Shift Work and Health in Policing

Penelope Baughman, Desta Fekedulegn, Luenda E. Charles, Ja K. Gu, Claudia Ma,

John M. Violanti, Michael Wirth, Anna Mnatsakanova, Tara A. Hartley,

Michael E. Andrew, Cecil M. Burchfiel

Introduction

Shift work is complex and encompasses a wide variety of work schedules and circumstances.

> "Shift work involves working outside the normal daylight hours. That is, outside the hours of around 7 a.m. to 6 p.m., the time period in which many people in our society work a 7- to 8-hour shift. Shift workers might work in the evening, in the middle of the night, overtime or extra-long workdays. They also might work regular days at one time or another. Many shift workers "rotate" around the clock, which involves changing work times from day to evening, or day to night. This might happen at different times of the week or at different times of the month" (National Institute for Occupational Safety and Health [NIOSH], 1997, p. 1–2).

The U.S. Bureau of Labor Statistics' most recent reports about shift work in the United States are based on data from a supplement to the May 2004 Current Population Survey, a monthly household survey of national employment and unemployment. Nearly 15% of full-time workers usually worked an alternative shift (6.7% on evening shifts, 3.2% on night shifts, 3.1% on employer-arranged irregular schedules, and 2.5% on rotating shifts), a decrease from 18% in May 1991. A greater percentage of men worked an alternative shift than did women (16.7 vs. 12.4%). Blacks worked alternative shifts more often than whites, Hispanics or Latinos, or Asians. Shift work was most common among workers in service occupations: 50.6% worked in protective service (police, firefighters, and guards), 40.4% in food preparation and serving, and 26.2% in production, transportation, and material moving (Bureau of Labor Statistics [BLS], 2005; McMenamin, 2007). Note that the above statistics are based on current work which may underestimate the number of individuals who have ever worked alternative shifts. It could also

be worthwhile to consider past work because the effects of shift work may be cumulative over time.

Police work necessarily entails shift work to help ensure public safety. “Police officers have reported that shift work and overtime are among the most difficult requirements of their job” (Violanti et al., 2009, p. 194). In this high-demand, high-stress occupation, shift work is a major contributor of stress and can present challenges in several ways—as the source of problems, hastening potential problems, or complicating existing ones.

Reasons for working an alternative shift among U.S. workers included “nature of the job” (54.6%), “personal preference” (11.5%), “better arrangements for family or child care” (8.2%), “could not get any other job” (8.1%), and “better pay” (6.8%). Personal preference was given as the reason many chose to work night and evening shifts (21.0 and 15.9%, respectively) or that working these shifts assisted with family or child care needs (15.9 and 11.0%, respectively). The “nature of the job” was the most common reason for working rotating, split, and employer-arranged irregular schedules (BLS, 2005; McMenamin, 2007).

Shift work is a recognized physical and psychological challenge to worker health and performance and is a far-reaching exposure in occupational health. Rearrangement of sleep and work time can not only have a vast impact upon police officers, but also upon their families and the people that they seek to protect and serve. A number of health concerns are associated with shift work and police officers represent a large share of the affected working population. Results from a study of Buffalo, New York police officers and studies of other law enforcement officers will be used to summarize health hazards associated with shift work.

Methods Used to Assess Shift Work

From a research perspective, shift work is much like a "natural experiment." Groups of workers are naturally exposed to different shifts, similar to the different treatments received by groups of people in a planned scientific experiment. In order to evaluate this "natural experiment," researchers must gather data on work history (shift work exposure information). Studies of associations between work history and various health outcomes would help us to better understand the health hazards related to shift work, but a readily-available source of national data on shift work is not available in the United States. In general, there are two approaches to capture shift work information. It can be collected directly from workers, through the use of questionnaires about work history, or indirectly from existing sources of work history information, such as payroll record-keeping systems.

Questionnaires can be a quick and inexpensive method to obtain work history data. They can be customized to the specific needs of the study and result in a rich source of information about shift work. An important limitation of questionnaires is that recall may be difficult for workers with long or complex work histories. Thus, questionnaires may be best used for collecting recent work history.

Because complete and accurate long-term work history can be difficult to obtain by questionnaire, a better source of long-term work history may be from existing information gathered in payroll record-keeping systems. These are very detailed records accumulated throughout the period of employment and are much more objective than self-reported data. Another advantage of long-term work history data is that researchers can study the effects of shift work that occurred prior to the development of a particular health outcome. This allows investigation of causal relationships between exposure to shift work and development of disease. The main challenge is that the payroll information was originally collected for an administrative

purpose. Preparing the existing data for the purposes of a research study can be costly and time-consuming. These data are also often difficult to obtain; and are rarely utilized for research on shift work in police officers.

In the Buffalo Cardio-metabolic Occupational Police Stress (BCOPS) study of Buffalo, New York police officers, both methods of data collection were used. The payroll records were a more reliable source of long-term work history (Violanti et al., 2006) and could be useful for studying conditions that take longer to develop, such as cancer. In contrast, questionnaires could capture specific details about recent work history that may be associated with changes in health that occur over shorter periods of time, such as sleep or psychological symptoms.

Daily computerized payroll records for Buffalo, New York police officers were made available from 1994–2010 from the Buffalo payroll department and officers worked fixed shifts during this time. These records include the start time, shift length, hours worked, and type of activity performed (regular work, overtime, and court time work). Information regarding sick days and time off due to on-duty injury was also available. Prior to 1994, Buffalo police officers worked a schedule requiring two of the three shifts of officers to work 16 hours within a 24-hour period or "doubling back" (Vena, Violanti, Marshall, & Fiedler, 1986). This work history was recorded using a paper-based system. Efforts are underway to capture information from these records to study the health effects of the earlier shift scheduling pattern.

Preparation of the computerized payroll records included several steps. Type of work was classified as regular time, overtime, or court time work using information on the type of pay received and type of leave taken. The shift for each work day was determined using start times for the regular time work. The distribution shift start times were consistent with those in other occupations involving shift work; typical start times were 7:00 or 8:00 a.m., 4:00 p.m., and 8:00

or 9:00 p.m. The shift start times were then used to define the shift for each day as follows: day shift (4:00 a.m. through 11:59 a.m.), afternoon shift (12:00 p.m. through 7:59 p.m.), and night shift (8:00 p.m. through 3:59 a.m.). The number of hours worked per week was also determined for each type of work (regular time, overtime, or court time). Although officers were scheduled on permanent shifts since 1994, they occasionally worked on shifts other than their permanent shift to cover for other officers who may be on sick or injury leave or vacation in their districts or other districts. To account for this, a variable that represents the shift on which a participant spent the majority of his/her work hours (the dominant shift) was derived. The total hours worked by each participant during the time period spanning from 1994 to the date of examination in the study was partitioned into hours worked on the day, afternoon, and night shift. A dominant shift for each participant was defined as the shift that accounted for the largest percentage of the total hours worked.

There are limitations in any investigation of shift work. Regardless of the approach used to collect work history information, there remains an important methodological challenge in studying the effects of shift work, known as the healthy worker effect (Rothman, Greenland, & Lash, 2008). For example, a project is developed to investigate the association between shift work exposure and a health outcome among workers in a particular industry. This effect is created when some workers leave employment due to an inability to adjust to the shift or the adverse health effects of the shift work, leaving only the "healthy workers" in the study. These "healthy workers" would be those who were more resilient to the effects of shift work or who learned to tolerate it more successfully. Although it is important to study these workers, it is also important to understand the experiences of the workers who left due to the effects of shift work on their health. Because the final results would be based on the experience of the "healthier

workers," there would likely be an underestimation of the effect of the shift work on the health outcome. The following sections describe some of health consequences related to shift work.

Shift Work and Sleep Disorders

Scientific evidence shows that shift work is disruptive to acquiring a sufficient amount and good quality sleep. As an occupational group, police officers have been a useful model for research on shift work, sleep, fatigue, and human performance (Charles et al., 2007; Vila, 2006). Police work involves exposure to both traumatic and nontraumatic (routine administrative and organizational aspects of police work) stressors and these may negatively impact sleep quality. Self-reported sleep quality was compared between police officers and individuals not involved in police, emergency, or security services. Those who worked variable work shifts and those who worked stable day shifts were considered separately. Compared to the non-police groups, police officers on variable-shifts and stable day shifts reported poorer sleep quality and fewer hours of sleep on average. Among police officers, exposure to traumatic incidents was connected mainly with nightmares. Nontraumatic stress was strongly associated with poor global sleep quality (Neylan et al., 2002).

Associations of shift work with sleep quantity and quality were investigated among Buffalo police officers. Charles and colleagues found that night shift work was significantly associated with snoring and decreased sleep duration among police officers (Charles et al., 2007). Shift workers may also experience breathing disturbances, such as obstructive sleep apnea. Police officers did not show a significant difference in sleep apnea severity after working the night shift as compared with working the day shift. However, several breathing characteristics were increased (worsened) on polysomnography during sleep after night work (Tafil-Klawe, Laudencka, Klawe, & Miskowiec, 2005). In another sleep study, results from

overnight polysomnography were compared between shiftworking and non-shiftworking police officers. However in this study, shift work was not significantly associated with obstructive sleep apnea since the disorder was identified in equal numbers in both groups of officers (Klawe, Laudencka, Miskowiec, & Tafil-Klawe, 2005).

Undiagnosed sleep disorders among police officers may pose health and safety risks. In a screening of a group of North American police officers, 40% had at least one sleep disorder, including 34.6% with obstructive sleep apnea, 6.5% with moderate to severe insomnia, and 5.4% with shift work disorder. On a sleepiness scale, 28.5% reported excessive sleepiness and 26.1% reported sleepiness while driving at least monthly. Police officers with obstructive sleep apnea or a sleep disorder had increased reports of physical and mental health conditions such as diabetes, depression, and cardiovascular disease (CVD). Using information from monthly follow-up surveys, police officers who were identified as having a sleep disorder reported making a serious administrative error, falling asleep while driving, making an error or safety violation due to fatigue, showing uncontrolled anger toward suspects, absenteeism, and falling asleep during meetings more frequently when compared to police officers who were not identified as having a sleep disorder (Rajaratnam et al., 2011).

Sleep duration may influence blood levels of leptin, a hormone that regulates appetite and metabolism. Higher levels of leptin are associated with CVD. In an investigation of police officers, those who reported having short (< 5 hours) and long (≥ 8 hours) sleep duration had higher levels of leptin compared to police officers who reported an average of 5 to 7 hours of sleep (Charles et al., 2011). These associations between sleep duration and leptin were stronger among female officers with a normal body mass index (BMI) (24.9 kg/m or less), officers (male or female) with smaller abdominal height (less than 20 cm), and those who primarily worked on

the day shift (Charles et al., 2011). The relationship between shift work, sleep, and wellness was evaluated at three U.S. midwestern police departments (Ramey et al., 2012). Comparisons were made for officers who worked primarily day shifts with those who worked primarily non-day shifts, and for officers who slept less than six hours per day with those who slept at least six hours per day. Officers who primarily worked non-day shifts were 14 times more likely to sleep less than six hours compared with officers who worked day shifts. Officers who slept less than six hours per day were twice as likely to experience poor sleep quality compared to those who slept more hours (Ramey et al., 2012).

Police officers who are shift workers may require a longer recovery time and longer sleep duration than police officers who are not shift workers. A group of state police officers in Italy had their sleep patterns, sleep disorders, sleepiness at work, and hypnotic drug intake assessed by self-administered questionnaire (Garbarino et al., 2002). The shift workers had more frequent difficulty in initiating sleep, with sleep latency (time it took to fall asleep exceeded 20 minutes), and with early awakenings than did non-shift workers. Daytime sleepiness and hypnotic drug intake were similar between the groups; however, shift workers reported requiring longer sleep duration (Garbarino et al., 2002).

The natural tendency to fall asleep and sleep deprivation due to lengthy waking hours may reduce vigilance and contribute to the danger of night shift work. Napping before working a night shift may be an effective countermeasure to the deterioration of alertness and performance associated with night work. In a group of Italian shift-working police drivers, naps were studied as a countermeasure to understand how they may help in preventing sleep-related accidents (Garbarino et al., 2004). Using highway accident data from 1993–97, the accident risk was influenced most by the natural tendency for sleep. Using 2003 data, it was estimated that drivers

who did not take naps had a 38% increase in accidents. The number of accidents per hour increased with sleep deprivation. Napping was associated with a 48% decrease in accidents (Garbarino et al., 2004).

Using a combined field and laboratory research design, the effect of consecutive night shift work on the sleepiness, vigilance, and driving performance of police officers was studied (Waggoner, Grant, Van Dongen, Belenky, & Vila, 2012). Officers worked their regular night shift cycles followed by measurements of driving performance and psychomotor vigilance in a laboratory on the morning following the fifth consecutive night shift and on the morning after three consecutive days off. Comparing results for the two observation periods, sleepiness, vigilance, and simulated driving performance were significantly degraded following five consecutive night shifts (Waggoner, Grant, Van Dongen, Belenky, & Vila, 2012).

Evidence suggests that occupational health physicians should be attentive to possible sleep disorders in shiftworking police officers as these may be associated with or result in health problems and accidents. Results from a cross-sectional study showed that sleep-related accidents were increased among shift workers and related to the presence of indicators of sleep disorders (Garbarino et al., 2001).

Shift Work and Injuries

Long and erratic work hours and insufficient sleep may result in fatigue that could impair the performance and decision making ability of police officers, potentially threatening their health and safety and that of the public they serve and protect (Vila, 2006). Work history and workplace injury records were used to study the association of shift work and injury occurrence among Buffalo police officers. Violanti and colleagues (2012) examined the association between shift work and injury occurrence. Compared to police officers who worked the day shift,

occurrence of first injury was significantly elevated in officers working the night (by 72%) and afternoon (by 66%) shifts. On the first day back to work after being off duty, injury occurrence was elevated for those on the night shift compared with those working the day (by 69%) or afternoon shift (by 54%). The joint combination of working the night shift and having a heavy workload (very busy, frequent complaints, high crime area) was associated with a 2.3-fold greater occurrence of injury compared with officers working the day shift and having a light workload (precinct not busy, low crime area) (Violanti et al., 2012).

Shift Work and CVD

Comparisons of CVD morbidity between police populations and the general population have revealed elevated rates among police officers. For example, CVD morbidity was more common in Iowa law enforcement officers than in the Iowa general population (31.5 vs. 18.4%) (Franke, Collins, & Hinz, 1998). Results such as these suggest that employment as a law enforcement officer is associated with an increased risk for CVD and stimulate interest in the relationship between occupational stress and early signs for CVD among police officers.

Because shift work is a key source of occupational stress for police officers and shift work may increase the risk of chronic disease (Wang, Armstrong, Cairns, Key, & Travis, 2011) the association between shift work and metabolic syndrome was studied among Buffalo police officers. Metabolic syndrome is a subclinical disorder associated with increased risk for development of CVD. It is defined as the presence of three or more of five metabolic syndrome components: elevated blood pressure (BP at or over 130/85 mmHg or on medication to treat elevated BP), elevated glucose (at or over 100 mg/dL or on medication to treat elevated glucose), elevated triglycerides (at or over 150 mg/dL or on medication to treat elevated triglycerides), reduced high-density lipoprotein (HDL) cholesterol (under 40 mg/dL in men, under 50 mg/dL in women, or on medication to treat cholesterol imbalance), elevated waist circumference (at or

over 102 cm [40 in] in men, and 88 cm [35 in] in women) (Grundy et al., 2005). Metabolic syndrome is preventable, treatable, and can also be a reversible condition through healthy lifestyle choices and behaviors.

Officers who worked night shift and either had less than six hours of sleep or worked more overtime had a four-fold greater number of metabolic syndrome components than officers working the day shift. Although age can be associated with an increasing number of metabolic syndrome components, these results were not explained merely by age differences. In fact, officers working the night shift were younger on average than officers working the day or afternoon shifts (Violanti et al., 2009).

Perceived stress can be an indicator of the effect of shift work and other occupational stressors. A study of law enforcement officers investigated whether perceived stress contributes to CVD (Franke, Ramey, & Shelley, 2002). They found the best predictors of CVD were time in the profession (even after adjustment for the effects of aging), perceived stress, and hypertension. Three CVD risk factors were affected by perceived stress: cholesterol, hypertension, and physical activity (Franke, Ramey, & Shelley, 2002).

Short-term effects of shift work have also been studied in policemen. The short-term effect of a change in shift rotation on cardiovascular risk factors was investigated by Orth-Gomer (1983). The officers worked four weeks in their customary counter-clockwise rotation, and then switched to a clockwise rotation. Measurements of "serum lipids, glucose, uric acid, blood pressure, nocturnal urinary excretion of catecholamines, the quality and quantity of sleep, and tobacco consumption" were collected before, during, and after each of the two schedules. Although tobacco consumption was similar between the two schedules, clockwise rotation was associated with several measures of improved health including lower serum levels of

triglycerides, glucose, systolic blood pressure, and urinary excretion of catecholamines, and reports of better and longer sleep (Orth-Gomer, 1983, p. 409).

Fatigue resulting from the demands of shift work may have an impact on the level and amount of physical activity that police officers can maintain. Occupational, sport, and household physical activity was collected for the BCOPS study by self-report from the officers. Shift work was associated with the prevalence of hard-intensity occupational and sport physical activity among male police officers and with very hard-intensity sport physical activity among female officers. Afternoon shift workers were the most active (Ma et al., 2011). Long work hours may also be associated with increased health risks for police officers. In Buffalo, working longer hours was significantly associated with larger waist circumference and higher body mass index among male police officers working the night shift. These measures were not associated with work hours among women on any shift (Gu et al., 2012).

Shift Work and Cancer

Excess risk for specific types of cancer (colon, male breast, and endocrine glands) may be linked to certain occupations and occupational exposures. For example, a higher risk of bladder cancer, kidney cancer, and non-Hodgkin's lymphoma may exist for professional drivers (Forastiere et al., 1994). Scientific evidence suggests an association between night work and development of breast cancer. The International Agency for Research on Cancer has classified shiftwork as a probable human carcinogen with most of the research focused on breast cancer (IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, International Agency for Research on Cancer, & World Health Organization, 2010). There is limited and inconsistent evidence related to other forms of cancer and all cancers combined (Wang, Armstrong, Cairns, Key, & Travis, 2011).

Scientific literature also suggests that there is a possibility that stress may influence the risk for certain types of cancer. In Buffalo police officers, increased risk of digestive cancer and cancer of the lymphatic and blood forming tissues was identified with 10–19 years of service. Officers with this length of service had been previously identified to have the highest stress scores among Buffalo police officers. At the time of the cancer mortality study, Buffalo police officers also worked a difficult schedule requiring two of the three shifts of officers to work 16 hours within a 24-hour period or "doubling back" (Vena, Violanti, Marshall, & Fiedler, 1986; Violanti, 1983).

Various cancers were represented in a 40-year mortality study of male police officers in Buffalo. The results showed higher than expected rates for all malignant cancers in officers with 1–9 years of service, for bladder cancer and leukemia in officers with 10–19 years of service, and colon cancer in officers with over 30 years of service (Violanti, Vena, & Petralia, 1998).

Records for Buffalo police officers who worked between 1950 and 2005 were matched with cancer registry records. Among white male officers, 18.2% developed cancer between 1976 and 2006. Their overall cancer risk was similar to that of the U.S. white male population, but an elevated risk of Hodgkin's lymphoma was observed. The risk of brain cancer was slightly elevated and was significantly increased for officers with 30 or more years of police service (Gu, Charles, Burchfiel, Andrew, & Violanti, 2011).

Shift Work and Cortisol

Cortisol is a well-known "stress hormone" and an abnormal pattern of secretion has been associated with immune system dysregulation and may serve as an early sign of disease. The association of short-term shift work duration with awakening cortisol response was studied among Buffalo police officers using cortisol extracted from saliva samples. Short-term duration

was characterized as 3-, 5-, 7-, or 14-day exposures determined from the work history records. The cortisol awakening response pattern was constructed from samples collected on first awakening, and at 15-, 30-, and 45-minute intervals thereafter. Based on work during the previous two weeks, night and afternoon shift workers had a significantly diminished awakening salivary cortisol levels (dysregulation) compared with day shift workers (Wirth et al., 2011).

Associations of long-term shift work (6–8 years) with waking salivary cortisol concentration and patterns during the first hour following awakening were also studied among Buffalo police officers. Long-term night shift work was associated with decreased average level and total volume of cortisol released over the waking period compared to the afternoon and day shift. However, the pattern of cortisol secretion was similar across shift (Fekedulegn et al., 2012).

Lower levels of basal cortisol on awakening have been associated with greater symptoms of post-traumatic stress disorder (PTSD), a severe anxiety disorder. This finding has been extended to urban police officers (Neylan et al., 2005). Apart from traumatic incidents on the job that may contribute to the development of PSTD, exposure to routine occupational stress also appears to be a risk factor for psychological distress among police officers, as well as a strong predictor of post-traumatic stress symptoms (Liberman et al., 2002).

Shift Work and Suicide Ideation

In a 40-year study of mortality among male police officers in Buffalo, New York, a significantly higher than expected mortality rate was found for suicide (Violanti, Vena, & Petralia, 1998). To better understand the processes that lead to suicide among police officers, a study focused on the relationships between psychologically traumatic work experiences, the development of posttraumatic stress (PTSD) symptoms, and increased use of alcohol associated

with PTSD. Traumatic work experiences increased the risk of PTSD symptoms followed by an increase in the risk of excessive alcohol use and suicide ideation. A ten-fold increased risk for suicide ideation was observed among Buffalo police officers with PTSD and increased alcohol use (Violanti, 2004).

The stress of shift work has been associated with suicide ideation among Buffalo police officers. Suicide ideation was more prevalent among policewomen with increased depressive symptoms and an increasing percentage of hours worked on the day shift, and among policemen with higher PTSD symptoms and an increasing percentage of afternoon shift hours (Violanti et al., 2008). Of note are the differing psychological symptoms between women and men, that women generally work the day shift, and that the afternoon shift is generally the busiest shift which may explain the results for men.

A nationwide study on suicidal ideation and suicide attempts among Norwegian police officers found a low occurrence of suicide ideation and attempts and identified marital status, subjective health complaints, traits associated with severe personality disorders, anxiety, and depression as independent predictors of serious suicidal ideation. Interestingly, female officers attributed personal problems as a greater influence on suicide ideation, while male officers attributed work problems as a greater influence on suicide ideation and attempts (Berg, Hem, Lau, Loeb, & Ekeberg, 2003).

Putting the occurrence of workplace suicide mortality into perspective, a study compared workplace injury deaths among U.S. law enforcement officers between 1992 and 2002. There were 2,280 fatalities over the period of which 122 (5%) were workplace suicides (Tiesman, Hendricks, Bell, & Amandus, 2010). Although suicide was a small percentage of all workplace

mortality, it represented a large number of opportunities to intervene with police officers who were having serious difficulties.

Shift Work among an Aging Workforce

Economic and demographic changes have created a general push toward increasing the legal retirement age. Two groups of German police officers participated in a study of the potential health and safety consequences that could be associated with later retirements. Data from one group were collected by questionnaire and data for the second group were collected from employment records. These sources were used to assess the "effects of lifetime exposure to shift work on health impairments and fitness for duty." Results indicated an increase in the risk of reduced fitness for duty as the number of years in shift work increased, in both groups. Health impairments increased rapidly beyond 20 years of shift work exposure (Wirtz & Nachreiner, 2012, p. 596).

It is important to understand how aging affects police officers' ability to tolerate shift work because changes in the workforce are resulting in an increasing number of shift workers over age 45. In a study of police officers in three age groups (20–32.9, 33–39.9, and 40 and above), "better attitudes towards their shift work, better adjustment to night-bound shifts, greater job satisfaction and organizational commitment, lower fatigue and longer sleep durations" were found among younger officers, while older officers reported "higher morningness and lower sleep" as compared to younger officers. Older officers also had greater caffeine intake on all shifts (Smith & Mason, 2001a, p. 312).

Reducing the Health Consequences of Shift Work

Shift work is a challenge that cannot be eliminated and must instead be dealt with through individual and organizational responses to lessen its effect on workers. Because shift

work is ever-present in policing, use of coping strategies is needed to tolerate the demands of shift work and offset its toll. For example, individuals can work to practice healthy sleep habits, such as maintaining a regular sleep schedule, eliminating noise and light from their sleeping area, avoiding caffeine close to bedtime, and avoiding alcohol as it can disturb sleep (National Sleep Foundation, 2011). To help ensure adequate family and social interaction, family and social gatherings could be scheduled to best accommodate the work-sleep schedule. A structured diary could be completed for a period of two or more shift cycles, including officer responses to questions regarding patterns and disturbances in sleep duration, sleep quality, food intake, appetite, health complaints, recovery, and family issues. This could be used to increase individual awareness of the daily impact of shift work or it could be part of an overall organizational assessment, where permanent day shift officers could also complete the diary and serve as a comparison group (Attia, Mustafa, Khogali, Mahmoud, & Arar, 1985).

Institutions and industries can implement organizational changes such as rotating shifts to periodically give workers the opportunity to work more desirable shifts. With the physiologic challenges associated with traditional night or rotating shifts and also with extended shifts and nonstandard hours, comprehensive fatigue management programs may be of benefit to police officers and organizations. These programs may include education, screening for sleep disorders, and interventions to lessen negative consequences associated with shift work (Barger, Lockley, Rajaratnam, & Landrigan, 2009).

Information was gathered using a group of methods to help develop interventions to reduce CVD and its risk factors in the Milwaukee Police Department. These methods included a health promotion planning model, survey data, and focus group data. Barriers and motivators to a healthy lifestyle emerged from the focus groups with police officers. Survey results were

compared between police officers and the general population as a benchmark for overweight and hypertension (Ramey, Downing, & Knoblauch, 2008). These methods could be adapted to explore problems associated with shift work.

Police officers with differing lengths of shift work exposure were studied to examine whether patterns in complaints change with increasing length of exposure. After 15 years of shift work exposure, health complaints associated with disruptions of circadian-controlled functions tended to be more dominant. This may suggest that shift-specific health impairment may be distinct from other non-shift-specific health issues (Nachreiner, Lubeck-Ploger, & Grzech-Sukalo, 1995). This distinction could be important in designing support programs for shift-working officers.

The type of shift could also be considered including fixed (permanent) shifts; rotating shifts, such as forward-rotating (day to afternoon then to night) and backward-rotating shifts (night to afternoon then to day); as well as the speed of rotation (slow or fast). These different types of rotation may be associated with different health effects. For example, the impact of rotation and timing of shifts on military police was studied to identify promising methods to lessen the negative consequences of shift work. The worker's shift could be predicted based on "work-home conflict, job attitudes, health, and absenteeism." In this case, rotation was related to unfavorable job attitudes and timing was related to increased work-home conflict. Avoiding fixed non-day shifts including weekends was suggested to reduce conflict between work and home as was a high degree of flexibility in rotation rosters (Demerouti, Geurts, Bakker, & Euwema, 2004, p. 987).

Police departments may also choose to change from rotating to permanent shift assignments. This change was made in the Lexington, Kentucky Police Department in 1989.

Following the change, sleep quality and sleep hygiene improved. Psychological well-being improved and absenteeism dropped from 1,400 hours in the six months prior to the change to 883 hours during the 6 months following the change (Phillips, Magan, Gerhardstein, & Cecil, 1991).

Understanding individual differences may also be important to helping police officers tolerate the demands of shift work. For example, as shift work may influence worker health in many ways, further effects may be observed in workers who have health conditions or require use of prescription medications. Alterations that shift work may have upon how the body and brain process medications may be critical to the well-being of these workers and require specific medical attention (Garbarino et al., 2002).

Personality characteristics may also influence how well workers tolerate shift work. Locus of control, or the extent to which individuals believe that they can control events that affect them, has been used to examine the relationship between internal locus of control and commonly reported outcomes of shift work such as "sleep disturbance, alertness on shift, psychological well-being, disturbance of social and family life, and fatigue." Higher internal locus of control was associated with fewer problems with shift work. This concept may be useful to consider in targeting interventions (Smith & Mason, 2001b, p. 217). Other personality traits that may be important to consider in the tolerance of shift work are "anxiety, emotional control, positive and negative affect, health complaints, sleep quality, difficulties in social and domestic life, and perceptions about shift work." Results suggest that tolerance of shift work, including shift and rotation, varies by personality traits and understanding these may be useful in matching workers to appropriate shifts (Tamagawa, Lobb, & Booth, 2007, p. 635).

While we may often think of shift work as a fairly simple concept to understand, existing results demonstrate that it is an exposure with complex implications, particularly for the large proportion of police officers who serve the public outside of daytime hours. Although shift work cannot be eliminated, diligent individual and organizational efforts may reduce its impact on morbidity, mortality, injury, and disability among police officers. Police officers and the services they provide are clearly tremendous assets in our communities. Additional investment in the promotion of police officer health and safety related to the challenge of shift work would not only provide a direct benefit for officers and law enforcement organizations, but it would also spillover in both subtle and important ways into our daily lives.

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