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List of Terms and Abbreviations

AASM	American Academy of Sleep Medicine
BAC	Blood alcohol concentration
BMI	Body mass index (kg/m^2)
CNS	Central nervous system
ESS	Epworth Sleepiness Scale
ICSD-2	International Classification of Sleep Disorders (2^{nd} Edition)
OSA	Obstructive sleep apnea
PVT	Psychomotor Vigilance Task
RLS	Restless Leg Syndrome
SAC	Study Advisory Committee
SD	Standard deviation
SEM	Standard error of the mean
SWD	Shift Work Disorder

Abstract

Background: Sleep disorders are common, costly, and treatable, but often remain undiagnosed and untreated. Police officers work some of the most demanding schedules known, which increases their risk of sleep disorders. The public expects officers to perform flawlessly, but unrecognized sleep disorders lead to severe sleep deprivation, which significantly degrades cognition, alertness, reaction time and performance. In addition, both acute and chronic sleep deprivation adversely affect personal health, increasing the risk of gastrointestinal and heart disease, impairing glucose metabolism, and substantially increasing the risk of injury due to motor vehicle crashes. We implemented and tested in a police department the effectiveness of a sleep disorders detection and treatment program, which we have called *Operation Healthy Sleep*. The goals of this program were to reduce the adverse consequences of fatigue on officers' health, safety, and performance.

Approach: The study design was a station-level randomized experiment. To achieve this design, pairs of stations were identified based on size, employee characteristics and the acuity of police work in which they engage. In phase 1, one of each pair was randomly assigned to the intervention group, the other to the control group, and in phase 2 the intervention was extended to all stations. Subjects were sworn police officers. 878 officers participated in the sleep education session, representing 59 percent of the active and available officers. 605 subjects completed the baseline questionnaire (mean age 38.3 ± 9.4 years, 94 percent male). The sleep disorders screening tool was the major part of the Baseline survey, and included screening for obstructive sleep apnea, insomnia, restless leg syndrome, shift work disorder, and narcolepsy with cataplexy. We selected validated questionnaires to compile a comprehensive sleep disorders screening tool for the purposes of this study. As there was no validated questionnaire available for shift work disorder, we developed one based on the International Classification of Sleep Disorders-2. In addition to sleep disorder screening, the baseline survey also contained questions about work and sleep schedules, demographics, medical and social history, accidents and stress. Completed surveys were scanned into electronic format and uploaded into the central study database. All free text fields were double-key entered and verified for accuracy. An automatic scoring algorithm based on published scoring criteria was developed for determining whether subjects were at high, low or unknown risk for each of the sleep disorders.

Key findings:

- The Operation Healthy Sleep program was successfully implemented with a high level of participation. 59 percent of active officers who were available to participate attended the sleep health education session, and of these 69 percent (n=605) completed and returned the Baseline survey.
- Demographic data obtained from the police databases showed that those who elected to attend the education session and complete the survey were on average approximately 2.5-3 years younger and 3 years less in police work than all officers in the Department.
- 20 percent of our sample reported nodding off or falling asleep while driving a vehicle at least 1-2 times a month.
- Sleep disorders appear to be highly prevalent in our sample. We found that approximately 25 percent of officers were at high risk for one or more sleep disorder. The most prevalent sleep disorder in the sample was OSA. The majority of subjects (~80 percent for most disorders) who were found to be at high risk for a sleep disorder reported not having been diagnosed previously with that disorder. Given the association between untreated sleep disorders and adverse health and safety outcomes, sleep disorders screening and management programs should be instigated in law enforcement agencies across the country.
- Sleepiness level was significantly higher in subjects who were found to be at high risk for a sleep disorder compared to those found to be at low risk for all disorders. Of particular note, we found that 12.6 percent of subjects who were at high risk for any sleep disorder showed extremely high

levels of sleepiness, compared to only 1.1 percent of subjects who were at low risk for all sleep disorders.
- Assessment of the efficacy of the detection and treatment program on health, safety and productivity measures is ongoing.

Translation of research findings: The overall goal of this research was to develop and test a sleep health detection and treatment program that ultimately can be disseminated to practitioners, policymakers and researchers nationwide to reduce police office fatigue and stress; enhance the ability of officers and their families to cope with shift schedules; improve the health, safety and performance of law enforcement officers; and thereby improve public safety. We are currently evaluating the potential for the Operation Healthy Sleep program to be implemented in law enforcement agencies nationwide and other first response occupational groups as a part of occupational health and safety programs. In addition, we are evaluating different models of program implementation, including a web-based educational and screening program. Of note, the demographic characteristics of subjects who elected to participate in this study suggests that, in the implementation of the Operation Healthy Sleep program, greater efforts need to be made to engage older individuals. This is particularly important given that the risk of many sleep disorders increases with age.

Highlights/Significant Findings

- The Operation Healthy Sleep program was successfully implemented with a high level of participation. 59 percent of active officers who were available to participate attended the sleep health education session, and of these 69 percent (n=605) completed and returned the Baseline survey.
- Demographic data obtained from the police databases showed that those who elected to attend the education session and complete the survey were on average approximately 2.5-3 years younger and 3 years less in police work than all officers in the Department.
- 20 percent of our sample reported nodding off or falling asleep while driving a vehicle at least 1-2 times a month.
- Sleep disorders appear to be highly prevalent in our sample. We found that approximately 25 percent of officers were at high risk for one or more sleep disorder. The most prevalent sleep disorder in the sample was OSA. The majority of subjects (~80 percent for most disorders) who were found to be at high risk for a sleep disorder reported not having been diagnosed previously with that disorder. Given the association between untreated sleep disorders and adverse health and safety outcomes, sleep disorders screening and management programs should be instigated in law enforcement agencies across the country.
- Sleepiness level was significantly higher in subjects who were found to be at high risk for a sleep disorder compared to those found to be at low risk for all disorders. Of particular note, we found that 12.6 percent of subjects who were at high risk for any sleep disorder showed extremely high levels of sleepiness, compared to only 1.1 percent of subjects who were at low risk for all sleep disorders.
- The objective (police database) measures collected in this study have required considerable editing/cleaning to bring them to a level suitable for formal data analysis. We are continuing our analysis of these data.

Translation of Findings

The overall goal of this research was to develop and test a sleep health detection and treatment program that ultimately can be disseminated to practitioners, policymakers and researchers nationwide to reduce police office fatigue and stress; enhance the ability of officers and their families to cope with shift schedules; improve the health, safety and performance of law enforcement officers; and thereby improve public safety. Ideally, in order to be sustainable, such a program should be able to be implemented with minimum involvement of the researchers. Our preliminary suggestion is that the sleep health education program and sleep disorders screening questionnaire be developed as an online (web-based) resource.

We are currently evaluating the potential for the Operation Healthy Sleep program to be implemented in law enforcement agencies nationwide and other first response occupational groups as a part of occupational health and safety programs. In addition, we are evaluating different models of program implementation, including a web-based educational and screening program. Of note, the demographic characteristics of subjects who elected to participate in this study suggests that, in the implementation of the Operation Healthy Sleep program, greater efforts need to be made to engage older individuals. This is particularly important given that the risk of many sleep disorders increases with age.

Outcomes/Relevance/Impact

1) Potential outcomes:

A report in 2006 by the Institute of Medicine of the National Academies concluded that sleep disorders and sleep deprivation represent an under-recognized public health problem, and are associated with considerable health consequences including increased risk of hypotension, diabetes, obesity, depression, heart attack and stroke. They estimated that approximately 20 percent of serious injuries from motor vehicle accidents in the general population are associated with driver sleepiness. A coordinated strategy is required to meet this substantial health and economic burden.

Sleep disorders are common, costly, and treatable, but often remain undiagnosed and untreated. Unrecognized sleep disorders adversely affect personal health and may lead to chronic sleep loss, which in turn increases the risk of accidents and injuries. These problems are exacerbated in shift workers, who may experience chronic sleep disturbance and sleep loss due to their work schedules.

Given that almost 15 percent of the full-time workers in the United States are shift workers, and the large proportion of police officers who were found in our study to be at high risk for sleep disorders, <u>sleep disorder screening and treatment programs should be implemented in occupational settings</u>, with the aim of improving health, safety and productivity. Such programs are particularly important in 'safety-sensitive' occupations including police officers, firefighters, other first responders, nurses, physicians, airline pilots, those operating heavy machinery, employees high-risk environments such as nuclear power plants, and military personnel.

In our study, in most cases approximately 80 percent of subjects who we identified as being at high risk for a sleep disorder had not previously been diagnosed with that disorder. Given the adverse health and safety consequences associated with untreated sleep disorders, this finding emphasizes the importance of instituting sleep disorder education and screening programs nationwide. Our study provides evidence that such programs implemented in the occupational environment can yield high participation rate.

2) Intermediate outcomes: We are presently evaluating the potential for translation of the Operation Healthy Sleep program to other occupational settings. We will continue to refine the Operation Healthy Sleep program to a package that can be disseminated widely.

3) End outcomes: The findings and recommendations of this study have not yet been adopted and implemented in other occupational settings.

Scientific Report

1. Background

In 1992, the National Commission on Sleep Disorders Research reported that 40 million Americans suffer from chronic sleep disorders, and another 20-30 million may experience intermittent sleep-related problems.[1] These sleep disorders lead to excess deaths from accidents and cardiovascular disease, decreased quality of life, and decreased workplace productivity. Although the precise figures are controversial,[2;3] as many as 20,000 deaths and over a million injuries due to sleepiness may occur every year in the United States.[4] The annual direct costs to the United States from sleep disorders and sleepiness are estimated to be in excess of $15 billion, and total costs including lost productivity may exceed $150 billion[1]. The total cost of accidents due to sleepiness have been estimated to be between $43 and $56 billion[4].

Several demographic and work-related variables have been demonstrated to increase the risk of fatigue and sleep disorders. Increasing age is associated with an increased risk of sleep disorders.[5] There is an extremely high prevalence of sleep apnea in men ages 30-60, and as many as half of all persons over 65 suffer sleep disorders and disturbances[1]. Obesity and overweight have also been strongly associated with sleep disorders, particularly obstructive sleep apnea (OSA) [6]. In addition, working frequent overnight shifts or a rotating shift work schedule increases the risk of sleep disorders, particularly shift work sleep disorder[7]. In total, chronic sleep disorders affect 60-80 percent of all shift workers[4]. Shift work sleep disorder, sleep apnea, and insomnia cause acute and chronic sleep deprivation, and may contribute to misalignment of circadian phase. They may also exacerbate the problem of sleep inertia, a phenomenon of decreased responsiveness in the minutes to hours after awakening from deep sleep. Each of these four problems has been independently associated with decrements in neurobehavioral performance, and an increased risk of accidents, as described below.

The detrimental effects of each of these four factors are likely to be exacerbated in police and, consequently, their performance is likely to be degraded. First, police officers regularly work during the biological night when the endogenous drive for alertness is lowest. Second, extended 24-48 hour shifts are common, and require long continuous episodes of wakefulness that induce fatigue. Third, police are regularly exposed to chronic partial sleep deprivation as they repeatedly fail to gain adequate recovery sleep after extended shifts. Finally, police who do manage to sleep when on-shift overnight are often asked to perform emergent actions immediately upon awakening when sleep inertia is maximal.

Furthermore, heart disease and motor vehicle accidents are closely linked to sleep disorders and fatigue. Sleep apnea, for example, the most common sleep disorder in middle-aged men, is a debilitating disorder that increases the risk of fatigue-related motor vehicle accidents, stroke, heart disease and hypertension (e.g. [8-13]). Shiftwork is associated with long-term health risks for peptic ulcer disease, cardiovascular disease, diabetes and some cancers (e.g., [14-23]) and we expect that the increased stress experienced by police officers may exacerbate the processes controlling appetite and metabolism, and further increase this risk, in addition to the direct effect of stress on sleep disruption.

1.1 Physiological determinants of fatigue

There are four major physiological determinants of alertness and performance in healthy subjects: 1) circadian phase (time of day); 2) number of hours awake (acute sleep deprivation); 3) nightly sleep duration (chronic sleep deprivation); 4) and sleep inertia (impaired performance upon waking). Each of these four problems has been independently associated with decrements in neurobehavioral performance, and an increased risk of accidents, as described below.

Impact of circadian phase/time of day on neurobehavioral performance. Laboratory [24-26] and field studies [27;28] have shown that during extended wakefulness, alertness and performance show a daily variation as well as an overall decline [29]. Alertness and performance vary rhythmically with a period of roughly 24 hours that is superimposed on the steady deterioration induced by acute sleep loss [30-33][2258][34]. These daily circadian rhythms are driven in humans by an endogenous circadian pacemaker, located in the suprachiasmatic nucleus of the hypothalamus [35]. This light-sensitive circadian pacemaker drives the diurnal rhythms of core body temperature, plasma cortisol and plasma melatonin, as well as neurobehavioral functioning (Figure 1A). Laboratory studies, where subjects are made to live on a sleep/wake schedule outside the normal 24-hour day [25;26;36-40], show that the circadian pacemaker cycles at an intrinsic periods of ~24.2 h. These studies also cause people to sleep and wake up at many different circadian phases (times of day) [37;38;41-43] and we and other have found that the largest neurobehavioral performance decrements are seen when subjects are awake during the biological night, with the worst performance several hours before normal wake time (e.g., ~3:00-6:00 am) [25;26;36;38;44;45]. These studies have also confirmed that, not only is the ability to stay awake dependent on the time of day, the quality and quantity of sleep also varies with circadian phase such that sleep during the day is shorter and of poorer quality than sleep during the night [46;47 48-50]. Thus, not only does circadian misalignment cause decrements in neurobehavioral performance when one is awake, it also induces impairment in sleep quality, continuity and duration during sleep, and because alertness and performance depend heavily on sleep quality and duration [51-54], the misalignment causes neurobehavioral function to decline indirectly via its effects on sleep as well as directly. This effect is seen commonly among night workers who find themselves unable to sleep during daytime hours and fatigued at night [27;55-58] and directly accounts for the increased rate of industrial and driving accidents during the night as compared to the day [59].

Impact of acute sleep deprivation on neurobehavioral performance. Acute sleep deprivation has been systematically documented to cause decrements in human alertness and performance, independent of the circadian system [24;29;30;33;60-66]. Every hour that one is awake in the laboratory, the homeostatic drive to sleep increases, which results in deteriorating performance (Figure 1B). In the real world, this deterioration results in an increase in the risk of fatigue-related fatal truck crashes with increased hours driving and awake [67]. Compared with the first hour, there is more than a 15-fold increase in the risk of a fatigue-related fatal crash after 13 hours of driving. This increased risk is important for police officers who drive while working double shifts.

Impact of chronic partial sleep loss on neurobehavioral performance. The history of nightly sleep duration has also been demonstrated to affect performance. Sleep loss on a nightly basis, also known as chronic partial sleep deprivation, results in a sleep "debt." The consequences of the sleep debt are cumulative and affect health and performance [68-76]. Dinges and colleagues found that subjects restricted to approximately 5 hours of sleep per night for 7 nights that the frequency and duration of lapses on a vigilance task increased significantly [77] (Figure 1C). Loss of even 2 hours of nightly sleep for 5 to 7 consecutive nights causes decrements in performance comparable to those seen after 24 hours of continuous sleep deprivation. After 12 to 14 consecutive nights at this level of sleep restriction, lapses of attention on the psychomotor vigilance task (PVT) are comparable to those observed after 48 hours of total sleep deprivation [77]. In less than a week of four hours per night of sleep, an amount not atypical of insomnia or severe sleep apnea, the rate of attention lapses was comparable to that seen after 48 h without sleep [77].

Impact of sleep inertia on neurobehavioral performance. Alertness and performance are quite impaired immediately following awakening [78], even in subjects who are not sleep deprived and are waking at their normal circadian phase [79-81] (Figure 1D). This impairment is called sleep inertia [82], and can profoundly impair performance. The effect dissipates over time in an asymptotic manner [79-81;83].

Sleep inertia has real-world effects: In a study of Air Force flight accidents due to pilot error [84], it was found that even following a normal night's sleep, pilots were more likely to make errors shortly after awakening than later.

Circadian phase and homeostatic sleep drive co-determine levels of alertness and performance [85]. Along with sleep inertia, these processes have been formalized into mathematical models of alertness and performance [44;79;85;86]. Since sleep disorders can both directly increase the homeostatic drive for sleep, and indirectly promote exaggerated decrements in performance at the circadian nadir, their presence is an important determinant of effective functioning, especially among night shift workers with a high incidence of sleep disorders.

1.2 Sleep deprivation and health

The major immediate health threat posed by sleep deprivation is the risk of a drowsy driving accident or incident, which places staff and the public in danger. Traffic accidents account for a large percentage of serious and fatal injuries in the United States [87]. Such accidents represent one of the leading causes of death among individuals aged 6-33 years [88].. Unfortunately, sleepiness has not received as much attention in driving safety program as alcohol use despite comparable levels of cognitive impairment: 19 hours of sustained wakefulness has been reported to be comparable to that observed at a blood alcohol concentration (BAC) of 0.05 percent and 24 hours of sleep deprivation induced performance decrements comparable to a BAC of 0.10 percent [89], legally drunk in many States. Determining the role sleepiness plays in motor vehicle crashes is often challenging to traffic safety professionals because of the multi-factorial nature of crashes [90]. However, a report from the National Transportation Safety Board Studies [91] cited fatigue as the most frequently cited accident probable cause of all fatal-to-driver heavy truck crashes (31 percent) [91], followed by alcohol or other drug use (29 percent). Similarly, the NTSB also reported that the amount of sleep in the last 24 hours was the key discriminating feature between fatigue- and non-fatigue-related crashes [92]. The temporal distribution of motor vehicles crashes attributed to drowsy driving shows two distinct peaks that can be attributed to circadian peaks in sleepiness, at night and mid-afternoon [92-96]. As those who work extended duty hours or shift-work schedules are often on the road during the nighttime hours, it follows that they would have a higher incidence of sleep-related motor vehicle crashes. In a survey study, 21.7 percent of rotating shift workers reported at least one motor vehicle crash or near miss whereas only 7.2 percent of non-rotating shift workers recalled such an event [97]. Nurses working rotating shift schedules had twice the odds of falling asleep while driving to and from work and 2.5 times the odds of a reporting a near-miss crash [98]. In our recent work studying medical residents, we found that residents driving home after an extended duration work shift had approximately twice the risk of a car crash, and six times the risk of a near-miss accident [99].

Night work and sleep deprivation have been implicated as root causes of major accidents and adverse events in a range of occupational settings, including nuclear power plants, transportation, and other industries [87]. Disastrous examples include the Three Mile Island nuclear power plant incident, the Chernobyl nuclear power plant explosions and the grounding of the oil tanker Exxon Valdez. Studies have shown that gas meter readers [100] train drivers [101] and commercial pilots [102] make more errors during the night shift, likely due to increased sleepiness [87]. As outlined below, highly trained professionals such as medical resident and nurses also make more serious medical errors during extended shifts and during overnight work, highlighting the inability of individuals to overcome the biological drive for sleep even when highly motivated ([99;99;103-105] and see Preliminary Results).

Sleep deprivation caused by clinical sleep disorders also increase daytime sleepiness, and increase the risk of accidents. OSA syndrome, which has a prevalence of 1-4 percent in the general population

[5;6;106], 4 to 8 percent in 40-59 year old males [5], and up to 40 percent in long-distance truck drivers [5], is associated with a seven-fold increase in risk of road traffic accidents [107]. Successful treatment of OSAS with continuous positive airway pressure (CPAP) therapy has resulted in a six- to seven-fold decrease in driving accident rates [108;109][13824}. One study found that patients with sleep disorders may be responsible for up to 71 percent of all sleep–related automobile accidents [110]. The incidence of sleep-related accidents per year of excess sleepiness was found to be between 3 and 7 percent, an alarmingly high annual rate. As sleep disorders are often under-recognized but are highly treatable, this represents an extremely high burden of excess, avoidable risk both to individuals with sleep disorders and to those with whom they may collide in motor vehicle crashes.

In addition to its immediate effects on performance, chronic sleep deprivation causes significant short and long-term health problems. Sleep deprivation and working during an adverse circadian phase have been linked with increased risks of obesity [19], gastric and duodenal ulcers [15;111], cardiovascular disease [15;112-116], and cancer [20;21]. Ingestion of meals at an inappropriate circadian phase may result in the gastrointestinal and metabolic problems [17;18;117], that lead to an increased risk of cardiovascular disease and diabetes. [19;111;118]. Workers who routinely work extended hours and night shifts are at particularly high risk of suffering health consequences.

1.3 Sleep deprivation and sleep disorders in police

There are about 700,000 full-time sworn police officers in the United States [119]. Many of these police officers work extended duration shifts and long work weeks, especially in recent years with escalating threats to homeland security. There is no one standard work schedule for police departments across the United States. A wide array of work schedules are employed, including fixed shifts, rotating shifts and varying shift lengths, most commonly 8-, 10-, or 12-hour shifts. Additionally, the unpredictable and operational nature of police work results in frequent requirements for overtime, often scheduled in a haphazard manner. To earn extra money, many officers supplement their contracted 40-hour work week with additional employment. There are numerous and diverse policies governing this additional work time, including court appearances, detail work, voluntary and mandatory overtime, and second jobs.

Police officer schedules, especially those involving night or rotating shifts, can lead to misalignment of circadian phase, acute sleep deprivation, chronic partial sleep deprivation and consequent cumulative sleep debt. Their combined effect creates an imposing biological force that can overpower an officer's ability to remain alert and to maintain a high level of performance, particularly those tasks requiring sustained vigilance such as driving. Moreover, police officers are often expected to make demanding, complicated decisions, often in split-seconds, with potentially grave results for individuals, families and communities [120].

Accident hazards are particularly important for police officers, as more officers are killed annually by accidents than by felonies. [121;122] A third of officers in one study reported being involved in preventable police vehicle crashes on the night shift, and 19 percent reported being involved in preventable crashes during the early afternoon, when going to court after a night shift. [123] The AAA Foundation for Traffic Study found in 1996 that 90 percent of troopers reported driving on duty while drowsy and 25 percent reported falling asleep at the wheel. [123] On July 8, 2001, CBS Health Watch reported four incidents of police officers falling asleep at the wheel in their patrol cars, including one that resulted in a fatality to a civilian. Two of these crashes occurred while the officers were working the night shift, one on the commute home following a night shift, and one while working a double shift. Although hard data on police fatigue have been limited, increasing evidence suggests that fatigue plays an important role in police officer accidents, injuries, and citizen complaints. [120]

Recently, Neylan and colleagues reported that police officers had significantly worse sleep quality and less average sleep duration than control subjects and work stress was strongly associated with poor global sleep quality [124]. Additionally, Italian state police shift workers reported sleep disturbances twice as often as non-shiftworkers [125].

1.4 Fatigue intervention strategies

While a range of approaches exist to tackle sleepiness, few have been rigorously tested under real-world conditions. Most efforts have been focused on addressing problems with the pattern of shift work rotations. In the earliest published shift work intervention study in 1982, we (Czeisler and colleagues) were able to improve work schedule satisfaction, subjective health estimates, personnel turnover, and worker productivity in a group of mining and chemical workers by implementing a work schedule that adhered to circadian principles [126]. In a similar demonstration project of the Philadelphia Police Department in 1988, we implemented a schedule that resulted in a 40 percent decrease in patrol car crashes by police officers and 29 percent improvement in subjective alertness during the night shift [127]. These studies changed shift-work patterns from advancing patterns (night to evening to morning shift) which is difficult to adapt to, to delaying patterns (morning to evening to night shift) that track the natural rhythm of the internal circadian clock, which has a tendency to delay. In non-rotating or extended shift duration schedules, these approaches are not appropriate and little has been done to develop rigorous intervention programs to reduce sleepiness. Even fewer have coupled these programs with sleep disorders screening to provide a more comprehensive program.

Direct interventions are possible but these tend to address the sleepiness temporarily rather than correct the underlying cause of the sleep disruption or sleepiness. Interventions include pharmacological agents such as caffeine [128][13789}[129], melatonin [130;131], modafinil (an FDA-approved agent for promoting wakefulness in patients with narcolepsy [132-135;135] and shift work sleep disorder, chemically unrelated to central nervous system (CNS) stimulants such as methylphenidate, amphetamine, or caffeine), and sedative hypnotics [136;137]; changes to sleep scheduling, diet, and the work environment;[138] real time alertness monitoring devices;[139] napping during extended duration work shifts;[140] the use of physiological screening devices to detect fatigue before or during a shift; [141;142] appropriate scheduling of hours of work and sleep;[143] and the use of bright light to hasten adaptation of circadian rhythms[144-146]. Although in their early stages, identifying and screening out individuals who have greater difficulty adapting to shift work [147] or who have sleep disorders [148;149] may be promising strategies, especially among demographic and occupational groups where sleep disorders are highly prevalent[5].

2. Specific aims

The aim of the study was to use a district/station level, randomized experimental design to test the hypotheses that implementation of a comprehensive sleep disorders detection and treatment program in a police department will:

1. improve the mean nightly sleep and alertness of police officers;
2. improve police officer safety, as determined by:
    a. decreased rates of motor vehicle crashes;
    b. decreased on-the-job injuries;
3. improve police officer productivity, as determined by:
    a. increased, citation and arrest rates;
    b. increased rate of motor vehicle assistances;

c. increased rate of citations and warnings issued;

4. improve officers' and families' job satisfaction and ability to cope with shift work

3. Methodology

3.1 Subjects

Subjects were sworn field service police officers of a police department in New England. According to Departmental statistics provided in June 2006, 1,610 officers were employed in field services. We subsequently found that the number of officers who were active and available to participate was 1,483. 878 of these officers participated in the sleep education session, representing 59 percent of the active and available officers. 692 officers subsequently provided written informed consent and were enrolled into the study. Of these, 86 withdrew consent or were lost to follow up prior to the study procedures. 606 subjects completed the baseline questionnaire and one subject was found ineligible. Characteristics of the 605 study participants who completed the study are reported in Table 1. Subject disposition in the protocol (for both phases combined) is illustrated in Figure 2.

3.2 Design

The study design was a station-level randomized experiment (see Table 2). To achieve this design, pairs of stations were identified based on size, employee characteristics and the acuity of police work in which they engage. In consultation with our Study Advisory Committee (SAC), which included members of the police department, we identified these pairs of stations. As we had originally proposed, in phase 1, one of each pair was randomly assigned to the intervention group, the other to the control group, and in phase 2 the intervention was extended to all stations. Since one of the station was considered dissimilar in the nature of business conducted we elected to divide it by line (there were 3 lines) and matched it within itself. This station is therefore represented in both years of the intervention.

3.3 Survey tools

The sleep disorders screening tool was the major part of the Baseline survey. We reviewed and selected appropriate and validated questionnaires to compile a comprehensive sleep disorders screening tool for the purposes of this study (see Table 3). As there was no validated questionnaire available for Shift Work Disorder, we developed one based on the International Classification of Sleep Disorders-2 (ICSD-2) [150]. In developing this screening tool we consulted with various sleep experts, conducted an extensive literature review on validated survey instruments, and engaged in discussions with police consultants to ensure that the language used would be appropriate for the target population. In addition to sleep disorder screening, the survey also contained questions about work and sleep schedules, demographics, medical and social history, accidents and stress.

The survey was produced using Raosoft Interform 2004 (Raosoft, Inc., Seattle, WA). Completed surveys were scanned into electronic format and uploaded into the central study database. All free text fields were double-key entered and verified for accuracy. An automatic scoring algorithm based on published scoring criteria was developed for determining whether subjects were at high, low or unknown risk for each of the sleep disorders.

A Year-End survey was also developed to obtain secondary outcome measures of the efficacy (self-report) of the *Operation Healthy Sleep* program. The questions on this survey were essentially the same as those on the Baseline survey, except that on the Year-End survey we did not seek to screen for sleep disorders.

3.4 Police Department Database Measures

The police department provided a number of (identifiable) datasets from their internal databases for all officers in field service (see Table 4). The period of data collection was September 2004 to June 2008. In addition, data on citations issued by officers from the department that was studied were obtained from a state agency.

We planned to use these data as objective measures of health, safety and productivity to evaluate the efficacy of the *Operation Healthy Sleep* program. Some of these datasets were found subsequently to have substantial missing data.

3.5 Procedures

The protocol and all study materials were approved by the Brigham and Women's Hospital Institutional Review Board/ Human Research Committee.

Participants were recruited by members of the research team through educational outreach sessions on the topic of sleep health and caffeine education conducted at police stations. The outreach sessions were advertised through flyers displayed in the police stations, email invitations sent by union groups to their members, and through the police department newsletter.

The study was conducted between September 2005 and April 2007. Phase 1 was completed between September 2005 and July 2006 and Phase 2 was completed between February 2007 and April 2007. Members of the research team visited the each police station several times during different shift times. During each visit, the researchers first presented a 45-minute educational session on sleep health, caffeine use and the symptoms, consequences and treatment of OSA. The education session included an introductory video and a presentation delivered by *Powerpoint*. Educational brochures developed by the American Academy of Sleep Medicine (AASM) and Sleep Health*Centers* were made available to officers at the end of the educational session. These educational brochures provided included the following:

- *Sleep well, perform well…be well* (Harvard Work Hours, Health and Safety Group)
- *Sleep Health Centers, better sleep, better health* (Sleep Health*Centers*)
- *Shift Work* (AASM)
- *Sleep Hygiene* (AASM)
- *Obstructive Sleep Apnea* (AASM)
- *Insomnia* (AASM)
- *Restless Leg Syndrome/Periodic Limb Movement Disorder* (AASM)
- *Narcolepsy* (AASM)
- *Overnight Sleep Studies* (AASM)
- *Sleep and Heart Disease* (AASM)
- *Sleep and Depression* (AASM)

Following the educational session, officers were invited to participate in the research study. Those who elected to participate provided written informed consent and completed the baseline survey. The survey took approximately 45-60 minutes to complete.

Subjects who screened positive for one or more sleep disorder were referred to one of the local sleep clinic (Sleep Health*Centers)* for formal evaluation, and if indicated, treatment. Subjects who accepted these referrals were asked to complete a medical release form to allow the researchers to access all records relating to their consultations for diagnosis and treatment of sleep disorders.

To validate the questionnaire screening tool for OSA in the police population, we selected a group of subjects whose questionnaire responses indicated that they were at low risk for OSA and invited these individuals to attend a sleep clinic for an overnight polysomnography study. 56 subjects agreed to participate in this component of the study. Our intention was to then compare these data with the polysomnographic data obtained from individuals whose questionnaire responses indicated that they were at high risk for OSA (n=63). Polysomnographic data from both groups were evaluated by an independent, blinded expert in sleep apnea.

A Year-End survey was sent by mail to all subjects who completed the Baseline survey approximately 1 year later. 130 Year-End surveys were completed and returned (21 percent response rate).

4. Results

We completed multiple visits to 40 of the 41 police stations and also three presentations at the police academy. One station was not visited for logistical reasons, but this station was invited to participate via mail in the sleep disorders screening portion of the program. Across both phases of the study our team scheduled 291 educational sessions during 167 station visits; we ultimately delivered 240 educational sessions. To conduct these sessions our staff drove over 16,000 miles. To ensure we gave officers every opportunity to attend the sessions, follow up station visits were scheduled during days and shifts when the largest numbers of officers who were not present during previous visits were scheduled to work. In phase 1, 94 percent of officers who were available and active were contacted and asked about willingness to participate. In phase 2 this number was 81 percent.

Of the 878 officers who attended the education sessions, 692 (79 percent) provided informed consent to participate in the research study, of which 605 (69 percent of officers attending sessions) completed and returned surveys. One subject was subsequently excluded when it was found that eligibility criteria were not met (see Figure 2).

Using the demographic data we collected from the police department, we compared the characteristics of those who elected to participate in the program compared to data for the entire department (field services) (see Table 5). The comparison revealed the following: (i) those who elected to participate in the education session were similar in their characteristics to those who elected to complete the survey; (ii) those who elected to attend the education session and complete the survey were on average approximately 2.5-3 years younger and 3 years less in police work than all officers in field services; (iii) the gender and rank distributions of those who elected to attend the education session and complete the survey were similar to those of all officers in field services.

To examine the extent of daytime sleepiness in the officers who completed the survey, we calculated the percentage of who reported having nodded off or fallen asleep while driving a vehicle, and how often this occurs (see Table 6). 46.6 percent of officers reported having nodded off or fallen asleep while driving, and of these officers, 20 percent reported that this occurs at least 1-2 times a month.

We examined the body mass index (BMI) characteristics of the sample (see Table 7). 21 percent of officers were categorized as normal or underweight (<25 kg/m^2), 57.7 percent were categorized as overweight (≥ 25 and < 30 kg/m^2), and 21.3 percent were categorized as obese (≥ 30 kg/m^2). 79 percent of the sample was, therefore, categorized as overweight or obese.

148 officers (24.5 percent) were found to be at high risk for one or more sleep disorder. The most common disorder in the sample was OSA (20.3 percent), followed by shiftwork disorder (7.4 percent), insomnia – moderate to severe (3.8 percent), followed by restless leg syndrome (1.0 percent) (see Table 8). None of the officers in the sample were found to be at high risk of narcolepsy.

To examine the proportion of officers who reported being aware that they suffered from a sleep disorder, we calculated the percentage of subjects who reported having been diagnosed previously with each sleep disorder as a function of the number who fell into the low and high risk categories for each disorder (see Table 9). The percentage of subjects in our high risk groups who reported never having been diagnosed with the disorder in the past were as follows: 79.7 percent, 78.3 percent, 100 percent, 83.3 percent of those we found to be at high risk for OSA, insomnia, shiftwork disorder, and restless leg syndrome, respectively.

We compared sleepiness ratings on the Epworth Sleepiness Scale (ESS) for individuals we found to be at high risk for any sleep disorder and those whom we found to be at low risk for all sleep disorders (see Figure 3). ESS scores for the group found to be at high risk for any sleep disorder (mean 9.00, SD 4.49) was significantly greater than the scores of those whom we found to be at low risk for all sleep disorders (mean 6.83, SD 3.47) ($p<0.001$, independent samples t-test). 42.6 percent of the subjects who were at high risk for any sleep disorder showed a high level of sleepiness during their waketime (ESS ≥ 10), compared to 20.5 percent of subjects who were at low risk for all sleep disorders. 12.6 percent of subjects who were at high risk for any sleep disorder showed extremely high levels of sleepiness (ESS ≥ 15), compared to only 1.1 percent of subjects who were at low risk for all sleep disorders (see Figure 3).

Using the definition of mean ± 2 SD in the low risk group to determine the cut-off for the reference range of normal values for the ESS [151], we found that 15.8 percent of the high risk group showed ESS scores above the normal value range, compared to only 3.5 percent of the low risk group.

In a preliminary analysis to examine the relationship between sleep disorders and social/domestic arrangements, we calculated the percentage of individuals who reported being currently divorced or separated and also the percentage reporting ever having been divorced in subjects we found to be at high risk for any sleep disorder compared to those we found to be at low risk of all sleep disorders. We found that the percentage of divorced or separated subjects was substantially higher in the high risk group compared to the low risk group (see Table 10).

The objective (police database) measures collected in this study have required considerable editing/cleaning to bring them to a level suitable for formal data analysis. We are continuing our analysis of these data.

5. Discussion and Conclusions

With respect to the specific aims of the study, data analysis is ongoing to examine the efficacy of the comprehensive sleep disorders detection and treatment program in improving mean nightly sleep duration and alertness, safety, and productivity of police officers. The primary reason for the delay in completing these analyses is that many of the database measures we obtained from the police department were not of sufficient quality for formal data analysis. We have now identified a subgroup of variables suitable for analyses.

The Operation Healthy Sleep program was successfully implemented with a high level of participation in the police department. Of the available and active officers in field services, 59 percent attended the sleep health education session, and of these 69 percent (n=605) completed and returned the Baseline survey that included a sleep disorders screening questionnaire.

Demographic data obtained from the police databases showed that those who elected to attend the education session and complete the survey were on average approximately 2.5-3 years younger and 3 years less in police work than all officers in the Division of Field Services. We conclude from these analyses that, in the implementation of the Operation Healthy Sleep program, greater efforts need to be made to engage older individuals in the Department. This is particularly important given that the risk of many sleep disorders increases with age.

We expected that drowsy driving would be under-reported in this population. We found that 20 percent of our sample reported nodding off or falling asleep while driving a vehicle at least 1-2 times a month. Given the well-established link between drowsy driving and motor vehicle crashes, our findings suggest that the frequency of drowsiness-related crashes in police would be very high. We are presenting examining the association between sleep disorders, drowsiness and motor vehicle crash risk.

Sleep disorders appear to be highly prevalent in our sample of police officers. We found that approximately 25 percent of officers were at high risk for one or more sleep disorder. The most prevalent sleep disorder in the sample was OSA. Given the association between untreated OSA and adverse health and safety outcomes, sleep disorders screening and management programs should be instigated in law enforcement agencies across the country.

The majority of subjects (~80 percent for most disorders) who were found to be at high risk for a sleep disorder reported not having been diagnosed previously with that disorder. Our finding that none of the individuals we identified as being at high risk for shiftwork disorder had been previously diagnosed suggests that the detection of this disorder by clinicians is poor. We suggest increased educational initiatives about sleep disorders, in particular shiftwork disorder, for primary care physicians and other clinician groups.

Sleepiness level (ESS score) was significantly higher in subjects who were found to be at high risk for a sleep disorder compared to those found to be at low risk for all disorders. Of particular note, we found that 12.6 percent of subjects who were at high risk for any sleep disorder showed extremely high levels of sleepiness (ESS ≥15), compared to only 1.1 percent of subjects who were at low risk for all sleep disorders. ESS scores in this range are reported to have high sensitivity and specificity for distinguishing narcoleptic patients from normals [151],suggesting that such scores represent excessively high sleepiness levels.

We conclude that sleep disorders and excessive sleepiness appear to be highly prevalent in our sample of police officers. Sleep disorders and sleep deprivation are associated with considerable health consequences including increased risk of hypotension, diabetes, obesity, depression, heart attack and stroke [152].The Institute of Medicine estimated that approximately 20 percent of serious injuries from motor vehicle accidents in the general population are associated with driver sleepiness. Our findings suggest that a coordinated strategy is required to meet the substantial health and economic burden associated with sleep disorders. Occupational screening programs, such the Operation Healthy Sleep program implemented in our study, appear to an effective means of identifying and managing sleep disorders in the general population.

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7. Figures

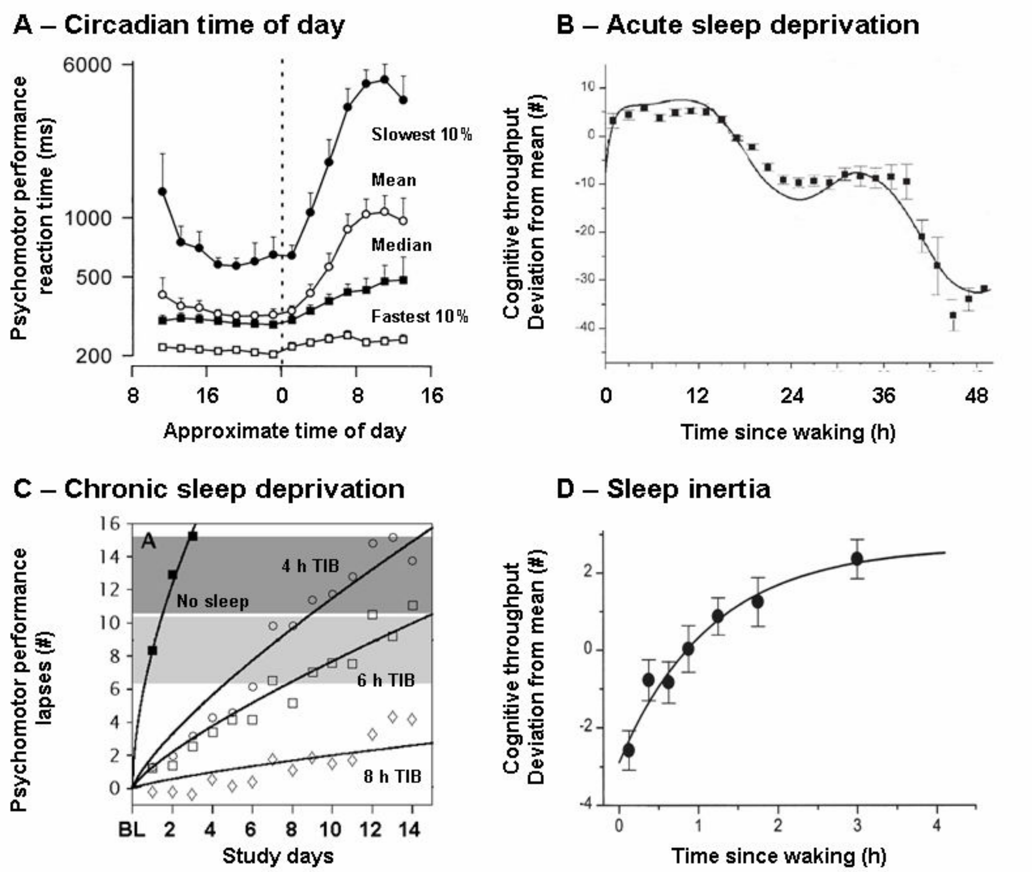


Figure 1: **Examples from experimental data sets of the four major physiological determinants of fatigue.**

Figure A illustrates the endogenous circadian rhythm in visual psychomotor performance over a 32-hour vigil under constant conditions (n = 10) [153]. While average reaction times may slow to ~1s, there is more than a 10-fold increase in the slowest 10 percent of responses which averages nearly 6 seconds at the circadian nadir before the subject reacts to a visual stimulus, which would represent a significant lapse of attention under real-world conditions. Figure B shows the effects of 48 hours of continual wakefulness on mean (± sem) cognitive throughput, as measured by a simple addition test (n = 94) [154]. A circadian component can also be observed but cognition declines across all circadian phases with increasing time awake. The line represents a model prediction of cognition under these conditions [81]. Figure C shows how different amounts of chronic partial sleep deprivation affect psychomotor performance and compare the time course of average daily lapses in attention (based on 2-hourly tests from 7:30-23:30 h) over two weeks in subjects with an 8-hour (◊, n=9), 6-hour (□, n=13) and 4-hour (O, n=13) time-in-bed (TIB) sleep opportunity each day, and 88-hours of continuous sleep deprivation (■, n=13) [155]. Performance deteriorated in both the 6- and 4-hour sleep groups such that after 14 days, the 6-hour sleep group performed at an equivalent level to those kept awake for 24 hours continuously, and the 4-hour group was performing at the same level as someone kept awake for three whole days. Figure D shows the time course of sleep inertia in cognitive throughput over the first 4 hours of wakefulness after a normal 8-hour sleep for 3 days [83]. While there is an exponential improvement in performance over time, it takes at least two hours to reach maximal performance and there is a highest risk of a fatigue-related error in the first 30 minutes after waking.

Figure 2: Subject disposition (phase 1 and 2 combined)

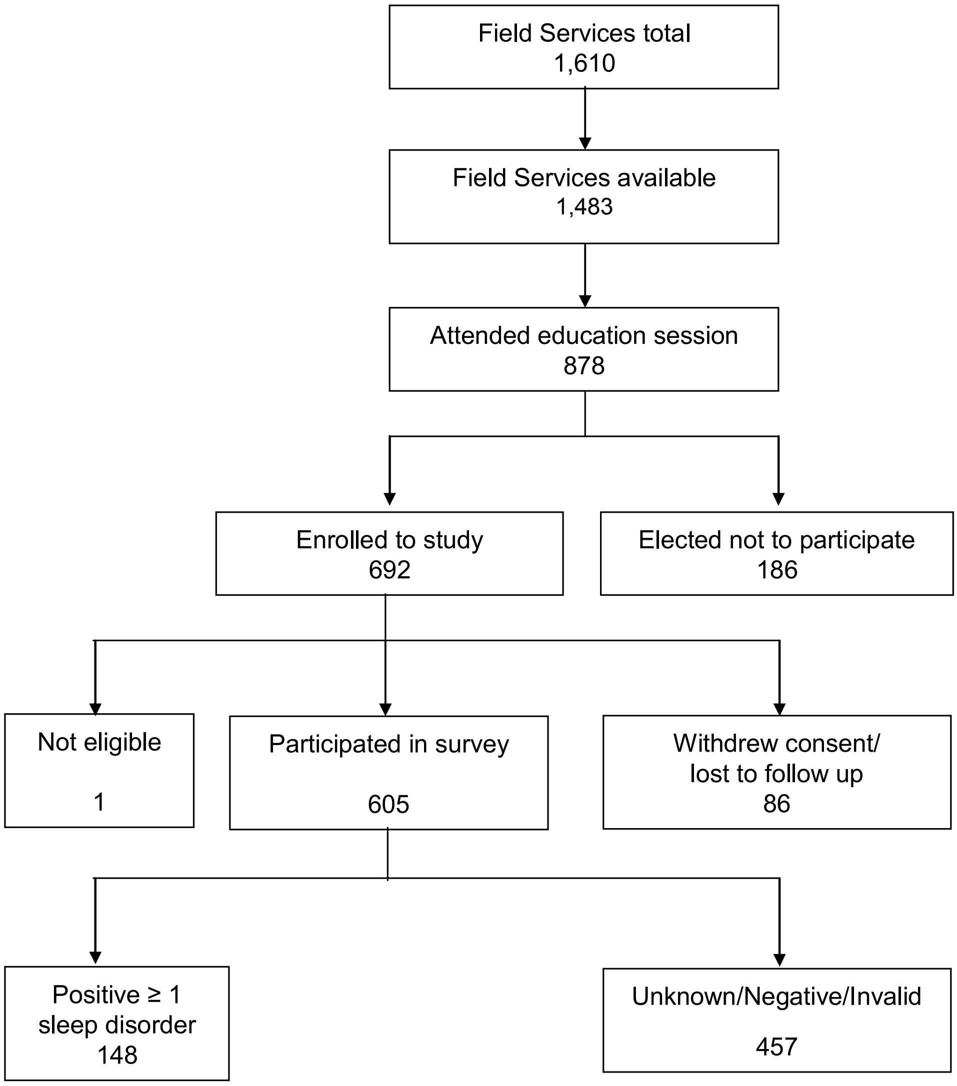
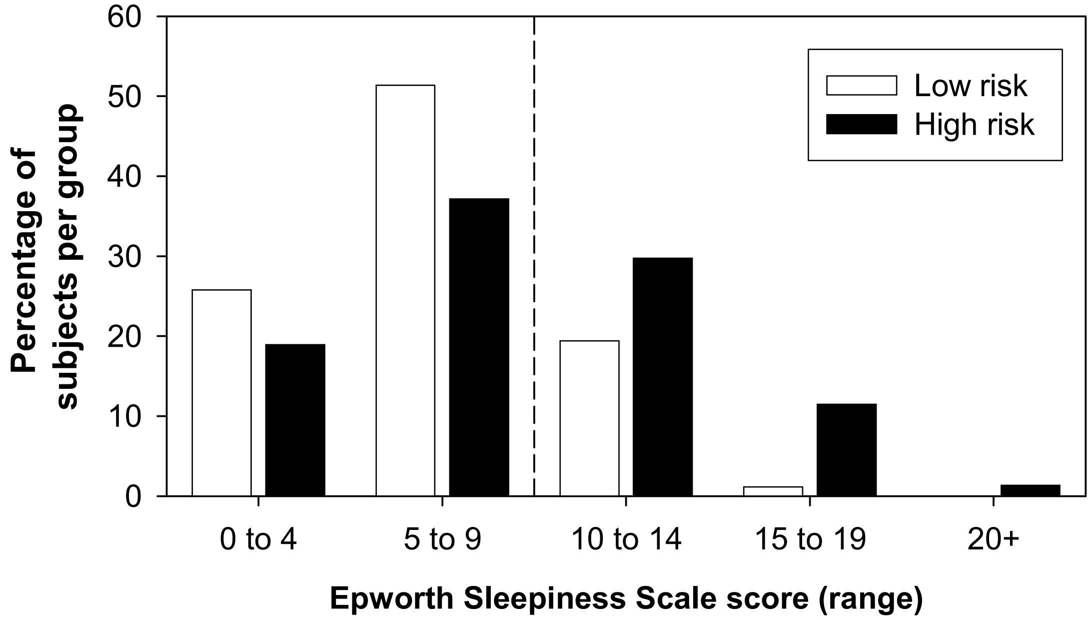


Figure 3: Epworth Sleepiness Scale score range as a function of the percentage of subjects categorised as high and low risk for any sleep disorder



8. Tables

Table 1: Participant characteristics

Characteristic	Data
N	605
Age, *y*	
Mean ± SD	38.3 ± 9.4
Service, *y*	
Mean ± SD	12.0 ± 9.0
Sex, *n (percent)*	
Female	34 (5.6)
Male	566 (93.6)
Not reported	5 (0.8)
Body mass index, *kg/m²*	
Mean ± SD	27.7 ± 3.6
Race, *n (percent)*	
White	548 (90.6)
Black	30 (5.0)
Asian	4 (0.7)
Native American	3 (0.5)
Other	12 (2.0)
Not stated	8 (1.3)
Rank, *n (percent)*	
Sergeant or higher	96 (15.9)
Trooper	353 (58.3)
Trainee	127 (21.0)
Not stated	29 (4.8)

Table 2: Study design

	Phase 1 *Study year 1*	Phase 2 *Study year 2*
Intervention group	Sleep health education and sleep disorders screening	No further intervention
Control group	No intervention	Sleep health education and sleep disorders screening

Table 3: Questionnaires used in the study to screen for major sleep disorders

Sleep disorder	Screening questionnaire	Reference
Obstructive sleep apnea	Berlin Questionnaire	Netzer N.C. et al. Ann Intern Med 1999[156]
Insomnia	Athens Insomnia	Soldatos C.R. et al. J Psychosom Res 2000[157]
Restless Leg Syndrome	Restless Leg Syndrome Questionnaire	Allen R.P. et al. Arch Intern Med 2005[158]
Narcolepsy-Cataplexy	Cataplexy Questionnaire Epworth Sleepiness Scale	Anic-Labat S. et al. Sleep 1999 Johns M.W. Sleep 1991[159]
Shift Work Disorder	Shift Work Disorder Questionnaire	Harvard Work Hours, Health and Safety Group (unpublished)

Table 4: Datasets obtained from internal databases of the police department

Measure	Data	Source
Demographics and assignment	Age, rank, years in police service, station assignment, rostered shift schedule	Departmental Attendance Record (Access Database)
Work hours	Work hours, leave, overtime, detail work	Payroll Record (Paystation)
Motor vehicle crashes	Motor vehicle crashes in police vehicle	Departmental Cruiser Accident Report (Access Database)
Mileage	Mileage in police vehicles	Odometer Readings at Pump Database
Motorist assist	Assist type, date	Departmental Motorist Assist Report (Access Database)
Citations	Citations issued	Merit Rating Board
Accidents Investigated	Accident type, date	Departmental Accidents Investigated Report
Arrests	Action taken, date	Departmental Arrests Report (Access Database)
Officer Calls	Call type, date	Departmental Officer Call Report (Access Database)
Tows	Status, date	Departmental Tow Report (Access Database)
Disabled vehicles	Classification, date	Departmental Disabled Vehicle Report (Access Database)

Table 5. Demographic characteristics of all field services officers, officers who elected to attend the education session, and officers who elected to complete the survey.[#]

	All officers	Officers who attended education session	Officers who completed survey
N	1,750	853	588
Age, *y*			
Mean ± SD	41.0 ± 9.7	38.5 ± 9.3	38.3 ± 9.3
Employed in police work, *y*			
Mean ± SD	13.5 ± 10.6	10.5 ± 10.2	10.2 ± 10.4
Sex, *n (percent)*			
Female	99 (6)	43 (5)	30 (5)
Male	1,651 (94)	810 (95)	558 (95)
Rank, *n (percent)*			
Trooper	1,402 (80)	732 (86)	499 (85)
Sergeant or higher	348 (20)	121 (14)	89 (15)

[#] Due to missing values in the data we obtained from the police department, the total number of officers for whom we have demographic data is slightly less than the number who actually participated in the study. We were able to obtain departmental data for 97 percent of our subjects.

Table 6: Percentage of subjects reporting nodding off while driving and frequency of nodding off while driving

Question	Percentage of subjects	Cumulative percentage
I have nodded off or fallen asleep while driving a vehicle		
Yes	46.6	46.6
No	53.4	100.0
If YES, how often does this occur?		
Nearly every day	0.2	0.2
3-4 times a week	0.3	0.5
1-2 times a week	2.3	2.8
1-2 times a month	17.2	20.0
Never or nearly never	42.0	62.0
Not applicable or not states	38.0	100.0

Table 7: Body mass index (BMI) ranges of subjects

BMI range (kg/m^2)	n	Percentage of subjects	Cumulative percentage
≥ 35	24	4.0	4.0
≥ 30 and <35	105	17.4	21.3
≥ 25 and <30	349	57.7	79.0
< 25	127	21.0	100.0

Table 8: Number and percentage of subjects found to be at high risk and low risk for sleep disorders

	n (percent)
Obstructive sleep apnea	
High risk	123 (20.3)
Low risk	471 (77.9)
Not reported	11 (1.8)
Insomnia	
High risk	23 (3.8)
Low risk	581 (96.0)
Not reported	1 (0.2)
Shiftwork Disorder	
High risk	14 (7.4)
Low risk	172 (91.0)
Not reported	3 (1.6)
Restless Leg Syndrome	
High risk	6 (1.0)
Low risk	593 (98.0)
Not reported	6 (1.0)
Narcolepsy	
High risk	0 (0)
Low risk	605 (100)
Not reported	0 (0)

Table 9: Sleep disorder screening result from present study as a function of self-reported previous diagnosis of sleep disorder

		Previous diagnosis of a sleep disorder?				
Sleep disorder screening outcome	**n**	**Never**	**Yes, in the past I have, but I don't have it now**	**Yes I have, but I do not regularly take medications / receive treatment**	**Yes I have, and I am regularly taking medications / receiving treatment**	**Not stated**
Obstructive sleep apnea						
High risk	123	79.7	2.4	4.9	7.3	5.7
Low risk	471	96.4	0.0	0.4	0.8	2.3
Insomnia						
High risk	23	78.3	0.0	4.3	13.0	4.3
Low risk	581	94.8	1.0	0.2	0.2	3.8
Shift Work Disorder						
High risk	14	100.0	0.0	0.0	0.0	0.0
Low risk	172	94.2	0.6	1.2	0.0	4.1
Restless Leg Syndrome						
High risk	6	83.3	0.0	16.7	0.0	0.0
Low risk	593	95.3	0.3	0.7	0.2	3.5
Narcolepsy						
High risk	0	0.0	0.0	0.0	0.0	0.0
Low risk	605	96.4	0.0	0.0	0.0	3.6

Table 10: Marital status (current) and history of divorce for subjects categorised as high and low risk for any sleep disorder

Marital status	**High risk for any sleep disorder**	**Low risk for any sleep disorder**
Currently divorced or separated (percent)	12.2	7.8
Ever been divorced (percent)	25.0	13.5

Publications

To disseminate the results of the study to the scientific community, we are preparing original reports for publication in scientific and medical journals. We will inform NIOSH about such publications after they are accepted.

We have published one preliminary report of the research:

> Rajaratnam SMW, Barger LK, Lockley SW, Cade B, O'Brien C, White DP, Czeisler CA: [2007] Screening for sleep disorders in North American police officers. Sleep 30(Suppl):A209 (abstract).

Preparation of the following published review article was supported by this grant:

> Barger LK, Rajaratnam SM, Lockley SW, Landrigan CP: [2009] Neurobehavioral, health and safety consequences associated with shift work in safety- sensitive professions. Curr Neurol Neurosci Rep. Mar;9(2):155-164.

Program Director/Principal Investigator (Last, First, Middle): Czeisler, Charles A.

Inclusion Enrollment Report

This report format should NOT be used for data collection from study participants.

Study Title: Sleep disorders management, health and safety in police

Total Enrollment: 692 **Protocol Number:** 2004-P-002713

Grant Number: 5 R01 OH008496

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race

Ethnic Category	Sex/Gender			
	Females	**Males**	**Unknown or Not Reported**	**Total**
Hispanic or Latino	1	16	0	17 **
Not Hispanic or Latino	29	487	2	518
Unknown (individuals not reporting ethnicity)	4	61	92	157
Ethnic Category: Total of All Subjects*	34	564	94	692 *
Racial Categories				
American Indian/Alaska Native	0	3	0	3
Asian	0	4	0	4
Native Hawaiian or Other Pacific Islander	0	0	0	0
Black or African American	1	29	0	30
White	31	513	3	547
More Than One Race	0	4	0	4
Unknown or Not Reported	2	11	91	104
Racial Categories: Total of All Subjects*	34	564	94	692 *

PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)

Racial Categories	Females	Males	Unknown or Not Reported	Total
American Indian or Alaska Native	0	1	0	1
Asian	0	0	0	0
Native Hawaiian or Other Pacific Islander	0	0	0	0
Black or African American	0	1	0	1
White	0	10	0	10
More Than One Race	0	0	0	0

Unknown or Not Reported	1	4	0	5
Racial Categories: Total of Hispanics or Latinos**	1	16	0	17 **

* These totals must agree.
** These totals must agree.

Inclusion of children

No children participated in the survey.

Materials available to other investigators

The research supported by this grant will result in data that will allow us to generate specific recommendations for the implementation of sleep disorders detection and treatment programs in police departments and potentially other occupational groups. The initial research plan did not include any formal plans for sharing final data. The data will be described in the various publications (original reports, reviews and proceedings of meetings). They are therefore in the public domain and are easily accessible.