investigators proposed collecting salivary cortisol as an objective measure of stress. To address concerns about noise and musculoskeletal strain, specific noise and ergonomic assessments were also proposed.

During the week of March 1-5, 1999, NIOSH investigators distributed questionnaires, collected serial salivary cortisol samples, measured ambient noise at selected locations in the call center, and evaluated the ergonomic design of workstations.

## BACKGROUND

The CPD Police Communication Section occupies space at 310 Ezzard Charles Drive in Cincinnati, Ohio. CPD management estimated that 124 workers were employed as emergency response operators and police dispatchers. Additionally, five to seven employees from the Cincinnati Fire Department were employed at this site as fire dispatchers and one Fire Department call taker provided emergency first aid advice for 911 calls. The Police Communication Section operates on a 24-hour basis, and 35-40 operators are on duty throughout five shifts.

When in a ready state (last call completed and open for a new call), an incoming emergency call can be automatically routed to the call taker. Call takers answer the phone according to protocol by informing callers that they have reached the 911 operator and then asking them to describe the nature of their emergency. Call takers input facts from the call (address, nature of the emergency, etc.) onto their computer screens and then transmit this information to the police dispatcher who finds an available police unit to respond. All incoming calls and conversations between call takers and the public are recorded. In addition, call center supervisors routinely monitor calls to insure that call takers are following established protocols and handling calls efficiently.

In August 1998, the Office of Environmental Management for the City of Cincinnati completed an indoor air quality assessment (IAQ) of the Police Communication Section and noted the following:

“Employees in the building generally reported less IAQ associated health complaints than a comparison group. However, Police and Fire telecommunication employees reported a higher prevalence of possible job-related psychosocial “stress” indicators (bad memory and



irritability/nervousness) and frequent neck, shoulder and back pain/discomfort.”

As a result of this report, CPS supervisory personnel and AFSCME union representatives requested that NIOSH conduct a health hazard evaluation to determine the extent to which workers at the Police Communication Section were exposed to work-related stressors and experiencing stress-related health symptoms.

## METHODS

The methods employed in this health hazard evaluation were approved by the NIOSH Human Subjects Review Board.

### **Questionnaire**

Data were gathered by means of a 200-item self-administered questionnaire which included questions on work history, demographics, musculoskeletal injury and pain, depression, anxiety, and psychosocial/work organization factors.

### **Questionnaire Components: Psychosocial Factors**

#### **Cognitive Demands**

Cognitive demands were assessed by a five-item scale that was developed by Hurrell and McLaney<sup>1</sup> to capture the mental demands of workers.

#### **Anxiety**

Anxiety was assessed by a 12-item scale that has been routinely used in the NIOSH generic job stress questionnaire. Participants indicate how often they experienced dry mouth, muscle tension, headache, feeling as if blood was rushing to their head, feeling a lump in their throat, trembling, shortness of breath, pounding heart, sweaty hands, upset stomach, loss of appetite, and difficulty sleeping.

#### **Depression**

Depressive symptomatology was assessed by a modified (short form) version of the Center for Epidemiologic Studies Depression Scale (CES-

D).<sup>2,3</sup> Participants were asked how often in the last week they experienced any of the scale symptoms. Scores were adjusted to correspond to the full CES-D. Persons who had scores of 12 or greater were considered to have symptoms consistent with major depression (equivalent to a score of 22 or higher on the full CES-D 20-item scale).

#### **Social Network**

The social network scale was developed by Donald and Ware<sup>4</sup> and consists of three subscales: social well-being, social contacts, and group participation. The 11-item scale covers a range of social and group activities including quantifying the number of friends and family, frequency of interaction with family and friends, group membership, and the extent of active involvement in groups and religious activity.

#### **Quantitative Workload**

Quantitative workload was assessed by a seven-item scale developed by Caplan et al.<sup>5</sup> that captures the pace of work and the amount of time available to complete an assignment or task.

#### **Work Control**

Work control, a combination of decision control and task control, was derived from job stress research by Greenberger<sup>6</sup> and Ganster.<sup>7</sup> Hurrell and McLaney used the work of these researchers to compile a 16-item scale for the NIOSH Generic Job Stress Questionnaire that assesses a worker's control over the selection of tasks and the pace of completing these tasks, workplace decision making, and influence over policies and procedures.

#### **Social Support**

For the purposes of this study, we focused upon social support provided by supervisory personnel based upon the work of Caplan et al.

#### **Job Satisfaction**

The job satisfaction scale developed by Caplan et al. determines job satisfaction based upon responses to whether the worker would recommend that a friend take a similar job, whether the worker would decide to take the same type of job again if given the choice, and whether the worker is generally satisfied with his/her job.

## Musculoskeletal Injury and Pain

Participants were presented with a body map and asked to indicate where they were experiencing musculoskeletal pain and the extent of the pain. Those who had experienced pain were asked the location of the pain and to rate the pain from 0 (none at all) to 5 (worst imaginable).

## Salivary Cortisol: A Marker for Stress

Salivary cortisol has been used in numerous studies as an objective measure for psychological stress.<sup>8,9,10</sup> During periods of stress, the adrenal gland produces a sharp rise in the levels of the glucocortical hormone cortisol. Normally, cortisol levels fluctuate during the day and are highest early in the morning. Levels taper off during late morning, then rise to a high again at noontime, and gradually decline to daily lows at 8-9 p.m. Cortisol levels that fluctuate against the normal daily pattern are considered markers of stressful periods.<sup>11,12</sup>

We collected salivary cortisol samples from participants four times daily for one week. This schedule allowed us to capture the natural daily variation in cortisol levels. Participants were given a 1-week supply of plastic sampling vials. Each vial contained a 3/8-inch diameter by 1.5-inch long dry cotton roll similar to those routinely used by dentists. At prescribed sampling intervals, workers were asked to remove the cotton swab from the vial and chew it for approximately 1 minute or until the swab was saturated with saliva. Workers then placed the saturated swab back into the plastic vial. Vials were coded to identify the individual providing the sample, the sample time, and the day the sample was collected. Salivary cortisol samples were then refrigerated and shipped to the NIOSH laboratory daily.

Samples were analyzed by NIOSH laboratory personnel using an enzyme-linked immunosorbent assay (ELISA) produced by Oxford Biomedical. Saliva samples were run in duplicate according to the manufacturer's instructions. Calibration standards were run in duplicate on each plate. Samples yielding results > 10 nanograms/milliliter (ml) were diluted 1:5 with buffer solution and reanalyzed.

## Noise

Real-time area noise sampling was conducted with a Larson-Davis Laboratory Model 2800 Real-Time Analyzer and a Larson-Davis Laboratory Model 2559 1/2-inch random incidence response microphone. The analyzer allowed for the analysis of noise into its spectral components in a real-time mode. The 1/2-inch diameter microphone had a frequency response range ( $\pm 2$  decibels [dB]) from 4 Hertz (Hz) to 21 kilohertz (kHz) that allowed for the analysis of sounds in the region of concern. Full octave bands consisting of center frequencies from 31.5 Hz to 16 kHz were integrated and stored in the analyzer. The analyzer was mounted on a tripod and placed at various locations where the police and the 911 telephone operators sat at their consoles with the microphone placed at approximately the level of people's ears.

## Statistical Analysis

Data were analyzed using SAS® version 8.0. Exploratory data analyses were conducted using univariate data techniques. Associations between questionnaire items were assessed by means of correlation statistics, and odds ratios (OR) were calculated. ORs were used to measure the strength of association between psychosocial variables and health outcomes. The OR is a ratio between the odds of an event among those exposed to a specified variable and the odds of an event among those not exposed to that variable. For example, the association between depression (the health outcome) and sex of the participant (exposure variable) would be expressed as an OR in the following manner:

***Odds of depression among women ÷ odds of depression among men = OR***

If the ratio is 1 (the same odds of depression is found in women as is found in men) then there is no greater prevalence of depression in women compared to men. If the OR exceeds 1, then the prevalence of depression would be higher in women than in men. An OR of 3 would mean that the prevalence of depression is three times greater among women than among men. Conversely, an OR less than 1 indicates that the prevalence of depression is less among women than among men.

Each estimated OR also has an associated confidence interval (CI). The confidence intervals are an indication of the statistical significance of the OR. A 95% CI of 1.1 to 2.0 indicates 95% certainty that the true OR is between 1.1 and 2.0. Conversely, this would suggest a 5% chance that the true OR is outside of the range indicated.

Multivariate modeling was employed in this evaluation. Multivariate modeling is a statistical technique used to evaluate the influence of more than one variable on the outcome of interest. In this evaluation, multivariate analysis was used to model which study variables (e.g., age, activity level, stressors) were most associated with the outcomes of interest (i.e., depression, anxiety, job satisfaction).

### **Missing Variables**

We imputed missing variables (i.e., assigned a value when data were missing) within psychometric scales when possible. Scale item responses were imputed when the participant had answered at least 75% of the scale. Individual average response scores were calculated from the scale items present. Items where an answer was missing were assigned an average response score that reflected each individual respondent's tendencies within that specific scale.

## **EVALUATION CRITERIA**

### **Psychosocial Factors**

With regard to psychosocial factors within the workplace, no minimum or maximum levels for identified work stressors exist. The purpose of this study was to assess what workplace stressors were most associated with health outcomes, not to determine whether workers exceeded a reference range. National prevalence rates and normative data are available for many of the scales used in this HHE and where practical, comparisons were made with national normative data or comparisons with results from other 911 Call Centers evaluated by NIOSH researchers.

### **Noise**

The A-weighted decibel (dBA) is the preferred

unit for measuring sound levels to assess worker noise exposures. The dB(A) scale is weighted to approximate the sensory response of the human ear to sound frequencies near the threshold of hearing. The decibel unit is dimensionless, and represents the logarithmic relationship of the measured sound pressure level to an arbitrary reference sound pressure (20 micropascals, the normal threshold of human hearing at a frequency of 1000 Hz). Decibel units are used because of the very large range of sound pressure levels audible to the human ear. Because the dB(A) scale is logarithmic, increases of 3 dB(A), 10 dB(A), and 20 dB(A) represent a doubling, tenfold increase, and hundredfold increase of sound energy, respectively. It should be noted that noise exposures expressed in decibels cannot be averaged by taking the simple arithmetic mean.

Neither the occupational noise regulation promulgated by the Occupational Safety and Health Administration (OSHA),<sup>13</sup> nor the limits published by NIOSH<sup>14</sup> and the American Conference of Governmental Industrial Hygienists (ACGIH),<sup>15</sup> are appropriate for the situation observed at this work location. The above referenced criteria are designed to prevent hearing losses from exposure to intense noise levels. However, noise of intensities lower than that which may cause a hearing loss can be disruptive in the workplace. Interference with speech and interruption of office activities are possible results of unwanted noise. The noise can interfere with the efficiency and productivity of the office staff and can be detrimental to the occupants' comfort, health, and sense of well-being. One set of noise criteria for occupied interior spaces, the balanced noise criteria (NCB) curves, has been devised to limit noise to levels where satisfactory speech intelligibility is obtained.<sup>16,17,18</sup> The noise criteria were devised through the use of extensive interviews with personnel in offices, factories, and public places along with simultaneously measured octave band sound levels. The interviews consistently showed that people rate noise as troublesome when its speech interference level is high enough to make voice communication difficult. The recommended space classification and

suggested noise criteria range for steady background noise heard in various indoor occupied activity areas are shown in Table 1. The NCB curves assume occupied spaces, with the heating, ventilating, and air-conditioning systems operating along with all other sources of normal interior and exterior noise. In general, the lower end of the range shown in Table 1 is selected if high reliability of speech communication is desired. The upper end of the range is used when economic conditions dictate that marginal conditions must be accepted and where it is expected that the users will not be overly critical of the space.

## RESULTS

Of the 115 on-duty police dispatchers and operators, 72 (63%) participated in at least the questionnaire phase of this study. Participants had an average age of 40 years (range 19-57), and the majority were female (75%). Forty-seven percent were married and 47% either attended some college or were graduates of a community college. Participants had worked for the city an average of 11 years (range <1-26 years), and worked as a call taker for 9 years (range <1-24 years).

### **Organizational Climate**

Participants were asked to select one of seven answers to describe what they liked best about their job. The seven choices represent those responses that were given most frequently during personal interviews with workers when asked the question, "What do you like best and what do you like worst about your job?" Thirty-seven percent of respondents selected "my paycheck," 26% selected "helping the public," and 16% selected "the people I work with" as the aspect of their job they liked best (Table 2). "How we are valued as employees" was selected by 35 persons (49%) to represent the single worst part of working as a 911 operator (Table 3). Seventeen respondents (24%) indicated "other" as the worst part of their job. Of those who responded with "other," the most common concerns involved aspects of work schedules and the lack of choice with hours worked.

### **Call Monitoring**

Department policy requires supervisory personnel to periodically monitor calls to ensure that operators adhere to established procedures and to determine whether a worker might require additional training. Call takers are aware that supervisors are able to monitor calls and that at least once per month their calls will be monitored. During a monitored call, the call takers are unaware that the supervisor is on the line. Immediately following the call, supervisors hand the call taker a score sheet that lists any deficiencies noted during the call.

To evaluate how workers perceive call monitoring procedures, participants were asked to describe why calls were monitored, whether call monitoring helped them with their job, and what type of feedback was likely after calls were monitored.

When presented the statement "Supervisors monitor our call to insure that we follow the correct procedures," 69% of the respondents "strongly agreed," and 26% "slightly agreed" with the statement (Table 4). Only 4% "strongly disagreed." Additionally, when asked to respond to the statement "Supervisors monitor our calls to help us do our jobs better," 35% "strongly agreed," and 46% "slightly agreed." Seven percent "strongly disagreed" with the statement. To evaluate what is likely to happen if the call taker adheres to policy, call takers were asked to respond to the following statement, "When calls have been monitored by a supervisor and we did a good job, our supervisor will tell us we did a good job." Among participants, 27% "strongly agreed," 37% "slightly agreed," and 35% disagreed (slightly/strongly).

Overall, when asked to respond to the statement "It bothers me that a supervisor may be listening to me on the phone," 39% selected "strongly disagree," 27% selected "slightly disagree," and 30% selected "slightly agree." Three persons (4%) "strongly agreed" that it bothers them when a supervisor monitors their phone conversations.

### **Job Performance Factors**

Call takers were asked about their work environment and what aspects of it made it difficult

for them to do their job effectively. Sixty-one persons agreed (of these, 48% “strongly agreed,” 38% “slightly agreed”) that it is sometimes difficult to concentrate on a caller because of interfering noise from other operators or dispatchers talking. When responding to the statement, “I can tune out the noise in the room when I am doing my work,” 57% “strongly agreed” and 38% “slightly agreed.” When asked if they can clearly see the information on their computer screen, 51% strongly agreed, 41% slightly agreed.

### **Self-Reported Sick Leave**

To evaluate sick leave use, participants were asked to estimate the number of days absent in the previous 12 months. Ninety-two percent responded they had been absent from work one or more days during this period. The median number of days absent from work was 5 days (range 0-84 days). Some or all of the sick leave was used to care for a sick family member according to 44% of the respondents. Seventy-one percent of the respondents indicated that they had not used leave in the last 30 days. Those who had used leave in the last 30 days were absent an average of 2.5 days. Table 5 presents a comparison of Cincinnati Police Communication Section employees with a comparison 911 call center in New York.

Cincinnati 911 operators used approximately 13.7 days of sick leave annually compared to 19.6 days among 911 operators in New York. In both 911 centers, women used more sick leave than men.

### **Job Satisfaction**

Participants were asked three questions pertaining to job satisfaction. Answers to these questions were used to construct an overall job satisfaction score. These overall scores and individual item scores are presented in Table 6 along with comparison scores from the New York 911 Call Center. Overall, Cincinnati employees had better job satisfaction, i.e., a lower job dissatisfaction score than the comparison center (Cincinnati average job dissatisfaction score = 2.04 vs. 2.31 for New York,  $p < 0.0001$ ). Among Cincinnati respondents, 21 (30%) would decide without hesitation to take the same job again, however, 50 (70%) would have second thoughts or would definitely not take the same job. When asked if they would recommend

this job to a friend, 15 (21%) would recommend it strongly, while 56 (80%) would have doubts about recommending it or would advise their friends against taking a similar job. When asked directly how satisfied they were with their job, 49 (70%) were “very” or “somewhat” satisfied, 18 (26%) were “not too” satisfied, and 3 (4%) were “not at all” satisfied.

Table 7 shows the variables associated with job satisfaction in a multivariate statistical model. Female call takers were four times more likely to report low job satisfaction than men (OR=4.34, 95% CI 1.34, 21.72) and participants who reported low levels of supervisory social support were 3.55 times more likely to report low job satisfaction (OR 3.55, 95% CI 1.30, 10.40).

### **Depression**

Twenty-seven respondents (38%) reported symptoms consistent with depression (CES-D scale greater than or equal to 16). Of these workers, 21 (78% of those with depressive symptoms and 29% of the overall participants) had the frequency and severity of depressive symptoms consistent with major depression (CES-D greater than or equal to 22). The proportion of men and women who reported these symptoms was comparable (30% of the men, 28% of the women).

The prevalence of symptoms consistent with depression among Cincinnati Communication Section workers was compared with New York 911 Call Center employees. Prevalence rates for Cincinnati workers were slightly lower than reported by New York 911 employees (29% vs. 32%); however, this difference was not statistically significant ( $p=0.65$ ).

Univariate (unadjusted) relationships between predictor variables and depression are presented in Table 8. Persons were more likely to report symptoms consistent with major depression if they reported anxiety (OR 6.91, 95% CI 2.14, 22.30), had low levels of supervisory social support (OR 3.57, 95% CI 1.24, 11.43), had low job satisfaction (OR 2.02, 95% CI 0.72, 5.80), had more than 6 months elapse since last vacation (OR 2.01, 95% CI 0.74, 5.94), were in the highest quartile for age

(OR 1.91, 95% CI 0.69, 5.40), had low levels of work status (OR 1.57, 95% CI 0.56, 4.36), had low levels of social contact (OR 1.57, 95% CI 0.57, 4.43), were in the highest quartile for years worked for the City (OR 1.38, 95% CI 0.48, 3.88), had low social well-being (OR 1.32, 95% CI 0.44, 3.95) and had low levels of group participation (OR 1.10, 95% CI 0.40, 3.10). Persons were less likely to report symptoms consistent with major depression if they exercised regularly (OR 0.81, 95% CI 0.28, 2.40), and reported a heavy workload (OR 0.40, 95% CI 0.10, 1.27). However, only the relationship between depression and both anxiety and supervisory social support were statistically significant.

## **Anxiety**

Symptoms consistent with anxiety were reported by 18 respondents (25%). Table 9 lists the unadjusted relationship between work organization variables and anxiety. Of the variables listed in Table 9, only time since last vacation showed a statistically significant association with anxiety (OR 3.4, 95% CI 1.03, 6.96). The limited number of persons reporting symptoms consistent with anxiety did not support further analysis using multivariate techniques.

## **Musculoskeletal Symptoms**

Participants were asked to recall whether they had any muscle pain, joint pain, or discomfort that lasted at least a week during the previous 12-month period. Fifty-three persons (76%) indicated they had experienced musculoskeletal pain or discomfort that had lasted at least a week in the past year. Table 10 describes the location and severity of the pain reported by call center participants.

Table 11 lists the results of univariate modeling of musculoskeletal pain. Increased prevalence of musculoskeletal pain is associated with more than 6 months since last vacation (OR 2.64, 95% CI 1.03, 6.96), anxiety (OR 2.30, 95% CI 0.78, 6.81), low social contact (OR 1.57, 95% CI 0.56, 4.36), lack of exercise (OR 1.53, 95% CI 0.48, 5.00), low social well-being (OR 1.32, 95% CI 0.42, 3.91), and years worked for the City (OR 1.23, 95% CI 0.56, 2.71). Only the association between musculoskeletal pain and time since last vacation was statistically significant.

## **Salivary Cortisol**

Salivary cortisol samples were collected from 51 participants (71 %) who submitted three samples per day for 5 days. In general, individual cortisol responses followed patterns that have been reported in other studies, namely cortisol levels were highest in the morning and decreased as the day progressed.<sup>19</sup> Additionally, as others have found, measured salivary cortisol diminished as the week progressed.<sup>20</sup> However, salivary cortisol levels were not associated with any of the health outcomes evaluated (no statistically significant difference in salivary cortisol levels was found between groups evaluated). Thus, salivary cortisol was not a predictor of depression, anxiety, or work stress in this study.

## **Noise**

Area octave band noise measurements were made at an active fire and dispatch console and at a 911 operator telephone console. Generally, the communication activity in the call center was light during the 60-second period when measurements were made at each of the three locations. However, each noise measurement shown in Figure 1 was made while the employee was talking through the headset. The overall sound levels at the three consoles were consistent, being measured at 57 dBA at the fire dispatch, 58 dBA at the 911 operator, and 59 dBA at the police dispatch areas.

When the octave bands were compared to the NCB (Balanced Noise Criterion Curve) criteria for occupied spaces, the police dispatch and the 911 operator areas fell between the NCB-50 curve and NCB-55 curve, respectively, while the fire dispatch area was right at the NCB-50 curve. According to the NCB classification scheme, the ambient levels appropriate for fair listening conditions or general secretarial areas are between the range of NCB-40 and NCB-50. Levels above NCB-60 are not recommended for any office or communication situation.<sup>7</sup>

# **DISCUSSION**

The purpose of this health hazard evaluation was to identify work stressors associated with work as a

911 operator and evaluate how these stressors affect worker health. Work stressors (factors that contribute to work stress) evaluated included supervisory social support, job satisfaction, workload, mental demands, and the degree to which workers had control over aspects of their job. The work-related strains that were measured in this evaluation were symptoms of major depression, anxiety, lost work days (absenteeism) and musculoskeletal pain.

### **Depression**

We found that 29% of the CPD Communication Section employees and 33% of the employees at a comparison location in New York reported symptoms consistent with major depression. Published estimates from the National Institute of Mental Health place the prevalence of major depression in the general public at approximately 9.5%.<sup>21</sup> Rates of depressive symptoms among 911 operators and police dispatchers may appear higher than what we would expect given the rates observed in the general population, because National Institute of Mental Health rates reflect actual diagnosed cases of depression and not responses to a screening questionnaire. Thus, the increased rates observed in this evaluation could be the result of using questionnaire responses rather than a physician diagnosis for depression.

### **Stressors Associated with Reports of Depressive Symptoms in this Work Force**

We compared those who reported the highest levels of depressive symptoms to others in this study. Our findings show that CPD 911 Communication Section operators were more likely to report depressive symptoms if they were highly anxious in their work and had low levels of supervisory social support.

### **Anxiety**

We found 25% of the participants reported symptoms consistent with anxiety. This is slightly higher than would be expected in the general population given that the National Institute of Mental Health estimates that 18% of the general adult population can report an anxiety disorder each year.<sup>22</sup> Participants who were most likely to report

symptoms consistent with anxiety were those who had greater than 6 months since their last vacation, increasing years worked for the City, and those who reported symptoms consistent with depression.

### **Stressors Common to Anxiety and Depression**

Job satisfaction is a contributor to both depression and anxiety. Thus, factors that can improve job satisfaction may have far-reaching effects including reduced depressive symptomatology, reduced anxiety-related symptoms, and improved attendance at work. Those with poor job satisfaction are more than twice as likely to report depressive symptoms, anxiety-related symptoms, and musculoskeletal-related symptoms. The statistically significant predictors of depressive symptoms in this study were anxiety and not having a vacation in over 6 months.

Two variables, workload and job satisfaction, are work-environment issues that, if properly addressed, could improve the mental health of the workforce. Factors that influenced perceived workload among participants included how much time workers had to think and contemplate their tasks. Work as a 911 operator allows little if any time to contemplate anything other than the emergency situation at hand. However, call takers could be included in decision making along with supervisors to consider broader organizational concerns, such as how to improve working conditions, supervisory/support relationships, or what changes could be implemented to accomplish their jobs more effectively. Factors that negatively influenced job satisfaction were being female and not having a vacation in the last 6 months.

Work absenteeism, primarily in the form of sick leave, was reported to NIOSH by management as a major concern. When the rates for the CPD 911 Call Center were adjusted to reflect a 12-month period, absentee rates for New York were higher than those found in the CPD 911 center (19.6 vs. 13.7). However, both call centers have absentee rates that exceed the national average for all workers. Factors contributing to absenteeism have been the subject of numerous studies, and researchers have shown absenteeism is associated with not only acute illness but chronic disease,

child care responsibilities, low job satisfaction, and work stress.<sup>23,24,25</sup> In addition, some studies have shown sickness absence rates to be highest among employees who have jobs with high cognitive or physical demands and limited choices or options for coping. On both a national level and within this work group, women tend to use more sick leave than men.<sup>26</sup> Among Cincinnati 911 participants, women had a median of 12 days sick leave vs. 2 days for men.

## **Call Monitoring**

Preliminary interviews with workers suggested that the policy of the department to monitor calls was a source of concern to workers. However, worker questionnaire responses seem to contradict the findings from oral interviews. Survey results indicated that call takers understood the reason for call monitoring and were aware that supervisors were monitoring calls to insure that they adhered to correct policies and procedures. This apparent disparity is most likely a factor of the questions asked and the context of the questions. Specifically, we may not have asked the questions in the same way we did in the interviews, and the questionnaire responses reflect an understanding of the reasons calls are monitored but they do not capture the feelings people have about being monitored. Thus, both situations may be correct, that 911 call takers understand why calls are monitored but are disturbed by the process.

## **Noise**

Interviews with workers suggested that room noise could at times be distracting, and at times it was difficult to hear the callers. Questionnaire responses seemed to contradict these findings. For instance, 61 persons (86%) strongly or slightly agreed that it is sometimes difficult to concentrate on a caller because of room noise, but 95% reported that they are able to tune out the room noise in order to do their work. On the surface, these results, appear to conflict; however, the most likely explanation for this is that room noise is a problem, but each person possesses the ability (at times) to tune out this noise. Thus, it is likely that not all persons are able to tune out all the noise all the time. The ambient sound levels measured during this survey show that noise levels were within acceptable guidelines for office environments; however, the

listening conditions are not ideal. The majority of the sound in the room is created by human speech. The maximum octave band levels are between 500 and 2000 Hz, which is the middle of human speech.<sup>27</sup> Thus, it will be difficult to improve listening conditions with the floor plan currently in use. A reconfiguration of the consoles where the operators and dispatchers are isolated from one another would reduce the ambient speech noise at each location. Also, the use of headsets that have sound attenuation cups over the ear piece, much like a pair of ear muffs, or an eartip that is also a hearing protector would also reduce the ambient noise at each station.

## **Musculoskeletal Symptoms**

Musculoskeletal symptoms described by participants were consistent with the type and severity of symptoms shown in other studies involving computer-based communication work. Wrist and extremity pain can be associated with the number of key strokes on the computer as well as static posture while listening to incoming calls.<sup>28,29,30</sup> The most severe and most frequent symptoms included back, shoulder, and wrist pain. Two of the strongest predictors of musculoskeletal pain were low job satisfaction and low supervisory social support. However, because of the design of this evaluation, it is not possible to determine causal direction, i.e., did low job satisfaction cause musculoskeletal pain or did the presence of musculoskeletal pain result in low job satisfaction.

The City's health and safety program conducted an ergonomic assessment of the chairs and workstations just prior to this study. Steps were in place to conduct periodic ergonomic training and review of furniture procurement to ensure that furniture purchased would be adjustable and well suited to the needs of the workers.

# **CONCLUSIONS**

Of the available workers, 63% participated in this study. Thus, nearly 40% of the population chose not to be included in this survey and are, therefore, unaccounted for in the analyses. A low participation rate lessens the confidence one can have about both the associations reported and the



conclusions reached. While the results reported may not be as robust as planned, the results do point to specific areas where careful attention could result in improved conditions for workers at CPD 911 Call Center.

The high prevalence of symptoms consistent with depression and anxiety and the fact that these symptoms increase with time on the job suggest that operators may not be adjusting to the stressors of this job over time and may be at increased risk for worsening symptoms of depression and anxiety. Two of the strongest predictors of depressive symptoms and anxiety in this study were time since last vacation (greater than 6 months) and social support from the immediate supervisor. Both of these variables were highly associated with health outcomes and can be points of focus for management at this center. Management should recognize that the intensity of work requires that employees take a break to rest and regroup. The apparently high use of sick leave among employees may be interpreted as a sign that current work-rest schedules are not sufficient to allow workers to return to work fully rested and ready to resume their duties.

The assessment of supervisory support in this study was not a measure of how well supervisors and workers like each other, or a measure of the personality of the supervisor. Rather, it measured the extent the manager and employee are able to communicate and work as a team and the extent to which a supervisor has the employee's best interest in mind when decisions have to be made. Those who did not feel they had a manager they could talk to, or felt they did not have a manager they could rely on when things got tough at work, or felt they did not have a manager who was willing to listen to their problems, were more likely to report symptoms consistent with anxiety and depression and were more likely to use sick leave. Thus, efforts on the part of management to improve the relationship between supervisor and employee may have some of the most influential results for improving the health and well being of this workforce.

We asked participants to list what they perceived to be the worst aspect of their job. By far the choice

most often selected was "How we are valued as employees." Virtually all of the call takers interviewed prior to the survey indicated that they became 911 operators because they wanted to help people. They described a sense of pride in having a job that provided a vital service to the community. Call takers also reported that over time they came to believe that the job is a thankless position. They perceive that they are the first to be blamed if something goes wrong and that their name and picture are likely to be aired on the nightly news. Seldom is the expedient handling of a 911 call praised in the media or by Police Department management. However, this workforce also sees a tremendous good in the work they do. The vast majority of workers indicated that the best part of their job was helping the public and working with the people in the department. The CPD should be commended for the caliber of people they are able to recruit and retain.

The results of this study have shown that health outcomes of 911 operators and dispatchers are associated with the social interaction of the employees and the support they receive from their supervisors. Steps that can be taken to improve managerial social support and job satisfaction will likely reduce absenteeism and reduce the impact of adverse health outcomes.

## RECOMMENDATIONS

### *Work Organization*

1. Improve social support by identifying areas where supervisors and their employees can increase a sense of teamwork and group cohesion. Include continuing education for supervisors and employees and establish routine meeting times to solicit staff input on steps that can improve working conditions.
2. Encourage workers to use accumulated leave. Persons who had reported more than 6 months since their last vacation were at increased risk for adverse health outcomes.
3. Make a greater effort to recognize the accomplishments of this workforce through regular awards, performance step increases, or positive media attention.

## Noise

4. The signals that go to the headset and tape recorders should be analyzed by an acoustical engineer to see if impedance mismatch or other incompatibility can explain the lack of signal clarity that operators reported.

5. Keep extraneous conversations to a minimum with the floor plan observed. Additional speech sounds add to the interference levels in the rooms.

6. Provide the manufacturer of the headsets with information on all of the telephone, radio, tape recorders, and switches used in the system. This will allow them to match the headset to the electronics used.

7. The fire dispatch position had a microphone with limited adjustability. The dispatchers reported that it was difficult to use the microphone while typing information into the computer and monitoring the video screen. An adjustable “gooseneck” extender for the microphone would likely reduce this problem.

## REFERENCES

1. Hurrell JJ Jr., McLaney MA [1988]. Exposure to job stress-A new psychometric instrument. *Scand J Work Environ Health* 14:27-28.

2. Anderson EM, Malmgre JA, Carter WB, Patrick DL [1994]. Screening for depression in well older adults: evaluation of a short form of the CES-D. *Am J Prev Med* 102:77-84.

3. Radloff LS [1977]. The CES-D scale: a self report depression scale for research in the general population. *Appl Psychol Measurement* 1:385-401.

4. Donald CA, Ware JE Jr. [1982]. The quantification of social contacts and resources. The Rand Corporation R-2937 HHS October.

5. Caplan RD, Cobb SF, French JRP Jr., Van Harrison R, Pinneau SR Jr. [1975]. Job demands

and worker health. HEW Publication No. (NIOSH) 75-160.

6. Greenberger DB [1981]. Personal control at work: Its conceptualization and measurement (Technical Report 1-1-14). University of Wisconsin-Madison.

7. Ganster DC [1984]. Antecedents and consequences of employee stress. Final report (NIMH 1 ROL-MH34408).

8. Kunz-Ebrecht SR, Kirschbaum C, Marmot M, Steptoe A [2004]. Differences in cortisol awakening response on work days and weekends in women and men from the Whitehall II cohort. *Psychoneuroendocrinology* 29(4):516-528.

9. Bremner JD, Vythilingam M, Vermetten E, Adil J, Khan S, Nazeer A, Afzal N, McGlashan T, Elzinga B, Anderson GM, Heninger G, Southwick SM, Charney DS [2003]. Cortisol response to a cognitive stress challenge in posttraumatic stress disorder (PTSD) related to childhood abuse. *Psychoneuroendocrinology* 28(6):733-750.

10. Steptoe A, Cropley M, Griffith J, Kirschbaum C [2000]. Job strain and anger expression predict early morning elevation in salivary cortisol. *Psychosom Med* 62(2):286-292.

11. Kirschbaum C, Hellhammer DH [1989]. Salivary cortisol in psychobiological research: an overview. *Neuropsychobiology* 22(3):150-169.

12. Kirschbaum C, Prüssner JC, Stone AA, Federenko I, Gaab J, Lintz D, Schommer N, Hellhammer D [1995]. Persistent high cortisol responses to repeated psychological stress in a subpopulation of healthy men. *Psychosom Med* 57:468-474.

13. CFR [1992]. 29 CFR 1910.95. Code of Federal Regulations. Washington, DC: U.S. Government Printing Office, Office of the Federal Register.

14. NIOSH [1998]. Criteria for a recommended standard: Occupational noise exposure (Revised criteria 1998). Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 98-126.

15. ACGIH® [2001]. 2001 TLVs® and BEIs®: threshold limit values for chemical substances and physical agents. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

16. Beranek LL [1989]. Balanced noise criterion (NCB) curves. *J Acoust Soc Am* 86(2):650-664.

17. Beranek LL [1988]. Criteria for noise and vibration in communities, buildings, and vehicles. *Noise and Vibration Control, Rev. ed.*, pp. 554-623. L.L. Beranek, Ed., Cambridge, Massachusetts: Institute of Noise Control Engineering.

18. American National Standards Institute [1995]. American national standard: criteria for evaluating room noise (ANSI S12.2-1995). New York, New York: Acoustical Society of America.

19. Ockenfels MC, Porter L, Smyth J, Kirschbaum C, Hellhammer DH, Stone AA [1995]. Effect of chronic stress associated with unemployment on salivary cortisol: overall cortisol levels, diurnal rhythm, and acute stress reactivity. *Psychosom Med* 57:460-467.

20. Kirschbaum C, Hellhammer DK [1989]. Salivary cortisol in psychobiological research: an overview. *Neuropsychobiology* 22:150-169.

21. National Institute of Mental Health [2000]. The effects of depression in the workplace. [<http://www.nimh.nih.gov/publicat/depression.cfm>] Date accessed: October 2006.

22. Kessler RC, Chiu WT, Demler O, Walters EE [2005]. Prevalence, severity, and

comorbidity of twelve-month DSM-IV disorders in the national comorbidity survey replication (NCS-R). *Arch Gen Psychiatry* Jun;62(6):617-627.

23. Kristensen TS [1991]. Sickness absence and work strain among Danish slaughterhouse workers: an analysis of absence from work regarded as coping behavior. *Soc Sci Med* 31 (1): 15-27.

24. Vaananen A, Toppinen TS, Kalima R, Mutanen P, Vahtera J, Peiro JM [2003]. Job characteristics, physical and psychological symptoms and social support as antecedents of sickness absence among men and women in the private sector. *Soc Sci Med* 57(5):807-824.

25. O'Brien-Pallas L, Shamian J, Thomson D, Alksnis C, Koehoorn M, Kerr M, Bruce S [2004]. Work related disability in Canadian Nurses. *J Nurs Scholarsh* 36(4):352-357

26. Pines A, Skulkeo K, Pollak E, Peritz E, Steif J [1985]. Rates of sickness absenteeism among employees of a modern hospital: the role of demographic and occupational factors. *Brit J Ind Med* 42:326-335.

27. Ward WD [1986]. Auditory effects of noise. In: Berger EH, Ward WD, Morrill JC, Royster LH, eds. *Noise & hearing conservation manual*. 4<sup>th</sup> ed. Akron, OH: American Industrial Hygiene Association, p. 197.

28. Keir PJ, Wells RP [2002]. The effect of posture on wrist extensor muscle loading. *Hum Factors* 44(3):392-403.

29. Roquelaure Y, Raumbau G, Dano C, Martin YH, Pelier-Cady MC, Mechali S, Benetti F, Mariel J, Fanello S, Penneau-Fontbonne D [2000]. Occupational risk factors for radial tunnel syndrome in industrial workers. *Scan J Work Environ Health* 26(6):507-513.

30. Bergqvist U, Wolgast E, Nilsson B, Voss M [1995]. Musculoskeletal disorders among visual display terminal workers: individual, ergonomic, and work organizational factors. *Ergonomics* 38(4):763-776.

# TABLES

**Table 1**  
**Recommended Space Usage for Balanced Noise Criteria Range in Occupied Indoor Areas**

Type of Space and Acoustical Requirements	NCB Curve
Concert halls, opera houses, and recital halls	10 - 15
Large auditoriums, large drama theaters, and large churches	Not to exceed 20
Small auditoriums, small theaters, small churches, music rehearsal rooms, large meeting and conference rooms, and executive offices	Not to exceed 30
Bedrooms, hospitals, residences, apartments, hotels	25 - 40
Private or semi-private offices, small conference rooms, classrooms, libraries	30 - 40
Large offices, reception areas, retail shops and stores, cafeterias, restaurants	35 - 45
Lobbies, laboratory work spaces, drafting and engineering rooms, general secretarial areas	40 - 50
Light maintenance shops, industrial plant control rooms, office and computer equipment rooms, kitchens, and laundries	45 - 55
Shops, garages	50 - 60 *
Work spaces where speech or telephone communication is not required	55 - 70

\* Levels above NCB-60 are not recommended for any office or communication situation.

**Table 2**  
**Responses to the Question**  
**“The *best* part of my job is....”**

<b>Response</b>	<b>Percent (number responding)</b>
My paycheck	37 (26)
Helping the public	26 (18)
The people I work with	16 (11)
Working with the police	14 (10)
Other	6 (4)
How we are valued as employees	<1 (1)

**Table 3**  
**Responses to the Question**  
**“The *worst* part of my job is....”**

<b>Response</b>	<b>Percent (number responding)</b>
How we are valued as employees	49 (35)
Other	24 (17)
The people I work with	18 (13)
Working with the police	4 (3)
Helping the public	3 (2)
My paycheck	1 (1)

**Table 4**  
**Cincinnati Police Communication Section**  
**Call Monitoring Responses**

Statements	Strongly Agree Number (%)	Slightly Agree Number (%)	Slightly Disagree Number (%)	Strongly Disagree Number (%)
Supervisors monitor our calls to insure that we follow the correct procedures	69 (50)	26 (19)	0	4 (3)
Supervisors monitor our calls to help us do our jobs better.	35 (25)	46 (33)	13 (9)	7 (5)
When calls have been monitored by a supervisor and we did a good job, our supervisors will tell us we did a good job.	27 (19)	37 (26)	18 (3)	17 (12)

**Table 5**  
**Comparison of Annual Sick Leave Use**  
**Cincinnati and New York 911 Centers**

	Cincinnati Police Communication Center (N=72)	New York 911 Comparison Location (N=607)
Average number of sick days	19.6 days*/year	13.7 days/year
Multiple of average sick days in U.S. workforce (6.2/year)†	3.3	2.2
Median sick leave	10.0 Days (all) * 2.0 Days Men* 12.0 Days Women*	10.0 Days (all) 8.0 Days Men 10.0 Days Women
Range of days	0-84 days	0-99 days

\* Numbers adjusted to reflect 12 months

† Harris Poll

**Table 6**  
**Responses to Job Satisfaction Questions**  
**Cincinnati Police Communication Section and New York 911 Center**

Question	Response	Cincinnati Police Communication Center Number (%) n=72	New York 911 Comparison Location Number (%) n=607
Knowing what you do now, if you had to decide all over again whether to take the type of job you now have, what would you decide?	Decide without hesitation to take same job	29.6 (21)	12.4 (62)
	Have some second thoughts	50.7 (36)	59.6 (298)
	Decide definitely NOT to take this type of job	19.7 (14)	28 (140)
If a friend of yours told you he/she was interested in working in a job like yours, what would you tell him/her?	I would strongly recommend it.	21.1 (15)	8.6 (43)
	Have doubts about recommending it.	56.3 (40)	58.2 (291)
	Advise against it.	33.2 (16)	33.2 (166)
All in all, how satisfied would you say you are with your job?	Very Satisfied	11.4 (8)	3.81 (19)
	Somewhat satisfied	58.6 (41)	44.3 (221)
	Not too satisfied	25.7 (18)	32.1 (160)
	Not at all satisfied	4.3 (3)	19.8 (99)

**Table 7**  
**Cincinnati Police Communication Section**  
**Multivariate Model: Job Satisfaction**

<b>Variable</b>	<b>Odds Ratio</b>	<b>95% CI*</b>
Female	4.34	1.34, 21.72
More than 6 months since vacation	3.55	1.30, 10.40

CI = Confidence Interval



**Table 8**  
**Cincinnati Police Communication Section**  
**Univariate Model: Symptoms of Major**  
**Depression**

Variable	Odds Ratio	95% CI
Anxiety	6.91	2.14, 22.30
Low supervisory social support	3.57	1.24, 11.43
Workload	2.52	0.80, 8.62
Low job satisfaction	2.02	0.72, 5.80
Greater than 6 mo. since vacation	2.01	0.74, 5.94
Age	1.91	0.69, 5.40
Low social contact	1.57	0.57, 4.43
Work status	1.57	0.56, 4.36
Years worked for the city	1.38	0.48, 3.88
Low social well being	1.32	0.44, 3.95
Low group participation	1.10	0.40, 3.10

CI = Confidence Interval

**Table 9**  
**Cincinnati Police Communication Section**  
**Univariate Model: Anxiety**

Variable	Odds Ratio	95% CI
Years worked for the city	5.2	0.56, 2.71
More than 6 mo. since last vacation	3.4	1.03, 6.96
Age (older)	2.0	0.37, 3.23
Job satisfaction	1.93	0.33, 2.20
High workload	1.5	0.49, 4.60
Teens in household	1.5	0.44, 5.12
Low social well being	1.32	0.42, 3.91
Low levels of group participation	1.0	0.56, 4.36
Low back pain	0.92	0.55, 1.55
Low supervisory social support	0.85	0.30, 2.60

CI = Confidence Interval

**Table 10**  
**Cincinnati Police Communication Section**  
**Prevalence and Severity of Musculoskeletal Pain**

Pain Location	% Reporting (Number)	Average Severity *
Low Back	53 (38)	2.94
Left Shoulder	43 (31)	2.70
Right Wrist	43 (30)	1.96
Left Wrist	43 (30)	1.80
Right Shoulder	40 (29)	2.62
Upper Back	40 (29)	2.31
Left Hip/Thigh	33 (24)	1.60
Right Elbow	31 (22)	1.59
Right Hip/Thigh	31 (22)	1.22
Left Lower Leg	29 (21)	1.47
Right Lower Leg	29 (21)	1.38
Neck	29 (21)	1.47

\*Range 0-5 with 0=no pain and 5=worst imaginable

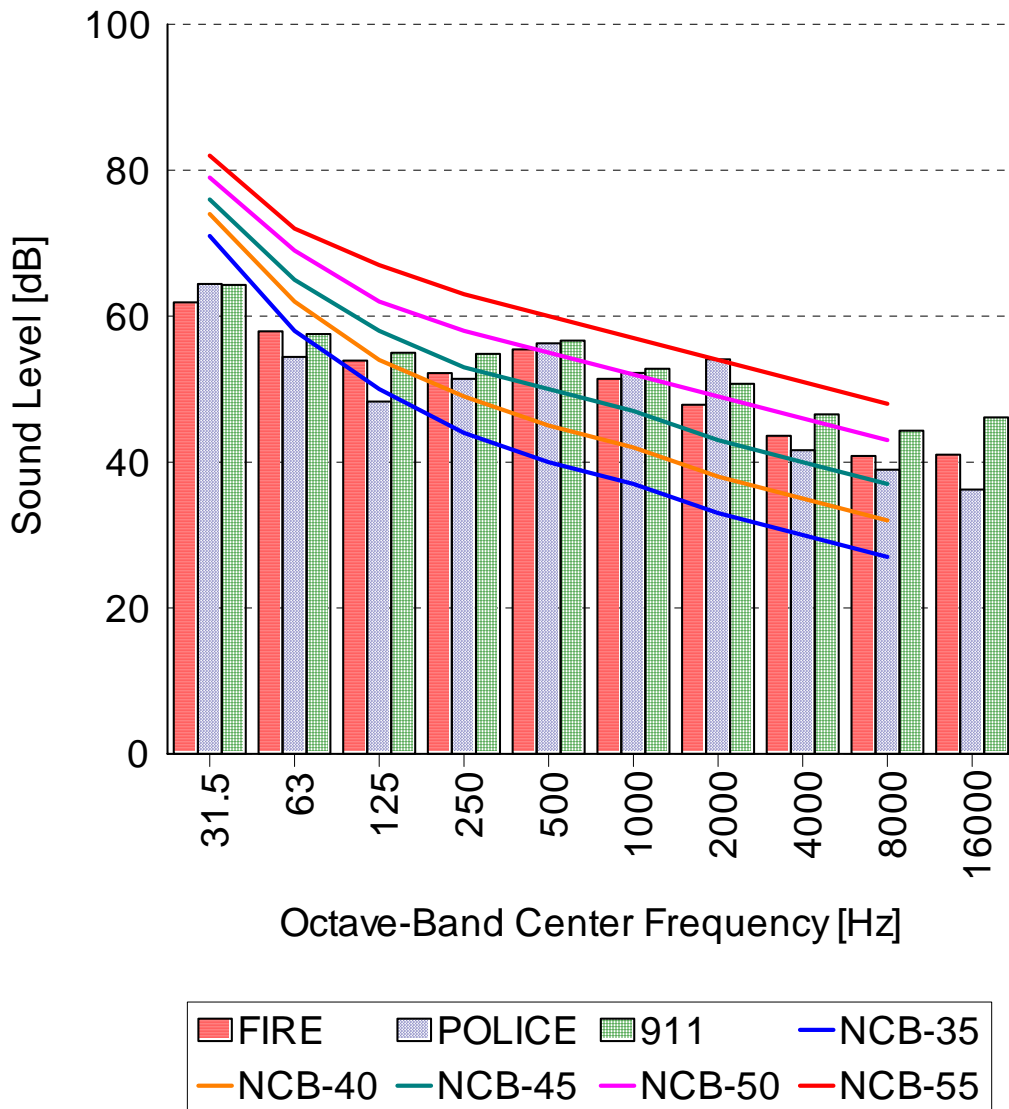
**Table 11**  
**Cincinnati Police Communication Section**  
**Univariate Model: Musculoskeletal Pain**

Variable	Odds Ratio	95% CI
Anxiety	4.54	2.89, 1.15
Depression	3.26	1.72, 6.75
Low job satisfaction	2.53	1.38, 5.00
Low supervisory social support	2.57	1.48, 4.42
Highest quartile of sick leave use	2.29	1.15, 5.16

CI = Confidence Interval

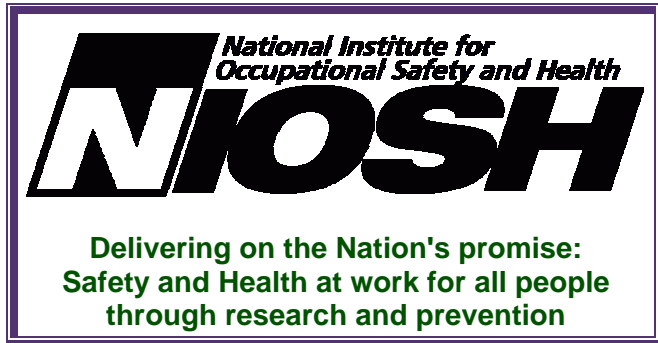
# FIGURE

**Figure 1**  
**Octave Band Sound Levels**  
**Comparison of Ambient Levels to Balanced Noise Criteria**  
**Cincinnati Police Communications Section**  
**Cincinnati, Ohio**  
**HETA 99-0199**



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