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Blood Pressure Control and Perceived Stress, Job Satisfaction, Life Satisfaction, and Perceived Health Status in Municipal Workers

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BLOOD PRESSURE CONTROL AND PERCEIVED STRESS, JOB SATISFACTION, LIFE SATISFACTION AND PERCEIVED HEALTH STATUS IN MUNICIPAL WORKERS

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ABSTRACT

Although hypertension is highly prevalent, associated with serious health consequences and treatable, fewer than half of those with hypertension have achieved blood pressure control (Centers for Disease Control and Prevention [CDC], 2011b). Limited studies have examined the influence of perceived stress, job satisfaction, life satisfaction, and perceived health status may have on blood pressure control, although epidemiological evidence reveals psychological factors can mediate and negatively influence health behavior leading to hypertension (Blanchflower & Oswald, 2008; Kulkarni, Farrel, Erasi, & Kochar, 1998; Walcott-McQuigg, 2000).

The purpose of this study was to explore the prevalence of hypertension, obesity, and blood pressure control and examine the influence of perceived stress, job satisfaction, life satisfaction, perceived health status, department, type of shift worked and personal factors (gender, race, age, obesity, abdominal adiposity, tobacco use, salt intake, and physical activity) on blood pressure control among 3,501 municipal workers in a large city in the southeastern U.S.

A secondary analysis of cross-sectional data collected during the municipality's 2010-2011 regularly scheduled wellness program was used to achieve the aims of the study. Associations were examined using multinomial logistic regression. Sixty-eight percent of the 1,577 workers with hypertension were obese. Furthermore, in females with hypertension, abdominal adiposity was particularly prevalent ($n = 350$, 83.7%). Using a backwards selection model of logistic regression and a p-to-stay criteria of 0.1, principal predictors of blood pressure control in this study were age ($p < .001$), gender ($p = < .001$), perceived stress ($p = .061$), tobacco abstinence ($p = .008$), and department ($p < .001$). Individuals with uncontrolled blood pressure reported the lowest levels of stress, a key finding which may suggest that the impact of perceived stress on blood pressure control could be mediated by individual differences in reactions to stress. Additionally, workers with high levels of perceived health had fewer maladaptive health behaviors such as eating salty foods every day, using tobacco, and infrequent physical activity. Further studies are needed to explore relationships among stress, age, gender, and tobacco use, and the control of hypertension in other occupational groups.

Keywords: Blood pressure control, perceived stress, perceived health

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CHAPTER 1

INTRODUCTION

Hypertension is a significant global public health challenge. Because it is highly prevalent and associated with grave complications, effective management of hypertension is needed to reduce morbidity and mortality from development of associated cardiovascular, cerebrovascular, and renal diseases. Therefore, adequate control of blood pressure is of enormous public health importance (Chen et al., 2010, Chobanian et al., 2003; Psaty et al., 2003).

Although hypertension is highly prevalent and treatable, fewer than half of those with hypertension have achieved blood pressure control (Centers for Disease Control and Prevention [CDC], 2011b). Increasing the proportion of hypertensive individuals with controlled blood pressure will reduce the serious consequences of this condition, therefore, blood pressure control among hypertensive adults in the U. S. population is of vital importance. The Center for Disease Control and Prevention (CDC) has a specific objective (Heart Disease and Stroke Objective 12) in *Healthy People 2020* to increase the proportion of hypertensive adults with controlled blood pressure from a baseline of 43.7 percent to 61.2 percent (U.S. Department of Health and Human Services, 2011b). While the specific objectives of *Healthy People 2020* provide a scorecard for blood pressure control outcomes, certain factors contributing to an individual's failure to achieve control of high blood pressure have not been fully explored.

Statement of the Problem

Hypertension, defined as blood pressure of 140/90 or more, a medical diagnosis of high blood pressure, or the use of drugs to lower blood pressure, is the most common primary diagnosis in the U. S., and affects approximately 73 million Americans or nearly one in three adults (Chobanian et al., 2003; Institute of Medicine of the National Academies [IOM], 2010; Kaplan, Huguet, Feeny, & McFarland, 2010; National Heart, Lung, and Blood Institute [NHLBI], 2011; Yancy, 2010). According to the Medical Expenditure Panel Survey, the estimated direct cost of high blood pressure in the U. S. for 2009, the most recent year available, was $47.5 billion (Davis, 2012). Only about 48 percent of those with hypertension in this country have adequate blood pressure control (CDC, 2011b). Therefore, the magnitude of this problem is quite large.

Two of the strongest risk factors for uncontrolled blood pressure are older age and obesity (Calhoun et al., 2008; Niskanen et al., 2004). Obesity has also been linked to obstructive sleep apnea, which has been identified as a cause of hypertension (Chobanian et al., 2003). Abdominal adiposity, in particular, has been cited as an important factor in lack of blood pressure control (Niskanen et al., 2004). Other risk factors include race, gender, stress, and shift work (Calhoun et al., 2008; Light, Turner, & Hinderliter, 1992; Yang, Schnall, Lauregui, Su, & Baker, 2006). Epidemiological studies linking shift work to the risk for hypertension are few, old, and of questionable quality (Sfreddo, Fuchs, Merlo, & Fuchs, 2010). Stress also has not been clearly linked to blood pressure control (Chaix et al., 2010). National gains in control rates have been modest in the last decade, suggesting a substantial missed opportunity for prevention of cardiovascular disease in this country (CDC, 2011b; Wang & Vasan, 2005).

Individuals lacking health insurance reportedly have lower rates of control than those with health insurance. Lack of health insurance has been linked to lower awareness, treatment, and control of hypertension (Nguyen, Waddell, Thomas, Huston, Kerker, & Gwynn, 2011). However, among individuals whose blood pressure is uncontrolled, more than 80 percent have private or public health insurance (CDC, 2011b). Even in the absence of financial barriers, efforts at blood pressure control continue to be characterized by poor outcomes.

Recognizing that health insurance alone does not guarantee blood pressure control, many employers have developed comprehensive health promotion and risk reduction programs at the worksite. The workplace is an important setting for health protection, health promotion, and disease prevention programs. On average, Americans working full-time spend more than one-third of their day, five days per week at work (CDC, 2012). Maintaining a healthier workforce can lower direct costs such as insurance premiums and workers' compensation claims, and indirect costs associated with presenteeism, absenteeism, and decreased worker productivity (CDC, 2012).

A leading cause of heart disease is hypertension, and emerging evidence clearly demonstrates prevention of heart disease must begin early in life. The Coronary Artery Risk Development in Young Adults (CARDIA) study indicated initial risk factor levels for the under-30 population were predictive of established subclinical atherosclerosis at 15 years follow-up, and those with risk factors above optimal levels were 2 to 3 fold more likely to have subclinical disease (Loria et al., 2007). Of note, individuals who reach middle age with optimal levels of all major risk factors including BP control, the remaining lifetime risk of developing CVD is only 6% to 8% (Lloyd-Jones et al., 2006).

Modest improvements in risk factors earlier in life can have a greater impact than more substantial reductions later in life (Heidenreich et al., 2011). In the workplace, there is an opportunity not only to promote individual health and foster a healthy work environment for more than 140 million workers in the United States, but to intervene early in the lives of young workers (Bureau of Labor Statistics [BLS], 2012).

Worksite health promotion programs often include annual health screenings, interventions, and other preventive services to reduce health risks and promote healthy lifestyles. Optimal screening programs are designed to identify risk factors for cardiovascular disease, cancer, preventable injury and occupational injury as a means to identify opportunities to improve employee health (Goetzel, & Ozminkowski, 2008).

Employers are seeking solutions to escalating health costs and explanations for why individuals with health insurance and access to health care have uncontrolled blood pressures. Epidemiological evidence widely supports the claim that psychological factors such as perceived stress, job satisfaction, life satisfaction, and perceived health status can mediate and negatively influence health behavior leading to hypertension (Blanchflower & Oswald, 2008; Kulkarni, Farrel, Erasi, & Kochar, 1998; Walcott-McQuigg, 2000). Few studies, however, have examined the role of perceived stress, job satisfaction, life satisfaction, and perceived health status in the development of uncontrolled blood pressure and as a result, these factors are incompletely understood in relation to blood pressure control (Hamer, Mollow, & Stamatakis, 2008). Given the significant influence of workers' health on their overall wellbeing and work productivity, it is important to understand what relationship perceived stress, job satisfaction, life satisfaction, and perceived health status have on blood pressure control. Opportunities for intervention exist if psychological factors which may place individuals with high blood pressure at risk for poor blood pressure control can be identified. Identifying whether these specific psychological factors are important in the control of hypertension might lead to improved treatment and targeted worksite interventions for workers with hypertension.

Purpose and Aims of the Study

The purpose of this study was to examine the influence of perceived stress, job satisfaction, life satisfaction, perceived health status, department, type of shift worked and personal factors (gender, race, age, obesity, abdominal adiposity, tobacco use, salt intake, and physical activity) on blood pressure control among municipal workers. The first aim of this study was to describe the prevalence of blood pressure control, obesity, and abdominal adiposity in a multiethnic population of municipal workers. The second aim was to examine the predictors of predictors of blood pressure control among municipal employees from the set of perceived stress, job satisfaction, life satisfaction, perceived health status, department, type of shift worked, and personal factors (gender, race, age, obesity, abdominal adiposity, tobacco use, salt intake, and physical activity). The third and final aim was to identify the best subset of predictors of blood pressure control among municipal employees for the set of perceived stress, job satisfaction, life satisfaction, perceived health status, personal factors (gender, race, age, obesity, abdominal adiposity, tobacco use, salt intake, and physical activity), type of shift worked, and department.

Research Questions

1. What is the prevalence of blood pressure control, obesity, and abdominal adiposity in municipal workers?
2. Is there a difference in BP control, perceived stress, job satisfaction, life satisfaction, and perceived health status among municipal employees working different shifts, controlling for age, obesity, tobacco use, salt intake, and physical activity?
3. Is there a difference in BP control, perceived stress, job satisfaction, life satisfaction, and perceived health status among municipal employees by department, controlling for age, obesity, and tobacco use?
4. What is the best model for BP control using perceived stress and personal factors (gender, race, age, obesity, abdominal adiposity, tobacco use, salt intake and physical activity) as explanatory variables?
5. Does the inclusion of job satisfaction and life satisfaction add to the predictive ability of the above model?
6. Does the inclusion of the type of shift worked improve the predictive ability of the model?
7. Does the inclusion of department improve the predictive ability of the model?
8. Does the inclusion of perceived health status add to the predictive ability of the above model?

Definition of Terms

Blood pressure control was defined as systolic blood pressure less than 140 mmHg and diastolic blood pressure less than 90 mmHg in an employee currently taking antihypertensive medicine as recorded on the health risk appraisal TeleForm ® instrument. Responses for systolic and diastolic BP were dichotomized into “elevated” or “not elevated” and combined into an overall BP variable of “elevated” or “not elevated” if either the systolic or diastolic BP readings were elevated. Having hypertension was defined as having: (1) a systolic blood pressure of 140 mmHg or greater, (2) a diastolic blood pressure of 90 mmHg or greater; (3) or taking antihypertensive medicine as recorded on the health risk appraisal TeleForm ® instrument. These individuals were dichotomized into two groups: (1) controlled BP; and (2) uncontrolled BP.

Perceived stress was the self-reported level of stress in the past two weeks as recorded on the health risk appraisal TeleForm®. Response categories of scoring were “a lot,” “moderate amount,” “relatively little,” or “almost none.”

Job satisfaction was the self-reported level of how satisfied the person was with his/her job. Respondents selected from the categories of “mostly satisfied,” “partially satisfied,” or “not satisfied.” Results were dichotomized into “mostly satisfied” and “partially or not satisfied.”

Life satisfaction was the self-reported level of how satisfied the person was with his/her life. Categories of responses were “mostly satisfied,” “partially satisfied,” or “not satisfied. Results were dichotomized into “mostly satisfied” and “partially or not satisfied.”

Perceived health status was the self-reported overall physical health. Respondents could select from four categories: (1) excellent; (2) good; (3) fair; or (4) poor. Results were recoded into: (1) excellent; (2) good; and (3) fair or poor.

Obesity was defined as body mass index of 30 or above. Body mass index provides a standardized definition of overweight and obesity for the purposes of national surveillance, and is defined as weight in kilograms divided by the square of the height in meters (kg/m^2) (World Health Organization [WHO], 2011). Computer software calculated BMI automatically by converting the screen weigh to kilograms (kg) and dividing by the height squared (converted to meters). Results for BMI were then converted into a dichotomous variable of "obese" and "not obese."

Abdominal adiposity was defined as a waist circumference of greater than 102 cm. (40.2 inches) in males and 88 cm. (34.6 inches) in females (National Cholesterol Education Program, 2002; National Institutes of Health [NIH], 1998). Results measured in inches and recorded on the health risk appraisal TeleForm® instrument were used for this study to report abdominal adiposity. Results were dichotomized to "abdominal adiposity present" and "abdominal adiposity not present."

Tobacco use was self-reported as never used tobacco, used to use tobacco, and currently use tobacco. Tobacco use included cigarettes, cigars, pipe tobacco, and smokeless tobacco (chewing tobacco, snuff, and pouches). For the purposes of this study, tobacco use was dichotomized into "currently using tobacco" and "not currently using tobacco."

Salt intake was self-reported as eating foods every day that are high in salt, such as fried foods, salty snacks, canned foods, prepackaged frozen dinners, processed luncheon meats, or salted nuts. Responses were dichotomized into "currently eating salty foods" every day and "not eating salty foods every day."

Physical activity was self-reported as the number of times per week that lively physical activity which lasts at least 20 minutes was performed. Lively physical activity was defined for the respondent as “exercise or work which lasts at least 20 minutes without stopping and which is hard enough to make you breathe heavier and your heart beat faster.” Responses were: (1) less than one time per week; (2) one or two times per week; (3) at least three times per week.

Gender was based on self-report with a dichotomous choice of male or female.

Race was self-reported as white, African American, Hispanic, Native American, Pacific Islander, Asian, other, or unknown. Because there were few non-white workers who designated their race as other-than-black, African American, Hispanic, Native American, Pacific Islander, Asian, other, and unknown were all placed in the category of “minority.”

Age was based on self-reported birth date, which was then converted into the nearest whole year of age.

Type of Shift Worked was a self-identified schedule of working time from response categories including: (1) day shift: 8:00 am-5:00 pm, 7:00 am-3:00 pm; (2) evening shift: 3:00 pm-11:00 pm; (3) night shift: 11:00 pm-7:00 am; (4) fire shift (24 hours at work and 48 hours off); (5) other. Shift work was recategorized as: (1) day shift; (2) evening shift; (3) night shift; (4) fire shift; (5) other.

Department was self-identified as: (1) police; (2) fire; (3); public works; (4); city hall.

Assumptions

For the purposes of this study, assumptions were as follows:

1) Blood pressure control is a complex phenomenon that consists of physiologic, behavioral, environmental, and psychosocial factors.

2) Individuals with hypertension can accurately report their health behaviors and perceptions of psychological factors.

Conceptual Model

The Expanded Biobehavioral Interaction Model (Appendix A) served as the conceptual framework for this study. Biobehavioral research explores links among psychosocial, behavioral, and biological factors in relation to health and health-related outcomes and can guide biobehavioral research (Greenberger, Yucha, Janson, & Huss, 2007; Kang, Rice, Park, Turner-Henson, & Downs, 2010). The Expanded Biobehavioral Interaction (EBI) model is an integrated biobehavioral model adapted from Selye's physiological model of stress, Lazarus and Folkman's Transactional Model of Stress and Coping, and the McEwen Stress, Allostasis, and Allostatic Load Model (Kang et al., 2010). In this model clusters of psychosocial, behavioral, individual, and environmental factors are postulated to individually interact and influence biological or physiological responses to shape health and health related outcomes (Kang et al., 2010).

The Expanded Biobehavioral Interaction model provides a framework for understanding the interaction of individual, environmental, psychosocial, behavioral, and biological domains and demonstrates how those may shape, influence, and lead to specific health-related outcomes. In addition to the uni- or bi-directional causal relationships among psychosocial, behavioral and biologic factors, the variables within individual and environmental domains are conceptualized to be correlational because these factors may be related (Kang et al., 2010). Psychosocial factors such as stress represent the factors processed through self-appraisals. This model has been used in several studies that address stress and inflammation in cardiovascular disease (Kang et al., 2010) and in studies relating psychosocial factors to immune system outcomes in asthma and breast cancer (Kang, 2003). Individual, environmental, psychosocial, behavioral and biological domains of the EBI model were examined to facilitate the understanding of relationships among key variables in this study and to identify factors contributing to blood pressure control.

Model Applied to Blood Pressure Control

The development of hypertension has been associated with a number of risk factors that may encompass both controllable factors, such as tobacco use, BMI and abdominal adiposity, and uncontrollable factors such as gender, age, and race. Examination of the factors that contribute to control of hypertension is important because effective treatment of hypertension reduces the risk of mortality from the development of associated cardiovascular, cerebrovascular, and renal disease (Chobanian et al., 2008). Based on the EBI model, the health outcome goal for hypertensive individuals is achieving blood pressure control.

Individual Domain

Important factors in the individual domain include race, age, and gender. Race is related to blood pressure control in a complex relationship perhaps due to possible interaction with environmental and individual factors. For example, findings by Bosworth, Powers, Grubber, Thorpe, Olsen, Orr, and Oddone (2008) demonstrated that African Americans were less likely to have blood pressure control than other groups. However, other researchers have not reported this relationship (Knight, Bohn, Wang, Glynn, Mogun, & Avorn, 2002; Psaty et al., 2002). Lower age has been associated with blood pressure control in several studies (Egan, Zhao, & Axon, 2010; Hyman & Pavlik, 2001). Though studies have reported conflicting results about whether females or males have better blood pressure control, gender has been reported to be a significant predictor of controlled blood pressure (Hajjar & Kotchen, 20003; Ong, Tso, Lam, & Cheung, 2008; Ornstein, Neitert, & Dickerson, 2004).

Environmental Domain

The environmental domain variables considered in this study were department and shift work. Department assignment affects multiple broad job characteristics such as physical work environment, work hours, physical exertion required on the job, job control, and decision latitude, all of which are factors known to influence cardiovascular health (Chikani, Reding, Gunderson, & McCarty, 2005). Shift work may affect circadian rhythms and psychophysiological function, and may be associated with adverse health (Costa, 1996; DeMoss, McGrail, Haus, Crain, & Asche, 2004). Researchers have suggested that there are associations between the metabolic risk factors of cardiovascular disease and shift work (Ha & Park, 2005). Discussions of an association of shift work and control of blood pressure are limited in the literature (Inoue, Morita, Inagaki, & Harada, 2004; Kales, Tsismenakis, Zhang, & Soteriades, 2009; Sfreddo et al., 2010). .

Psychosocial Domain

Psychosocial domain factors examined in this study were perceived stress, job satisfaction, life satisfaction, and self-rated health. Stress has been identified as a cause of increased sympathetic nervous system activity that can elevate an individual's blood pressure (Artinian, Washington, Flack, Hockman, & Jen, 2006; Ohlin, Berglund, Rosvall, & Nisson, 2007). Many studies have suggested that stress is related to the development of cardiovascular disease and hypertension independent of known risk factors, but the literature demonstrates conflicting results (Greiner, Krause, Ragland, & Fisher, 2004; Hajjar & Kotchen, 2003; Heslop, Smith, Metcalfe, Macleod, & Hart, 2002). Studies have demonstrated an association between stress, job satisfaction and blood pressure (Heslop, Smith, Metcalfe, Macleod, & Hart, 2002). Life satisfaction may have a relationship with hypertension, but this is not well established (Muller, Montoya, Schandry, & Hart, 1994; Roca-Cusachs, Dalfo, Dadia, Aristegui & Roset, 2001; Siahpush, Spittal, & Singh, 2008). Self-rated health may influence behaviors which have an effect on health in that individuals who perceive their health as poor may have more risk-taking behaviors, such as tobacco use (Idler & Benyamini, 1997; Phillips, 2011).

Behavioral Domain

As described conceptually in the EBI model, tobacco use, physical activity, and salt intake are behaviors under an individual's control. The use of tobacco appears to have a relationship with the development and exacerbation of high blood pressure (Parikh et al., 2008; Wang & Vasan, 2005). In numerous epidemiologic, clinical, and experimental studies, dietary sodium intake has been linked to blood pressure, and a reduction in dietary salt intake has been documented to lower blood pressure. (Frisoli, Schmieder, Grodzicki & Messerli, 2012). For overweight or obese persons with above normal BP, the DASH diet along with the addition of exercise and weight loss can result in large BP reductions (Blumenthal et al., 2010).

Biological Domain

The biological domain includes blood pressure control, obesity, and abdominal adiposity. Obesity may have an indirect effect as a confounder associated with the development of high blood pressure, which presumably makes control difficult (Lloyd-Jones et al., 2000; Timpson, Harbord, Smith, Zacho, Tybaerg-Hansen, & Nordestgaard, 2009).

The EBI model (Appendix A) illustrates the relationships between individual, environmental, behavioral, psychosocial and biological domains and demonstrates how these are related to health outcomes. Appendix B depicts the study variables as applied to the EBI model. The EBI model is appropriate for the study because it demonstrates the relationships between the research variables (perceived stress, job satisfaction, life satisfaction, self-rated health, and shift work, tobacco use, age, gender, and race). In summary, the EBI model addresses the purpose of the study and supports the predicted relationships between the variables.

Summary

Controlling blood pressure to levels recommended by the JNC VII could dramatically decrease coronary events in the U. S. and thereby reduce healthcare utilization and costs significantly (Wang & Vasan, 2005; Wong et al., 2003). The associations of perceived stress, job satisfaction, life satisfaction, self-rated health with the control of high blood pressure are incompletely understood. Although the literature supports the assertion that psychological factors such as perceived stress, job satisfaction, life satisfaction, and self-rated health may influence health behaviors leading to high blood pressure, few studies examined the direct role of these factors in the development of uncontrolled blood pressure. Exploration of the relationship between blood pressure control and perceived stress, job satisfaction, life satisfaction, and self-rated health is needed to contribute to the body of knowledge regarding risk factors related to uncontrolled blood pressure. Examining these relationships will help in identifying those workers most at risk so that intervention targeting blood pressure control is possible.

CHAPTER 2

LITERATURE REVIEW

Background and Significance of Blood Pressure Control

For every employee that dies as a result of a workplace incident, there are 90 times as many deaths in working age individuals which can be attributed to a cardiovascular cause (Bureau of Labor Statistics, 2012; Roger et al., 2012). In fact, by 2030, 40.5% of the U.S. population is projected to have some form of cardiovascular disease (Heidenreich et al., 2011). Many known risk factors have been identified for cardiovascular disease, but hypertension has the strongest association with cardiovascular catastrophes such as heart attack and stroke. High blood pressure can silently damage body systems for years before symptoms develop, and can cause cardiovascular disease, kidney disease, stroke, blindness, and many other complications (Chobanian et al., 2003). In diabetics, up to 75% of the complications can be attributed to hypertension alone (Sowers, Epstein, & Frohlich, 2001). It has been estimated that control of hypertension to levels recommended by the Seventh Report of the Joint National Commission (JNC VII) could prevent between 19 and 56 percent of coronary events in males, and between 31 and 57 percent of coronary events in females, depending on the blood pressure achieved (Wong et al., 2003). Ironically, hypertension is one of the most treatable and responsive conditions to available interventions (Chobanian et al., 2003).

In addition to the personal costs of uncontrolled blood pressure, the cost to the U. S. economy is significant. Blood pressure control improvements could dramatically decrease health care utilization and costs in the U. S. (Wang & Vasan, 2005). Although the potentially disabling and deadly associated conditions may not actually occur in an individual with uncontrolled high blood pressure, at the population level even if a small percentage of those at risk avoided developing life-threatening conditions, the nation's health care system would accrue billions of dollars in savings (Francouer, 2010). In 2010, the cost of cardiovascular diseases and stroke alone was estimated at $444.2 billion, including $273 billion in direct medical expenses and $171.7 billion in indirect costs (Heidenreich et al., 2011). Furthermore, between 2010 and 2030, direct medical costs of cardiovascular disease are projected to triple, from $273 billion to $818 billion. Indirect costs (due to lost productivity) for all cardiovascular diseases are estimated to increase 61% during the same time frame (Heidenreich et al., 2011).

The prevalence of hypertension has been relatively stable at 30% for U. S. adults for the past two decades (Yoon, Ostchega, Louis, 2010). Despite the availability of effective treatments, during the same time frame, the prevalence of uncontrolled blood pressure is currently estimated to be between 50 and 66 percent (CDC, 2011b; Egan, Zhao, & Axon, 2010; Keenan & Rosendorf, 2011). Controlling blood pressure with medications and other means is a very cost-effective method of reducing premature cardiovascular morbidity and mortality. A 12 to 13-point reduction in blood pressure can reduce the number of heart attacks by 21%, strokes by 37% and all deaths from cardiovascular disease by 25% (Campbell, Lanza, Dixon, Chattopadhyay, Molinari, & Finch, 2006). In *Rankings of Preventable Services for the U.S. Population*, the Partnership for Prevention group analyzed scientific research to identify effective policies and practices and estimated that blood pressure screenings would rank third highest in cost effectiveness of all preventive services in preventing disease, injury and premature death (Partnership for Prevention, 2012). Therefore, there are many benefits of blood pressure screening and subsequent management of identified hypertension.

In addition to the physical effects of uncontrolled blood pressure, psychological effects may also manifest on the job. Workers' health may significantly influence their overall wellbeing and work productivity. The health status of an employee will directly influence work behavior, attendance, and on the job performance (Chenoweth, 2012). Decreases in health-related productivity can manifest as production issues such as absenteeism or presenteeism (Koopman et al., 2002). Burton and colleagues (1999) described presenteeism as being measured in costs associated with decreased or slowed output, failure to maintain a production standard, additional training time, errors in work, substandard output, and other events. A number of studies demonstrated, on average, workers who suffer from any of a number of health problems have higher absenteeism levels (Aldana & Pronk, 2001; Burton, Chen, Schultz & Edington, 2001; Dewa & Lin, 2000; Keech, Scott & Ryan, 1998). An employee's health is related to personal ability to be maximally productive. Those who are impaired are understood to be less effective than workers in good health (Burton, Conti, Chen, Schultz, & Edington, 1999). Lenneman, Schwartz, Giuseffi and Wang (2011) also demonstrated that stress is a driver of poor productivity and indicated that improvements in employee health status can lead to significant gains in productivity. Although presenteeism may be better than absence, alleviating and managing health problems appears to significantly decrease both presenteeism and absenteeism (Koopman et al., 2002).

Personal Factors Associated with Uncontrolled Blood Pressure

Various personal factors are risk factors for hypertension and presumably exacerbate blood pressure leading to difficult blood pressure control. Factors which have been associated with blood pressure control include gender, race, age, (Egan et al., 2010; Hyman & Pavlik, 2001; Lloyd-Jones, Evans, Larson, O'Donnell, Roccella, & Levy, 2000; Ornstein, Nietert, & Dickerson, 2004), obesity, (Lloyd-Jones et al., 2000; Timpson, Harbord, Smith, Zacho, Tybaerg-Hansen, & Nordestgaard, 2009), abdominal adiposity, tobacco use (Wang & Vasan, 2005; Parikh et al., 2008), salt intake, and physical activity.

Gender

The association of gender with blood pressure control is inconsistent. In some studies, rates of control among those with hypertension were significantly higher in females (Hajjar & Kotchen, 2003; Knight et al., 2001; Ornstein et al., 2004). Stockwell and others (1994) found that though females were no more likely than males to be aware of or treated for their hypertension, once in treatment, they were far more likely to achieve control. This finding was supported by other researchers who found compliance with antihypertensive medication is higher in those who are older, female and those with comorbidity (Ahn, 2007; Kim & Kang, 2008; Wang et al., 2005). However, Ong et al. (2008) found that age-adjusted prevalence of uncontrolled blood pressure was higher in females (50.8 ±2.1% in males and 55.9 ±1.5% in females) and also demonstrated that males had a higher prevalence of other concomitant cardiovascular risk factors such as obesity (Ong, et al., 2008).

Other studies have reported better blood pressure control in males (Bailey, Grossardt, & Graves, 2008; Ezzati, Oza, Danaei, & Murray, 2008; Majernick, Zacker, Madden, Belletti, & Arcona, 2004; Navar-Boggan, Boggan, Stafford, Muhlbaier, McCarver, & Peterson, 2012; Ong, Tso, Lam, & Cheung, 2008). Egan et al. (2010) found that in the years between 1988 and 2008, the proportion of patients treated and whose blood pressure was controlled increased in males but only marginally increased in females and was greater in males as compared to females.

Race

Race may be related to blood pressure control due to possible interaction with multiple other factors including access to care, susceptibility to hypertension, and comorbid conditions such as obesity (Egan et al., 2010; Wang & Vasan, 2005). Research on blood pressure control in African Americans has been inconclusive. Some studies have reported that African Americans have poorer blood pressure control than other groups after Multinomial adjustment (Bosworth, Powers, Grubber, Thorpe, Olsen, Orr, & Oddone, 2008; Hyman & Pavlik, 2001; Ong et al., 2008). Other investigations have not found significant relationships between blood pressure control and race (Hicks, Fairchild, Horng, Orav, Bates, & Ayanian, 2004; Knight, Bohn, Wang, Glynn, Mogun, & Avorn, 2001). Bosworth et al. (2008) found strong evidence of racial differences but could not fully account for an explanation. Though the study did not account for the socioeconomic status of patients, Navar-Boggan, Boggan, Stafford, Muhlbaier, McCarver, and Peterson (2012) found that blood pressure control was associated with white ethnicity.

Age

Hyman and Pavlik (2001) cited increasing age as the most important correlate of uncontrolled blood pressure, accounting for almost 32% of cases. Even so, conflicting results have been reported. Egan, Zhao, and Axon (2010) found that while the prevalence of hypertension increased with age, blood pressure control also increased. Blood pressure control was found to be higher in those 40 years or older, as opposed to those 18 to 39 years. Conversely, multiple researchers assessed factors independently associated with blood pressure control in people with diagnosed hypertension and found increasing age significantly associated with uncontrolled blood pressure (Bailey, Grossardt, & Graves, 2008; Knight, Bohn, Wang, Glynn, Mogun, & Avorn, 2001; Ong et al., 2008). Bailey, Grossardt, and Graves (2008) determined blood pressure control rates ranged from 80.8% for persons age 15 to 39 years to only 42.1% for persons age ≥80 years. Navar-Boggan, Boggan, Stafford, Muhlbaier, McCarver and Peterson (2012) found blood pressure control was associated with younger age in a large group of patients followed by cardiologists and mid-level providers. It is possible that the outcomes in this group, however, were influenced by other factors, such as higher socioeconomic status. In addition, most of the patients in this study were white.

Shift Work

Evidence associating shift work with control of blood pressure is limited (Inoue, Morita, Inagaki, & Harada, 2004; Kales, Tsismenakis, Zhang, & Soteriades, 2009; Sfreddo et al., 2010). However, shift work disrupts normal sleep and dietary patterns which can promote insulin resistance and the metabolic syndrome (Getz & Reardon, 2007; International Association of Fire Chiefs (IAFC), 2012; Wolk & Somers, 2007). A growing body of literature documented adverse associations between sleep disturbance or deprivation and insulin resistance, weight gain, hypertension, and cardiovascular disease (Boggild & Knutsson, 1999; Di Lorenzo et al., 2003; Fialho, Cavichoi, Povoa, & Pimenta, 2006; Jennings, Muldoon, Hall, Buysse, & Manuck, 2007; Kitamura et al., 2002; Matthews et al., 2008; Vioque, Torres, & Quiles, 2000; Wolk, Gami, Garcia-Touchard, & Somers, 2005). Chen, Lin, and Hsiao (2010) found males working fixed 12 hour night shifts had significantly elevated odds ratios for obesity (OR = 2.7; 95% CI, 1.6–4.5), abdominal adiposity (OR = 2.9; 95% CI, 1.7–5.1), and high blood pressure (OR = 2.3; 95% CI, 1.2–4.4) compared to female office workers who worked day hours. In a comprehensive review published in the journal *Sleep*, researchers found that those who work swing shifts had a disrupted circadian rhythm cycle and alterations in brain chemistry which have previously been shown to cause disturbances in the larger hormone systems in the body, encouraging weight gain, overeating, and disrupting some of the chemical systems that are responsible for blood pressure control. Furthermore, day workers developed comparable symptoms when switched to night shifts (Sack, Auckley, Auger, Carskadon, Wright Jr., Vitiello, & Zhdanova, 2007).

Obesity

More than two-thirds of the prevalence of high blood pressure is thought to be attributed to obesity (Narkiewicz, 2006). Weight loss in overweight or obese persons can prevent or delay the onset of hypertension (He, Whelton, Appel, Charleston & Klag, 2000). In the U. S., as in other developed countries, the prevalence of obesity is increasing (Wang & Beydoun, 2007). In a detailed study of obesity in NHANES 1999–2004, Ogden, Carroll, Curtin, McDowell, Tabak and Flegal (2006) found a significant increase in the overall prevalence of obesity among males but not females. In a later study, Flegal, Carroll, Kit, and Ogden (2012) found the age-adjusted prevalence of obesity in the U. S. was 35.5% (95% CI, 31.9%-39.2%) among adult males and 35.8% (95% CI, 34.0%-37.7%) among adult females. Further, they found between 1999 through 2010, obesity showed no significant increase among females overall ([OR, 1.01; 95% CI, 1.00-1.03; p = .07), but increases were statistically significant for non-Hispanic black females (p = .04) and Mexican American females (p = .046). For males, there was a significant positive linear trend (OR = 1.04; 95% CI, 1.02-1.06; p < .001) over the 12-year period.

As the weight of individuals in the U. S. rises, the risk for sleep apnea rises in corresponding fashion (Wang & Beydoun, 2007). Obstructive sleep apnea (OSA) is linked to high blood pressure in both cross-sectional and prospective studies, and is considered a cause of hypertension (Chobanian et al., 2003; Lavie, Herer, & Hoffstein, 2000). In 2008, a scientific statement reported about 30 percent of people with high blood pressure also have sleep apnea (Calhoun et al., 2008). The apnea-hypopnea index (AHI) is a measure of sleep apnea severity that combines pauses in breathing (apnea) and decreases in blood oxygenation (hypopneas) to evaluate both the number of sleep disruptions and the degree of oxygen desaturation (Ruehland, Rochford, O'Donoghue, Pierce, Singh, & Thornton, 2009). Peppard, Young, and Palta (2000) found a dose–response increase in incident hypertension in people with OSA. There was an almost threefold increased risk for those with a high AHI. Undiagnosed sleep apnea may explain the difficulty in controlling high blood pressure in some patients (Vidt, 2000). Improved blood pressure control was reported in patients after treatment of their sleep apnea (Calhoun et al., 2008).

Abdominal Adiposity

Brummett et al. (2011) found a higher body mass index, greater waist circumference, and tobacco use were each independently associated with higher blood pressure. Similarly, Resende and Velasquez-Melendez (2003) reported a waist size over 35.4 inches was an independent risk factor for both uncontrolled systolic (OR =2.65, 95% CI 1.07-6.56) and uncontrolled diastolic (OR =2.89, 95% CI 1.36-6.10) blood pressure.

Abdominal adiposity is becoming a greater problem in the U. S. In a study examining the factors associated with blood pressure control in the U. S., Ong et al. (2008) found although weight and BMI did not increase significantly from 1999–2000 to 2003–2004, waist circumference increased from 37.4+/-0.3 inches in 1999–2000 to 38.1+/-0.1 inches in 2003–2004 ($\underline{p}$ = 0.014). From this study, Ong et al. concluded there has been a significant increase in waist circumference but not weight and BMI, suggesting an increasing trend of abdominal adiposity.

Abdominal adiposity is a factor in metabolic syndrome (Pillar & Shehadeh, 2008). Metabolic syndrome is a complex of interrelated risk factors for cardiovascular disease and diabetes which include lipid abnormalities, elevated blood pressure, elevated triglyceride levels, low high-density lipoprotein cholesterol levels, and obesity (particularly abdominal adiposity) (Alberti et al., 2009). Adipose tissue secretes a variety of bioactive substances known as adipocytokines (Ohashi, Ouchi, & Matsuzawa, 2011). One type of adipocytokine, adiponectin, has a variety of protective properties against obesity-linked complications, such as hypertension, metabolic dysfunction, atherosclerosis, and ischemic heart disease (Matsuzawa, 2010). Adiponectin is exclusively secreted from adipose tissue, but in contrast to other adipocytokines, the production is reduced in subjects with visceral fat accumulation in an inverse relationship with the degree of abdominal adiposity (Matsuzawa, 2010). Therefore, obesity, and in particular, visceral fat accumulation, is implicated in the dysregulated secretion of adipocytokines, which can contribute to the development of metabolic syndrome and cardiovascular diseases (Ohashi, Ouchi, & Matsuzawa (2011). The changes associated with metabolic syndrome may make blood pressure more difficult to control (Alberti et al., 2009).

Tobacco Use

The use of tobacco such as cigarettes is a modifiable cardiovascular risk factor that can have profoundly negative health effects. Those who use tobacco and individuals with hypertension are at greatest risk for negative cardiovascular outcomes, such as heart attacks and early mortality. (Eddy, Peskin, Pawlson, Shih, & Schaaf, 2009; Mokdad, Marks, Stroup & Gerberding, 2005; Schroeder, 2005). Individuals who use tobacco may be a particularly difficult population to reach and treat. Smokers are more reluctant to adhere to a physicians' preventive advice than non-smokers and tend to underestimate the health risks associated with tobacco use, which both have been associated with lower likelihood of making a quit attempt (Bell & Kravitz, 2008; Davila et al., 2009).

Data from the CDC show that 19.3% of adults (18 years of age and older) in the U.S. currently smoke cigarettes (CDC, 2011a). Those who smoke 15 or more cigarettes per day have a higher incidence of hypertension than those who do not smoke. Nicotine use immediately raises BP and heart rate transiently through increasing sympathetic nerve activity and myocardial oxygen consumption. Nicotine also damages the lining of the arterial walls of the heart, resulting in artery stiffness and narrowing that can last for 10 years after tobacco use ceases (Chobainian et al., 2003). Iwashima et al. (2005) found that tobacco decreases the hormone adoponectin; low levels of adoponectin are known to be associated with obesity. Further, tobacco use seems to decrease adoponectin more in males than females.

Tobacco use was associated with uncontrolled blood pressure in several studies. He, Munter, Chen, Roccella, Streiffer and Whelton (2002) found that cigarette smoking was associated with a small but statistically insignificant increase in the number of those with uncontrolled blood pressure. Lang (2000) and Neito et al. (1995) found that cigarette smoking was correlated with a statistically significant increase in uncontrolled blood pressure.

Salt Intake

In numerous epidemiologic, clinical, and experimental studies, dietary sodium intake has been linked to blood pressure, and a reduction in dietary salt intake has been documented to lower blood pressure (Frisoli, Schmieder, Grodzicki & Messerli, 2012). Older individuals, African Americans, and the obese are more sensitive to the blood pressure-lowering effects of a decreased salt intake (Frisoli, Schmieder, Grodzicki, & Messerli, 2012). Dietary salt intake reduction can delay or prevent the incidence of antihypertensive therapy and can facilitate blood pressure reduction in hypertensive patients receiving medical treatment (Frisoli, Schmieder, Grodzicki, & Messerli, 2012). The relationship of salt intake and blood pressure is direct and progressive with a consistent dose-response relation between salt intake and blood pressure within the range of 3 to 12 grams of salt per day (Feng & MacGregor, 2002). A reduction of only 3 grams per day predicts a decrease in blood pressure of 3.6 to 5.6/1.9 to 3.2 mm Hg in hypertensive subjects and 1.8 to 3.5/0.8 to 1.8 mm Hg in normotensive subjects (Frisoli, Schmieder, Grodzicki, & Messerli, 2012). Daily consumption of salty foods has a considerable effect on blood pressure control.

Physical Activity

In an analysis of U.S. adults over the age of 20 who participated in the National Health and Nutrition Examination Survey (NHANES) from 2001 to 2006, researchers found that physical activity was a strong independent predictor of BP control (Redmond, Baer, & Hicks, 2011). Regular exercise may also be more effective in reducing the blood pressure of hypertensive individuals than those who are normotensive (Fagard & Cornelissen, 2007). Furthermore, regular aerobic exercise may be as effective in reducing BP as an antihypertensive medication (Baster, & Baster-Brooks, 2005). Redmond, Baer, and Hicks reported that compared with non-Hispanic whites, minorities reported less physical activity, with approximately 27% of non-Hispanic blacks and approximately one third of Mexican Americans reporting no leisure-time physical activity (Redmond, Baer, & Hicks, 2011).

Physical activity and low stress are generally associated with better physical health (Cohen, Janicki-Deverts, & Miller, 2007; Haskell et al., 2007). The health benefits of activity are particularly evident among individuals who experience high, as compared with low, levels of stress (Carmack, Boudreaux, Amaral-Melendez, Brantley, & Moor, 1999).

Perceived Stress

The extent to which psychosocial stress concurs to raise blood pressure is uncertain (Cesana, Sega, Ferrario, Chidini, Corrao & Mancia, 2003). Wiernik (2013) found perceived stress was negatively associated with high BP among individuals of high occupational status (OR: 0.91; 95% CI: 0.87–0.96), but positively associated among those of low status (OR: 1.10; 95% CI: 1.03–1.17) or unemployed (OR: 1.13; 95% CI: 1.03–1.24), but could not determine an underlying explanatory mechanism. Some studies suggested stress is related to the development of cardiovascular disease and hypertension independent of other known risk factors. However, the literature demonstrates conflicting results, which could be because the relationship between stress and mediating factors is complex, or because methodological problems exist in the definition and assessment of stress (Greiner, Krause, Ragland, & Fisher, 2004; Hajjar & Kotchen, 2003; Heslop et al., 2002; Keenan et al., 2011; Ohlin, Berglund, Rosvall, & Nilsson, 2007; Rod, Gronbaek, Schnohr, Prescot, & Kristensen, 2009; Theorell, 1987).

Studies relating stress to blood pressure control in the workplace may also be confounded by the *healthy worker effect* in that those individuals who have strong motivation to work and are relatively healthy are in the workforce (Shah, 2009).

Job Satisfaction

Studies that explored the associations between job satisfaction and cardiovascular disease factors were largely cross-sectional in approach and report contradictory findings (Heslop, Smith, Metcalfe, Macleod, & Hart, 2002). Though some studies have recognized job dissatisfaction as a particular form of stress and related this stress to the development of CVD, there is a lack of published data about the association of job satisfaction and blood pressure control,. Heslop et al. (2002) examined the associations between job satisfaction, perceived stress, cardiovascular risk factors, and mortality using longitudinal data from a cohort of Scottish males and females, and found males who were dissatisfied with their jobs had a lower BMI and smoked a greater number of cigarettes each day than men who were very satisfied with their jobs. A weak association between high blood pressure and job dissatisfaction was found in females, though both males and females who were dissatisfied with their jobs perceived their stress to be high. Fischer and Sousa-Poza (2009) found a positive link between job satisfaction and several subjective health measures which included perceived health status. Matthews, Cottlngton, Talbott, Kuller, and Siegel (1987) found stressful work and job dissatisfaction were significant predictors of diastolic blood pressure, controlling for age, body mass index, and other personal factors.

Life Satisfaction

Life satisfaction is considered to be a measure of positive well-being, and is one of a set of constructs which is used to define quality of life. Limited studies investigated the relationship between life satisfaction and hypertension, blood pressure control or cardiovascular risk factors. In a study of 9,981 Australian adults, Siahpush, Spittal, and Singh

(2008) found those with high levels of life satisfaction had higher perceived health status and better overall health compared to those with low levels of life satisfaction, measured as few limiting chronic health conditions.

Roca-Cusachs and colleagues (2001) measured life satisfaction and quality of life of 283 adult males and females in Spain and found that hypertensive patients had significantly poorer quality of life than those with a normal blood pressure. Those with the lowest quality of life were older, female, and had an increased BMI or lower levels of education. Of significance was the finding that improving the control of blood pressure produced a positive impact on quality of life. This result was similar to the findings of Muller, Montoya, Schandry, and Hart (1994) who observed individuals with high blood pressure were less satisfied with life until treated for hypertension and attaining normal blood pressure.

Perceived Health Status

Perceived health status may influence behaviors that have an effect on health in that individuals who perceive their health as poor tend to have more health risk behaviors (Idler & Benyamini, 1997). Unfortunately, the association of perceived health status and blood pressure control has received little attention in the literature. However, studies relating perceived health status to other chronic diseases indicate perceived health status may reflect risk-taking behaviors that are not captured in the more objective assessments of health status. Barreto and Figueiredo (2009) found no interaction between poor perceived health status and risk factors, but did find an inverse association between number of risk factors and the presence of two or more chronic conditions.

In a secondary analysis of 2007 BRFSS data, researchers found a direct association between the number of healthy behaviors such as smoking abstinence, not currently drinking excessively, being physically active, and consuming fruits and vegetables five or more times per day and high perceived health status among U.S. adults. They concluded the number of healthy behaviors is associated with optimal self-rated health among adults, with an especially strong association among adults with CVDs or diabetes (Tsai, Ford, Chaoyang, Zhao, Pearson, & Balluz, 2010). Poor self-rated health was also found to be associated with elevated serum inflammatory markers such as CRP and cytokines among generally healthy older adults (Christian, Glaser, Porter, Malarkey, Beversdorf, & Kiecold-Glaser, 2011).

Summary

Controlling blood pressure to levels recommended by the JNC VII could dramatically decrease coronary events in the U. S. and thereby reduce healthcare utilization and costs significantly (Wang & Vasan, 2005; Wong, Lopez, L'Italien, Chen, Kline, & Franklin, 2007; Wong et al., 2003). The association of perceived stress, job satisfaction, life satisfaction, self-rated health and the control of high blood pressure are incompletely understood. Although the literature supports the assertion that psychological factors such as perceived stress, job satisfaction, life satisfaction, and self-rated health may influence health behaviors leading to hypertension, few studies examined the direct role of these factors in combination on the development of uncontrolled blood pressure. Exploration of the relationship between blood pressure control and job satisfaction, life satisfaction, perceived stress and self-rated health is needed to contribute to the body of knowledge regarding risk factors related to uncontrolled blood pressure.

CHAPTER 3

METHODOLOGY

This chapter provides information on the data set and a description of the methods for implementation of the study. Design, protection of human subjects, setting, characteristics of the sample, inclusion and exclusion criteria, power analysis, data collection strategies, and data measurement are presented. The data used for this study originated from the health risk appraisal TeleForm® instrument self-report measures completed by participants in a worksite wellness program, and physiologic measures recorded by the wellness program screen personnel.

Data Set

The SPSS data set was received through the secure university email. The following information was included in the data set: average (of two) systolic blood pressures, average (of two) diastolic blood pressures, taking of antihypertensive medication, perceived stress, job satisfaction, life satisfaction, perceived health status, shift, department, age, gender, race, BMI, abdominal girth, BMI, tobacco use, salt intake, and physical activity. Tobacco use included the self-reported per-day use of the number of cigarettes, pipes, or smokeless tobacco. Initially, descriptive level information about the data set was examined and summary tables of variables were compiled. Missing data were identified and coded as such. Values were examined for the presence of outliers, along with ranges and means for continuous variables. Blood pressure control, perceived stress, job satisfaction, life satisfaction, perceived health status, shift, department, race, BMI, abdominal girth, and tobacco use were recoded as described in other sections. Crosstabs and frequencies were examined for the new variables and compared to the values of the old variables to ensure correct coding. A coding key was compiled to describe variable coding and examined for logic. Descriptive data were compiled and examined on responses from screen participants. The data set was then split into two groups: those with controlled BP and those with uncontrolled BP. Descriptive statistics were compiled for these two groups, and statistical analyses as described in subsequent sections were performed, analyzed and reported.

Study Design

The design for this study was correlational, using secondary analysis of cross-sectional data which was appropriate given the setting, population, and research questions. Secondary analysis studies are generally an efficient way of solving some research problems (Burns & Grove, 2005; Norwood, 2000).

Structure

Non-experimental research designs are typically used when knowledge, attitudes, beliefs and behaviors are examined, as was the case in this study (Cottrell & McKinzie, 2005). A correlational design was appropriate for the purposes of this study because critical relationships among selected variables were to be explored. In correlational designs, investigators use a correlational statistic technique to describe and measure the degree of association between two or more variables (Creswell, 2002). The strengths of a correlational design include efficiency, practicality, and realism (Polit & Beck, 2008).

Time Dimension

In cross-sectional research, data are collected from the research participants at a single point in time or during a single time period long enough to collect data from all of the participants included in a study (Norwood, 2000). This study captured data from one set of employees who participated in the 2010-2011 worksite health screens.

Protection of Human Subjects

A limited de-identified data set provide by the principal investigator was used for all analyses. In order to optimize confidentiality, data access was limited to the researcher and the research team members with password access to the university computer server. Statistical analyses were performed off-site and raw data were stored at the university in a locked office. Physical data were kept under direct control of the collectors and when stored, were held securely under lock and key. The raw data are destroyed after five years according to the wellness program policies and procedures.

Finally, because workers can be considered a vulnerable research population, worksite studies must maintain confidentiality of participants and ensure that no coercion or job repercussions can occur (Rogers, 2005; Rose & Pietri, 2002). In this wellness program, the municipality requires participation in regular health screening for employees electing to participate in one of the employer-sponsored health plans. Employees have a choice of obtaining the screening from either their personal physician or at the wellness program screen, and participation has been very high (93%) (Brown, 2012). In compliance with legal and ethical standards, individual health information is released only to the employee. The municipality receives only aggregate reports on health risks in the worker population, and does not use participation in the screening as a requirement for hiring or retaining an employee (Brown, 2012).

After receiving approval from the principal investigator for use of a limited data set, an application for expedited review describing the use of the wellness program existing data was requested through the Institutional Review Board at the University of Alabama at Birmingham. The study strictly adhered to the guidelines implemented by the Institutional Review Board (IRB) for protection of human subjects at UAB.

Setting

The University of Alabama at Birmingham School of Nursing directs occupational health nursing services including a comprehensive wellness program for the approximately 4,800 individuals employed by the municipality. This health promotion and risk reduction wellness program, conducts regularly scheduled health screenings for all municipal employees. The program was begun in 1985 as a pilot project when escalating health care costs and a desire to focus on health-promotion and disease-prevention prompted the introduction of the wellness concept for employees of the municipality. The program is aimed at reduction of morbidity and mortality related to chronic disease and helping high-risk individuals incorporate healthier behaviors into their lifestyles, and is one of the oldest, most extensive, and unique city wellness programs in the U. S. (Brown, 2012). A unique feature of the program is the predominantly African-American and male client base--typically a difficult population to reach (Sadler, & Hau-Chen Lee, 2010).

The health screening is a form of limited medical examination designed specifically for the purpose of identifying risk factors for cardiovascular disease, cancer, preventable injury and occupational injury as a means to improve employee health. Information collected during this screening program was described and analyzed and used as the basis for this study. The physical locations for data collection were a large city auditorium facility and a fire station, both located within city limits. Only fire department personnel were screened at the fire station.

Characteristics of the Sample

The population in this study was comprised of municipal workers employed by the municipality since 2010 who participated in health risk appraisal screens in 2010 and 2011. This time period was selected to capture one set of employee screenings, given that firefighters and police are screened annually and all other employees are screened biennially. A secondary analysis of health risk appraisal TeleForm ® instrument data from municipal employees participating in the health screenings during this two year period was used for this study. All city departments were represented. The three largest departments employed by the municipality were fire, police and public works and account for approximately 62% of city employees.

Inclusion Criteria

Inclusion criterion was a measured blood pressure over 140 systolic or over 90 diastolic at the health screen, or an indication on the health history form that they were taking medication for high blood pressure. This definition of hypertension is consistent with

NHANES and most epidemiological studies (Want & Vasan, 2005). Approximately 1,200 participants were expected to meet the inclusion criteria for the analysis cohort. This figure was estimated from previous years' data on the number of employees with hypertension (Sinsuesatkul, 2008). There were no exclusionary criteria in this study because individuals with other medical problems which presumably made blood pressure control difficult could not be identified in the questionnaire.

Power Analysis

Power analysis builds on the concept of an effect size which expresses the strength of relationships among research variables (Polit & Beck, 2008). As the sample size in this study was estimated to be well over 1,000, a post hoc power analysis was conducted using a significance criterion of .05, a population r^2 of .20, and a power set at the conventional standard of .80. A population r^2 of .20 is typical of behavioral studies and was used as the estimated effect size (Cohen, Cohen, West, & Aiken, 2003). Because the sample size was to be quite large, the observed statistical power was calculated to be 1.0 (Soper, 2011). The dependent variable in this study was blood pressure control. Independent variables were department, shift, perceived stress, perceived job satisfaction, perceived life satisfaction, perceived health status, and personal factors of gender, race, age, obesity, abdominal adiposity, physical activity, salt intake, and tobacco use.

Data Collection Strategies

As part of a long-term contract with the university, municipal employees participate at least every other year in health risk appraisal screening and are provided health education regarding life style modifications to reduce their risk factors for cardiovascular disease and death. As part of the screen, participants complete a standard health risk appraisal TeleForm ® instrument reporting on current health behaviors and use of preventive health services. The wellness program personnel distribute health risk appraisal TeleForm ® instruments in confidential envelopes to the workplace one week before the screen. Completion and return of the questionnaire at the screen constitutes willingness to participate in the study. Data from evaluations at these sites are maintained by the principal investigator of the program and are available for secondary analysis.

To collect physical data, wellness program personnel set up stations to measure blood pressure, height and weight, and other physical data. Private areas were available for participants to complete the health risk appraisal questionnaire, and wellness program personnel are available to provide assistance in completing the form if requested. The areas were large enough that wellness program personnel could carry on non-confidential or confidential conversations with employees during the screening procedure. This approach was designed to help each employee feel comfortable and relaxed and to decrease the anxiety many individuals experience when they encounter members of the health care profession.

Measurement

Data used for this study originated from a limited data set provided by the principal investigator of the wellness program. The data set included self-reported and physical measures that are routinely collected at the screens.

Instrument

The health risk appraisal TeleForm® instrument was developed by faculty at the University of Alabama at Birmingham School of Nursing, and has been the standard instrument used in the wellness program since 1991. A TeleForm® instrument for each employee was used to record both self-report and staff-measured physical variables.

Anthropometric Measures

Physical measures obtained as a component of the screen included blood pressure, height, weight, and waist circumference. Body mass index was calculated for each employee using height and weight data.

Blood pressure control. Blood pressure was measured twice upon arrival at the screen site and recorded by registered nurses after the participants rested and/or abstained from using tobacco for at least 20 minutes. Blood pressure was considered controlled if both blood pressure measurements were less than 140/90 and was considered uncontrolled if one or both measurements were greater than 140/90. Consistent with NHANES and most epidemiological studies, an individual was considered to have hypertension if blood pressure was uncontrolled or if they indicated that they were taking antihypertensive medication (Wang & Vasan, 2005). Clinical automated blood pressure Omron ™ equipment was utilized to conduct blood pressure and pulse measurements at the screens. Automated blood pressure devices which have been validated for accuracy independent of the manufacturer have been shown to predict future cardiovascular events significantly better than manual BP, and have been advocated as replacements for manual BP in the management of hypertensive patients in the community (Myers, 2009). Given that the environment at the screens can be noisy, obtaining accurate results with the manual equipment would have been difficult. In addition, most medical personnel now use automated equipment in clinical practice and are more confident in the use of electronic equipment than in use of the manual equipment. Finally, if questionable results were obtained when taking blood pressure, the wellness program personnel are instructed to recheck the blood pressure and then call a supervisor.

Because the objective of identifying and treating high blood pressure is to reduce the risk of cardiovascular disease and associated morbidity and mortality, the Joint National Committee classification of adult blood pressure is used to identify high-risk individuals who require follow-up and treatment (Chobanian et al., 2003). Wellness program personnel utilize the BP classification for health education at the screen, distribute copies to employees with hypertension, and determine which employees are referred for immediate treatment due to BP elevations.

Body mass index. The body mass index (BMI) is a heuristic proxy for human body fat based on an individual's weight and height (American Medical Association, 2003). This measure was calculated using the screen height and weight data by converting weight in pounds to kilograms (kg) divided by the square of height in meters (m2). The subject's height (without shoes) was measured in inches with a metal tape ruler mounted on a wall while the participant was instructed to look straight ahead with the head in straight alignment. Results were measured in inches and recorded on the health risk appraisal TeleForm® instrument.

Weight was measured on a calibrated digital scale after the participant removed shoes, outer jackets and other heavy items. The participant received instructions to step firmly onto the center of the digital scale while facing the equipment and standing still. The weight was recorded in pounds on the data form as displayed. Wellness program personnel were cautioned to reevaluate and repeat weighing if results do not appear accurate. The scales could measure weights up to 440 pounds. Participants weighing excess of 440 lbs. had results coded as 441.0 lbs.

Waist circumference. A Gulick II tape measure was placed around the abdomen on the umbilicus line. Waist circumference was obtained and recorded in inches while the participant lifted his or her arms. The Gulick II tape measure has two red balls in the cylinder and the tape was pulled until only the first ball was visible. This ensured that a uniform tension was placed on the measuring device. Wellness program personnel were instructed to keep the tape measure straight and even, and record the result to the nearest ¼ inch on the TeleForm®.

Validity and Reliability

Validity refers to the degree to which the measurements obtained actually reflect the phenomena being studied (Polit & Beck, 2008). Reliability refers to the degree of accuracy and consistency of the study data. In quantitative research, the quality of measures is determined by reliability and validity (Polit & Beck, 2006). The worksite wellness program has incorporated methods to help ensure the accuracy and consistency of the information collected. The methods employed include a procedure manual, standardized data collection and entry procedures, and standardized training of screening personnel. Personnel were trained in the procedures which they performed during the screen and successfully accomplished a return demonstration of the procedure(s) before being certified to collect data. Temporary staff and students spent approximately 4 to 5 hours in training, to perform data collection and recording, completing paperwork, and participating in HIPAA training (Carver, 2011).

Because this study was a secondary analysis of cross-sectional data, test-retest reliability could be assessed. Moreover, many of the study factors, such as perceived stress, job and life satisfaction, perceived health status, and tobacco use, were measured as single items on the questionnaire, and this precluded use of other types of reliability analyses. Single item questions for perceived stress have been found to have acceptable vality (kappa and intraclass correlations between 0.66 and 0.74), though not as good as two or three measure questions (Littman, White, Satia, Bowen, & Kristal, 2006). Single measures of smoking status have been found to be valid in large studies of ambulatory populations, producing results comparable to physiologically based measures of smoking (SRNT Subcommittee on Biochemical Verification, 2002; Velicer, Prochaska, Rossi, & Snow, 1992).

Measures for BMI and waist circumference were based on guidelines and procedures which have been recognized as being valid (Deurenberg, Weststrate, & Seidell, 1991; Flegal, et al., 2009; Meeuwson, Horgan, & Elia, 2010). Though it is widely used as a proxy for fatness with the well-known advantage of being easy to measure, BMI does not represent adiposity directly as it does not distinguish between fat and lean tissue and above average muscular development (Meeuwson et al., 2010).

In the NHANES surveys, BMI was highly correlated with percentage of body fat, slightly more so for females than for males (Flegal et al. 2009). The U.S. Preventive Services Task Force (2003) reported that BMI had a high correlation between percentage of body fat and body fat mass, with r^2 = 0.95 in males. Deurenberg, Weststrate, & Seidell (1991) assessed the validity of BMI in sample of 1,229 subjects and found a correlation of bu7 = .79. Klein, Allison, Heymsfield, Kelley, Leibel, Nonas, and Kahn (2007) found a strong correlation between waist circumference and total body fat content. BMI and waist circumference perform similarly as indicators of body fat and are more closely related to each other than with percentage body fat. These variables may be an inaccurate measure of percentage body fat for an individual, but they correspond fairly well overall with percentage body fat within sex-age groups and distinguish categories of percentage body fat (Flegal et al., 2009). Across genders and ethnicities, there is a very strong correlation between BMI and waist circumference (*r* from 0.88 to 0.92) indicating high validity for these two variables (Zhu, Heymsfield, Toyoshima, Wang, Pietrobelli, & Heshka, 2005).

Data Management and Data Analysis

Following data collection, health risk appraisal TeleForm® instruments were optically scanned into a database. Data which were deemed not readable were individually reviewed and reentered manually by an experienced operator. Each item in the questionnaire was checked for completion and if incomplete, was included in the study only if fewer than 20% of items were missing.

The limited data set in this study was analyzed using the Statistical Package for the Social Sciences (SPSS) software program version 17. Descriptive statistics, including frequencies, percentages, means and standard deviations, were used to examine the distributions of variables in this study. All research questions were analyzed at a .05 significance level.

Data Analysis Related to Research Questions

Research question one is: *What is the prevalence of blood pressure control, obesity, and abdominal adiposity in municipal workers*? The prevalence of controlled blood pressure, obesity and abdominal adiposity was described using frequencies and percentages.

Research question two is: *Is there a difference in BP control, perceived stress, job satisfaction, life satisfaction, and perceived health status among municipal employees working different shifts, controlling for age, obesity, tobacco use, salt intake, and physical activity?* Research question three is: *Is there a difference in BP control, perceived stress, job satisfaction, life satisfaction, and perceived health status among municipal employees by department, controlling for age, obesity, and tobacco use?* Multinomial logistic regression was used to address questions two and three.

Research question four is: *What is the best model for BP control using perceived stress and personal factors (gender, race, age, obesity, abdominal adiposity, and tobacco use) as explanatory variables?* Research question five is: *Does the inclusion of life satisfaction and job satisfaction improve predictive ability of the model?* Research question six is: *Does the inclusion of type of shift worked add to the predictive ability of the above model?* Research question seven is: *Does the inclusion of department add to the predictive ability of the model?* Research question eight is: *Does the inclusion of perceived health status add to the predictive ability of the above model?* These questions are related and were analyzed separately but in a similar fashion. A model was built utilizing multiple logistic regression, using the factors as listed in the research questions. Multiple logistic regression was used to examine the influence of these multiple independent variables on the nominal dependent variable blood pressure control.

CHAPTER 4

FINDINGS

This chapter provides study results including a description of the sample and findings from analyses related to the research questions. The first section describes sample characteristics including gender, race, age, department, the shift worked, the prevalence of obesity, abdominal obesity, tobacco use, salty diet, and physical activity. The second section presents descriptive analyses for the variables in the study. The third section provides findings from analyses relevant to the research questions.

Description of the Sample

A total of 3,501 employees who participated in the health screen in 2010-2011 were included in the analysis. These workers were predominantly male (n = 2,549, 72.8%) and African American (n = 2,343, 67.2%). There were 91 non-white, non-African American screen participants, comprised of 35 Hispanics, 17 Native Americans, six Asians, three Pacific Islanders, 43 workers who identified their race as *other*, and 22 who said they didn't know their race. Non-white workers comprised a majority of employees in the sample (n = 2,434, 70.0%). Twenty-five responses were missing in the category of race.

Nearly half of the employees in this study (n = 1,577, 46.2%) were found to have either elevated systolic blood pressure, elevated diastolic blood pressure, or were treated with one or more antihypertensive medications. The gender of workers with hypertension was largely male (n = 1,122, 71.2%) and over three-fourths (76%) of the workers with hypertension selected a non-white category of race on the health risk appraisal TeleForm® questionnaire. The mean age of those with controlled blood pressure was 49.9. For those with uncontrolled blood pressure, the mean age was 46.3. Descriptive statistics for the sample are presented in Table 1.

Table 1

Gender, race, and age of municipal workers with controlled BP, uncontrolled BP, and high BP, as compared to all workers who were screened

Variable	Controlled BP (N = 770)	%	Uncontrolled BP (N = 807)	%	Controlled and Uncontrolled BP (N = 1,577)	%	All Workers (N = 3.501)	%
Gender								
Male	492	63.9	630	78.0	1, 122	71.2	2,549	72.8
Female	277	36.0	177	12.0	454	28.8	951	27.2
Missing	1	0.1	0	0.0	1	0.0	1	0.0
Race								
White	194	25.2	183	22.7	377	23.9	1,042	29.8
Minority	573	74.4	619	76.7	1,192	75.6	2,434	69.5
Missing	3	0.4	5	0.6	8	0.5	25	0.7
Age								
Mean	49.9	n/a	46.3	n/a	48.0	n/a	43.8	n/a
SD	8.9	n/a	9.9	n/a	9.6	n/a	10.8	n/a

Table 2 shows the health risk appraisal TeleForm® responses for perceived stress, life satisfaction, job satisfaction, and perceived health status in municipal workers with controlled and uncontrolled BP. As shown below, only 9.8% of the workers with uncontrolled BP said that their perceived stress level was “a lot.” For other variables, the percentages for each response category were similar between workers with controlled and uncontrolled BP.

Table 2

Health risk appraisal TeleForm® responses for perceived stress, job satisfaction, life satisfaction, and perceived health status in municipal workers with hypertension

Variable	Controlled BP (N = 770)	%	Uncontrolled BP (N = 807)	%	Controlled and Uncontrolled BP (N = 1,577)	%
Perceived Stress						
None	123	16.0	135	16.7	258	16.4
Relatively Little	204	26.5	236	29.2	440	27.9
Moderate	325	42.2	352	43.6	677	42.9
A Lot	117	15.2	79	9.8	196	12.4
Missing	1	0.1	5	0.6	6	0.4
Job Satisfaction						
Mostly Satisfied	518	67.3	549	68.0	1,067	67.7
Partially or Not Satisfied	238	30.9	250	31.0	488	30.9
Missing	14	1.8	8	1.0	22	1.4
Life Satisfaction						
Mostly Satisfied	587	76.2	643	79.7	1,230	78.0
Partially or Not Satisfied	182	23.6	157	19.5	339	21.5
Missing	1	0.1	7	0.9	8	0.5
Perceived Health Status						
Excellent	71	9.2	83	10.3	154	9.8
Good	498	64.7	529	65.6	1,027	65.1
Fair or Poor	194	25.2	183	22.7	377	23.9
Missing	7	0.9	12	1.5	19	1.2

Table 3 shows the health risk appraisal TeleForm® responses for tobacco use, daily salty food, and physical activity. As shown in the table below, workers with uncontrolled BP were more likely to report both tobacco use and daily consumption of salty foods.

Table 3

Health risk appraisal TeleForm® responses for tobacco use, daily salty foods, and physical activity in municipal workers with controlled and uncontrolled BP

Variable	Controlled BP (N = 770)	%	Uncontrolled BP (N = 807)	%	Controlled and Uncontrolled BP (N = 1,577)	%
Tobacco Use						
Not a tobacco user	694	90.1	680	84.3	1,374	87.7
Tobacco user	76	9.9	127	15.7	` 203	12.9
Missing	0	0.0	0	0.0	0	0.0
Daily Salty Foods						
Don't eat salty foods daily	444	57.7	432	53.5	876	55.5
Eat salty foods daily	324	42.1	371	46.8	695	44.1
Missing	2	0.3	4	0.5	6	0.4
Physical Activity						
Less than one time per week	168	21.8	168	20.8	336	21.3
One to two times per week	277	36.0	282	34.9	559	35.4
At least three times per week	315	40.9	348	43.1	663	42.0
Missing	10	1.3	9	1.1	19	1.2

Findings Related to Research Questions

In this section, results were organized by research question. Descriptive statistics were used to answer the first research question. Multinomial logistic regression was used to investigate research questions two through eight, and a backwards selection with a p to stay of 0.1 was used to build a best-fit model in research questions four through eight.

Research Question One

Research question one is: *What is the prevalence of blood pressure control, obesity, and abdominal adiposity in municipal workers?*

The prevalence of normotensive BP, antihypertensive medication use, and controlled and uncontrolled BP in workers who participated in the health screen is shown in Table 4. More than three-fourths of the municipal workers who participated in the screen had blood pressure lower than 140/90 (n = 2,628, 75.1%). Approximately one-third of the workers who participated in the screen reported taking blood pressure medication (n = 1,170, 33.4 %,). Overall, 1,577 workers (45.0%) fell into the category of "having hypertension," with either elevated blood pressure or use of an antihypertensive medication to control blood pressure. Blood pressure control was achieved in 48.8% of the workers with hypertension.

Table 4

Prevalence of normotensive BP, antihypertensive medication use, controlled BP, and uncontrolled BP in municipal workers (N = 3,501)

BP Status	Total (N = 3,501)	%
Normotensive BP	1,829	52.2
Missing	95	2.7
Antihypertensive Medication Use	1,170	33.4
Total Hypertensive	1,577	45.0
Controlled BP	770	21.9
Uncontrolled BP	807	23.1

Obesity (BMI of 30 or more) and abdominal adiposity (abdominal girth greater than 40.2 inches in males and 34.6 inches in females) were highly prevalent in this sample. As shown in Table 5, the majority of the 1,577 individuals with controlled or uncontrolled BP were obese. Two-thirds of the 807 individuals with uncontrolled blood pressure (n = 538, 66.8%) were obese. In the total population, abdominal adiposity was present in more than half of the workers (n = 1688, 51.0%). In females with elevated blood pressure or taking blood pressure medication, abdominal adiposity was particularly prevalent. Approximately 84% of females in this category had the condition. Only 30 females out of 164 (18.3%) without abdominal adiposity had uncontrolled blood pressure. Table 5 depicts the prevalence of obesity and abdominal adiposity. BMI (n = 83, 2.4%) and abdominal adiposity data (n = 194, 5.5%) were missing on a number of cases and were excluded from consideration.

Table 5

*Prevalence of obesity (BMI ≥ 30) and abdominal adiposity (waist circumference > 40.2 in males and > 34.6 in females) in municipal workers (*N *= 3,501)*

Variable	Obesity (N = 1,907)	%	Abdominal Adiposity (N = 1,688)	%
All participants	1,907	55.8	1,688	51.0
Missing	83	4.2	194	10.3
No hypertension	820	24.0	700	21.2
All hypertensive	1,072	56.2	982	58.2
Controlled BP	534	28.0	500	29.6
Uncontrolled BP	538	28.2	482	28.6

Descriptive Statistics for Workers with Controlled and Uncontrolled BP

Table 6 illustrates controlled and uncontrolled blood pressure by gender. In this sample, uncontrolled blood pressure was markedly more prevalent in males. As shown, females (n = 277, 61%) possessed a higher rate of BP control than males (n = 492, 43.9%).

Table 6

Controlled and uncontrolled BP by gender in municipal workers (N=1,576)

BP Status	Total	Male (N = 1,122)	%	Female (N = 454)	%
Controlled BP	759	492	43.9	277	61.0
Uncontrolled BP	807	630	56.2	177	39.0

Table 7 exhibits blood pressure control rates by department. Of those with hypertension, Police Department (n = 221, 52%) and City Hall (n = 238, 53.8%) employees had the highest rates of controlled blood pressure, and Public Works Department (n = 168, 38.4%) and Fire Department (n = 108, 39.7%) workers had the lowest rates of controlled blood pressure. The department was unknown in 18 cases (1.1%) and these were excluded from consideration.

Table 7

Controlled and uncontrolled BP by department in municipal workers (N = 1,559)

	Department							
BP Status	Public Works	%	Fire	%	Police	%	City Hall	%
Controlled BP	168	38.4	108	39.7	221	52.0	228	53.8
Uncontrolled BP	270	61.6	164	60.3	204	48.0	162	38.2

Table 8 shows gender and mean age by department for municipal workers with hypertension. The majority of workers with hypertension were male (n = 1,106, 70.1%). The mean age of those with hypertension across departments was approximately the same, although employees of the Fire and Police Department were slightly younger than workers in other departments. The department was unknown in 18 cases (1.1%) and the gender was unknown in one case (<0.1%), and these were excluded from consideration.

Table 8

Gender and mean age by department in municipal workers with hypertension (N = 1,577)

Department	Total (N = 1,558)	Mean age	Male (N =1,106)	%	Female (N = 452)	%
Public Works	438	48.56	354	32.0	84	18.6
Fire	272	45.10	245	22.2	27	6.0
Police	425	45.52	273	24.7	152	33.6
City Hall	423	51.41	234	21.1	189	41.8

As can be seen in Table 9, in workers with hypertension, those on the Fire shift had the lowest rate of blood pressure control with only 93 of the 235 workers (39.5%) achieving blood pressure control. Night shift had the second lowest rate of blood pressure control with only 34 of 79 workers (43%) achieving blood pressure control. Day shift, Evening shift, and Other shift were at near parity between those with controlled and uncontrolled blood pressure.

Table 9

Controlled and uncontrolled BP by shift in municipal workers with hypertension

(N= 1,557)

Shift	Total	Controlled BP (N = 757)	%	Uncontrolled BP (N = 800)	%
Day	798	409	54.0	389	48.6
Evening	73	38	5.0	35	4.4
Night	79	34	4.5	45	5.6
Fire	235	93	12.3	142	17.8
Other	372	183	24.2	189	23.6

Table 10 shows the mean age and gender of workers with hypertension. The mean age across shifts was similar, though the mean age of those working Fire shift and Evening shift was slightly lower than Other shift and Day shift. All shifts employed more males than females, and some shifts markedly so. Of the 235 workers employed on Fire shift, only 11 were females.

Table 10

Mean age and gender by shift in municipal workers with hypertension
(N = 1,558)

Shift	Mean Age	Male (N = 1,110)	%	Female (N = 446)	%
Day	48.0	530	47.7	267	59.9
Evening	44.4	55	5.0	18	4.0
Night	46.6	57	5.1	22	4.9
Fire	44.5	224	20.2	11	2.5
Other	48.8	244	22.0	128	28.7

Research Question Two

Research question two is: *Is there a difference in BP control, perceived stress, job satisfaction, life satisfaction, and perceived health status among municipal employees working different shifts, controlling for age, obesity, tobacco use, salt intake, and physical activity?*

Blood pressure control. Results for the multinomial regression analysis of the association of BP control with shift, age, obesity, tobacco use, salt intake, and physical activity are shown in Table 11. After controlling for covariates, shift worked was found to be not significantly associated with blood pressure control (p = 0.086). Blood pressure control was, however, significantly associated with increasing age (OR = 1.041; 95% CI 1.029 - 1.053) and abstinence from tobacco (OR = 1.739; 95% CI 1.260 - 2.399).

Table 11

Association of shift worked with BP control, controlling for age, obesity, tobacco use, salt intake and physical activity

Outcome	Type III Test P-value
Shift Worked	.086
Age	<.001
Obesity	.143
Tobacco Use	.001
Salt Intake	.542
Physical Activity	.919

Perceived stress. The P-values for the association of shift and covariates age, obesity, tobacco use, salt intake and physical activity with perceived stress are presented in Table 12. Shift was significantly associated with perceived stress (p=0.005). Compared to those who work Day shift, those working Fire shift had .435 times the odds of a perceived stress level of "none" as opposed to a stress level of "a lot" (OR = .435; 95% CI .226 - .837), and Night shift workers had 3.16 times the odds of reporting "relatively little" stress vs. "a lot" of stress (OR = 3.16; 95% CI 1.185 - 8.425). Age was significantly related to perceived stress, as demonstrated by the Type III P-value of .012. Though the direction of the association of age and perceived stress was inverse (as age increased, perceived stress decreased), the individual levels were not significant. There was also a significant association of perceived stress and daily intake of salty foods ($p < .001$). Workers with higher levels of perceived stress had higher odds of eating salty foods on a daily basis, compared to those with low levels of perceived stress. Those with a perceived stress level of "none" (OR = 2.70; 95% CI 1.809 - 4.028) or "relatively little" (OR = 2.145; 95% CI 1.502 - 3.062) had lower odds of not eating salty foods on a daily basis as compared to those who reported a perceived stress level of "a lot."

As can be seen in Table 13, there was no association between shift and job satisfaction (p=0.428), life satisfaction (p=0.168), or perceived health status (p=0.393). Within the variables of job satisfaction and life satisfaction, "partially satisfied" and "not satisfied" were combined and used as the reference category because there were too few workers who were "not satisfied" in each category to allow for valid analysis

Job satisfaction. Also shown in Table 13, age ($p < .001$) and not eating daily salty foods ($p = .006$) were statistically associated with job satisfaction. Workers had slightly

Table 12

Association of shift worked with perceived stress, controlling for age, obesity, tobacco use, salt intake and physical activity

Outcome	Type III Test P-value
Shift Worked	.005

Age	.012
Obesity	.555
Tobacco Use	.359
Salt Intake	<.001
Physical Activity	.226

higher odds (2.1%) of reporting that they were "mostly satisfied" with their jobs as age increased (OR = 1.021; 95% CI 1.010 - 1.034). Furthermore, workers who were "mostly satisfied" with their jobs had 37% lower odds of eating salty foods on a daily basis (OR = .728; 95% CI .579 - .912), as compared to those who were "partially or not satisfied."

Life satisfaction. Table 13 shows age ($\underline{p} = .027$) and physical activity ($\underline{p} = .015$) were statistically significantly related to life satisfaction. Workers had slightly higher odds (1.5%) of reporting that they were "mostly satisfied" with life as age increased (OR = 1.015; 95% CI 1.002 - 1.029). In addition, workers who were "mostly satisfied" with life were more active than workers who were "partially or not satisfied" with life. These individuals had lower odds of reporting that they performed physical activity "less than one time per week" (OR =.677; 95% CI .493 - .929) as compared to workers who were "partially or not satisfied."

Perceived health status. The P-values for the association of shift and covariates age, obesity, tobacco use, salt intake and physical activity with job satisfaction, life satisfaction and perceived health status are presented in Table 13. Obesity ($\underline{p} < .001$), tobacco use ($\underline{p} = .032$), daily salty food ($\underline{p} < .001$), and physical activity ($\underline{p} < .001$) were statistically associated with perceived health status. Employees rated their perceived health as "excellent," "good," "fair," or "poor." Because there were too few responses in the "poor" health category to perform a valid statistical analysis, "fair" and "poor" were combined and used as the reference group. Using "fair or poor" perceived health status as the reference group, workers rating their perceived health as "excellent" had much higher odds of having a BMI under 30 (OR = 4.114; 95% CI 2.689 - 6.296), higher odds of not being a tobacco user (OR = 2.243; 95% CI 1.096 - 4.591), and higher odds of abstaining from salty foods on a daily basis (OR = 2.326; 95% CI 1.512 - 3.577). Furthermore, workers with "excellent" perceived health had higher odds of reporting high levels of physical activity as compared to workers with "fair or poor" levels of perceived health status. This group had 87.7% lower odds of reporting a physical activity level of "less than one time per week" (OR = .123; 95% CI .0618 - .246) and 60.8% lower odds of reporting a physical activity level of "one to two times per week" (OR = .392; 95% CI .248 - .619). Workers with "good" levels of perceived health status also had 79% lower odds of obesity (OR = 1.790; 95% CI 1.341 - 2.389), 31.5% lower odds of abstinence from eating salty foods on a daily basis (OR = 1.315; 95% CI 1.026 - 1.685) and 50.8% lower odds of reporting a physical activity level of "less than one time per week" (OR = .492; 95% CI .358 - .577).

Table 13

Association of shift worked with job satisfaction, life satisfaction, and perceived health status, controlling for age, obesity, tobacco use, salt intake and physical activity

	Type III Test P-value		
Outcome	Job Satisfaction	Life Satisfaction	Perceived Health Status

Shift Worked	.428	.168	.393
Age	<.001	.027	.199
Obesity	.371	.139	<.001
Tobacco Use	.276	.363	.032
Salt Intake	.006	.076	<.001
Physical Activity	.292	.015	<.001

Research Question Three

Research question three is: *Is there a difference in BP control, perceived stress, job satisfaction, life satisfaction, and perceived health status among municipal employees by department, controlling for age, obesity, and tobacco use?*

Controlling for age, obesity and tobacco use, department was significantly associated with blood pressure control ($p<0.001$), perceived stress ($p<0.001$), and life satisfaction ($p=0.046$).

Blood pressure control. As illustrated in Table 14, department, age, and tobacco use were significantly associated with blood pressure control. As compared to City Hall employees, those employed in the Public Works Department had lower odds of BP control (OR = .443; 95% CI .334 - .588). Those employed in the Fire Department had lower odds of blood pressure control (OR = .502; 95% CI .364 - .694). As age increased, workers had higher odds of blood pressure control (OR = 1.041; 95% CI 1.029 - 1.053). For every year of increased age, the odds of blood pressure control increased by 4.1%. Workers not using tobacco also had higher odds of blood pressure control (OR = 1.543; 95% CI 1.118 - 2.129) as compared to workers who used tobacco. There was no association of blood pressure control and obesity (p = .154).

Table 14

Association of department with BP control, controlling for age, obesity, and tobacco use

Outcome	Type III Test P-value
Department	<.001
Age	<.001
Obesity	.154
Tobacco Use	.008

Perceived stress. As shown in Table 15, department ($p < .001$) and age ($p = .008$) were significantly associated with perceived stress. Public Works Department employees (OR = 3.405; 95% CI 2.018 - 5.744) had significantly increased odds of reporting a perceived stress level of "none" as compared to City Hall workers, using a perceived stress level of "a lot" as the comparison group. Furthermore, as age increased (OR = 1.024, 95% CI 1.002 - 1.046), workers had increased odds of reporting a perceived stress level of "none" using the perceived stress level of "a lot" as the comparison group.

Table 15

Association of department with perceived stress, controlling for age, obesity, and tobacco use

Outcome	Type III Test P-value
Department	<.001
Age	.008
Obesity	.453
Tobacco Use	.819

Job satisfaction. As shown in Table 16, only age was significantly associated with job satisfaction. As age increased (OR = 1.023; 95% CI 1.011 - 1.035), workers had increased odds of reporting that they were "mostly satisfied" with their jobs, as compared to workers who were "partially or not satisfied." There were no other associations of significance.

Life satisfaction. Life satisfaction was significantly associated with age (p = .006) and department (p = .046) (Table 16). As age increased (OR = 1.019; 95% CI 1.019 - 1.032), workers expressed more life satisfaction. Workers in the Police Department (OR = 1.464; 95% CI 1.039 - 2.063) had increased odds of being "mostly satisfied" with their jobs.

Perceived health status. Perceived health status was significantly associated with obesity and tobacco use (Table 16). There were no differences among the departments in perceived stress or perceived health status. Workers with a perceived health status of "excellent" were significantly more likely to have a BMI of less than 30 (OR = 4.287; 95% CI 2.838 - 6.478) and more likely to be abstinent from tobacco (OR = 2.028; 95% CI 1.017 - 4.042). Workers with a perceived health status of "good" were more likely to have a BMI of less than 30 (OR = 1.810; 95% CI 1.356 - 2.416), compared to workers who had "fair or poor" perceived health.

Table 16

Association of department with job satisfaction, life satisfaction, and perceived health status, controlling for age, obesity, and tobacco use

Outcome	Type III Test P-value

Job Satisfaction	
Department	.371
Age	<.001
Obesity	.403
Tobacco Use	.318
Life Satisfaction	
Department	.046
Age	.006
Obesity	.100
Tobacco Use	.476
Perceived Health Status	
Department	.267
Age	.266
Obesity	<.001
Tobacco Use	.038

Research Questions Four through Eight - Model for BP Control

Research question four is: *What is the best model for BP control using perceived stress and personal factors (gender, race, age, obesity, abdominal adiposity, tobacco use, salt intake and physical activity) as explanatory variables?*

Using logistic regression, a best-fit model was determined using backwards selection with a p to stay of 0.1. The selection was an iterative process where the least significant Type III P-value was removed until all values were $p = .1$ or less. For this BP control model (1) abdominal adiposity ($p = .969$), (2) physical activity ($p = .632$), (3) salty foods ($p = .291$), and (4) obesity ($p = .261$) were not found to reach significance and therefore were sequentially eliminated during the selection process. The final model (Model 1, Table 18), included age ($p < .001$), tobacco use ($p < .001$), gender ($p < .001$), perceived stress ($p = .029$), and race ($p = .086$). To evaluate the goodness-of-fit of logistic models, a pseudo R-square was evaluated with the higher pseudo R-square used to indicate which model better predicted the outcome (Long, 1997).

Research question five is: *Does the inclusion of job satisfaction and life satisfaction add to the predictive ability of the above model*?

Job satisfaction (p = .336) did not reach significance. Life satisfaction did not reach significance (p = .054) but was left in the model since p > .100. Job satisfaction was removed for the next iteration. Results are shown in Table 18 (Model 2).

Research question six is: *Does the inclusion of the type of shift worked improve the predictive ability of the model?*

To analyze this question, Shift worked was added to the model. Shift worked (p = .378) was found to be non-significant and was therefore removed prior to performing the next iteration.

Research question seven is: *Does the inclusion of department improve the predictive ability of the model*?

In this iteration, department (p < .001) reached significance, but life satisfaction (p = .169) and race (p = .168) were no longer significant with the addition of this variable. Life satisfaction was removed, and race did not reach significance (p = .186). Therefore, race as removed as well prior to performing the next iteration.

Research question eight is: *Does the inclusion of perceived health status add to the predictive ability of the above model?*

For question eight, perceived health status was added to the model. Perceived health status was not found to reach the level of significance (p = .477) and was removed to reveal the final best-fit model, shown in Table 18 (Model 3).

Table 17

Best model for blood pressure control in municipal workers using department, perceived stress, gender, age, and tobacco use with a p-to-stay of .10

Outcome	Type III P-value
Department	<.001
Perceived Stress	.061
Gender	<.001
Age	<.001
Tobacco Use	.008

Best Model for Blood Pressure Control

In this population, the best model for blood pressure control was found to be perceived stress, gender, age, tobacco use, and department (Model 3, Table 18). Low perceived stress was associated with uncontrolled blood pressure. Workers with a perceived stress level of "none" (OR = .662; 95% CI .439 - .999), "relatively little" (OR = .636; 95% CI .442 - .916), and "moderate" (OR = .636; 95% CI .451 - .897) had decreased odds of BP control than workers with "a lot" of perceived stress. Increasing age (OR = 1.039; 95% CI 1.027 - 1.051), female gender (1.545; 95% CI 1.22 - 1.96), and tobacco avoidance (OR = 1.534; 95% CI 1.113 - 2.115) were also associated with blood pressure control. Gender was independently related to the odds of blood pressure control in a previous study conducted with this study population in which females had a control rate that was double the control rate of males (Sinsuesatkul, 2008). Individuals working for the Department of Public Works (OR = .504; 95% CI .376 - .676) and the Fire Department (OR = .583; 95% CI .417 - .817) had lower odds of blood pressure control, using City Hall as the comparison group.

Table 18

Logistic regression analysis summary of models predicting blood pressure control in municipal workers

Model	Predictor Variables	Nagelkerke Pseudo *R*2	P-value
Model 1	Perceived Stress, Gender, Race, Age, Tobacco Use	.091	< .001
Model 2	Perceived Stress, Gender, Race, Age, Tobacco Use, Life Satisfaction	.096	< .001
Model 3	Perceived Stress, Gender, Age, Tobacco Use, Department	.109	< .001

CHAPTER 5

DISCUSSION

This correlational study was conducted to examine the relationship of blood pressure control, perceived stress, job satisfaction, life satisfaction, perceived health status, and personal factors including age, gender, race, obesity, abdominal adiposity, tobacco use, salt intake and physical activity in municipal workers. The Expanded Biobehavioral Interaction (EBI) Model was used to guide the study. The EBI Model is an integrated biobehavioral model adapted from Selye's physiological model of stress, Lazarus and Folkman's Transactional Model of Stress and Coping, and the McEwen Stress, Allostasis, and Allostatic Load Model. Biobehavioral research explores links among psychosocial, behavioral, and biological factors in relation to health and health-related outcomes (Greenberger, Yucha, Janson, & Huss, 2007; Kang, Rice, Turner-Henson, & Downs, 2010). Descriptive statistics and multinomial logistic regression analyses were utilized to examine data for the study. A discussion of the findings, conclusions, and nursing implications and recommendations will be presented in this chapter.

Discussion of the Findings

Within this population of 3,501 municipal workers, over three-fourths of the workers had blood pressure levels less than 140/90, exceeding the goal of Healthy People 2010, which was to decrease uncontrolled blood pressure rates to 50% or more of the

U.S. population (U.S. Department of Human Services, 2000). A total of 1,577 workers either had elevations of systolic or diastolic blood pressure or were taking blood pressure medication. Of those, 770 (48.8%) had achieved blood pressure control, and 808 (51.2%) had not, leaving 23% of the municipal workers with uncontrolled blood pressure overall.

Though studies of blood pressure control rates in insured workers are scant, a recent analysis of 2004 NHANES data reported similar results in which 47.8% of fire and police being treated for hypertension had their blood pressure under control in a population in which 80% of the workers had health insurance (Davilla, Kuklina, Valderrama, Yoon, Rolle, & Nsubuga, 2012). In the current study, in addition to access to insurance, workers participated in a longstanding workplace wellness program which included an annual or biennial health screening. The wellness program has been in place since 1986 (Brown, 2012). Furthermore, these workers have the support of the workplace wellness staff which includes a nurse case manager, nurse coordinator, and a dietician.

Obesity and abdominal adiposity were highly prevalent in the population. In fact, only 313 of the 3,501workers had a BMI of 24.9 or less. More than two-thirds of workers with controlled or uncontrolled blood pressure had a BMI of 30 or over. Abdominal adiposity was highly prevalent in the general and hypertensive population as well, particularly in females.

Predictors of Blood Pressure Control

In this study, the variables of perceived stress, gender, age, tobacco use, and department predicted blood pressure control. Workers reporting low levels of perceived stress, females, older workers, and workers not using tobacco had higher odds of blood pressure control. Furthermore, employees of the Public Works and Fire Department had higher odds of blood pressure control as compared to City Hall workers.

In this study, increasing age was associated with blood pressure control. There were mixed findings in the literature of the association of age and blood pressure control. Egan, Zhao, and Axon (2010) determined that while the prevalence of hypertension was higher in those 40 years or older, as opposed to those 18 to 39 years, blood pressure control also increased. It is possible that over time, some individuals learn to cope more effectively with behavioral and emotional challenges (Steptoe, 2008). Older adults have been found to use more adaptive strategies in managing life changes as a result of experience and maturity (Diehl, Coyle, and Labouvie-Vief, 1996). They may also have greater emotional stability and less emotional reactivity, and may be more flexible in their response to stress (Diehl et al., 1996; Lawton, Kleban, Rajagopal, & Dean, 1992). Other possible explanations are the healthy worker effect, or the positive influence of cumulative years of exposure to the workplace wellness program. In this municipality, workers have had access to the wellness program for over 25 years. This exposure would be of particular benefit to older workers who had an extended length of service with the municipality.

However, other studies have demonstrated that increasing age is significantly associated with uncontrolled blood pressure (Bailey, Grossardt, & Graves, 2008; Knight, Bohn, Wang, Glynn, Mogun, & Avorn, 2001; Ong et al., 2008). Bailey, Grossardt, and Graves (2008) attributed poor BP control in older individuals to decreasing efficacy of treatments, in part, due to less aggressive medication therapy. Indeed, this finding was duplicated by Knight and others, who acknowledged that efficacy of treatment declines in those who are older (Knight et al., 2001). However, Knight concluded that the multidrug regimens needed to control hypertension in those who are older may lead to side effects which appear to ultimately decrease compliance in older hypertensive individuals.

Hyman and Pavlic (2001) found that an independent predictor of uncontrolled blood pressure was male gender, a finding which is consistent with the results of this study. The association of male gender and uncontrolled blood pressure in this study was significant, with males having approximately 55% lower odds of blood pressure control in the final best-fit model. Lindquist, Beilin, and Knuimen (1997) found that females were more likely to use "healthier" or adaptive coping mechanisms than males. In the Lindquist study, relationships between job stress and maladaptive or unhealthy behaviors were more clearly demonstrated in males than females, particularly with respect to excessive consumption behavior (food, cigarettes, and alcohol). They concluded that males tend to have an avoidant/denial style of dealing with stress as opposed to females, and found that this tendency for males to deny stress was associated with poor blood pressure control (Lindquist et al., 1997).

In this study, Police and Fire Department employees had the lowest prevalence of hypertension, and City Hall and Public Works employees had the highest rates of hypertension. Night and Fire shift employees had the lowest prevalence of hypertension, and Day and Other shift employees had the highest prevalence of hypertension. Among individuals with hypertension, those employed in the Public Works Department and Fire Department had greater odds of having uncontrolled blood pressure compared to City Hall workers, the comparison group. Shift was not significantly associated with blood pressure control. That there was a difference in the odds of BP control between the Fire Department and Fire shift may be explained by discrepancies in the makeup of these two groups. Individuals working Fire shift are more likely to be employed as firefighters because the Fire Department employs numerous administrative workers. Fire shift workers may have a higher level of fitness than administrative workers employed with the Fire Department, and this higher level of fitness may have accounted for differences between these two groups.

Though studies in insured groups of workers are limited, researchers in one study found blood pressure control generally ranged from 48 to 85%, which is consistent with the BP control rate in the current study of 48.8% (Davilla et al., 2012). Blood pressure control was found to be dependent upon the occupational group in Davilla's study. Protective service workers such as police officers and firefighters had the second highest prevalence of hypertension (25.7%) and the second lowest level of BP control (47.7%), just behind sales supervisors and proprietors, even after adjusting for sociodemographic factors, body weight, tobacco use, and alcohol (Davilla et al., 2012). Police officers and firefighters are known to have a higher risk of heart disease than the general population, so it is vitally important to control blood pressure (Kales, Tsismenakis, Zhang, & Soteriades, 2009). Davilla concluded that protective service workers stood to benefit the most from a workplace wellness program. It is possible that the workplace wellness program in this municipality has impacted the rates of hypertension prevalence and BP control in various groups. Although the Fire Department has a policy of taking firefighters with uncontrolled blood pressure off duty which almost certainly increases compliance in these individuals, firefighters in the current study had a level of control similar to Davilla's study.

Perceived Stress

In an effort to explore the unexpected finding relating poor blood pressure control to low levels of stress, additional literature is reviewed in this section. Individuals experiencing stress have been long known to cope with stress through maladaptive mechanism such as tobacco use, drinking or overeating. These behaviors can trigger a biological cascade through the hypothalamic-pituitary-adrenal cortical axis which contributes to multiple health issues (Jackson, Knight, & Rafferty, 2010). However, the role of stress in the pathology of hypertension is controversial, and findings have been inconsistent. Employees of the Public Works Department have higher odds of low levels of perceived stress in comparison to City Hall employees. Those working a Fire shift have higher odds of high levels of stress compared to Day shift as the reference group. Response differences in Fire shift and Fire Department may be attributed having a more homogenous group of workers in the Fire shift group. Workers in Fire shift are predominantly male firefighters, while the Fire Department includes administrative and clerical workers.

Of interest in this study was the finding that workers who stated that they had low stress had higher odds of uncontrolled blood pressure. Surprisingly, this finding is consistent with studies conducted in the 1990's. Winkleby, Ragland, and Syme (1988) proposed that there may be a direct inverse association between subjective appraisal of stress and blood pressure. Correspondingly, in a longitudinal study of employed men, researchers found that those with higher anxiety and hostility scores had higher blood pressures, and that those with the highest pressures reported lower amounts of stress (Jenkins, Somervell, & Hames, 1983). Furthermore, Suter, Maire, Holtz and Vetter (1997) posited that *stress denial* in combination with abdominal adiposity, alcohol consumption and tobacco use may be a proxy for high stress level. Other researchers have determined that an inverse relationship between perceived job strain and hypertension may be most prevalent among workers in lower socioeconomic groups (Albright, Winkleby, Ragland, Fisher, & Syme, 1992). It is possible that there may be racial differences in the ways stress is experienced as well. Williams (1997) proposed that some minority groups may be more likely than whites to access religious involvement, family support, or psychosocial resources that act as buffers in regard to stress. As previously noted, the Public Works Department, a group with both poor blood pressure control and low perceived stress, was comprised of 90% minority workers.

There may be several explanations for the phenomenon of stress denial in individuals with hypertension. Stress researchers working with the military have noted that there is stigma associated with a stress reaction (Krupnick & Green, 2008). It is possible that employees do not want to report stress in the setting of their workplace, fearing a label of poor mental health. Another possible explanation may be habituation. Habituation occurs when individuals become accustomed to and accommodate to stress. In a review of occupational stress and hypertension, Mustacci (1990) suggested that an inverse relationship of perceived stress and hypertension may occur because familiarity with a job renders the demands made by the work environment more predictable and less threatening in terms of vasopressor response. Continuous exposure to a stressor without habituation may suggest that individuals with established hypertension may have reactions which are psychologically or metabolically different than those without hypertension (McCarty, Konarska, & Stewart, 1992).

Psychological or physical stress is known to raise blood pressure and heart rate and can lead to physiological arousal, called cardiovascular reactivity, in some people more than others (Jackson, Knight, & Rafferty, 2010). If cardiovascular reactivity during stress is a consistent physiological characteristic of an individual, then it is possible that highly reactive individuals experiencing stress would have a greater allostatic stress load than individuals who are either not highly reactive or perceive less stress. Cardiovascular reactivity has also been associated with a personality construct, the *Type D* or distressed personality (Sher, 2005). Type D dimensions (negative affectivity and avoidance coping) are associated with greater cortisol reactivity to stress which may be a mediating factor in the association between Type D personality and the increased risk for coronary heart disease (Sher, 2005).

Therefore, it is possible that some individuals with high reactivity may respond to perceived stress with denial or suppression of emotion. Indeed, though not necessarily linked to blood pressure control, researchers have found an association between hypertension and a low capability to express emotions (Henry, 1988; Suter et al., 1997; Theorell, 1987). Flaa and colleagues proposed that some personalities are characterized by a suppression of feelings in a way that raises the blood pressure, while those who express their feelings to the surroundings are more likely to have lower blood pressure and reactivity. Phillips (2011) presented evidence that low reactivity may characterize those with more symptoms of depression, those who are fatter, and those with worse self-reported health.

Though studies are few, a study of individuals in Finland showed that alexithymia, or increased reactivity combined with inability to express emotions, is associated with male gender, low educational level and low socioeconomic status (Salminen, Saaijarvi, Toikka, & Kauhanen, 1999; Suter et al., 1997). Poor ability to express emotions has also been associated with elevated blood pressure independent of sodium and alcohol intake, body mass index, and physical fitness (Jula, Salminen, & Saaijarvi, 1999). This inability to be aware of and to process emotions may make an alexithymic individual vulnerable to continuous stress. Nyklicek, Vingerhoets, and Van Heck, (1996) also suggested this inverse relationship of stress and blood pressure may be found when stress measurement is subjective and attributed the results to an altered appraisal of stressors.

To fully explain the finding of no relationship between high levels of perceived stress and blood pressure control, it is possible that mediating variables may need to be further investigated. Some lifestyle strategies such as using tobacco, making poor food choices, and not being physically active may be considered maladaptive strategies to manage stress as compared to positive health behaviors which may be adaptive and facilitate better health. Lindquist, Beilin, and Knuimen (1997) found that solution-oriented, positive attitudinal coping factors were correlated with a number of independent lifestyle behaviors such as exercise habits and healthy eating. Results may suggest that there could be indirect influences on the strategies used to manage stress. Thus, stress may have no direct effect on blood pressure control, but the mechanisms employed to contend with stress may be significantly related to blood pressure, with blood pressure elevation effects appearing to be mediated by lifestyle habits. If so, this would be consistent with multiple studies (Jenkins, Somervell, & Hames, 1983; Lindquist et al., 1997; Mustacchi, 1990; Suter, Maire, Holtz, & Vetter, 1997; Winkleby, Ragland, & Syme, 1988).

Job Satisfaction, Life Satisfaction, and Perceived Health Status

Neither job satisfaction nor perceived health status were associated with shift or department. The odds of job satisfaction increased as age increased, as did the likelihood that the individual would abstain from eating salty foods on a daily basis. Individuals who were *mostly satisfied* with life had increased odds of higher levels of physical activity, compared to those who were *partly or not satisfied*. While no differences by race or gender were discerned in job satisfaction, life satisfaction or perceived health status, it should be noted that among the sample of hypertensive workers, individuals in the Public Works Department were 88% minority and 81% male, and the Fire Department was 90% male. Therefore lack of variability may have influenced the findings.

Although perceived health status did not appear to be related to blood pressure control, workers with higher levels of perceived health status had higher odds of having a BMI of less than 30, of being more physically active and abstaining from salty foods as compared with individuals reporting fair or poor levels of perceived health status. There was no statistically significant association of perceived health status and shifts or departments. Numerous large-scale prospective epidemiological studies testify that self-reported health predicts various health outcomes including mortality in a dose-response fashion, independently of traditional risk factors and medical status. Those reporting poor health have a mortality risk two to seven times greater than those reporting excellent health (Idler and Benyamini, 1997; Phillips, 2011). Abdominal adiposity has been linked with psychological distress, and it has been argued that an increased vulnerability to stress in the abdominally obese may be manifest as physiological hyperreactivity (Bjorntorp, 1991; Phillips, 2011; Quilliot, Bohme, Zannad, & Zeigler, 2008). Although no differences in perceived health status were found by shift or department, workers with excellent or good perceived health status had lower odds of obesity, abdominal adiposity, being a tobacco user, eating salty foods on a daily basis, and having low levels of physical activity as compared to those with fair or poor perceived health status.

The Study's Conceptual Model

The conceptual model for this study was the Expanded Biobehavioral Interaction (EBI) model (Appendix A), an integrated biobehavioral model adapted from Selye's physiological model of stress, Lazarus and Folkman's Transactional Model of Stress and Coping, and the McEwen Stress, Allostasis, and Allostatic Load Model (Kang et al., 2010). The EBI model posits that health effects may be direct via biological changes that parallel, precede, or are part of emotional reactions or behavioral patterns in response to life stresses. The impact of this stress burden or *allostatic load* is further exacerbated by personality characteristics, such as anger/hostility, neuroticism, and pessimism, and by the clustering of health-endangering behaviors, such as tobacco use, alcohol and drug abuse, sedentary lifestyle, and obesity (Contrada et al., 2000; Williams, Yu, Jackson, & Anderson, 1997).

Findings from this study supported the EBI model. The EBI model includes biologic, individual, behavioral, psychosocial and environmental factors which interact over time to produce gradients of risk for disease. Biological responses typically function as a mediator for various psychosocial, behavioral, individual, and environmental factors to influence health and health-related outcomes (Kang et al., 2010). The results of this study indicated that workers who had uncontrolled blood pressure had higher odds of being male, being younger in age, and being a tobacco user, as compared to those with blood pressure control. In addition, those with uncontrolled blood pressure were had higher odds of being employed in the Public Works, Fire Department, or on a Fire shift. This is possibly explained by a strong likelihood that workers in Public Works, Fire Department or Fire shift are much more likely to be male than in other departments. The biologic factors of obesity and abdominal adiposity are known to cause multiple physiologic changes which include lipid abnormalities, elevated blood pressure, elevated triglyceride levels, low high-density lipoprotein cholesterol levels, increased fibrinogen and leptin (Alberti et al., 2009). However, while both abdominal adiposity and obesity were highly prevalent in the hypertensive workers in the study, these factors could not be shown to strongly influence whether hypertension was controlled. It is possible that no differences were detected because of the lack of variability in the sample due to the high prevalence of overweight and obesity.

Overall, the EBI model provided guidance in identifying psychosocial, individual, environmental, and behavioral factors that predicted blood pressure control. Psychosocial factors represent the factors processed through individual appraisals, and cumulative effects on biological responses include both acute and chronic effects (Kang et al., 2010). In this study, there was an association between perceived stress and blood pressure control. Individual factors which emerged as relevant were age and gender. Race was not identified as a relevant factor in this population. Environmental factors which emerged as relevant were employment with Public Works and Fire. Behavioral items most relevant to blood pressure control were tobacco use, daily salty foods and physical activity.

Limitations

Seven limitations affected this study. First, causal conclusions could not be drawn about relationships between the independent variables and the dependent variable, blood pressure control, because the study design was a predictive correlational research design. Predictive correlational research designs are those designs that explore the association between two or more variables. This study aimed to examine the relationship between all independent variables and blood pressure control.

Second, a self-report response bias could have occurred because the participants may have attempted to protect themselves by answering in a socially or occupationally desirable manner. Employees may feel they must present their answers in a positive manner when information is provided by self-report. This may have been particularly relevant in the occupational setting where workers may have had the erroneous perception that employers have access to individual responses.

Third, because the study group consisted of municipal workers, the generalizability of results may be limited. Municipal workers are healthy enough to be in a work environment and therefore the generalizability of results of this group is limited to other similar populations.

Fourth, the time dimension of the study may limit the utility of the secondary data. The data for this study were collected in 2010-2011. It is possible that since the data were collected in the past, it may not be current.

Fifth, it must be recognized that several variables which were necessarily dichotomized may not have best reflected a true measure of that variable. Two examples are the variables *tobacco use* and *obesity*. *Tobacco use* was dichotomized into "currently smoking" and "not currently smoking." A response of "not currently smoking" could indicate that a respondent discontinued smoking twenty years previously, or one day previously. Additionally, *obesity* was dichotomized into "obese" and "not obese." A consequence of this use may have been a decrease in measured strength of the association of increasing weight and the dependent variable.

Sixth, two demographic characteristics could have influenced results: gender and race. The population in some departments was predominantly male. Furthermore, the racial makeup of the group was heavily weighted to minority. Low variability may have limited findings in regard to gender and race.

Finally, the influence of other conditions (such as obstructive sleep apnea) on BP control that may be highly prevalent in this group was not known in this set of analyses. Cross-sectional studies are limited on the part of confounding factors because of additional variables which may affect the relationship between the variables of interest but not affect those variables themselves (Grimes & Schulz, 2002).

Conclusions

Factors that predict blood pressure control in patients diagnosed with hypertension have not been well identified, and few studies have examined the predictors of blood pressure control in workers with health care insurance (Cushman et al., 2002; Sinsuesatkul, 2008). In this study, low levels of perceived stress, female gender, increasing age, abstinence from tobacco, and employment in the Public Works or Fire Department were associated with the variable of blood pressure control. Paradoxically, a statistically significant number of workers with uncontrolled blood pressure reported the lowest levels of stress. This may suggest that the impact of perceived stress on blood pressure control may be mediated by individual differences in reactions to stress. Additionally, control may be influenced indirectly by adaptive or maladaptive health behaviors that determine dietary and related lifestyle habits known for their direct effects on blood pressure. Further studies are needed to assess causality and relationships among stress and the control of hypertension.

Implications

Although the participants of this study were insured and participated in an annual health maintenance program where they received medical support and referrals, 23.1% of the participants had uncontrolled blood pressure, suggesting that factors other than access to care and antihypertensive treatment are involved. Many studies have investigated the individual predictors of blood pressure control among adults such as sociodemographic characteristics, access to health care, psychological factors, and lifestyle factors but a prediction model has not been established for use in examining interactions among these predictors, particularly in individuals receiving regular antihypertensive drug treatment (Dean et al., 2007). In order to facilitate the prevention of cardiovascular diseases and complications in those with hypertension, this study established a prediction model for blood pressure control of older age, female gender, and no tobacco use. Furthermore, there is an association of poor blood pressure control and the subjective self-identification of low amounts of stress.

Additional efforts can and should be made in this group of municipal workers to focus blood pressure control interventions on younger workers, on men, and on smokers.

In addition, this study suggests that the reaction to stress may be a significant factor in blood pressure control and therefore should be accounted for when seeking to identify those who are most at risk for poor blood pressure control. Finally, this study supports the notion that identifying workers with low perceived health may also identify those who have poor health habits such as eating salty foods, low levels of physical activity, tobacco use and perhaps others. These poor health habits are associated with poor control of blood pressure.

The workplace presents an accessible environment for introducing and maintaining health-promotion programs for working-age adults because it contains a concentrated group of people who share a common purpose and common culture (Goetzel & Ozminkowski, 2008). With health care expenditures rising, there is widening interest in workplace-based disease prevention and health promotion as a means of improving health while lowering costs (Baicker, Cutler, & Song, 2010). Good worker health has the potential to enhance company profitability and help achieve other organizational goals (Goetzel & Ozminkowski, 2008). Given the importance of healthy lifestyle in the prevention and treatment of high blood pressure, employers may see a reduction in health care costs associated with hypertension and other chronic diseases through implementation of evidence-based strategies (Goetzel & Ozminkowski, 2008). In fact, in a recent study, researchers found medical costs fall about $3.27 for every dollar spent on wellness programs, and absentee day costs fall by about $2.73 for every dollar spent (Baicker, Cutler, & Song, 2010). Health care models and worksite programs that address these factors may improve blood pressure control among employees with high blood pressure. The high return on investment suggests that the wider adoption of health promotion programs could prove beneficial for budgets and productivity as well as health outcomes.

Clearly, given the significant morbidity, mortality, and cost of uncontrolled blood pressure to society, the benefits of improving BP control could be significant. The results of this study highlight the need to target individual perceptions of stress and lifestyle as much as the working environment in workplace cardiovascular health promotion programs. Programs designed to improve blood pressure control in the workplace should focus not only on the working environment but also on the way individuals perceive stress insofar as this influences behaviors directly affecting blood pressure.

Recommendations for Future Research

There are many opportunities for future research. The findings of this study suggest that subjects with low self-perceived levels of stress could be psychologically and/or metabolically different from those with controlled BP. Therefore, expanded tools should be used to measure objective and subjective stress in order to more fully understand the workers' perception of and reaction to stress and strengthen conclusions which may be inferred from the association of blood pressure control and the perception of stress. Additional variables such as alcohol use, sleep quality (including sleep apnea, presence of snoring and neck circumference), and better and more detailed measures of dietary quality and physical activity that are important in controlling blood pressure in this population should also be examined. Expanded measures of physical activity to include intensity and duration should be used to determine which elements of exercise are most effective in controlling blood pressure. Important comorbidities such as diabetes should be considered as an additional variable in future studies. These relationships may need to be explored in both short term and long term studies. This study provided insight into a diverse and hard-to-reach population. Furthermore, some occupational groups such as police officers and firefighters are known to have a higher risk of heart disease than the general population as well, so it is vitally important to identify unknown risk factors and control known risk factors (Kales, Tsismenakis, Zhang, & Soteriades, 2009).

Longitudinal studies should be conducted so that significant relationships between various predictors and health status can be explored over time. Given the excess mortality and cost to society resulting from hypertension, increased knowledge of how workers perceive stress and their reaction to stress in the workplace may be a particularly salient factor for future study. Finally, because of possible lack of findings due to low variability in gender, race, abdominal adiposity and obesity, further studies should be conducted in other worker populations to investigate the potential contributions of these factors in the control of blood pressure.

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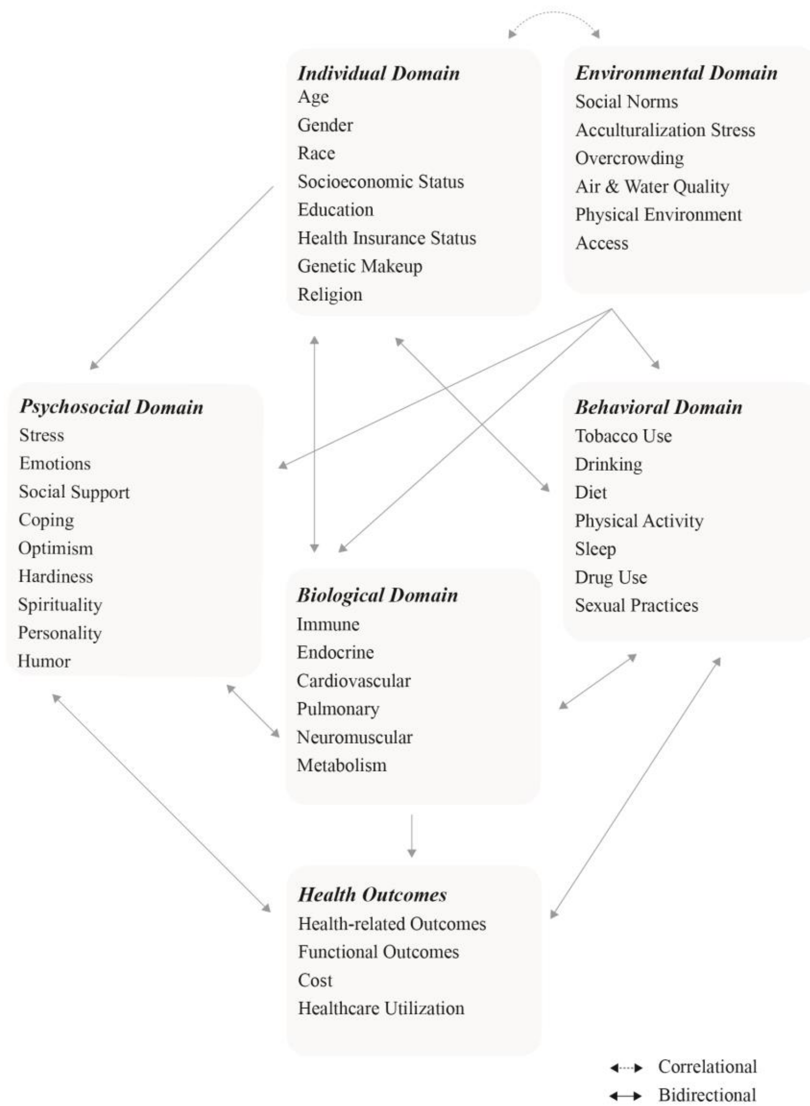
APPENDIX A

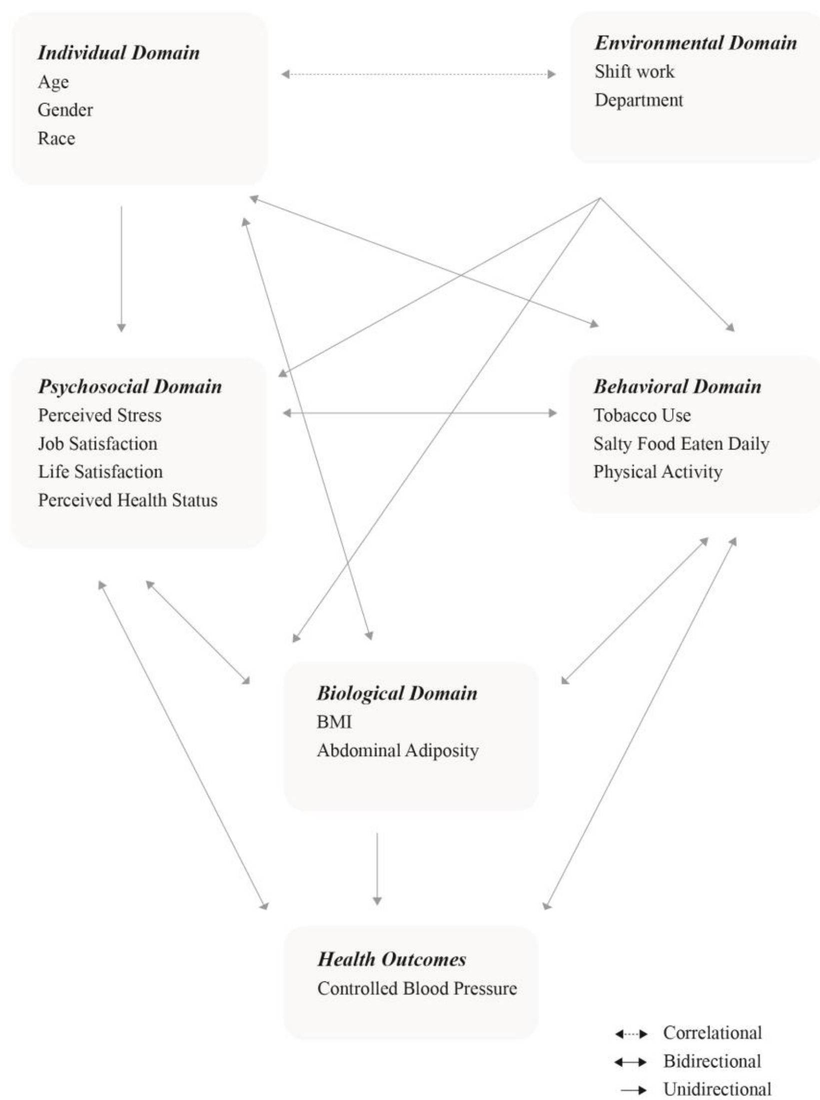
THE EXPANDED BIOBEHAVIORAL INTERACTION MODEL



Source: Kang, Rice, Turner-Henson, Park, & Downs, 2010

APPENDIX B

MODEL APPLIED TO THE STUDY


Individual Domain
Age
Gender
Race
Environmental Domain
Shift work
Department
Psychosocial Domain
Perceived Stress
Job Satisfaction
Life Satisfaction
Perceived Health Status
Behavioral Domain
Tobacco Use
Salty Food Eaten Daily
Physical Activity
Biological Domain
BMI
Abdominal Adiposity
Health Outcomes
Controlled Blood Pressure
Correlational
Bidirectional
Unidirectional

APPENDIX C

INSTITUTIONAL REVIEW BOARD APPROVAL

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Institutional Review Board for Human Use

DATE: August 8, 2012

MEMORANDUM

TO: Debra D. Baldwin
Principal Investigator

FROM: Cari Oliver, CIP
Assistant Director, UAB OIRB

RE: Request for Determination—Human Subjects Research
IRB Protocol #N120725001 – Blood pressure control and perceived stress, job satisfaction, life satisfaction and perceived health status in municipal workers

A member of the Office of the IRB has reviewed your exempt application with the above title, and it was determined that the application **qualifies for the designation of Not Human Subjects Research**.

The reviewer has determined that this proposal is **not** subject to FDA regulations and is **not** Human Subjects Research. Note that any changes to the project should be resubmitted to the Office of the IRB for determination.

470 Administration Building
701 20th Street South
205.934.3789
Fax 205.934.1301
irb@uab.edu

The University of
Alabama at Birmingham
Mailing Address:
AB 470
1530 3RD AVE S
BIRMINGHAM AL 35294-0104

APPENDIX D

HEALTH RISK APPRAISAL TELEFORM ® INSTRUMENT

Good Health Program, UAB School of Nursing, LRC 381
1530 3rd Avenue S., Birmingham, AL 35294-1210

22356

MEDICAL INFORMATION FORM

Voice: (205)934-7549; 934-6101
Fax: (205)975-2501
E-mail: pcarver@uab.edu

Dear Dr.________________________________:
(please print)

Periodic health screenings are a requirement for enrollment in a City sponsored health insurance program. Your patient, listed below, has requested that this screening be conducted by you. Therefore, we would appreciate your completion of the screening measures and mailing this form or faxing it to the Good Health Office at **975-2501** by **Thursday, May 6th, 2010***. We appreciate your cooperation with this request. If you have any questions, please call the Good Health Office at 934-7549 or 934-6101.

PATIENT INFORMATION:

Name: [ ] SS #: 999 - [ ] - [ ]

City Department: [ ] DOB: [ ] / [ ] / [ ]

MEDICAL SCREENING INFORMATION: To fulfill the City's requirement for participation in a health screening, all of the following measures MUST be taken:

BLOOD PRESSURE (two pressures taken 3 minutes apart after initial 5-minute rest)

(1) [ ] / [ ]

(2) [ ] / [ ]

PULSE [ ]

TAKING ANTIHYPERTENSIVE? O Yes O No

CLASS OF ANTIHYPERTENSIVE
- O Beta Blocker
- O Calcium Channel Blocker
- O Diuretic
- O ACE Inhibitor
- O AR Blocker
- O Combination
- O Other

Please record to the nearest quarter pound/inch. **WEIGHT (lbs.)** [ ] . [ ] **HEIGHT (inches)** [ ] . [ ]

BLOOD WORK: A cholesterol value (HDL, LDL if available) is required. If cholesterol test is not indicated at this time, please record last value obtained and date.

Fasting: O Yes O No

Date of blood work [ ] / [ ] / [ ] HgbA1c [ ] . [ ]

Total Cholesterol (serum) [ ] Triglycerides [ ] HDL Cholesterol [ ] LDL Cholesterol [ ]

Patient is currently taking medications for: O Diabetes O High Cholesterol O Asthma O Arthritis

DR.'S SIGNATURE: ______________________________ **DATE OF EXAM:** [ ] / [ ] / [ ]

*This form MUST be sent from physician's office.

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Copyright 2010

GOOD HEALTH PROGRAM, UAB SCHOOL OF NURSING

HEALTH QUESTIONNAIRE - SCREENING INFORMATION

INSTRUCTIONS: **Double check prefilled information. Do not bend or fold the form. USE A BLACK PEN.**

Shade circles like this: ●
Not like this:

For optimum accuracy, please print carefully and avoid contact with the edges of the box. The following will serve as an example: 1 2 3 4 5 6 7 8 9 0

LAST NAME　　FIRST NAME　　MI

SCREEN DATE __ / __ / ____　　DEPARTMENT

SCREENING ID NUMBER　　DATE OF BIRTH (mm/dd/yy) __ / __ / ____　　WORK PHONE NUMBER ___ - ____

○ **1. Checkout Personnel Only**

Employees: Please Answer Questions # 2-85. If you are pregnant, please call 934-7549 before starting.

2. What shift do you work? ○ Shift A Fire ○ Shift B Fire ○ Shift C Fire
○ 7:00am-3:00pm ○ 8:00am-5:00pm ○ 3:00 pm-11:00pm ○ 11:00pm-7:00am ○ Other

3. Sex: ○ Male ○ Female

4. How many times per day do you usually use smokeless tobacco? (Chewing tobacco, snuff, pouches, etc.) [ ][ ] times per day.

5. How many cigars do you usually smoke per day? [ ][ ] cigars per day.

6. How many pipes of tobacco do you usually smoke per day? [ ][ ] pipes per day.

7. How would you describe your cigarette smoking habits? ○ Never Smoked **(go to Q #12)** ○ Used to Smoke **(go to Q #10)** ○ Still Smoke **(answer Q #8-9 then go to Q #12)**

8. How many cigarettes a day do you smoke? [ ][ ] cigarettes per day.

9. How many times in the last year have you made a serious attempt to quit (stopped smoking for 1 day or more)? [ ][ ]

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10. How many years has it been since you smoked cigarettes fairly regularly? [|] years.

11. What was the average number of cigarettes per day that you smoked in the 2 years before you quit? [|] cigarettes per day.

12. On a typical day, how do you USUALLY travel? (select one only)
- O Walk
- O Bicycle
- O Motorcycle
- O Sub-compact or compact car
- O Mid-size or full-size car
- O Truck or van
- O Bus, subway or train
- O Mostly stay home

13. In the next 12 months, how many thousands of miles will you probably travel by car, truck, or van? [|] thousand miles.
(Note: U.S. average travel = 15 thousand miles per year.)

14. In the next 12 months, how many thousands of miles will you probably travel by motorcycle? [|] thousand miles.

15. What percent of the time do you usually buckle your safety belt when driving or riding? [| |] percent of the time.

16. On the average, how close to the speed limit do you usually drive?
O Within 5 mph of limit O 6-10 mph over limit O 11-15 mph over limit O More than 15 mph over limit

17. How many times in the last month did you drive or ride when the driver perhaps had too much alcohol to drink? [|]

18. How many bottles or cans of beer do you drink in a typical week? [|]

19. How many glasses of wine do you drink in a typical week? [|]

20. How many wine coolers do you drink in a typical week? [|]

21. How many mixed drinks or shots of liquor do you drink in a typical week? [|]

MEN: Please skip down to Question #32.

---

22. Women only: At what age did you have your first menstrual period? [|] years old.

23. Women only: How old were you when your first child was born? (If no children, mark 00) [|] years old.

24. Women only: How long has it been since your last breast X-ray (mammogram)?
O Less than 1 year ago O 1 year ago O 2 years ago O 3 or more years ago O Never

25. Women only: How many women in your natural family (mother and sisters only) have had breast cancer? [|]

26. Women only: Have you had a hysterectomy operation (had your womb removed)? O Yes O No O Not sure

27. Women only: How long has it been since you had a Pap smear test?
O Less than 1 year ago O 1 year ago O 2 years ago O 3 or more years ago O Never

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28. Women only: How often do you examine your breasts for lumps? ○ Monthly
○ Once every few months
○ Rarely or never

29. Women only: About how long ago has it been since you had your breast examined by a doctor or nurse?
○ Less than a year ago ○ 1 year ago ○ 2 years ago ○ 3 or more years ago ○ Never

30. Women only: About how long ago has it been since you had a rectal exam?
○ Less than a year ago ○ 1 year ago ○ 2 years ago ○ 3 or more years ago ○ Never

31. Women only: Are you currently taking estrogen? ○ Yes ○ No

WOMEN: Please skip down to Question #34.

---

32. MEN ONLY: About how long ago has it been since you had a rectal or prostate exam?
○ Less than 1 year ago ○ 1 year ago ○ 2 years ago ○ 3 or more years ago ○ Never

33. MEN ONLY: How long has it been since you had a blood test for prostate cancer?
○ Less than 1 year ago ○ 1 year ago ○ 2 years ago ○ 3 or more years ago ○ Never

34. How long has it been since your last complete physical examination (including blood work) with your doctor?
○ Less than 1 year ago ○ 1-3 years ago ○ 3 or more years ago ○ Never

35. Have you had a tetanus shot (booster) in the last 10 years? ○ Yes ○ No ○ Never

36. Do you have any chronic condition that requires frequent visits to your doctor? ○ Yes ○ No

37. A stool test is when the stool is examined to determine if it contains blood. How long has it been since you had this test done?
○ Less than 1 year ago ○ 1 year ago ○ 2 years ago ○ 3 or more years ago ○ Never

38. Did you do the blood stool test yourself or was it done by a doctor or medical person?
○ Self ○ Doctor/Medical Person ○ Does not apply

39. A proctoscopic exam is when a tube is inserted in your rectum to check for problems. How long ago did you have one?
○ Less than 1 year ago ○ 1 year ago ○ 2 years ago ○ 3 or more years ago ○ Never

40. When not on the job, how many times in the last year did you witness or become involved in a violent incident where there was a risk of serious injury to someone?
○ 4 or more times ○ 2 or 3 times ○ 1 time or never ○ Not sure

41. When on your job, how many times in the last year did you witness or become involved in a violent incident where there was a risk of serious injury to someone?
○ 4 or more times ○ 2 or 3 times ○ 1 time or never ○ Not sure

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42. Considering your age, how would you describe your overall physical health? O Excellent O Good O Fair O Poor

43. In an average week, how many times do you perform lively physical activity which lasts at least 20 minutes? Lively activity is exercise or work which lasts at least 20 minutes without stopping, and which is hard enough to make you breathe heavier and your heart beat faster.

O Less then 1 time per week O 1 or 2 times per week O At least 3 times per week

44. In an average week, what type of activities do you usually do for exercise? (Mark ALL that apply)

O None O Calisthenics

O Walk O Lift weights

O Run or jog O Basketball

O Aerobics O Swim

O Bicycle O Other

O Stair climb

45. How long does each exercise session usually last?

O 0 to 20 minutes O 21 to 60 minutes O 61 to 120 minutes O More than two hours

46. How vigorous, on average, is your exercise session?

O Light activity (small increase in breathing rate)

O Medium activity (some increase in breathing rate, some perspiration)

O Heavy activity (large increase in breathing rate, heavy perspiration)

47. Which of the following best describes the level of physical effort in your daily activities?

O Light (office work, driving, sitting) O Medium (walking, carpentry, housework) O Heavy (pushing or carrying heavy objects)

48. If you ride a motorcycle or all-terrain vehicle (ATV), what percent of the time do you wear a helmet?

O 75% to 100% O 25% to 74% O Less than 25% O Does not apply to me

49. Is there a working smoke detector in your household? O Yes O No

50. How often do you eat out?

O Once a week O 2-4 times per week O 5-7 times per week O More than 7 times per week O Never

51. Do you eat some food every day that is high in fiber, such as whole grain bread, cereal, fruits or vegetables? O Yes O No

52. Do you eat foods every day that are high in cholesterol or fat, such as red meat, cheese, fried foods or eggs? O Yes O No

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53. Do you eat foods every day that are high in salt, such as fried foods, salty snacks, canned foods, prepackaged frozen dinners, processed luncheon meats, or salted nuts? ○ Yes ○ No

54. Do you eat foods that are high in processed sugar, such as cake, cookies, pies, pastries, doughnuts, sugary cereals, candy, candy bars, or baked desserts? ○ Yes ○ No

55. How many times a day do you eat snacks, such as doughnuts, cookies, packaged crackers, chips, candy bars, and any of the other foods listed in the previous two questions? ○ 0-1 ○ 2-3 ○ more than 3 ○ Never

56. In general, how satisified with life are you? ○ Mostly satisfied ○ Partly satisified ○ Not satisfied

57. In general, how satisified with your job are you? ○ Mostly satisfied ○ Partly satisified ○ Not satisfied

58. During the past two weeks, how much stress would you say you experienced?
○ A lot ○ Moderate amount ○ Relatively little ○ Almost none

59. Have you suffered a personal loss or misfortune in the past year that had a serious impact on your life? (For example, a job loss, disability, separation, jail term, or death of someone close to you.)
○ Yes, 1 serious loss or misfortune ○ Yes, 2 or more ○ No

60. What is your race?
○ Aleutian, Alaska Native,Eskimo, American Indian ○ Asian ○ Black ○ Pacific Islander ○ White ○ Other ○ Don't know

61. Are you of Hispanic origin, such as Mexican-American, Puerto Rican, or Cuban? ○ Yes ○ No

62. What is the highest grade you completed in school?
○ Grade School or less
○ Some high school
○ High school graduate
○ Some College
○ College Graduate
○ Post Graduate Degree

63. Are you currently: ○ Never married ○ Married ○ Divorced ○ Separated ○ Widowed

64. Have you ever had any pain in your lower back? ○ Yes ○ No

65. Do you still have back pain occasionally? ○ Yes ○ No

66. If you still have back pain occasionally, what year did your problems first start? [ ][ ][ ][ ]

67. If you still have back pain occasionally, did the pain start with an injury at work? ○ Yes ○ No

68. If you still have back pain occasionally, have you received any medical treatment for back pain? ○ Yes ○ No

69. If you still have back pain occasionally, do you do any exercises now to strengthen your back? ○ Yes ○ No

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70. Have you ever been told that you have high blood pressure? ○ Yes ○ No If yes, how many years ago were you first told? [|]

71. Have you ever been told that you have had a heart attack? ○ Yes ○ No If yes, how many years ago were you first told? [|]

72. Have you ever been told that you have had a stroke? ○ Yes ○ No If yes, how many years ago were you first told? [|]

73. Have you ever been told that you have angina (chest pain caused by heart disease)? ○ Yes ○ No If yes, how many years ago were you first told? [|]

74. Have you ever been told that you have asthma? ○ Yes ○ No If yes, how many years ago were you first told? [|]

75. Have you ever been told that you have diabetes? (sugar diabetes) ○ Yes ○ No If yes, how many years ago were you first told? [|]

76. Have you ever been told that you have arthritis? ○ Yes ○ No If yes, how many years ago were you first told? [|]

77. Have you ever been told that you have any form of cancer? ○ Yes ○ No If yes, how many years ago were you first told? [|]

Have any of your grandparents, parents, brothers, or sisters had any of the following?

78. High Blood Pressure ○ Yes ○ No ○ Don't know

79. Heart Attack ○ Yes ○ No ○ Don't know

80. Stroke ○ Yes ○ No ○ Don't know

81. Angina ○ Yes ○ No ○ Don't know

82. Asthma ○ Yes ○ No ○ Don't know

83. Diabetes ○ Yes ○ No ○ Don't know

84. Arthritis ○ Yes ○ No ○ Don't know

85. Cancer ○ Yes ○ No ○ Don't know

NOTICE: In order to provide me with information on preventive health education programs and disease awareness programs, the results collected in the questionnaire will be sent from the Good Health Program to my chosen health carrier.

In an effort to promote wellness and health awareness among City employees, the City of Birmingham encourages all employees to participate in health screenings. Periodic health screenings are a requirement for enrollment in a City-sponsored health insurance program.

For the health screen, I understand that:

- By completing and returning this questionnaire, which will take about one hour, with testing, I am agreeing to participate in the City's Good Health Screen.
- The benefits I will receive will include information on improving my health and a personal health risk appraisal report, which will be mailed to me in a sealed confidential envelope approximately six weeks after the screen.
- There is minimal risk to me from participation in the health measurements, mainly bruising or soreness from the blood draw.
- I am free to have my physician obtain these measurements and send the results to the Good Health Program instead of being measured at the screen.
- The results of this screen will provide guidance for developing health education and exercise programs for City employees. Any information collected will remain confidential, with results reported only as group averages.

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Items 201 - 242
To be Filled Out By Good Health Staff

I. Blood Pressure

NOTE: Enter a leading 0 (zero) if the reading has fewer digits than is provided for. e.g.: A diastolic BP of 88 would be entered as 088.

201. Pulse #1 [| |]   202. Blood pressure #1 [| |] / [| |]

INITIALS

203. Pulse #2 [| |]   204. Blood pressure #2 [| |] / [| |]

205. Referral for abnormal pulse or BP made? (Complete appropriate referral logs if required) O No O 13-day O Immediate

206. Taking antihypertensive? O Yes O No O Don't know

207. Indicate class of antihypertensive:
O Diuretic O Beta Blocker O Ca Ch Blocker O ACE Inhib. O AR Blocker O Comb. O Other O Don't know

208. Taking any medications for the following diseases?
O Diabetes O High Cholesterol O Asthma O Arthritis O None

II. Blood Work

209. Fasting: Hours since last ate or drank (record nearest hour) [|]

NOTE: Code fasting hours as 99 if refusing blood work.
Code as 88 if medically excused.
Code as 77 if unable to obtain specimen.

210. Has had Hepatitis B immunization: O Yes O No O In process

III. Height, Weight, & Body Composition

211. Weight: Pounds [| |] . [ ]

INITIALS

212. Waist circumference: Inches [|] . [|]

213. Height: Inches [|] . [ ]

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IV. Vision

214. Time since last eye doctor vision exam?
O 6 months or less O More than 6 months-Less than a year O 1-3 years O More than 3 years

215. Wears glasses or contact lenses for distance vision? O Yes O No

216. Wears glasses or contact lenses for near vision? O Yes O No

217. Excluded because did not have lenses for distance vision? O Yes O No

INITIALS

218. Excluded because did not have lenses for near vision? O Yes O No

For vision results, enter leading '0' (i.e.: 030).

219. Distance Vision: Right 20 / ☐☐☐
220. Near Vision: Right 20 / ☐☐☐
221. Distance Vision: Left 20 / ☐☐☐
222. Near Vision: Left 20 / ☐☐☐

V. Pulmonary Function

NOTE: Record liters and 1/100 liter. 223. FEV1 ☐.☐☐ 224. FVC ☐.☐☐

225. Exclude due to high blood pressure? O Yes O No

226. Exclude due to cough/cold/respiratory infection past 7 days? O Yes O No INITIALS

VI. Hearing

For each frequency below, record the lowest decibel (dB) at which the sound was heard for each ear. For example, if the lowest decibel level heard at 2000 Hz in the right ear is 25 dB, then write 25 in the space provided.

Right Ear		Left Ear	
227. 500 Hz	☐☐ dB	234. 500 Hz	☐☐ dB
228. 1000 Hz	☐☐ dB	235. 1000 Hz	☐☐ dB
229. 2000 Hz	☐☐ dB	236. 2000 Hz	☐☐ dB
230. 3000 Hz	☐☐ dB	237. 3000 Hz	☐☐ dB
231. 4000 Hz	☐☐ dB	238. 4000 Hz	☐☐ dB
232. 6000 Hz	☐☐ dB	239. 6000 Hz	☐☐ dB
233. 8000 Hz	☐☐ dB	240. 8000 Hz	☐☐ dB

INITIALS

241. If not passing on 1 or more frequencies (more than 35 dB), check if any of the following apply:
O Otitis/Fluid present O Obstructed canal O Ruptured membrane O High ambient noise level

242. Subject indicates that he/she is exposed to noise on a regular basis outside of work at Fire Dept.: O Yes O No

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