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Health Disparities in Police Officers: Comparisons to the U.S. General Population

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Abstract

Police officers have one of the poorest cardiovascular disease (CVD) health profiles of any occupation. The goal of this study was to determine if police officers in the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study (between 2004 and 2009) had a more adverse CV profile than the general U.S. employed population. Nearly one-half (46.9%) of the officers worked a non-day shift compared to 9% of U.S. workers. The percent of officers with depression was nearly double (12.0% vs. 6.8%) and officers were nearly four times more likely to sleep less than six hours in a 24-hour period than the general population (33.0% vs. 8.0%). A higher percentage of officers were obese (40.5% vs. 32.1%), had the metabolic syndrome (26.7% vs. 18.7%), and had higher mean serum total cholesterol levels (200.8 mg/dL vs. 193.2 mg/dL) than the comparison employed populations. In addition to having higher levels of traditional CVD risk factors, police officers had higher levels of non-traditional CVD risk factors. These findings highlight the need for expanding the definition of a health disparity to include occupation. Future studies should expand this comparison to additional traditional and non-traditional CVD risk factors and to other occupational groups.

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Keywords

law enforcement; cardiovascular disease; risk factors; health disparity; epidemiology

In the United States, cardiovascular disease (CVD) mortality declined considerably (by 65%) from 1968 to 2006, yet heart disease remains the leading cause of death for adults (National Heart, Lung, and Blood Institute [NHLBI], 2009). Consistent with this, the prevalence of key CVD risk factors (e.g. obesity, high blood pressure, high cholesterol, and diabetes) have also decreased over time but in more recent years these trends have leveled off or actually reversed (Gregg et al., 2005). These recent trends can have important implications for the workplace, as heart disease is the third leading activity-limiting chronic condition behind arthritis and back and neck conditions (NHLBI, 2009).

Policing is an occupation that requires unpredictable and stressful bursts of intense and strenuous physical activity, placing high demand on the cardiovascular system (Kales, Tsismenakis, Zhang & Soteriades, 2009). In an earlier study, Vena and colleagues (1986) found that white male police officers died on average seven years earlier than the general U.S. white male population (Arias, 2010). This finding led to numerous subsequent studies to identify specific risk factors and conditions for this disparity. Police officers exhibit some of the poorest CVD health profiles of any occupation, including higher rates of CVD risk factors (Franke, Ramey & Shelley, 2002; Ramey, Downing, & Franke, 2009; Hartley et al., 2011; Ramey, Perkhounkova, Downing & Culp, 2011; Wright, Barbosa-Leiker, & Hoekstra, 2011), overt CVD (Franke et al., 2002; Ramey et al., 2009), and on-duty CVD events (Kales et al., 2009).

Compounding this issue is the well-known fact that police officers experience high levels of job-related stress, frequently attributed to shift work, the potential for witnessing or experiencing violent events, and organizational pressure (Chen et al., 2006; Franke et al. 2002; Gershon, Lin & Li, 2002; Kales et al., 2009). The effects of job stress are well studied and include increased levels of psychological disorders such as anxiety, depression, and post-traumatic stress disorder (Gershon et al., 2002), and physiological conditions including hypertension (Franke et al., 2002; Ramey, 2003), and CVD (Backe, Seidler, Latza, Rossnagel & Schumann, 2011).

A health disparity is a “chain of events signified by a difference in environment, access to, utilization of, and quality of care, health status or a particular health outcome that deserves scrutiny” (Carter-Pokras & Baquet, 2002, p. 427). Health disparities are generally thought of as existing in differing groups, such as racial/ethnic groups, between men and women, or within social classes. However, health disparities may also exist in groups that are strongly influenced by the context of their occupation. This paper compares data on health disparities between participants in an epidemiologic study of police officers from a large Northeastern city with similar estimates from large epidemiologic population-based studies of primarily U.S. employed adults. The goal of this analysis is to determine if this cohort of police officers has a more adverse cardiovascular profile than the general U.S. employed population.

METHOD

Study Population

Data for the police officers came from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study conducted between 2004 and 2009. The overall objective of this cross-sectional study was to examine the association between psychological stress and subclinical CVD among 464 police officers. Each reported value for the variables of interest are taken or derived from findings in published manuscripts from the BCOPS Study (Hartley et al., 2011; Ma et al., 2011; Hartley et al., 2012; Slaven et al., 2012). All four studies excluded from the analyses 33 retired police officers who participated in the BCOPS Study.

Values for each of the variables of interest were obtained from peer-reviewed publications or from data available in U.S. Government reports or Web sites. Data for the general population estimates are primarily from large epidemiological studies of U.S. adults, including the U.S. Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES) and the National Health Interview Survey (NHIS), the U.S. Bureau for Labor Statistics' Current Population Survey (CPS), and the Multi-Ethnic Study of Atherosclerosis (MESA). For most of these study populations it was possible to restrict the comparison to employed adults (McMenamin, 2007; Davila et al., 2010; U.S. Bureau for Labor Statistics, 2011; Fujishiro et al., 2011). The estimates for depression and glucose intolerance are from U.S. adult populations not restricted by employment status (Ervin, 2009; U.S. Centers for Disease Control and Prevention, 2011). Table 1 describes these comparison studies and study populations by variable of interest.

Study Measures

Demographics—Sex and ethnicity were obtained from a self-reported demographics questionnaire for the BCOPS Study (Hartley et al., 2011) and from the 2010 U.S. Bureau for Labor Statistics Current Population Survey for the general U.S. employed population (U.S. Census Bureau, 2006). The percent of women in each study is reported with the corresponding variable of interest. The mean age of the participants in each study is also reported. Fujishiro and colleagues (2011) reported the mean age using data from employed participants in the MESA Study. For the remaining studies, age was reported by categories and the mean age for these studies was calculated using a weighted average. An upper age limit of 85 was assumed for data from the NHIS and NHANES except for Ervin (2009) where 59 was the upper limit. The upper age limit of 75 was assumed for data from the Current Population Survey.

Shift Type—For the BCOPS Study participants, daily payroll records were obtained from 1994 to date of examination (between 2004 and 2009) and used to calculate the shift most frequently worked (day, afternoon, midnight). A detailed description of the methods used to determine the most frequently worked shift has been reported (Ma et al., 2011). Shift type was determined for the employed comparison population using questions from the 2004 U.S. Bureau for Labor Statistics' Current Population Survey (McMenamin, 2007) as this was the most recent year available.

Psychosocial Measures—Depressive symptoms were measured in the BCOPS Study using the Center for Epidemiologic Sudies--Depression (CES-D) Scale. Details of the CES-D are reported (Radloff, 1977, Slaven, et al., 2012). For this study, a cutoff score of 16 or higher was used to identify officers with depression (Radloff, 1977). For the comparison population, depressive symptoms were measured using the Patient Health Question-naire-9 (PHQ-9) (CDC, 2011) and for this study a cutoff score of 10 or greater was used to identify participants with depression (Kroenke, Spitzer, & Williams, 2001).

Lifestyle Behaviors—For both groups, smoking status was derived from self-reported questionnaires and participants were classified as never smokers, former smokers, or current smokers. Hours of sleep was defined for the BCOPS Study participants using the Pittsburgh Sleep Quality Index (PSQI) question “During the past month, how many hours of actual sleep did you get at night?” (Slaven et al., 2012). For the comparison population, participants responded to the question “On average, how many hours of sleep do you get in a 24-hour period?” (Luckhaupt, Tak, & Calvert, 2010).

Cardiometabolic Risk Factors—Cardiometabolic risk factors (i.e. body mass index, total serum cholesterol, blood pressure, glucose intolerance, metabolic syndrome, common carotid intima media thickness) were obtained using the same procedures for the BCOPS Study participants (Hartley et al., 2011; Hartley et al., 2012) and the comparison participants (Ervin, 2009; Davila et al., 2010; Fujishiro et al., 2011). Body mass index (BMI) was used to define the percent of participants who were overweight or obese; a BMI between 25 and 29.9 kg/ m2 is considered overweight and a BMI of 30 kg/m2 or greater is considered obese. Total serum cholesterol levels (mg/dL) were obtained from a 12-hour fasting blood sample. Resting systolic blood pressure was measured three times with a standard sphygmomanometer and reported values are the average of the second and third readings. Glucose intolerance was defined as a fasting serum glucose level of 100 mg/dL or greater, or self-reported diabetes and taking hypoglycemic medication.

The metabolic syndrome (MetSyn) was defined using the modified version of the 2001 Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Grundy et al., 2005). MetSyn was considered present in individuals with 3 or more of the following components: hypertension, reduced high density lipoprotein cholesterol, abdominal obesity, glucose intolerance or hypertriglyceridemia.

Common carotid intima media thickness (IMT) measurements were obtained via ultrasound scans using standardized protocols. Details of the scan have been previously reported (Fujishiro et al., 2011; Hartley et al., 2011). Briefly, standardized longitudinal images were acquired of the near and far walls of the distal 10 mm portion of the common carotid artery (CCA) on both the right and left sides.

RESULTS

The comparison between the BCOPS Study participants and the general U.S. employed population can be found in Table 2. In general, just over 25% of the BCOPS Study

participants were women (range 25.9% - 28.6%) compared to nearly 50% of the comparison study participants (range 42.4% - 50.6%). The mean age for the BCOPS Study participants across the studies was approximately 41 years (range 40.7 – 41.5). There was considerable variation in the mean age for the comparison study participants. The weighted mean age ranged from 39.5 years for the 2003 – 2006 NHANES population to 56.4 years for the employed participants of the MESA Study.

Focusing on the specific variables of interest, slightly more than one-quarter of the BCOPS Study participants were women compared to 42% of U.S. workers. Twenty percent of the officers were black compared to only 11% of U.S. workers; only 1.8% of officers were Hispanic compared to 14.3% of U.S. workers. Nearly one-half (46.9%) of the police officers worked a non-day shift compared to 9% of U.S. workers. The percent of officers with depression (police officers: CES-D ≥ 16; comparison group: PHQ-9 ≥ 10) was nearly double that of the general population (12.0% vs. 6.8%).

A slightly higher percent of officers were current smokers compared to the employed population (16.7% vs. 13.6%). Police officers were four times more likely to sleep less than six hours in a 24-hour period than the employed population (33.0% vs. 8.0%). The percentage of officers who were overweight was similar to the employed population (41.5% vs. 40.0%); the percent obese was higher for the officers compared to the employed population (40.5% vs. 32.1%).

Mean serum total cholesterol levels were slightly higher for officers compared to the employed population (200.8 mg/ dL vs. 193.2 mg/dL), while systolic blood pressure levels were similar for both groups (120.9 mm Hg, 121.6 mm Hg, respectively). The percent of police officers who were glucose intolerant was lower than the general population (23.6% vs. 32.4%). However, nearly 27% of police officers had MetSyn, which includes glucose intolerance and hypertension, compared to 18.7% of the employed population. The mean common carotid intima media thickness for the police officers was 0.62 mm compared to 0.82 mm for the employed population.

CONCLUSIONS

In the current study we compared levels of traditional and non-traditional CVD risk factors between participants in the BCOPS Study with estimates from the general U.S. employed population. Nearly three-quarters of the police officers were men compared to about 58% of U.S. workers. This discrepancy was consistent throughout each of the comparisons of the variables of interest. Policing is a male dominated occupation where women account for just over 10% of all sworn law enforcement personnel in the U.S. (National Center for Women and Policing, 2002). Ethnicity also varied between the two groups. Just over 20% of police officers were black compared to 11% of all U.S. workers. There were a very small percentage of Hispanic police officers compared to 14% of U.S. workers.

Nearly half of the police officers worked a non-day shift compared to less than 10% of the U.S. workforce. Policing is a 24-hour occupation and shift work is a necessity. However, night shift work can have considerable consequences on health and safety. Shift work has

been associated with CVD, obesity, MetSyn, diabetes, and mood and anxiety disorders, most likely as a result of circadian rhythm disruption (Shift work and sleep, 2011).

One-third of police officers reported sleeping less than six hours in a 24-hour period; this finding was four times higher than employed workers completing the National Health Interview Survey. Sleep loss can be a consequence of shift work, and has been associated with higher levels of perceived stress in male police officers and among those with higher police ranks and greater workloads (Charles et al., 2012). Chronic sleep loss can lead to excessive fatigue and impaired alertness. These outcomes can have immediate consequences for police officers as the nature of their job requires them to function in a hypervigilant state (Shift work and sleep, 2011).

The prevalence of depression was nearly twice as high for the police officers as the general population. This finding is somewhat surprising given that the comparison study sample was not restricted to employed adults, included a higher percentage of women, and possibly included a higher percentage of persons who have chronic medical conditions and those who are unemployed. Depression is known to be higher among women, those with chronic medical conditions, and those who are unemployed (Marcotte, Wilcox-Gok, & Redmon, 1999; National Institute of Mental Health; U.S. Department of Health and Human Services, 1999). However, age is also a significant risk factor for depression. According to the National Health Statistics Report (Pratt & Brody, 2008), persons between 40–59 years of age have the highest prevalence of depression compared to teens, young adults, and older adults. Roughly 60% of the BCOPS Study participants fall into this working age category (Hartley et al., 2011). Workers in this age category may also be providing child care and/or elder care in addition to their responsibilities as a police officer. And as previously indicated, policing itself is considered to be a high stress occupation (Gershon et al., 2002) and job strain and low social support at work have been significantly associated with major depressive disorder (MDD; Blackmore et al., 2007).

With regard to the cardio-metabolic risk factors, police officers had a similar percentage of participants who were overweight (BMI 25–30 kg/m2), similar levels of systolic blood pressure, and lower levels of glucose intolerance compared to the respective comparison population. Yet the prevalence of MetSyn, which includes these three risk factors in addition to hypertriglyceridemia and reduced HDL-C, was approximately 8% higher for police officers than workers in the comparison study. The MetSyn component hypertension includes three items: systolic blood pressure ≥ 130 mm Hg, diastolic blood pressure ≥ 85 mm Hg, and antihypertensive treatment. Relying solely on systolic blood pressure levels may represent an underestimation of hypertension as successful treatment for hypertension should reduce levels of systolic blood pressure. As we have reported, the MetSyn component hypertension is high among these police officers with 39% meeting at least one of the three component criteria (Hartley et al., 2011; Hartley et al., 2012).

The percentage of officers currently smoking was 3.1% higher at 16.7%, obesity was 8.4% higher at 40.5%, and the serum total cholesterol levels were approximately 7.6 mg/ dL higher at 200.8 mg/dL, than the employed MESA Study participants. These values for the police officers fall well short of the U.S. Healthy People 2010 recommendations: reduction

in mean total blood cholesterol to 199 mg/dL, smoking to 12% of the population, and obesity to 15% of the population (U.S. Department of Health and Human Services, 2000). The higher values are not entirely attributable to age as the mean age of the police officers is notably 15 years younger than the employed comparison study participants. This makes these differences more striking given that obesity and total cholesterol typically increase from young adulthood to retirement age (Mizuno, Shu, Makimura & Mobbs, 2004; National Center for Health Statistics, 2009) and are often higher in women than in men regardless of ethnicity or educational level (Mensah, Mokdad, Ford, Greenlund & Croft, 2005; Wang & Beydoun, 2007). One possible explanation for these differences is that police officers spend a considerable amount of on-duty time being relatively inactive (Kales et al., 2009) and physical inactivity is a risk factor for both obesity and hypercholesterolemia (Pate et al., 1995).

Common carotid IMT values were much lower for police officers compared to the employed MESA Study participants. This finding is somewhat surprising given the difference in the percentage of women between the BCOPS Study and the MESA Study participants (25.9% vs. 46.9%, respectively). Women typically have lower carotid IMT than men (Howard et al., 1993; Hartley et al., 2011). However, the BCOPS Study participants were about 15 years younger than the MESA Study participants which may explain most of the difference between the two groups; carotid IMT increases at approximately 0.01 mm per year (Howard et al., 1993).

Previous studies have found police officers to have higher rates of CVD risk factors and CVD morbidity than other groups (Franke et al., 2002; Ramey et al., 2009; Ramey et al., 2011). In the current study, we compared police officers with reported results from studies including mostly employed adults. Our findings are consistent with those previously reported: a higher percentage of police officers were obese and had the MetSyn. In addition to these more traditional CVD risk factors, we found a higher prevalence of depression, and a higher percentage of police officers who work a non-day shift and sleep less than six hours a night compared to other employed adults. Previous research has reported that police officers are a known high stress occupational group (Collins & Gibbs, 2003) and that the stress associated with policing may predispose officers to higher rates of CVD morbidity and mortality (Franke, Collins & Hinz, 1998). Importantly, stress initiates an inflammatory process that may attribute to the CVD observed in 40% of atherosclerotic patients who lack traditional CVD risk factors (Black & Garbutt, 2002). This pathway may be supported by the findings in the current study.

This study has several noteworthy limitations. First, variables were selected based on their availability in published findings. Information on other key demographic variables, lifestyle variables, and CVD risk factors would be beneficial in providing a more comprehensive understanding of the health disparities of police officers. Second, there may be key differences in the demographic profile of the BCOPS Study participants and each of the comparison groups. The comparison groups were carefully selected based on the following criteria: 1) publication of findings in the scientific literature, 2) studies were conducted in the United States, 3) study participants were adults (≥ 18 or ≥ 20, depending upon the individual study), and 4) study participants were employed. Percentage of women and mean

age (actual or calculated from weighted averages) were reported and, where appropriate, were considered as a potential explanation for differences between the two groups. Third, CVD risk factors may differ by demographic characteristics. For example, in our previous findings, male police officers were found to have a higher prevalence of MetSyn than female police officers (Hartley et al., 2011). Yet, in the current study we were not able to stratify the analyses by key demographic characteristics, such as sex and age. Finally, several of the variables used in the comparison were derived from different measures. For example, the prevalence of depression is based on the Center for Epidemiologic Studies – Depression Scale (CES-D) for the BCOPS Study participants and from the Patient Health Questionnaire-9 (PHQ-9) for the comparison group, which may represent one potential explanation for the difference found between the two groups, although the level of agreement between the two measures has been addressed by others (Dbouk, Arguedas, & Sheikh, 2008; Milette, Hudon, Baron, Thombs & Canadian Scleroderma Research Group, 2010).

Strengths of this study include the use of clinical measurements versus self-report. Previous studies comparing police officers with the general population have relied upon self-report measures of hypertension, hypercholesterolemia and diabetes (Ramey, Downing & Knoblauch, 2008). In the current study, all six of the cardio-metabolic risk factors were obtained via standardized anthropometric and clinical protocols for both the BCOPS Study participants and the respective comparison groups, thus eliminating concerns about reporting bias.

In the current study we found that police officers have higher levels of traditional and non-traditional CVD risk factors than other employed adults. To our knowledge this is the first comparison of key CVD risk factors between a sample of police officers and the general U.S. employed population. Our findings highlight the need for expanding the scope of demographic characteristics that define a health disparity to include occupation, as this factor can contribute significantly to an individual's overall health and well-being. Future studies should reexamine this comparison with additional traditional and non-traditional CVD risk factors and should be expanded to other occupational groups.

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Table 1

Origin of general population estimates for key comparison characteristics

Variable	Reference Study	Study Population
Demographics and Workplace		
Sex	U.S. Current Population Survey (CPS), 2010	Full-time employed persons age ≥20
Race/Ethnicity	U.S. CPS, 2010	Full-time employed persons age ≥20
Shift Work	U.S. CPS Supplement, 2004	All employed persons age ≥20
Psychosocial Measures		
Depression	National Health and Nutrition Examination Survey (NHANES), 2005–2008	Adults age ≥18
Lifestyle Behaviors		
Smoking Status	Multi-Ethnic Study of Atherosclerosis (MESA), 2000–2002	2,801 employed adults age 45–84
Hours of Sleep	National Health Interview Survey, 2004–2007	66,099 employed adults age ≥18
Cardio-Metabolic Risk Factors		
Body Mass Index	MESA, 2000–2002	2,801 employed adults age 45–84
Serum Cholesterol Levels	MESA, 2000–2002	2,801 employed adults age 45–84
Hypertension	MESA, 2000–2002	2,801 employed adults age 45–84
Glucose Intolerance	NHANES, 2003–2006	3,423 adults age ≥20
Metabolic Syndrome	NHANES, 1999–2004	8,457 employed adults age ≥20
Caritud Untima Media Thickness	MESA, 2000–2002	2801 employed adults age 45–84

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Table 2

Health disparities between BCOPS Study participants compared to the general U.S. employed population estimates.*

Variable	BCOPS			General Employed Population Estimate		
	N or %	Mean Age	% Women	N or %	Mean Age	% Women
Demographics and Workplace Characteristics						
Men, %	73.8[a]	41.5	-	57.6[b]	43.1	-
Women, %	26.2[a]	41.5	-	42.4[b]	43.1	-
White, %	76.7[a]	41.5	26.2	81.4[b]	43.1	42.4
Black, %	20.3[a]	41.5	26.2	11.2[b]	43.1	42.4
Hispanic**, %	1.8[a]	41.5	26.2	14.3[b]	43.1	42.4
Day Shift, %	53.1[c]	41.2	28.6	84.0[d]	40.5	48.2
Afternoon Shift, %	26.3[c]	41.2	28.6	3.1[d]	40.5	48.2
Night Shift, %	20.6[c]	41.2	28.6	5.6[d]	40.5	48.2
Psychosocial Measures						
Depression, %	12.0[e]	40.7	27.4	6.8[f]	48.3	50.6
Lifestyle Behaviors						
Current Smokers, %	16.7[a]	41.5	26.2	13.6[g]	56.4	46.9
Sleep < 6 hours/24 hour period, %	33.0[e]	40.7	27.4	8.0[h]	41.5	50.1
Cardio-metabolic Risk Factors						
Overweight (BMI 25–29.9 kg/m²), %	41.5[a]	41.5	26.2	40.0[g]	56.4	46.9
Obese (BMI ≥ 30 kg/m²), %	40.5[a]	41.5	26.2	32.1[g]	56.4	46.9
Total Cholesterol, mg/dL	200.8[i]	41.1	25.9	193.2[g]	56.4	46.9
Systolic Blood Pressure, mm Hg	120.9[i]	41.1	25.9	121.6[g]	56.4	46.9
Glucose Intolerance, %	23.6[a]	41.5	26.2	32.4[j]	39.5	47.6
Metabolic Syndrome, %	26.7[a]	41.5	26.2	18.7[k]	41.0	46.5
Carotid Intima Media Thickness, mm	0.62[i]	41.1	25.9	0.82[g]	56.4	46.9

Data Sources.

a: Hartley, 2012;

b: U.S. Bureau of Labor Statistics Household Data;

c: Ma, 2011;

d: McMenamin, 2007;

e: Slaven, 2012;

f: MMWR, 2011;

g: Fujishiro, 2011;

h: Luckhaupt, 2010;

i: Hartley, 2011;

j: Ervin, 2009;

k: Davila, 2010

* The study populations for depression and glucose intolerance were not restricted by employed status.

** Hispanic race or ethnicity. In BCOPS, Hispanic was collected as “Race”. In BLS, Hispanic was collected as “Ethnicity”. A person could then list “Race” as “White” and also list “Ethnicity” as “Hispanic”. As a result, the BLS percentages will not sum to 100 like those for BCOPS.