

**THE EFFECT OF BODY MASS INDEX, PHYSICAL ACTIVITY AND
CAFFEINE CONSUMPTION ON HOT FLASHES IN HISPANIC WOMEN**

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CHAPTER 1

INTRODUCTION

The pathophysiology of hot flashes, the most common vasomotor symptom of menopause, is not completely understood but it has been hypothesized that hot flashes are induced by the withdrawal of estrogen (Stearns, 2007). There are many studies available on the progression of symptoms during menopause in Caucasian women but limited amount is known on ethnic differences. A large cross sectional survey of women ages 40-55 showed that women across varied racial/ethnic groups, including Hispanic women, experience two leading menopausal symptoms, hot flashes and night sweats (Guthrie, Dennerstein, Hopper, & Burger, 1996). During a hot flash, women may feel mild warmth to intense heat, rapid heartbeat, perspiration of mostly upper body and a chilled feeling when hot flash diminishes. Frequency of hot flashes varies, several per day or few symptoms per week, and lasts up to few minutes or longer (Gynecologists, 2011). Specific risk factors associated with a higher frequency of hot flashes include above normal body mass index (BMI) of 24.9 kg/m^2 and being of African American ethnicity (Miller et al., 2006; RF Casper, 2010). Asian women are least likely to experience menopausal symptoms, and no symptoms associated with menopause have been reported in Mayan Indian women

(Martin, Block, Sanchez, Arnaud, & Beyene, 1993). African American women have the highest BMI followed by Hispanic women and are more likely to experience hot flashes, including more severe hot flashes, than Caucasian women (Gold et al., 2006; Thurston et al., 2008).

The onset of menopause, though it can be induced by surgery, chemotherapy, or radiation, begins at mid to late 40s with reduced secretion of the ovarian hormones estrogen and progesterone. Reduced estrogen induces reduction of endorphins in the hypothalamus causing a release of norepinephrine and serotonin which are neurotransmitters that decrease the threshold in the thermoregulatory nucleus, resulting in improper heat loss (H. D. Nelson, 2008).

Longitudinal data from the Study of Women's Health Across the Nation (SWAN) showed that Hispanic women were least physically active and had higher BMI compared to Asian and Caucasian women (Gold, et al., 2006). Women with a BMI greater than or equal to 35 kg/m^2 are at a significantly greater odds of having hot flashes than women with a BMI less than 25 kg/m^2 (Gallicchio et al., 2005). Limited research has been conducted to examine the effects of caffeine, BMI and physical activity on the frequency and severity of hot flashes among Hispanic menopausal women. New data indicating the association between these factors and vasomotor menopausal symptoms will be useful in establishing recommendations for menopausal women of different ethnicities.

Problem

Hot flashes are unpleasant and interrupt women's quality of life. Any behavior that can be modified to ameliorate the effects of hot flashes is worthy of studying. It has been suggested that caffeine intake and physical activity may influence the severity and duration of hot flashes especially among women of ethnic descent (Gold et al., 2000; Romani, Gallicchio, & Flaws, 2009; Sturdee, 2008). Evidence has suggested that there are indeed differences in severity of hot flashes between women of different ethnicities (Gold, et al., 2000; Guthrie, et al., 1996). Perhaps there is a difference in the amount of caffeine consumed, frequency and/or intensity of physical activity or BMI values, thus identifying a relationship will be essential if ethnic-specific recommendations are to be established.

Purpose

The purpose of this study was to examine the effects of caffeine consumption, BMI and physical activity on the frequency and severity of hot flashes in pre-menopausal, peri-menopausal, menopausal and/or naturally post-menopausal Hispanic women.

Research Hypothesis

The researcher hypothesizes that there will be no relationship between:

1. Consumption of caffeine in Hispanic women and the:
 - a. Frequency and severity of hot flashes

2. Frequency and/or intensity of physical activity in Hispanic women and the:
 - a. Frequency and severity of hot flashes
3. There will be no relationship between BMI in Hispanic women and the:
 - a. Frequency and severity of hot flashes

Rationale

More than 40 million women in the United States are over the age of 40, and 75 percent of those women will undoubtedly experience menopausal vasomotor symptom (Gold, et al., 2000; Umland, 2008). Unlike asymptomatic menopausal women, women with hot flashes experience disturbed sleep, depressive symptoms and consequently significant reduction in quality of life (NAMS, 2004). Other studies have examined the impact of physical activity on the frequency and severity of hot flashes indicating that high intensity exercise may increase menopausal symptoms; while others indicate that active lifestyle may possibly decrease menopausal symptoms (D. B. Nelson et al., 2008; Romani, et al., 2009; Whitcomb, Whiteman, Langenberg, Flaws, & Romani, 2007). Use of different methods to assess variety of menopausal symptoms such as stages compared and when and how frequent symptoms are measured, has made it difficult to compare studies. (H. D. Nelson, 2008).

Hispanic population in the U.S. is rapidly growing. In the 1990 census, Hispanic population consisted of 22.4 million, in 2000 it grew to 35.6 million and in 2006 census stated 44.3 million were living in the U.S. and is continuing to grow (Bureau, 2010). Due to the rapid influx of Hispanic and its fast growing population in the U.S. it is pertinent to

educate women as a result of environmental changes, namely, dietary and physical. The findings of this study may provide Hispanic women a better avenue to help overcome challenges of menopause symptoms, especially for those women who are unable to use hormonal therapy.

Assumptions

For the purpose of this research, the following assumptions will be made:

1. Participants will be literate in English or Spanish language (8th grade reading level);
2. Participants will understand the survey questions as the researcher intended;
3. Participants will answer the survey questions truthfully and to best of their abilities.
4. The weighting scale and stadiometer will be properly calibrated to provide accurate measurements.
5. Measurements of height and weight will be accurately assessed.

Limitations

The results of this study will be limited by the following factors:

1. Self-reported severity and frequency of hot flashes will vary among participants.
2. The sample population will be limited to Midwestern metropolitan area.
3. Self-reported frequency and intensity of exercise will vary among participants.

Definitions

For the purpose of this study the following definitions were used:

- *Hispanic* - Central American, Cuban or Cuban American, Dominican, Mexican or Mexican American, Puerto Rican, South American, Spanish or other Hispanic ethnicity (Gold, et al., 2000)
- *Hot flashes (HFs), hot flushes, vasomotor symptoms (VMS)* - a transient episode of flushing, sweating, and a sensation of heat, often accompanied by palpitations and a feeling of anxiety, and sometimes followed by chills (Kronenberg, 1994)
- *Natural menopause* – cessation of menstrual periods permanently due to loss of ovarian follicular activity (Sherman, 2005)
- *Peri-menopause* – last menstrual period within the last 3 months (Sherman, 2005)
- *Menopause* - no menstrual periods for 12 consecutive months and no other biological or physiological cause can be identified (Sturdee, 2008)
- *Hot flash severity* - level or degree of hot flash (Sturdee, 2008)
- *Mildly severe hot flash* - a warm sensation without sweating or disruption of normal activity (Kronenberg, 1994)
- *Very severe hot flash* - heat sensation with sweating that may have interrupted daily activities (Kronenberg, 1994)
- *Frequency of hot flash* - number of times an event occurs (Sturdee, 2008)

- *Body Mass Index (BMI)* – a ratio of weight-to-height in relation to amount of body fat (CDC, 2010)
- *Physical activity* – activity that causes your body to work harder than normal, beyond daily activities such as sitting, standing and walking upstairs. (NIH, 2011)
- *Light intensity physical activity* - don't break a sweat during activity include routine daily life activities such as casual walking and standing. (ACSM, 2007)
- *Moderate intensity physical activity* –. (ACSM, 2007)
- *Vigorous (Heavy) intensity physical activity* – increased heart rate, break a sweat, and unable to say more than a few words without pausing for a breath. (ACSM, 2007)
- *Caffeine* – a stimulant, 1,3,7-trimethylxanthine, found in coffee, tea, soft drinks and kola nuts. (Heckman, Weil, & Gonzalez de Mejia, 2010)

Summary

Menopausal vasomotor symptoms are a major concern to women across all ethnicities. The etiology of hot flashes is not well understood. Speculating theory of hormonal changes inducing point temperature drop in the hypothalamus and dramatic rise in skin temperature, flushed appearance, rapid heartbeat and perspiration have been attributed. As women age, some have reported being completely asymptomatic of hot flashes, while others report severe and frequent menopausal symptoms. Diet and lifestyle factors may contribute to the frequency and severity of hot flashes in menopausal women,

but data is inconclusive. Studies that use standardized objective and subjective methods of measuring menopausal symptoms are needed. This research will look at the effect of caffeine, BMI, and physical activity on the severity and frequency of hot flushes in Hispanic women over the age of 40 from Midwestern metropolitan area.

CHAPTER 2

LITERATURE REVIEW

The purpose of this research was to survey the effects of consumption of caffeine, BMI, and physical activity on the frequency and severity of hot flashes in perimenopausal, and/or menopausal Hispanic women in a Midwestern metropolitan area. For the most part, this literature review will provide an overview of present and past research from 2000 to present on variables including physical activity, caffeine, BMI, biological factors of hot flashes as well as frequency and severity of the menopausal vasomotor symptoms in women.

Introduction

Menopausal hot flashes are experienced by women across all ethnic cultures and races causing significant discomfort to the affected individual (Guthrie, et al., 1996). Hot flashes are very common and about three out of four women going through menopause can experience the symptoms (RF Casper, 2010). Hot flashes typically start during the perimenopausal period but sometimes can begin after menopause has started (RF Casper, 2010). The degree and severity of hot flashes vary in women especially of

different ethnicities (Gold, et al., 2006; Gynecologists, 2011; Im, Lee, Chee, Brown, & Dormire, 2010). Studies on menopausal symptoms in ethnicities have varied results. Compared to Caucasian women, highest symptom rates have been noted among African American women followed by Hispanic women while reduced frequency of symptoms has been observed among Asian women. (Gold, et al., 2006; Thurston, et al., 2008). Significant predictors for menopausal symptoms among ethnic women are BMI but limited information is available on etiology of menopausal symptoms in different ethnicities (Avis et al., 2003). In addition, more menopausal symptoms are reported among women who state low physical activity level (Gold, et al., 2000; Im, et al., 2010). Diet and lifestyle factors of the geographical area may be related to the variances in hot flashes but minimum research is currently available.

Menopause

Menopause is a physiological cessation of menses in women due to decreased ovarian function with symptomatic manifestations, such as hot flashes and osteoporosis (Pintiaux, Chabbert-Buffer, & Foidart, 2009). The clinical diagnosis is established based on absence of menses for one year. In the United States, the average age for menopause is 51 years of age (NIH, 2010). Peri-menopause is used to describe the time period before and one year after having the last menses with symptomatic patterns such as increase in

frequency of menses and later a decrease. Menopause is caused by the aging of ovaries and their decreased ability to respond to hormones. This results in less ovulations and decreased production of progesterone, hormone responsible for menses ("The Merck Manual for Healthcare professionals," 2007).

Peri-menopause is a transition phase that lasts six years or more and ends one year after the final menses before menopause actually starts. Menopause marks the permanent end of fertility. (NAMS, 2010; Sherman, 2005). The severity of symptoms during perimenopause and menopause can vary where some women may not experience symptoms at all while others have severe symptoms (Kronenberg, 1994; Stearns, 2007). Hot flashes can affect 75% to 85% of women. Feelings of warmth with occasional and up to extreme perspiration may be experienced along with head and neck redness. Although limited research has been done on the variables that impact hot flashes, it has been proposed that alcohol and caffeine may trigger hot flashes (NAMS, 2004).

Frequency and Severity of Hot Flashes

Whiteman et al., analyzed data from 3167 women who participated in the Multiple Outcomes of Raloxifene Evaluation (MORE) trial. These women were two years postmenopausal (95 % were five or more years postmenopausal) and met the criteria established by the World Health Organization (femoral neck or lumbar spine bone mineral density 2.5 SDs below normal, or history of at least one moderate or two mild prevalent vertebral fractures regardless of baseline bone density). Researchers found through multivariate analyses that women with higher body mass index (BMI) and higher

serum follicle-stimulating hormone (FSH) levels were more likely to have clinically significant hot flashes (Huang et al., 2008).

Gold et al., investigated preventative lifestyle factors related to vasomotor symptoms in a multiethnic Study of Women's Health Across Nations (SWAN). Using multiple logistic regressions and adjusting for covariates data showed prevalence and severity of VMS vary based on race/ethnicity. VMS were more prevalent in women with higher BMI including Hispanic women. Hot flashes and/or night sweats were highest among Hispanic women (49.4%) (Gold et al., 2004).

Hispanic women complained more of vaginal symptoms as well as reported vaginal irritation highest compared to other ethnic group (Green & Santoro, 2009).

Pastore et al. used a cross sectional analysis (n=98,705) using Women's Health Initiative study to examine prevalence rates of urogenital symptoms and possible correlations. Prevalence rates for dryness (27%) and irritation or itching (18.6%) showed a correlational factor of Hispanic ethnicity (adjusted odds ratio =2.1-3.1) versus Caucasian women (Pastore, Carter, Hulka, & Wells, 2004).

Biological Factors

Women that have hot flashes experience peripheral vasodilation and have increased temperature of their skin. These changes are brought on by changes in brain neurotransmitters and instability in the hypothalamic thermoregulatory center due to estrogen withdrawal. Two cytokines (IL-6 and TNF- α) have been reported to be associated with hormonal induced peripheral vasodilation in women with hot flashes. A

convenient sample of 129 pre/peri/post-menopausal and 50 bilateral oophorectomized women had a venous blood sample taken and assessed for severity of hot flashes using FDA draft for clinical evaluation of vasomotor symptoms. The purpose was to identify a relationship between cytokine concentrations and severity of hot flashes. Findings showed serum IL-8 concentration to be significantly higher in women experiencing severe hot flashes versus women having no hot flashes or experiencing mild-to-moderate hot flashes (Yasui et al., 2006). Randolph et al., investigated the relationship of reproductive hormones and vasomotor symptoms in the Study of Women's Health Across Nations (SWAN) in which 3302 women across United States participated. Higher levels of FSH and estradiol- 17β (E2) sex hormones were noted in women experiencing greater hot flashes (Randolph et al., 2003).

Body Mass Index

Body Mass Index, calculated as weight in kilograms divided by height in meters squared, is used as an estimate of body fat in order to classify adults into categories: Underweight BMI of $< 18.4 \text{ kg/m}^2$; Normal BMI of $18.5\text{-}24.9 \text{ kg/m}^2$; Overweight BMI of $25\text{-}29.9 \text{ kg/m}^2$; Obese: Grade I BMI of $30\text{-}34.9 \text{ kg/m}^2$; Obese: Grade II BMI of $35\text{-}39.9 \text{ kg/m}^2$, Obese: Grade III BMI of $\geq 40 \text{ kg/m}^2$ (Charney & Malone, 2009).

Obesity (BMI ≥ 30) has been relatively stable between the years of 1960-1980 but since then has increased by 8% according to the data from the 1988-1994 National Health and Nutrition Examination Survey (NHANES). This increasing trend continues as NHANES (1999-2000) data indicates that obesity significantly increased from 22.9% to

30.5%, extreme obesity (BMI ≥ 40) significantly increased from 2.9% to 4.7% and people being overweight (BMI ≥ 25) has significantly increased from 55.9% to 64.5%. (Flegal, Carroll, Ogden, & Johnson, 2002). The Behavioral Risk Factor Surveillance Surveys (BRFSS) data from 2000 looked at self-reported weight and height of 184,450 participants from 50 states. Results indicated a rise of 19.8% prevalence of obesity since 1991 among U.S. adults (Mokdad et al., 2001).

Trends in obesity are continuing to escalate among U.S. adults, as well as among ethnic groups. Singh et al., looked at National Health Interview Survey data based on BMI obtained in 1992-1995 (n=323,627) and in 2003-2008 (n=154,649). Majority of U.S. born Mexicans are overweight with a mean BMI of 28.6 kg/m². It was found that obesity based on ethnicity data from 2003-2008, indicated, the prevalence of overweight and obesity were 70% and 30.6% respectively among Mexicans, Puerto Ricans and long-term Mexican and Puerto Rican immigrants. (Singh, Siahpush, Hiatt, & Timsina, 2011).

Castelo-Branco et al., investigated whether BMI affects health-related quality of life (HRQOL) in 284 postmenopausal Spanish women (45-64 yo) ranging from obese to normal weight. Results showed that obese respondents had lower self-reported HRQOL. In addition BMI had a negative correlation with HRQOL and increased vasomotor symptoms. Incidence of hot flashes (HFs) were more common in overweight women (P<.05) and obese women (P<.01) compared with women of normal weight (Castelo-Branco et al., 2009).

Huang et al., examined predictors of HFs by analyzing data from 3167 postmenopausal women with osteoporosis participating in Multiple Outcomes of Raloxifene Evaluation (MORE) trial. Data showed that severity of clinically significant

HF's were associated with higher BMI (>25) (Huang, et al., 2008). Women with higher BMI have reported more frequent and severe HF's when compared to women with lower BMI. Furthermore, Huang et al., investigated overweight to obese (BMI 25-50 kg/m²) women (n=338) to determine the effects of a 6-month intensive behavioral weight loss program (intervention) versus a structured health education program (control) on bothersome hot flushes. The control group (n=112) underwent a one hour a month educational group sessions for four months, while the experimental group (n=226) was assigned to a lifestyle and behavior change program. The intervention's weight loss program was modeled after the Diabetes Prevention Program and Look AHEAD (Action for Health in Diabetes) trials, which was designed to produce a 7-9% average weight loss in 6 months. Reduction in weight and BMI (P<.001) and improvement in hot flushes by 1 Likert scale category (P=.01) was noted in the 6 month intervention program (Huang et al., 2010).

Physical Activity Level

Physical activity (PA) is beneficial to overall health and can help with weight control, bone strength and muscle as well as reduce the risk of many diseases such as heart disease, type 2 diabetes and metabolic syndrome and certain cancers (*2008 Physical Activity Guidelines for Americans* 2008). The National Physical Activity Guidelines for adults recommend aerobic activities need to be at least 150 min each week of moderate-intensity or 75 minutes each week of vigorous intensity aerobic activity (*2008 Physical Activity Guidelines for Americans* 2008).

Physical activity has been proposed as an alternative method to reduce the burden of menopausal vasomotor symptoms (Huang, et al., 2010) and stress (D. B. Nelson, et al., 2008). Though effects of PA on menopausal hot flashes have recently been studied with an emphasis that PA increases hot flashes, the results are mixed and inconclusive. Studies have shown that women with increased levels of PA may actually increase the severity of hot flashes (Romani, et al., 2009; Whitcomb, et al., 2007). Whitcomb et al., looked at self-reported PA frequency surveys, categorized as rare (0-3 times/month), occasional (4-15 times/month), or frequent (>16 times per month), submitted by 512 perimenopausal and postmenopausal women. Data showed that women who had higher activity levels had higher odds for moderate-to-severe hot flashes ($P=.01$) and daily hot flashes ($P<.01$) than women who reported minimal activity (Whitcomb, et al., 2007).

Romani et al., used a cross-sectional population-based study to examine the association between self-reported PA and HFs in 45-54 year old women not on hormone therapy (HT). Detailed history was taken from 603 participants including PA. The PA component was divided into 4 groups with a corresponding assigned score (inactive =1, light=2, moderate=3, and heavy=4 defined as vigorous activity on regular basis including jogging, tennis, gardening and strenuous farm work). Results showed higher levels of PA were significantly associated with increasing odds of moderate or severe hot flashes (Romani, et al., 2009). These studies are inconclusive possibly due to diversified study sample characteristics such as age, education level, HT use, and level of racial mix.

A longitudinal 8-year cohort study with African American (49%) and Caucasian (51%) participants (n=401) found that women (mean age 42 yo) with higher PA levels (top third tertiles ≥ 1450 kcal/wk as expended kilocalories) had lower levels of perceived

stress and anxiety. No significant association between PA and HFs for both ethnic populations was observed (D. B. Nelson, et al., 2008). Another study surveyed women at a small Midwestern university which indicated increase prevalence in frequency of hot flashes associated with increased aerobic exercise. However a decrease in frequency and severity ($p=.011$, $p=.003$, respectively) of hot flashes was observed with higher intensity aerobic activities (Amend, 2009).

Caffeine

Caffeine is naturally found in coffee/cacao beans, kola nuts, guarana berries, and tea leaves. Caffeine is absorbed by the body rapidly and completely with an average five hour half-life. It is one of the most commonly consumed dietary ingredients in the world. In the U.S. caffeine consumption is typically high due to U.S. being largest per capita consumers of carbonated drinks, followed by Mexico and Chile. On average an adult consumes 4 mg/kg body weight/day and 7 mg/kg body weight/day of caffeine in U.S. and Denmark respectively (USDA, 2000). Although it is believed that caffeine intake is high in Latin American countries, there is no accurate and reliable data of caffeine consumption (Heckman, et al., 2010).

Caffeine intake, smoking, spicy foods and alcohol intake, have been proposed as a risk factor for hot flashes (Andrikoula & Prelevic, 2009; NAMS, 2010; Sturdee, 2008). However Gold et al., used caffeine intake data from women ($n=3198$) in the Study of Women's Health Across the Nation (SWAN) to investigate whether frequency of vasomotor symptoms varied with caffeine consumption. Longitudinal multiple logistic

regression concluded that there was no significant association between caffeine consumption and HFs (Gold, et al., 2006).

A descriptive, correlational, two-group design was used to determine differences between dietary practices and acculturation in Hispanic women and their adult daughters (n=76). A score of 27 represented a diet high in fat and a score of 17 or less indicated diet low in fat. Results of the research showed that daughters ate more fat (M=32.36) compared to mothers (M=28.7) and were more acculturated than their mothers. Analysis of fruit/vegetable/fiber intake indicated mothers had better intake (M=16.3) than their adult daughters (M=14). Daughters ate significantly more fat (p=.04) and mothers ate significantly more fruits and vegetables (p=.02) (Garcia-Maas, 1999).

Unfortunately to date, there is limited amount of research and interest in the relationship between consumption of caffeine and hot flashes. As part of the alternate therapy it is important to research and establish dietary guidelines for women as an appropriate intervention instead of Hormone Therapy.

Summary

This literature review has stated past and current research on variables such as physical activity, caffeine, and BMI, biological factors of hot flashes as well as frequency and severity of the menopausal hot flashes in women. Limited amount of research is available on ethnic populations and variables of interest stated. In addition to that there is lack of agreement on certain variables such as physical activity which may in part be due to diversified characteristics of population samples. Lack of a gold standard on

menopausal guidelines affirms the need for further investigations into variables of interest stated.

CHAPTER III

Methods

The purpose of this descriptive study was to survey the effects of caffeine consumption, BMI and physical activity on the frequency and severity of hot flashes in Hispanic women at different stages of reproduction. Stages of reproduction included: pre-menopausal, peri-menopausal, menopausal and post-menopausal. This study took place in a Midwestern region of the U.S. A secondary purpose of this study was to identify relationships existing between these variables with regards to the outcome of level of severity and frequency of hot flashes; to identify any relationship existing between duration of residence in the United States and environmental/behavioral changes evidenced by changes in BMI (related to weight changes), physical activity, and caffeine intake. This chapter details the methodology that was used to conduct the study.

Subjects

Subjects in this study included a convenience sample of 285 Hispanic women who attended predominantly Hispanic churches and/or utilized community center

services and/or were patients at community health clinics in the Midwestern region during the summer of 2011. To qualify for the study test subjects had to be non-smoking, not taking any medications or supplements that disrupt or effect hormone levels, be literate at the eighth grade reading level in English or Spanish, Hispanic women over the age of 40 years old in varying reproductive stages. The data used for this study is representative of peri-menopausal, menopausal and post-menopausal Hispanic women in a Midwestern region.

In order to distribute the surveys to a desirable population the researcher contacted community center coordinators in charge of community events that would involve or interest Hispanic populations. The researcher attended those events hosted by the community centers with the permission from the coordinator to describe the study and to distribute surveys. The researcher also contacted pastors, priests and ushers of churches that held services in Spanish as well as personnel responsible for volunteers and interns at local community health clinics in order to obtain permission and set up times for distribution of surveys to eligible Hispanic women.

Survey Instrument

Permission was obtained by the researcher to use a previously validated 25-itemized Women's Health Survey (WHS) (Amend, 2009). The WHS included questions regarding demographic information, stage of menopause, whether participants experienced hot flashes, average daily intake of caffeine containing beverages and/or foods and physical activity. The itemized survey was previously validated but modified

for use in this study as follows: questions regarding alcohol intake were eliminated and replaced with short answer questions regarding weight, height, place of birth and duration of U.S. residence. Participants were asked to record any consumption of caffeinated pills, diet pills containing caffeine and dark chocolate. BMI was calculated using reported weights and heights which were provided to the researcher by the participants. Due to the fact that self-reported weight and height can be an unreliable source, the researcher recorded actual weight and height from a subpopulation.

The usual frequency of hot flashes was recorded and the usual severity of hot flashes were measured using a subjective ten-point rating scale of 1 for “very mild” to 10 for “extremely severe” (Appendix A). The Women’s Health Survey contained 25 questions in five distinct sections. The first section consisted of five qualifier questions related to age, ethnicity, smoking practices, supplement and medication use. The second part consisted of four questions related to current reproductive stage, presence or absence of menopausal symptoms, frequency of symptoms and severity of symptoms with a subjective ten-point rating scale. The third section consisted of four physical activity questions inquiring as to frequency and intensity of 30 minute aerobic and strength exercise. The fourth part consisted of nine caffeine intake questions related to consumption of beverages, foods, medications or supplements containing caffeine. Lastly, three questions were asked concerning participants’ place of birth, years of residence in the United States and best estimate of their current weight and height.

Since the study was conducted with a Latino population, the survey was translated into Spanish to accommodate participants who are not fluent in English or for

participants who would prefer to take the survey in Spanish. Translation was completed by an experienced Spanish speaking translator. The Spanish version of the survey was validated for accuracy by medical staff at Alivio Medical Center, a local Hispanic health clinic (see Appendix B).

Data Collection Methods

The primary researcher and a trained Ball State University dietetic student administered WHS to all participants. Prior to completion of the survey, all eligible participants were instructed following the guidelines of the instructions found in Appendix B. Each participant was given an anonymous WHS survey, a pen, and instructions on how to complete the survey in both English (Appendix C) and Spanish (Appendix D). Surveys were collected between months of July 9th, 2011 to October 11th, 2011. A translator fluent in Spanish was present throughout the study period and was available at all times to address any questions. The survey took approximately ten to fifteen minutes to complete. In order to maintain anonymity, participants were assigned a number. Participants were informed that by completing the survey they were giving their consent.

Every third participant who finished filling out the survey first was used for height and weight measurements, a sub-population. These participants proceeded to follow the head researcher to a room or another location to be weighed and measured for height. These measurements were used to calculate actual BMI. All measurements were taken by the head researcher. During the 2011 data collection period, the participants'

heights and weights were taken by researcher using a SECA™ Digital Scale (www.secacorp.com, 2004). The participants were instructed to empty their pockets and remove their shoes and jackets. Each participant was given a designated space for their belongings to be placed. Space was close to the scale and made it safer and easier for them to find after measurement completion. The participants were directed to stand erect with their shoulders level, hands to the sides, and weight distributed evenly between both feet. The participant's feet were placed flat on the foot piece, with their heels together and touching the base of the vertical board. Each participant was asked to adjust the angle of their head by moving the chin up or down and to look forward. The participant's height was recorded to the nearest ¼ inch and weight to the nearest 1/5 of a pound. The researcher recorded measurements on the survey and no additional personal identifiable information was obtained. The data was labeled with a number and was placed in a locked cabinet to be retrieved at a later date for data entry and analysis by the head researcher. The surveys will be stored locked in a filing cabinet in the researcher's office for three consecutive years after which time they will be destroyed via shredder.

Weights and Heights

A subpopulation (n=37) of study participants were randomly selected and measured for actual weight and height. These actual values were then compared to the self-reported weight and height in order to establish validity for the self-reporting of weight and height. The random selection of the subpopulation was achieved by including every third test subject from the initiation of the survey until an adequate number of validation measurements were accomplished. Upon completion of the WHS this

subpopulation was measured for weight and height using a standard weight scale and stadiometer.

Data Entry and Analysis

Caffeine consumption was an approximate calculation based on average content of caffeine found in the beverage, food, supplement or medicine products. The levels of caffeine consumption were determined based on an averaged intake and stated as mg per day. The intake levels are as follows: no intake (0 mg/day), low intake (1-199mg/day), moderate intake (200-300 mg/day), high intake (301-499 mg/day), and very high intake (500-600 mg/day). One cup (8 oz) of coffee was equivalent to approximately 100 mg of caffeine.

Data obtained (caffeine intake, weights and heights for BMI, and physical activity) was entered into an Excel spreadsheet and transferred into SPSS v20.0 for statistical analysis. Frequency counts and descriptive statistics were run on all variables. Pearson correlation analysis and multiple regression analysis was used to identify correlations between levels of caffeine intake and menopausal symptoms, intensity and/or frequency of physical activity and menopausal symptoms, BMI levels and menopausal symptoms, namely, intensity and severity of hot flashes. Data was statistically analyzed and was established at $p < 0.05$.

Internal Review Board Approval

This study was approved as exempt by the Ball State University Institutional Review Board prior to conducting this study (Appendix D). Prior to the start of the study, the primary researcher in this project completed the Collaborative Institutional Training Initiative (CITI) Human Subjects tutorial (Appendix F).

CHAPTER IV

Results

The purpose of this study was to identify any correlations existing between: Body Mass Index (BMI), level of caffeine consumption, frequency and intensity of physical activity with the frequency and severity of hot flashes in Hispanic women over the age of 40 years. A 25-question survey, Women's Health Survey (Appendix B), was utilized to gather all data relevant to the objective. Data analysis was then performed with statistical significance established at $p < 0.05$. Results of the study will be presented in this chapter.

Subjects

Two-hundred and eighty-five women in total participated in WHS (Women's Health Survey) study. Of these women, two-hundred and forty-seven met the inclusion criterion. Data for the study was collected from completed WHS (Women's Health Surveys) that met the following criteria: a) pre-menopausal, peri-menopausal, menopausal or post-menopausal as defined previously in this study; b) not taking any medication or supplements that disrupt or affect hormonal levels, i.e. Hormone Replacement Therapy; c) non-smokers; d) literate at the eighth grade level in either English or Spanish; and e) of Hispanic ethnicity. Several women omitted certain WHS questions which resulted in varied pool of participants in data analyses.

The first five questions served as qualifier questions and addressed general demographic information of the test subjects in this study. The first question asked the age of women in the study. Participants stated their age in the following age categories and valid percent: 40-44 (n = 57, 23.6%); 45-49 (n = 61, 25.2%); 50-54 (n = 54, 22.3%); 55-59 (n = 37, 15.3%); 60 years or over (n = 33, 13.6%), with all test subjects being Hispanic (n = 242, 100%) and five subjects failing to state their age. Ethnicity was addressed in the second question with Hispanic subjects being further categorized as Central American, Cuban or Cuban American, Dominican, Mexican or Mexican American, Puerto Rican, South American, Spanish, or other Hispanic ethnicity. Question #3 of WHS inquired in regards to smoking practices and 271 (93.1%) replied that they did not smoke. Question #4 and #5 asked whether study participants took medication or were undergoing alternative therapies to treat menopausal symptoms. Majority of women did not participate in either therapies, 265 (91.1%) said that they did not participate in traditional medical therapy (i.e. hormone replacement therapy) nor did 275 (94.5%) use alternative therapy (i.e. use of red clover and soy) to alleviate menopausal symptoms. See Table I for demographic characteristics of study participants included in this research.

Table 1. Demographic Characteristics of Subjects (n = 247)

Question	Description	n*	Percent %
Age	40-44	57	23.1
	45-49	61	24.7
	50-54	54	21.9
	55-59	37	15.0
	≥60	33	13.4
	Age not specified *	5	2.0
Smoker:	Yes	13	4.5
	No	271	93.1
Meds:	Yes	19	6.5
	No	265	91.1
Alt Therapy:	Yes	7	2.4
	No	275	94.5
Ethnicity	Hispanic	247	100

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

Descriptive statistics revealed that hot flashes were experienced mostly by women in their 50's (category 50 - 54 years old). Severities of hot flashes had an average rating of 3 based on a 1 - 10 hedonic scale of severity. The majority were born outside the US and resided less than 20 years in the US. Subjects reported on average two hot flashes per week and consumed an average of about 120 mg of caffeine per day. The average BMI of study participants was 30.18 kg/m² which is an Obese I category. On average, women reported that they participated in light aerobic physical activity 1 - 2 times per week but did not participate in strength exercise. Table 2 below depicts the mean of variables collected in the WHS.

Table 2. Mean \pm SD of descriptive statistics of participants and variables

Variables	Mean (SD)	N
# of HF last week	2.27 \pm 3.6	216
Severity of HF last week	2.97 \pm 2.7	217
Age (yrs)	2.67 \pm 1.3	216
Yrs of US residence	2.03 \pm 0.8	216
total est caffeine/day	121.19 \pm 116.3	231
BMI	30.18 \pm 6.0	227
PA frequency (aerobic)	2.05 \pm 1.2	216
PA Intensity (aerobic)	1.93 \pm 1.0	216
PA frequency (strength)	1.46 \pm 0.9	216
PA Intensity (strength)	1.53 \pm 0.9	216

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

Data gathered from Questions #6 and #7 are shown below in Table 3. Results of Question #6 revealed that the majority of participants were in the pre-menopausal (n = 76, 30.8%), menopausal (n = 56, 22.7%), and naturally post-menopausal (n = 64, 25.9%) stages of reproduction. Other stages included: peri-menopausal (n = 35, 14.2%); post-menopausal due to surgery or chemotherapy/radiation (n = 9, 3.6%); and stage not specified (n = 7, 2.8%) which is excluded from Table 3. Question #7 inquired whether study participants have ever experienced a hot flash. Data shows that the majority of participants had experienced a hot flash in the past (n = 144, 58.8%), excluding two women who failed to state if they have ever experienced a hot flash.

Table 3. Menopausal stages of participants (n = 247)

Question	Description	n*	Percent%
Stage of Menopause?	Pre-menopausal	76	31.7
	Peri-menopausal	35	14.6
	Menopausal	56	23.3
	Naturally postmenopausal	64	26.7
	Post-menopausal other**	9	3.8
Have ever experienced a menopausal hot flash?	Yes	144	58.8
	No	101	41.2

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

** other represents events causing menopausal symptoms such as surgery, chemotherapy or radiation

MENOPAUSAL CHARACTERISTICS

Question #8 requested women to indicate how many hot flashes they experienced in the week prior to taking the survey. As indicated in Table 4, most participants did not experience hot flashes within the preceding week (n = 133, 54.5%). Participants who failed to state frequency were excluded. On the other end of the spectrum eleven subjects (4.5%) experienced more than 12 hot flashes. Women were also asked to rate the severity of hot flashes they experienced one week prior to taking the survey in Question #9 with **1** being **very mild** (a warm sensation without sweating or disruption of normal activity) to **10** being **very severe** (heat sensation with sweating that may have interrupted daily activities). Of the women surveyed who experienced hot flashes in the past week the majority reported severity as very mild (n = 50, 20.6%) and 23 women (9.5%) rated hot flashes as severe to very severe (Table 4).

Table 4. Characteristics of hot flashes (n = 247)

		n*	Percent %
Frequency	0	133	54.5
	1-3	58	23.8
	4-6	22	9.0
	7-9	16	6.6
	10-12	4	1.6
	13+	11	4.5
Severity	No HF**	131	53.9
	1-3 (mild)	50	20.6
	4-6	39	16.0
	7-10 (severe)	23	9.5

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

**HF (Hot Flash) did not experience any hot flashes

The average number of hot flashes women in all categories (i.e. peri-menopausal, menopausal, etc.) experienced was 2.28 hot flashes daily (n = 229). At least 2 hot flashes were experienced by 24.5% (n = 56) of the women, whereas 53.3% (n = 122) of study participants reported that they did not experience any hot flashes in the last week. Overall 46.7% (n = 107) of participants reported at least having one hot flash a week prior to taking the WHS and 53.3% (n = 122) of participants denied experiencing any symptoms.

Measures

Several scales were used in this study to help with identifying a relationship with hot flash symptoms. Caffeine scale, exercise scale, and BMI scales were used to identify relationships and isolate possible factors that may have affected the frequency and severity of hot flashes women experienced in this study. These scales were also addressed in previous chapters.

CAFFEINE SCALE

The caffeine scale was established based on average content of caffeine found in beverages, foods, supplements, and /or medicine products. The levels of caffeine consumption in WHS women were determined based on an averaged intake and stated as mg per day. The intake levels are as follows: no intake (0 mg/day), low intake (1 - 199mg/day), moderate intake (200- 300 mg/day), high intake (301 - 499 mg/day), and very high intake (500 - 600 mg/day). One cup (8 oz) of coffee was equivalent to approximately 100 mg of caffeine.

EXERCISE SCALE

The exercise scale was also used to group women into four subcategories based on their level of exercise per week. Inactive individuals were represented by women who lead inactive lifestyles and do not partake in any type of physical activities. Light intensity physical activity is representative of participants who don't break a sweat during activity including routine daily life activities such as casual walking and standing. Moderate intensity physical activity involves working hard enough to raise heart rate and break a sweat, yet still being able to carry on a conversation. Vigorous or heavy intensity physical activity was representative of women who had an increased heart rate, broke a sweat, and were unable to say more than a few words without pausing for a breath during their exercise routine. The scale on survey was as follows: inactive = 1, light = 2, moderate = 3, and heavy = 4 defined as vigorous activity on regular basis.

WEIGHT, HEIGHT, AND VALIDITY

As stated previously in this study, Body Mass Index (BMI) is calculated as weight in kilograms divided by height in meters squared. This system is used as an estimate of body fat in order to classify adults into categories: Underweight BMI of $< 18.5 \text{ kg/m}^2$; Normal BMI of $18.5 - 24.9 \text{ kg/m}^2$; Overweight BMI of $25 - 29.9 \text{ kg/m}^2$; Obese: Grade I BMI of $30 - 34.9 \text{ kg/m}^2$; Obese: Grade II BMI of $35 - 39.9 \text{ kg/m}^2$, Obese: Grade III BMI of $\geq 40 \text{ kg/m}^2$. Due to the fact that WHS collected self-reported weights and heights, it was important to validate self-reported BMI values. A subpopulation ($n = 37$) of study participants were randomly selected and measured for actual weight and height. These actual values were then compared to the self-reported weight and height in order to establish validity for the self-reported values. Reliability test revealed the intraclass correlation coefficient for height was 0.582 , $p < 0.0001$ and weight was 0.788 , $p < 0.0001$.

Survey Findings

The following section will look at variables in isolation. Chi-Square statistics were based on a varied population size due to incomplete survey responses. Hot flashes were compared to the current reproductive stage of women in the study. Results indicated that hot flashes increased with the level of reproductive stage up to menopause and then dropped at naturally post-menopause ($\chi^2 = 47.255$, $df = 3$, $p < 0.001$). Premenopausal women had 30% of reported hot flashes, and that percentage increased to 80% for perimenopausal women and 84% for menopausal women (Table 5).

Table 5. Comparison between reproductive stage and HF's

Hot Flash?		Current reproductive stage				Total
		pre	peri	menopausal	naturally post	
Yes	Count	23	28	47	40	138
	Expected	45.4	20.9	33.5	38.2	138
	% within stage	30.30%	80.00%	83.90%	62.50%	59.70%
	Adj residual	-6.4	2.7	4.2	5	
No	Count	53	7	9	24	93
	Expected	30.6	14.1	22.5	25.8	93
	% within stage	69.70%	20%	16.10%	37.50%	40.30%
	Adj residual	6.4	-2.7	-4.2	-0.5	
Total	Count	76	35	56	64	231
	Expected	76	35	56	64	231
	% within stage	100%	100%	100%	100%	100%

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

As Table 5 indicates, of those who experienced hot flashes during the previous week ("yes" response) 23 women were pre, 28 women were peri, and 47 women were menopausal. Fewer pre-menopausal women experienced hot flashes (n = 23) than would be expected (n = 45.4).

A majority of the women who stated they did not experience hot flashes were pre-menopausal and naturally post-menopausal. However, 1/3 of peri-menopausal women and 18% of menopausal women also denied having menopausal symptoms. When placed in categories for number of hot flashes per week and compared to stages of menopause the resultant data indicated that frequency of hot flashes was associated with the current reproductive stage ($\chi^2 = 61.122$, $df = 12$, $p < 0.001$). No hot flashes were experienced by majority of pre-menopausal and naturally post-menopausal women (73.3% and 70.3% respectively). The next category of 1-3 hot flashes per week was mostly populated by women in peri-menopausal and menopausal stages, 40% and 32.7% respectively. This

trend followed for the next 3 categories in peri-menopausal and menopausal stages: 4-6 hot flashes per week (8.6% and 21.8% respectively), 7-12 hot flashes per week (8.6% and 16.4% respectively) and more than 12 hot flashes at 8.6% for peri-menopausal stage and 10.9% for menopausal stage. Table 6 shows the frequency of hot flashes according to the reproductive stage.

Table 6. Frequency of hot flashes and current reproductive stage

Hot Flashes	Current reproductive stage				Total
	pre	peri	menopausal	naturally post	
0 Count	55	12	10	45	122
Expected	40	18.6	29.3	34.1	122
% within stage	73.30%	34.30%	18.20%	70.30%	53.30%
Adj residual	4.2	-2.4	-6	3.2	
1-3 Count	13	14	18	11	56
Expected	18.3	8.6	13.4	15.7	56
% within stage	17.30%	40%	32.70%	17.20%	24.50%
Adj residual	-1.7	2.3	1.6	-1.6	
4-6 Count	4	3	12	2	21
Expected	6.9	3.2	5	5.9	21
% within stage	5.30%	8.6%	21.8%	3.1%	9.2%
Adj residual	-1.4	-0.1	3.7	-2	
7-12 Count	3	3	9	4	19
Expected	6.2	2.9	4.6	5.3	19
% within stage	4.00%	8.6%	16.40%	6.20%	8.30%
Adj residual	-1.6	0.1	2.5	-0.7	
>12 Count	0	3	6	2	11
Expected	3.6	1.7	2.6	3.1	11
% within stage	0.00%	8.60%	10.90%	3.10%	4.80%
Adj residual	-2.4	1.1	2.4	-0.7	
Count	75	35	55	64	229
Total Expected	75	35	55	64	229
% within stage	100%	100%	100%	100%	100%

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

The severity rating of hot flashes was also associated with the current reproductive stage ($\chi^2 = 91.939$, $df = 30$, $p < 0.001$). When rating severity of hot flashes

was compared to current reproductive stage of participants the results showed that half of all the participants (53%, n=122) did not experience hot flashes. The majority of women who stated that they did not experience hot flashes were either pre-menopausal women or naturally post-menopausal women. Thus a very small percentage of pre-menopausal and menopausal women marked severity of hot flashes at 1, 10.5% and 8.9% respectively. The next several severity ratings of 2-8 were marked most often by women in peri-menopausal stage. Hot flash severity of 9 was only marked by women who were in natural post-menopause stage. The highest hot flash severity rating of 10 was marked by women in peri-menopause and menopause stage. The following findings are summarized in Table 7.

Table 7. Severity of hot flashes and current reproductive stage

Severity of Hot Flashes		pre	peri	menopausal	naturally post	Total
No hot flashes	Count	56	11	11	44	122
	Expected	40.3	18.6	29.7	33.4	122
	% within stage	73.7%	31.4%	19.6%	69.8%	53.0%
	Adj residual	4.4	-2.8	-5.8	3.1	
1	Count	8	2	5	1	16
	Expected	5.3	2.4	3.9	4.4	16
	% within stage	10.5%	5.7%	8.9%	1.6%	7.0%
	Adj residual	1.5	-0.3	0.7	-2	
2	Count	0	3	8	3	14
	Expected	4.6	2.1	3.4	3.8	14
	% within stage	0.0%	8.6%	14.3%	4.8%	6.1%
	Adj residual	-2.7	0.7	3	-0.5	
3	Count	3	8	3	4	18
	Expected	5.9	2.7	4.4	4.9	18
	% within stage	3.9%	22.9%	5.4%	6.3%	7.8%
	Adj residual	-1.5	3.6	-0.8	-0.5	
4	Count	1	5	6	3	15
	Expected	5	2.3	3.7	4.1	15
	% within stage	1.3%	14.3%	10.7%	4.8%	6.5%
	Adj residual	-2.2	2	1.5	-0.7	
5	Count	5	2	7	3	17
	Expected	5.6	2.6	4.1	4.7	17
	% within stage	6.6%	5.7%	12.5%	4.8%	7.4%
	Adj residual	-0.3	-0.4	1.7	-0.9	
6	Count	1	0	4	0	5
	Expected	1.7	0.8	1.2	1.4	5
	% within stage	1.3%	0.0%	7.1%	0.0%	2.2%
	Adj residual	-0.6	-1	2.9	-1.4	
7	Count	2	0	4	1	7
	Expected	2.3	1.1	1.7	1.9	7
	% within stage	2.6%	0.0%	7.1%	1.6%	3.0%
	Adj residual	-0.3	-1.1	2.1	-0.8	
8	Count	0	2	5	1	8
	Expected	2.6	1.2	1.9	2.2	8
	% within stage	0.0%	5.7%	8.9%	1.6%	3.5%
	Adj residual	-2	0.8	2.6	-1	
9	Count	0	0	0	1	1
	Expected	0.3	0.2	0.2	0.3	1
	% within stage	0.0%	0.0%	0.0%	1.6%	0.4%
	Adj residual	-0.7	-0.4	-0.6	1.6	
10	Count	0	2	3	2	7
	Expected	2.3	1.1	1.7	1.9	7
	% within stage	0.00%	5.70%	5.40%	3.20%	3.00%
	Adj residual	-1.9	1	1.2	0.1	
Total	Count	76	35	56	63	230
	Expected	76	35	56	63	230
	% within stage	100%	100%	100%	100%	100%

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

EXERCISE

Question #12 of WHS (Women's Health Survey) inquired about frequency of participation in at least 30 min of strength exercises in the week prior to taking the survey. Majority of women responded that they did not participate in strength exercises (n=174, 71%). The rest of the participants that performed 30 min strength exercises were: 62 women who did strength exercise some days of the week (1-4 times per week), 9 women stated that they participated in strength exercise most days of the week (5-8 times per week), and only 2 women (0.8%) participated all days of the week (more than 9 times per week). Question #13 of WHS inquired about the intensity of the 30 min strength exercises. The intensity of strength exercise data indicated that majority did not participate (n=166, 68.6%) while only five women participated in heavy strength exercise (2.1%). Of the women who did exercise, the majority participated in strength exercise 1-2 times per week at moderate intensity.

Table 8. Frequency and Intensity of Strength Physical Activity per Week (n=247)

Variables		n*	Percent
Frequency	0	174	71
	1-2	45	18.4
	3-4	17	6.9
	5-6	7	2.9
	≥7	2	0.8
Intensity	Don't participate	166	68.6
	Light	28	11.6
	Moderate	43	17.8
	Heavy	5	2.1

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

When assessing potential relationship between frequency of aerobic physical activity and current reproductive stage of women, the findings were not significant ($\chi^2 = 8.452$, $df = 15$, $p = 0.904$). The data revealed that slightly more than half (58%) of women exercised during all reproductive stages. The greatest 30 min aerobic PA frequency that the Hispanic women seem to participate in was 1-2 times weekly. If the women did participate in 30 min aerobic PA the intensity of their work out was either light (no break of sweat) or moderate intensity marked by light sweat and increased heart rate. Very low percentage (5.6%) of test subjects participated in heavy aerobic PA.

Similarly no statistically significant findings were noted when 30 min strength exercise was compared to current reproductive stage ($\chi^2 = 5.066$, $df = 12$, $p = 0.956$). The majority of participants did not participate in 30 min strength exercise (70.1%). The remaining women who did participate in strength exercise were scattered across all frequencies of PA and all reproductive stages. No statistically significant relationship was found between intensity of strength exercise and reproductive stage ($\chi^2 = 9.811$, $df = 9$, $p = 0.366$). Most women did not participate in strength exercise and if they did, most performed at moderate intensity followed by light. Least amount of women (2.2%) performed at a heavy intensity.

One way ANOVAs were run to compare mean frequency and intensity of aerobic and strength exercise by hot flash categories. The data showed a violation of the equal variances assumption, so an alternative test, Welch, was used instead of normal F ratio. Data between number of hot flashes and aerobic PA frequency (Welch $F_{(3, 30.827)} = 0.483$, $p = 0.697$), PA intensity (Welch $F_{(3, 32.461)} = 2.449$, $p = 0.081$) did not indicate any

significant differences. Comparison between reduced categories of hot flashes per week with frequency of 30 min aerobic physical activity showed that women with 1-3 hot flashes per week on average exercised 1-2 times per week at a light intensity of 2.07 (2 is a representative of light intensity exercise). Women who experienced 4-6 hot flashes also on average exercised 1 - 2 times per week at a slightly lower intensity of 1.86. Women who had 7 - 12 hot flashes per week also exercised 1 - 2 times per week but with lower intensity of 1.58. Surprisingly, women who experienced more than 12 hot flashes per week on average exercised slightly more than 1 - 2 times per week at a slightly higher than light intensity of 2.55.

Table 9. Average Aerobic Exercise and Hot Flashes

30 min Aerobic PA	#HF/wk	n	Mean \pm SD	Std Error
Frequency	1-3	56	1.98 \pm 1.2	0.154
Intensity			2.07 \pm 1.0	0.137
Frequency	4-6	21	2.10 \pm 1.1	0.248
Intensity			1.86 \pm 0.9	0.186
Frequency	7-12	19	1.95 \pm 1.1	0.259
Intensity			1.58 \pm 0.8	0.176
Frequency	12+	11	2.64 \pm 1.8	0.544
Intensity			2.55 \pm 1.3	0.390

When looking at differences between hot flashes and strength PA frequency (Welch $F_{(3, 30.991)} = 1.711$, $p = 0.185$), PA intensity (Welch $F_{(3, 32.243)} = 0.790$, $p = 0.508$) the results were also not significant. Comparison of reduced categories of hot flashes per week with frequency of 30 min strength exercise showed that women who experienced 1-3 hot flashes per week on average did not exercise. Women who experienced 4-6 hot flashes per week along with women who experienced 7-12 hot flashes per week also did

not participate in strength exercise. Women who experienced more than 12 hot flashes per week on average barely did strength exercise (1.73) at barely light intensity of 1.45.

Table 10. Average Strength Exercise and Hot Flashes

30 min Strength PA	#HF/wk	n	Mean \pm SD	Std Error
Frequency	1-3	56	1.48 \pm 0.7	0.095
Intensity			1.65 \pm 0.9	0.122
Frequency	4-6	21	1.38 \pm 0.8	0.176
Intensity			1.43 \pm 0.7	0.163
Frequency	7-12	19	1.16 \pm 0.5	0.115
Intensity			1.33 \pm 0.8	0.198
Frequency	12+	11	1.73 \pm 1.6	0.469
Intensity			1.45 \pm 0.9	0.282

CAFFEINE

One-way ANOVA indicated significant differences in caffeine intake based on hot flash categories. Looking at lower categories of hot flashes and total estimated caffeine per day revealed that there is a steady increase in caffeine consumption as hot flash symptoms increase in women, ($F_{(3,103)} = 3.54$, $p < 0.05$). The following is the discussion of caffeinated beverages consumption.

The next nine questions on the WHS addressed the weekly caffeine intake. Question #14 asked the subject's consumption frequency of 8 fluid ounce caffeinated coffee. The WHS data indicated that the majority of Hispanic women consume about 1 - 3 cups of coffee weekly ($n = 79$, 32.2%) followed close by 65 (26.5%) women indicating that they did not consume coffee at all. Only 13 women (5.3%) stated that they consume more than 18 cups of coffee per week. One cup is equivalent to 8 fluid ounces. When

women were asked about their consumption of energy drinks in Question #15 of WHS, a strong majority stated that they never consume energy drinks (n = 221, 89.8%). Only one (0.4%) woman indicated that she consumes 10-12 times of 12 fluid ounce energy drink per week.

Question #16 inquired about consumption of 8 fluid ounce caffeinated hot tea and most women stated that they never drink hot tea (n = 159, 64.9%) with only one woman (0.4%) indicating that she drinks 13-15 cups of caffeinated hot tea per week. When asked about 8 fluid ounce caffeinated iced tea consumption in Question #17, even more women indicated that they do not drink iced tea (n = 172, 69.6%). One woman (0.4%) indicated that she drinks 10-12 cups of tea per week. Question #18 investigated caffeinated soda consumption. Majority indicated that they drink 1-3 beverages (12 fluid ounce serving) per week (n = 95, 38.5%). Question #19 of WHS asked how often study participants consumed 8 fluid ounce hot chocolate or cocoa. As it turns out, hot chocolate consumption was second least to be consumed. Majority of WHS stated that they did not consume hot chocolate, followed by 1-3 cups per week (n = 185, 75.5%; n = 53, 21.6% respectively). Question # 20 inquired about dark chocolate consumption which was infrequent along with use of caffeine pills which was addressed in Question #21. Both sets of data were omitted due to low levels of consumption. Question #22 asked about caffeinated diet pills and 97.2% of women replied that they did not use caffeinated diet pills. Table 14 below shows the consumption of caffeine examined in this study.

Table 11. Subjects usual consumption of caffeinated beverages per week (n = 247)

Variables	Beverage frequency	n*	Percent
Caffeinated Coffee (8 fl oz)	Never	65	26.5
	1-3 times	79	32.2
	4-6 times	30	12.2
	7-9 times	29	11.8
	≥ 10 times	42	17.1
Energy Drinks (12 fl oz)	Never	221	89.8
	1-3 times	19	7.7
	4-6 times	4	1.6
	≥7 times	2	0.8
Hot Tea (8 fl oz)	Never	159	64.9
	1-3 times	56	22.9
	4-6 times	12	4.9
	7-9 times	10	4.1
	≥ 10 times	8	3.2
Iced Tea (8 fl oz)	Never	172	69.6
	1-3 times	58	23.5
	4-6 times	9	3.6
	7-9 times	7	2.8
	≥ 10 times	1	0.4
Caffeinated Soda (12 fl oz)	Never	77	31.2
	1-3 times	95	38.5
	4-6 times	30	12.1
	7-9 times	25	10.1
	≥ 10 times	20	8.0
Hot Chocolate/Cacao (8 fl oz)	Never	185	74.9
	1-3 times	53	21.5
	≥4 times	7	2.8
Caffeine pills (200 mg)	Never	179	72.5
	1-3 times	57	23.1
	≥ 4 times	10	4.0

* n does not always equal to 247 nor 100% due to incomplete responses to WHS

Referring to Table 12 for mean caffeine intakes from different sources, estimated mean caffeine intake from coffee was 70.93 mg per day, 20.06 mg per day from soda, 10.62 mg from tea, and scarce amounts from the rest of the caffeine containing categories, such as energy drinks, hot tea, iced tea, dark chocolate, and caffeine and diet

pills. Total estimated intake of caffeine from all sources is on average 121.19 ± 116.3 mg/day, but 25% of study participants stated that they do not consume caffeine.

Table 12. Subjects usual consumption of caffeinated beverages per week

Variables	N		Mean \pm SD
	Valid	Missing	
Estimated caffeine from:			
Coffee (8 fl oz)	230	1	70.93 \pm 80.7
Energy drinks (12 fl oz)	231	0	4.64 \pm 17.2
Hot Tea (8 fl oz)	230	1	10.62 \pm 22.8
Iced Tea (8 fl oz)	231	0	1.96 \pm 4.0
Caffeinated Soda (12 fl oz)	231	0	20.06 \pm 25.8
Hot Choc/Cocao (8 fl oz)	230	1	0.99 \pm 2.6
Dark Chocolate (≥ 1 oz)	231	0	1.59 \pm 3.2
Caffeine pills (200 mg)	231	0	6.18 \pm 36.7
Caffeine diet pills	231	0	4.58 \pm 33.0
Total estimated caffeine/day	231	0	121.1874 \pm 116.3

A breakdown of intake levels per day was as follows: no intake was reported by 5.2% of participants, low intake (1-199 mg/day) was reported by 75.3%, moderate intake (200-300 mg/day) was reported by 11.3%, high intake (301-499 mg/day) was reported by 6.9%, and very high intake (500 + mg/day) was reported by only 1.3% of the participants. Caffeine consumption was tested for association with stages of sexual reproduction but no differences were found between caffeine products and stages. Looking at energy drinks there was no statistically significant relationship between consumption and reproductive stages ($\chi^2 = 20.025$, $df = 12$, $p = 0.067$). Women mostly indicated on the survey that they did not consume energy drinks (89.6%). Only 7.8% of women indicated that they consumed energy drinks and of those women most were either in pre-menopausal or peri-menopausal reproductive stage (10.5% and 11.4%, respectively).

Similarly, most participants did not consume caffeinated hot tea (64.8%). The rest of the participants, who drank hot tea, mostly drank only 1-3 cups (8 fl oz) per week. Looking at intake of iced tea in WHS women, 70.6% stated that they did not consume iced tea. Those who did consume iced tea mostly had 1-3 cups per week (22.5%). In 1-3 cups per week category, iced tea was also consumed by menopausal group (30.4%), peri-menopausal group (25.7%), pre-menopausal group (25%) and naturally post-menopausal women (10.9%).

Most participants indicated that they consumed 1-3 servings of 12 fl oz caffeinated soda weekly (36.8%). The other groups consisted of 31.6 % of women stating that they do not consume caffeinated drinks, 12.1% of women stating they consume 4-6 servings and 10.8 % women drinking 7-9 servings. No statistical significance was noted between soda consumption and reproductive stage ($\chi^2 = 25.118$, $df = 21$, $p = 0.242$). The majority of women across all reproductive stages did not drink hot chocolate. If they did consume hot chocolate then most of them consumed 1-3 (8 fl oz) servings of hot chocolate across all four reproductive stages. No identifiable relationship was noted between hot chocolate consumption and reproductive stages. Similarly, comparison of dark chocolate consumption to reproductive stage indicated that the majority of women did not consume dark chocolate, 71.4 %. If the participants consumed dark chocolate, the majority consumed 1-3 (1oz) servings per week across all stages. Higher servings of dark chocolate were minimally consumed or not consumed at all by WHS women. Use of caffeine pills also had not identifiable trend and, as the matter of fact, most of the women did not take caffeinated pills across all reproductive stages, 94.8 %. Minimal

consumption was noted by peri-menopausal women and naturally post-menopausal women, 5.7 % and 4.7 % respectively. Similarly, most women did not take caffeinated diet pills, 97 %. Minimal consumption of diet pills (1-3 times per week) was noted among 3.6 % menopausal, 2.9 % peri-menopausal and 1.3% pre-menopausal women.

No difference was found for overall caffeine intake and reproductive stage. Consumption of caffeinated coffee was compared to current reproductive stage and no statistically significant findings were found (Welch $F_{(3, 30.677)} = 1.392$, $p = 0.264$). One quarter of study participants indicated that they did not consume caffeinated coffee equally across all reproductive stages. The majority of participants (32.2% of all participants) consumed 1-3 cups of caffeinated coffee per week. Pre-menopausal women were the biggest consumers of 1-3 cups of caffeinated coffee per week at 40.8%. The higher levels of caffeine consumption (more than 18 cups per week) were prominent with peri-menopausal women at 11.4%.

Total estimated caffeine intake per day was low overall across all reproductive stages (1-199 mg/day). Highest estimated intake of 150 mg of caffeine per day was among peri-menopausal women. Menopausal women had intake of 133 mg/day and naturally post-menopausal women had total estimated intake of 118 mg/day. Pre-menopausal women had a low total estimated caffeine intake of 102 mg/day. Women indicating 1-3 hot flashes per week had low intake of 114 mg/day. Women in category 4-6 hot flashes/week had caffeine intake of 138 mg/day and women with 7 - 12 hot flashes increased their caffeine intake on average to 141 mg/day. Women experiencing more

than 12 hot flashes per week had on average an intake of 240 mg/day, a moderate intake of caffeine.

PLACE OF BIRTH AND RESIDENCE

Question #23 of WHS inquired whether study participants were born in the US or outside the US. The majority of women who participated in the study were born outside the US across all ages and across all stages of sexual reproduction relatively equally. The categorization consisted of foreign born women (217, 87.9%) and 29 women (11.7%) stated that they were born in the US. Looking at age groups and place of birth, there was an association between where the woman was born and her age ($\chi^2 = 11.118$, $df = 4$, $p = 0.025$). The majority of women born outside the US were in age groups 40-44, 45-49 and 60 years old and over. On the other hand, age groups 50-54 and 55-59 years old were mostly women born in the US. There was an association between younger women (ages 40-49) being foreign born and older women (ages 50-59) being born in the US.

Comparing categories of hot flashes women experienced per week with their place of birth revealed differences between hot flash symptoms and place of birth ($\chi^2 = 16.57$, $df = 4$, $p = 0.002$). The majority of foreign born (57.4%) women stated they were asymptomatic. Those who did experience hot flashes, the majority were in the 1-3 hot flashes per week category. The least amount of women experienced more than 12 hot flashes per week and was split nearly equally between the populations of US and foreign born women (4.9% and 4.2% respectively). Women that were born in the US indicated that 16.7% of them were asymptomatic and of those who did experience symptoms, 41.7% were in the 1-3 hot flashes per week group. Other women indicated 4-6 hot

flashes per week (16.7%) and 20.8% of women were in the 7-12 hot flashes per week category. However, it is important to state that there was a relationship between place of birth and stage of menopause ($\chi^2 = 19.318$, $df = 3$, $p < 0.001$). Women born in the US were for the most part either in the peri-menopausal (17.1%) or menopausal (23.2%) group.

When comparing place of birth to severity of hot flashes, women that were born outside the US (57.1%) tended to be asymptomatic and of those who did experience hot flashes, 7.8% indicated a severity of 1, 4.9% indicated severity of 2, 5.9% of women indicated a severity of 3 and 4, 6.8% indicated a severity of 5. Higher severities up to 10 were indicated by few women. Of the US born women, 16.7% indicated that they were asymptomatic. Women that did have hot flashes 16.7% indicated severity of 2, 25% indicated severity of 3, 12.5% indicated severity of 4 and 5, and 4.2% indicated severity of 7 ($\chi^2 = 40.845$, $df = 10$, $p = 0.002$). No other severities were indicated. Unfortunately statistical data concerning severity of hot flashes may not be generalizable due to the large number of empty cells.

Upon comparing the frequency and intensity of 30 min aerobic PA and 30 min strength PA with place of birth, no significant results were found. Similarly caffeinated coffee consumption, energy drinks, caffeinated hot tea, caffeinated iced tea, soda, hot chocolate/cacao, and dark chocolate consumption per week compared to place of birth had no statistically significant data findings; neither did caffeine pills, caffeinated diet pills nor total estimated daily caffeine intake. However, an ANOVA indicated that based on amount of time a Hispanic woman lived in the US, her BMI and aerobic intensity

differed ($F_{(2,219)} = 3.510, p = 0.032$; $F_{(2,222)} = 3.077, p = 0.048$, respectively). BMI is noted to be different among groups of women living 10-20 years in the US and women living more than 20 years in the US. As observed in Table 13, independent sample t-tests showed that for women born outside the US the mean BMI is larger, 30.67 kg/m^2 (obese), compared to women that were born in the US which were overweight (mean BMI = 26.2 kg/m^2 ; $t = 5.117, df = 38.885, p < 0.001$).

Table 13. T-test between place of birth and variables

Group Statistics							
	Born outside U.S.	Mean	Std Dev	N	t	df	P
BMI	Yes	30.67	6.01	202	3.553	224	< 0.001
	No	26.2	3.74	24	5.117	38.89	< 0.001
Total est caffeine/day	Yes	118.97	116.92	206	-0.928	228	0.355
	No	142.29	113.29	24	-0.951	29.01	0.349
Freq of 30 min aero PA	Yes	2.04	1.249	206	-0.783	228	0.434
	No	2.25	1.26	24	-0.778	28.53	0.443
Intensity of aero PA	Yes	1.91	0.971	206	-1.415	228	0.159
	No	2.21	1.103	24	-1.279	27.319	0.212
Freq of 30 min strength PA	Yes	1.45	0.864	206	-0.263	228	0.793
	No	1.5	0.78	24	-0.285	29.973	0.778
Intensity of strength PA	Yes	1.52	0.868	204	-0.317	226	0.751
	No	1.58	0.776	24	-0.347	30.201	0.731

Question #24 asked participants their period of residence in the US and 65 women (26.3%) stated that they lived less than 10 years, 92 women (37.2%) stated that they lived less than 20 years while the rest, 83 women (33.6%), stated other.

BODY MASS INDEX

The mean BMI for all participants who took the WHS survey was 30.2 kg/m² (n=227 provided weight and height). BMI measurements indicated that none of the study participants were underweight (BMI below 18.5 kg/m²), 17.2% of participants had normal BMI, 36.1% were overweight, 26.9% were Obese level I, 15% were obese level II, and 4.8% of participants were obese level III. The average BMI for pre-menopausal women was 30.7 kg/m² (Obesity I). Peri-menopausal women were on average also Obese I at 30.8 kg/m². Menopausal women had slightly lower average BMI and were in the overweight category at 28.8 kg/m² and naturally post-menopausal women were also Obese I at 30.3 kg/m².

Comparing frequency categories of hot flashes to BMI showed a slight trend of increased BMI with increased number of hot flashes except for the category of women who experienced 7-12 hot flashes per week. Women who experienced 1-2 hot flashes per week had an average BMI of 29.2 kg/m². The BMI slightly increased to 30.3 kg/m² for women who experienced 4-6 hot flashes per week. The BMI slightly dropped to 29.7 kg/m² for women who experienced 7-12 hot flashes per week. Then the BMI increased again to 31kg/m² for women in category of 12 hot flashes or more per week category. Relationship of BMI to years of residence in the US showed that the average BMI for women who lived less than 10 years in the US was 29.9 kg/m². Women who lived 10-20 years the BMI increase to 31.3 kg/m² but then the BMI decreased to 28.9 kg/m² for women who lived in the US for more than 20 years. As stated earlier in this chapter, there

is a statistical significance between amount of time lived in the US and the BMI of participants ($F_{(2,219)} = 3.510$, $p = 0.032$).

Multiple Regression

This section will look at all variants combined and address correlations between multiple variables and WHS hypotheses. The zero order correlations between the predictors and the number of hot flashes can be seen in Table 14.

Table 14. Correlation between frequency of HF's and variables

Number of hot flash occurrence correlated to variables			
Variables	Pearson Correlation	Sig. (1-tailed)	N
Age	0.074	0.140	216
Yrs of residence in the US	0.055	0.211	216
Total est caffeine/day	0.234	0.000	216
BMI	-0.017	0.400	216
PA frequency (aerobic)	0.072	0.144	216
PA Intensity (aerobic)	0.047	0.247	216
PA frequency (strength)	-0.024	0.365	216
PA Intensity (strength)	-0.055	0.212	216

Age, years of residence in the US, caffeine intake, BMI, and physical activity data were regressed on the number of hot flashes. Overall there was a lack of a strong predictive relationship for the frequency of hot flashes with only 7.8% variability in hot flashes accounted for by the predictors ($R^2 = 0.078$; $F_{(8,207)} = 2.20$, $p = 0.029$). As shown in Table 15, after controlling for all other predictors (age, BMI, PA, etc.), caffeine was found to be the only statistically significant predictor for frequency of hot flashes women experienced ($b = 0.008$, $\beta = 0.251$, $p < 0.001$). This would suggest that for every 100 mg

of caffeine consumed the number of hot flashes women experienced weekly increased by 0.8, approximately one hot flash.

Table 15. Coefficients of HF's and variables

Model	Unstandardized coefficients		Standardized coefficients	T	Sig
Variables	B	Std. Error	Beta		
Constant	-0.358	1.765		-0.203	0.839
Age	0.226	0.184	0.084	1.230	0.220
Yrs of residence in the US	0.198	0.306	0.044	0.649	0.517
Total est caffeine/day	0.008	0.002	0.251	3.588	<0.001
BMI	0.019	0.041	0.032	0.471	0.638
PA frequency (aerobic)	0.261	0.270	0.090	0.967	0.335
PA Intensity (aerobic)	0.127	0.346	0.035	0.366	0.715
PA frequency (strength)	-0.356	0.417	-0.086	-0.855	0.394
PA Intensity (strength)	-0.106	0.419	-0.026	-0.254	0.800

Table 16 indicates zero-order correlations associated with severity of hot flashes.

Overall, the predictive relationship determined just 8.6% of the variability in severity of hot flashes. ($R^2=0.086$; $F_{(8,208)} = 2.45$, $p = 0.015$).

Table 16. Correlation between severity of HF's and variables

Severity of hot flashes			
Variables	Pearson Correlation	Sig. (1-tailed)	N
Age	0.127	0.031	217
Yrs of residence in the US	0.117	0.043	217
Total est caffeine/day	0.168	0.007	217
BMI	-0.096	0.080	217
PA frequency (aerobic)	0.039	0.285	217
PA Intensity (aerobic)	0.058	0.198	217
PA frequency (strength)	-0.085	0.107	217
PA Intensity (strength)	-0.015	0.411	217

After controlling for all other variables caffeine was found to be a statistically significant positive predictor for severity of hot flashes ($b = 0.005$, $\beta = 0.205$, $p = 0.004$). This would indicate that for each 100 mg of caffeine consumed, the severity of hot flashes increased by roughly 0.5 (scale of 1 - 10). The data additionally indicated that the frequency of 30 min strength exercise was a statistically significant predictor for severity of hot flashes ($B = -0.717$, $\beta = -0.225$, $p = 0.027$). The severity of hot flashes was diminished by almost 1 severity (on a scale of 1-10) for every increase in 30 min strength exercise. Results are shown in Table 17.

Table 17. Coefficients of HF's and variables

Model	Unstandardized coefficients		Standardized coefficients	t	Sig
	B	Std. Error	Beta		
Constant	1.942	1.352		1.436	0.152
Age	0.214	0.140	0.104	1.523	0.129
Yrs of US residence	0.344	0.235	0.098	1.462	0.145
Total est caffeine/day	0.005	0.002	0.205	2.951	0.004
BMI	-0.025	0.032	-0.054	-0.789	0.431
PA frequency (aerobic)	0.154	0.207	0.069	0.741	0.459
PA Intensity (aerobic)	0.076	0.265	0.027	0.286	0.775
PA frequency (strength)	-0.717	0.321	-0.225	-2.230	0.027
PA Intensity (strength)	-0.334	0.321	0.105	1.040	0.300

HYPOTHESIS

In conclusion null hypothesis for caffeine is rejected. There were relationships found between consumption of caffeine and frequency and severity of hot flashes in Hispanic women. Additionally, null hypothesis for exercise is rejected because there were relationships between strength exercise and severity of hot flashes in Hispanic

women. No statistically significant changes, however, were seen in Body Mass Index and the frequency and severity of hot flashes for different menopausal stages. This could be due to small sample size as well as the lack of variation in BMI categories, as a majority of the women in WHS study were either overweight or obese.

Subpopulation: Peri-menopausal and Menopausal Women

Due to the fact that data was obtained and processed on all stages of reproduction: pre-menopause, peri-menopause, menopause and natural post-menopause, it was imperative to process data only related to women who stated that they were either in peri-menopause or in menopause. Consequently data findings on Hispanic women who were either peri-menopausal and/or menopausal will be discussed below.

Subjects

After controlling for test subjects study criteria, second set of statistics comprised of peri-menopausal (n = 35) and menopausal women (n = 56). All test subjects were Hispanic and were for the most part between the ages of 45-54 (n = 29, 45 - 49 years old; n = 29, 50 - 54 years old). The average age was 50 - 54 years old.

Menopausal Symptoms

Test subjects which stated they experienced a menopausal hot flash (n = 75, 82.4%), 1-3 hot flashes per week was the most common frequency (n = 32, 35.6%). Severities of hot flashes ranged equally 2 - 4 on a hedonic scale (n = 11, 12.1% per 1 scale measurement). The mean number of hot flashes women experienced were 3.9 hot flashes per week (n = 84) with a mean severity of 3 (n = 85).

Physical Activity

Slightly more than half of test subjects participated in 30 min aerobic exercise with 1 - 2 times per week as the most common frequency (n = 26, 28.6%) and at moderate intensity (n = 24, 26.4%). Concerning 30 min strength exercise, slightly more than a quarter participated. Most common frequency was 1-2 times per week (n = 16, 17.6%) and at moderate intensity (n = 16, 17.6%).

One-way ANOVA showed that intensity of 30 min aerobic exercise increased to 2.44 (slightly more than light) for high number of hot flashes (more than 12 per week) ($F_{(4, 85)} = 2.749, p < 0.05$). Similarly women who experienced more than 12 hot flashes had a higher frequency of 30 min strength exercise of 1.89, $p < 0.05$.

Caffeine

Main sources of caffeine in test subjects came from coffee, iced tea, and soda. Total estimated caffeine intake per day is 139.8 mg, which is equivalent to slightly more than one cup of coffee. Intake levels show that 3.3% (n=3) had 0 mg of caffeine intake, 71.4% (n = 65) had low intake (1-199 mg), 13.2% had moderate intake (200-300 mg), 9.9% had high intake (301-499 mg), and 2.2% had very high intake (500+ mg).

Birth Place

Majority of women in this study were born outside the US (n=72, 79.1%) and resided here for more than 20 years (n=37, 41.6%).

BMI

The average BMI of peri-menopausal and menopausal women in our study was 29.6 kg/m², overweight category, but on the border of being obese. The frequency table revealed that 19.3% (n=17) of women had normal BMI, 43.2% (n=38) were overweight, 22.7% (n=20) were obese I, 10.3% (n=9) were obese II, and 4.5% (n=4) were obese III. A one-way ANOVA was run testing changes in BMI over the hot flash categories. Because the homogeneity of variance assumption was violated ($p = 0.004$), the Welch test was used instead of the normal F test. No statistically significant differences were found (Welch $F_{(4,28.66)} = 2.042$, $p = 0.115$), however, it did appear that there was a possible progression of increasing hot flashes as BMI becomes higher with the exception of asymptomatic women.

Multiple Regression

As with the prior regression, age, years of residence in the US, caffeine intake, BMI, and physical activity data were regressed on the number of hot flashes. Unlike the previous regression, there was not a statistically significant portion of the variance accounted for ($R^2 = 0.152$; $F_{(8,75)} = 1.682$, $p = 0.117$). This was likely the result of a substantially reduced sample size, dropping from 215 to 83 subjects. Similar to the previous regression, after controlling for all other predictors (age, BMI, PA, etc.), caffeine was still found to be a statistically significant predictor for frequency of hot flashes women experienced ($b = 0.012$, $\beta = 0.381$, $p = 0.003$). This would suggest that for every 100 mg of caffeine consumed the number of hot flashes women experienced weekly increased by 1.2 hot flashes compared to the previously found 0.8 increase.

After regressing these predictors onto severity of hot flashes, the overall equation was not found to be statistically significant either ($R^2 = 0.126$; $F_{(8,76)} = 1.372$, $p = 0.223$). Despite this, the coefficient for caffeine consumption was still found to be a statistically significant predictor for severity of hot flashes ($b = 0.006$, $\beta = 0.261$, $p = 0.040$). This would suggest that intake of 100 mg of caffeine per day would increase the severity of hot flashes by 0.6 on a hedonic scale of 1-10, $p < 0.05$, similar to the previous finding of 0.5.

CHAPTER V

Discussion

This study analyzed data gathered through WHS (Women's Health Survey) regarding caffeine consumption, frequency and intensity of physical activity, and BMI in pre-menopausal, peri-menopausal, menopausal and post-menopausal Hispanic women over the age of 40 in the Midwest. The data associated with pre-menopausal, peri-menopausal, menopausal, and naturally post-menopausal Hispanic women was collected in order to: 1) to evaluate caffeine intake, level of physical activity, intensity of physical activity, and weight and height information; 2) determine what relationship, if any, exists between caffeine consumption, BMI, and physical activity on the frequency and severity of hot flashes; 3) investigate what relationship, if any, exists between place of birth, years of residence in the US, caffeine intake, level of physical activity, intensity of physical activity, BMI and frequency and severity of hot flashes. The population size varied due to omitted questions and incomplete responses on the WHS. A discussion of the results is presented in this section.

WHS Q#1: Age

According to the answers given by study participants, descriptive statistics showed that hot flashes were experienced by women in their late 50's, indicated by

category 50-54. A weak positive relationship was established between age and number of hot flashes per week study participants experienced, signifying that as women age they are more likely to experience hot flashes. Due to the fact that many younger women stated they experience menopausal symptoms similarly, the relationship between age and symptoms was found to be not significant. This indicates that although older women tend to experience more hot flashes, there are other factors affecting menopausal symptoms in Hispanic women rather than age alone.

Reproductive stage

Looking at age and current reproductive stage a clear pattern emerged showing that a majority of the participating Hispanic women fell in the age-range: 40-44 years were in pre-menopausal stage; 45-49 years in peri-menopausal stage; 50-54 years and 55-59 years in menopausal stage; and 60 years and over were in naturally post-menopausal stage ($p < 0.001$). Although there were no relationships found between age and hot flash frequency, there was an association between stage of menopause and the likelihood of having a hot flash. Of the participants in pre-menopausal stage, 30% reported experiencing a hot flash. This number drastically increased to 80% for peri-menopausal and further increased to 84% for menopausal subjects ($p < 0.001$).

Initially thought that pre-menopausal data would adversely affect results and the accuracy of research, data collected from pre-menopausal women was under consideration to be omitted. However, the data showed that very few pre-menopausal or post-menopausal women experienced hot flashes. The majority of women that did experience hot flashes were either peri-menopausal and/or menopausal women. In addition, comparison of severity of hot flashes to current reproductive stage indicated that

pre-menopausal and naturally post-menopausal women for the most part did not experience hot flashes, $p < 0.05$.

Peri-menopausal women rated their hot flash severities between 3 and 4. Thus in the beginning stages of menopause, Hispanic women in our study experienced mild to moderate menopausal symptoms and very rarely experienced severe hot flashes.

Menopausal women rated their hot flash severities across all scales from 1-10.

Regardless, additional statistics were run on peri-menopausal and menopausal women with comparable results to findings for all stages of reproduction.

Looking at age and place of birth showed that Hispanic women that participated in this study were about equally distributed between these age groups: 40-44, 45-49 and 50-54. Among these age groups, women between ages of 40-49 were born mostly outside the US and women between ages of 50-54 were born in the US. We can conclude that the test subjects that were born outside the US were between ages 40-49 and test subjects that were born in the US were older, between ages 50-59.

WHS Q#2: Ethnicity

This study looked at solely Hispanic women as defined in Chapter 1: Central American, Cuban or Cuban American, Dominican, Mexican or Mexican American, Puerto Rican, South American, Spanish or other Hispanic ethnicity. All participants who met study criteria indicated on WHS of being Hispanic ethnicity.

WHS Q#3: Smoking

Study criteria required for test subjects to be non-smokers as to avoid external influences on hormonal levels. Out of 285 women who filled out WHS, 271 women stated that they did not smoke. Data from surveys was used only if the restriction was met as indicated by inclusion criteria.

WHS Q#4: Medications

Study criteria required for test subjects not to be taking medication that would impact hormonal levels, such as hormone replacement therapy. Out of 285 women who filled out WHS, 265 indicated that they were not taking medications that altered hormone levels. Data from surveys was used only if the restriction was met as indicated by inclusion criteria.

WHS Q#5: Alternative Medicine

Study criteria required for test subjects not to be using alternative therapy to treat menopausal symptoms such as red clover supplements. Out of 285 women who filled out WHS, 275 indicated that they were not using alternative medicine to treat menopausal symptoms. Data from surveys was used only if the restriction was met as indicated by inclusion criteria.

WHS Q#6: Current Reproductive Stage

After selecting all the cases that met study criterion, 247 WHS were used for data processing. Categories of current reproductive stages were adequately spread out among the categories of interest. They consisted of pre-menopausal women at 31.7%, followed

by naturally post-menopausal women at 26.7%, menopausal women at 23.3%, and peri-menopausal women at 14.6%. A small percentage of women indicated that they were post-menopausal due to external factors such as surgery (3.8%) and were omitted from statistical analysis. As stated earlier, when age was compared to current stage of reproduction it was noted that most women in peri-menopausal were 45-49 years old and menopausal women were 50-54 years old. A pattern emerges that Hispanic women who participated in WHS study started menopause in their 50's and experience post menopause in their 60's. In addition, there is an association between stage of menopause and the likelihood of having a hot flash ($\chi^2=47.255$, $df=3$, $p<0.001$). Chances of experiencing a hot flash significantly increase as the stage changes from pre-menopausal to peri-menopausal and/or menopausal stage. Consequently the severity of hot flash also increases with increased reproductive stage ($\chi^2=91.939$, $df=30$, $p<0.001$). During peri-menopausal stage, participants indicated severity ranges of 2-4, with most common severity of 3. Menopausal participants indicated severity ranges of 4-8 and more or less equally spread out. Data indicates that across all reproductive stages, majority of participants were born outside the US ($\chi^2=19.318$, $df=3$, $p<0.001$).

The mean BMI for current reproductive stages are as follows: obese I for pre-menopausal and peri-menopausal stages, overweight for menopausal stage and obese for naturally post-menopausal stage. BMI was compared across all groups and data shows that there is no difference between BMI and stages of reproduction.

WHS Q#7: Hot Flash Episode

Out of 245 participants who participated in the WHS, 144 (58.8%) experienced a hot flash episode. Stated earlier in this chapter is a positive association between stage of menopause and the likelihood of experiencing a hot flash. Comparison between hot flash episode incidence and place of birth showed that of women born outside the US, slightly more than half (56.3%) experienced a hot flash. On the other hand, a large majority of the women born in the US (91.7%) experienced a hot flash episode. Pearson-Chi Square of continuity was performed between association of residency status and occurrence of hot flashes and it was found that woman of Hispanic ethnicity born in the US had higher hot flash frequency ($\chi^2=16.57$, $df=4$, $p = 0.002$).

WHS Q#8: Hot Flash Frequency

Hispanic women who participated in WHS study on average experienced 2 hot flashes per week. Correlation of frequency of hot flashes to total estimated caffeine intake per day indicated statistically significant positive correlation of 0.234 with 7.8% variability. After controlling for all other predictors, such as age, BMI and physical activity, caffeine was found to be the only statistically significant predictor for number of hot flashes Hispanic women experienced. Data showed that for every 100 mg of caffeine intake, the frequency of hot flashes went up by 0.8. Approximately, when a Hispanic woman increases her caffeine intake by 100 mg of caffeine, which is about 1 cup of coffee, then frequency of hot flashes will increase by 1 hot flash ($p<0.001$).

Reduced categories of hot flash frequency per week revealed that BMI slightly increases with hot flash frequency. Women who stated they experience: 1-3 hot flashes

per week had a BMI of 29.2 kg/m², 4-6 hot flashes per week had a BMI of 30.3 kg/m², 7-12 hot flashes per week had a BMI of 29.7 kg/m², and more than 13 hot flashes per week had a BMI of 31 kg/m². A tendency for BMI to increase HF's in Hispanic women but was not found to be statistically significant.

WHS Q#9: Hot Flash Severity

Descriptive statistics indicated that the average severity of hot flashes in Hispanic women who participated in WHS was 2.97 (indication on scale of 0-10 the severity is 2). Comparison of severity data revealed that statistically significant positive relationships with age, years of residence, and total estimated caffeine intake per day. Model summary R square statistics show that these correlations account for 8.6% in severity, ($R^2=0.086$ $F_{(8,208)}=2.45$, $P=0.015$). After controlling for all other variables, statistically significant predictors were caffeine and frequency of strength exercise. Increase in 100 mg of caffeine per day, increased the severity of a hot flash by 0.5 with statistical significance of $p=0.004$. Conversely, increased frequency of 30 min strength exercise decreased severity of hot flashes, $p < 0.05$.

WHS Q#10: 30 min Aerobic Physical Activity Frequency

The mean frequency of 30 min aerobic exercise among Hispanic women was 1-2 times per week. Considerably less women exercised more than 5 times a week and most women either did not exercise or exercised 1-2 times a week. Although a trend was noted in data that women who experienced more than 12 hot flashes per week performed aerobic exercise more frequently, it was not statistically significant.

WHS Q#11: 30 min Aerobic Physical Activity Intensity

Average intensity at which study participants performed aerobic PA was light. There were positive relationships between the intensity of aerobic exercise and frequency and severity of hot flashes but not statically significant. It is necessary to mention that there were slightly more women participating in moderate intensity than light. Very few participated in heavy aerobic PA. Although a trend existed between increase in frequency and severity of hot flashes due to aerobic exercise it may not have reached a statistical significance due to small population size. One way statistics also indicated that women who experienced more than 12 hot flashes per week indicated that they exercise at 2.55 (a slightly higher intensity than light).

WHS Q#12: 30 min Strength Physical Activity Frequency

On average the women surveyed did not participate in strength exercise. A slight negative correlation between frequency of strength exercise and frequency of hot flashes was noted but was not found to be significant. On the other hand, frequency of strength exercise decreased the severity of hot flashes. Increasing the frequency of 30 min strength exercise per week decreases the severity of hot flashes by 0.717, $p < 0.05$.

WHS Q#13: 30 min Strength Physical Activity Intensity

The average intensity of strength exercise performed by the women as indicated on the WHS was 1.53 which translates to between not exercising at all and/or light intensity. Correlations between intensity of strength exercise and frequency and severity

of hot flashes also proved to be slightly negative but not statistically significant. No other findings were significant concerning intensity of strength exercise.

WHS Q#14-#22: Caffeine Intake

The leading source of caffeine from variables studied in this experiment (coffee, energy drinks, hot tea, iced tea, soda, hot chocolate, dark chocolate, caffeine pills, and diet pills) are coffee and soda. Within our study population, estimated average daily intake of caffeine from coffee is 70.93 mg and from 20.06 mg from soda with a total estimated caffeine intake per day from all sources of 121.19 mg. Sorting the data into categories of caffeine intake per day resulted in: 0 mg of caffeine consumed by 5.2% of participants; 1-100 mg consumed by 50.2% of study participants; 101-199 mg consumed by 25.1% of study participants; 200-300 mg consumed by 11.3% of study participants; 301-499 mg consumed by 6.9% of study participants; and 500+ mg consumed by 1.3% of study participants. This means that half of Hispanic women from WHS study consumed at least 100 mg per day or 1 cup of coffee and most of our participants had a low intake (1-199 mg) of caffeine, about 1-2 cups of coffee per day. Small amount of women had a moderate intake (200-300 mg) and high intake (301-499 mg). Only a few subjects had a very high intake (500+ mg) of caffeine.

Data indicates that as intake of caffeine per day increased the frequency of hot flashes also increased. WHS women that indicated experiencing more than 12 hot flashes per week had a moderate caffeine intake which is equivalent to 240 mg of caffeine ($p < 0.05$). As stated earlier, caffeine intake was the only positive predictor for frequency

and severity of hot flashes ($p < 0.05$). This approximately translates that for every cup of coffee (assuming 1 cup of coffee contains only 100 mg of caffeine) Hispanic women in our study experienced an increase in hot flashes by 1 hot flash.

No significant association was found between caffeine intake and reproductive stages of women. No difference was noted between caffeine intake and birth place as well as years of residence within the US.

WHS Q#23: Birth Place

WHS study participants that were born outside the US were more in the age group of 40-44 and 45-49 and women who were born in the US were for the most part in the age group of 50-54, $p < 0.05$. Also a comparison between birth place and question #7 (Have you ever experienced a hot flash?) revealed that women who are born in the US are more likely to experience a hot flash than women who were born outside the US. As stated previously, Hispanic women who were born in the US experienced a higher frequency of hot flashes than women who were born outside the US ($p < 0.05$).

Women born in the US also indicated having more moderate severities of hot flashes than women who were born outside the US ($p < 0.005$) which indicated low frequency and high severity hot flashes for those women born outside the US and high frequency low severity hot flashes for those born within the US.

WHS Q#24: Residence in the US

Less than 20 years is the average amount of years WHS women lived in the US. There is a weak positive relationship between years of residence in the US and severity of

hot flashes, $p < 0.05$. No other identifiable trends were noted with data concerning years of residence in the US.

WHS Q#25: Body Mass Index (BMI)

In general the self-reported weights and heights are consistent but there was a tendency to underreport. Height was underreported by 0.73 of an inch and weight was off by 4 lbs. Thus differences in BMI of self-reported versus measured BMI are not significant to changing the results.

Keeping that in mind, the average BMI was 30.18 kg/m^2 . None of the participants were found to be underweight and 17.2% were within normal BMI. The majority of Hispanic women who participated in our study were overweight (36.1%), obese I (26.9%), obese II (15%), and obese III (4.8%). One way analysis of variances was performed to assess effects of caffeine, BMI and PA on hot flashes and there was a tendency for BMI to increase hot flashes but was not found significant.

There is a difference in BMI between Hispanic women who have resided in the US for less than 20 years and those who have lived in the US for 20 years or more, $p < 0.05$. Study subjects who indicated that they have lived in the US for more than 20 years had a lower BMI. WHS data also shows that Hispanic women born outside the US had a larger BMI (obese) than Hispanic women that were born in the US (overweight), $p < 0.001$.

Peri-menopausal and Menopausal Population

Furthermore, when population was restricted to peri-menopausal and menopausal Hispanic women the following findings were found.

ANOVA was performed to assess variables (caffeine intake, BMI and PA) and hot flashes in Hispanic women. Although the overall equation was not statistically significant, related to reduced sample size, total caffeine intake was still found to be a statistically significant predictor ($b=0.012$, $p=0.003$). There was also a tendency for BMI to increase hot flashes but was not proven significant on all variances tests.

Women who lived in the US longer than 10 years performed at higher intensity aerobic exercise (Welch $F_{(2, 53.252)}=5.426$, $p=0.021$). Women who lived in US more than 20 years had a significantly lower BMI, $p<0.05$. In addition, data shows that women who were born in the US had a lower BMI, $p<0.05$.

Summary

Hispanic women across all reproductive stages were used for this study. Data from surveys of pre-menopausal and post-menopausal women were also included. This is due to the fact that women in pre- and post-menopausal stage also experience hot flashes in varying frequencies (Guthrie, et al., 1996). The purpose of this study was to identify a correlation between hot flash frequency and hot flash severity with external factors, thus it was pertinent to include all stages. It was found that caffeine is positively correlated to frequency and severity of hot flashes while strength exercise decreased the severity of hot

flashes in Hispanic women. For the purpose of making statistical analysis stronger, a subpopulation of peri-menopausal and menopausal women was used. Similar findings were noted; caffeine had a positive correlation on frequency and severity of hot flashes. In addition as BMI increased, the frequency of hot flashes in peri-menopausal and menopausal women tended to also increase with exclusion of asymptomatic women.

CHAPTER VI

Conclusions, Limitations/Delimitations and Recommendations for Future Research

Despite the huge prevalence of undesired menopausal symptoms in women, there is a limited amount of information available dealing with the unpleasant side effects of menopause. Hot flashes are unpleasant and interrupt women's quality of life. Any behavior that can be modified to ameliorate the effects of hot flashes is worthy of studying. It has been suggested that caffeine intake and physical activity may influence the severity and duration of hot flashes especially among women of ethnic descent (Gold, et al., 2000; Romani, et al., 2009; Sturdee, 2008). Evidence has suggested that there are indeed differences in severity of hot flashes between women of different ethnicities (Gold, et al., 2000; Guthrie, et al., 1996). Perhaps there is a difference in the amount of caffeine consumed, frequency and/or intensity of physical activity or BMI values, thus identifying a relationship will be essential if ethnic-specific recommendations are to be established.

The purpose of this study was to examine the effects of caffeine consumption, BMI and physical activity on the frequency and severity of hot flashes in pre-menopausal, peri-menopausal, menopausal and/or naturally post-menopausal Hispanic women. Results from this study may have a positive effect on improving the quality of life for women especially of different ethnic descent.

In this study, data collected from WHS indicates women experience an increase in frequency and severity of hot flashes as their reproductive stage progresses to menopause. Caffeine intake and physical activity may influence severity and frequency of hot flashes in women (Gold, et al., 2000; Romani, et al., 2009; Sturdee, 2008). WHS data indicates that for every 100 mg increase in daily caffeine intake, women experienced an increase in hot flash incidence as well as increase in severity by 0.5. In addition to that moderate caffeine intake in WHS Hispanic women proved to be associated with higher frequency of hot flashes per week. A subpopulation of peri-menopausal and menopausal women indicated similar results indicating that increased caffeine intake of 100 mg increases frequency and severity of hot flashes by 1.2 hot flashes and 0.6 severity scale.

Physical activity did have an impact on frequency and severity of hot flashes. In congruence, physical activity decreased menopausal symptoms (D. B. Nelson, et al., 2008; Romani, et al., 2009), WHS study showed that there is a negative correlation between strength exercise and decrease in severity of hot flashes by 0.717. Impact of aerobic exercise on frequency and severity of hot flashes was statistically insignificant and thus inconclusive. Although a positive trend with hot flash symptoms was noted with increased frequency and intensity of aerobic exercise.

Castelo-Branco et al., stated that incidence of hot flashes were more common in overweight and obese women. Our data showed a trend of increased BMI and increased hot flash symptoms in women cross all stages of sexual reproduction but was found to be not statistically significant (which may be related to small sample size and data being limited to mostly overweight and obese population). On the other hand a subpopulation of only pre-menopausal and menopausal women indicated that as BMI increased then frequency of hot flashes increased as well with an exception of asymptomatic women ($T=2.151$, $df=86$, $p=0.034$).

Recommendations for Future Research

Based on the results of this study, the following recommendations for future research are made:

1. Increase the population size by conducting the study in communities with a prevalent Hispanic population.
2. Repeat the study among other ethnicities.
3. Include objective measurements of hot flash symptoms.
4. In the survey instrument, instead of asking the test subjects if they are “Pre-menopausal (regular menstrual cycle),” modify the question to ask “regular menstrual cycle (every month regular cycle)”.
5. In addition, when asking “Born outside the U.S.” modify the question to fill in the blank, “participants place of birth? _____”.
6. In the survey instrument, instead of answering to “How long have you been residing in U.S.” as “Less than 10 years, less than 20 years and other” the answer should be modified to 5 year increments time intervals, such as: 0, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35 etc.

7. Study actual amount of caffeine consumption in a laboratory setting and detail the effects of caffeine from coffee with subjective measurements.
8. Study effects of hot flashes and amounts as well as sources of caffeine (i.e. soda, tea).
9. Consider asking questions in regards to soy intake from food sources and the effects of soy on menopausal hot flashes in Hispanic women.
10. Study sources and amount of fat intake and the effects on menopausal symptoms.
11. Consider studying effects of Socio Economic Status and hot flash symptoms in Hispanic women.

Recommendations for Practice

The results of this study suggests, to minimize menopausal hot flashes in Hispanic women, a registered dietitian, should:

1. Help identify caffeine sources in diet and recommend a decrease in caffeine intake.
2. Work with a sports nutritionist on developing exercise routine for optimal energy and reduction in hot flash symptoms, such as strength exercises.
3. Develop a dietary plan for optimal nutrition with sound examples of types of foods and beverages to consume bearing in mind of ethnic differences.
4. Provide cooking demonstrations and grocery store tours with being aware of ethnic differences (i.e. Ethnic stores and bakeries versus conglomerate grocery stores).
5. Consider developing dietary support groups at local community centers.

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APPENDIX A

Directions for Taking the Survey

Instructions

Good afternoon! My name is Olga Suchshinskaya. I am currently a graduate student at Ball State University studying dietetics. I am interested in trying to understand the role various factors play in causing hot flashes in menopausal women. My project is geared specifically toward Hispanic women as there is a lack of research on this topic, especially in Hispanic women. I would like to ask you to help me make that change by participating in this short survey.

The answers you provide will be confidential and will take approximately 10-15 minutes to complete. No personal identification information will be collected. In addition, your responses will be anonymous. You will not experience any harm by participating in this survey. The data collected from you will be important in setting guidelines on how to prevent hot flashes in women.

I would sincerely appreciate it if you could take a few minutes to participate in this study. The information gathered from this survey may help with setting future guidelines on managing hot flashes in Hispanic women.

In the folder you will find a consent form, a letter of information, the Women's Health Survey, and a pen. Once you have completed the survey, please bring it to me and I will place it in an envelope. You can keep the pen and the letter of information. Please do not put your name on the survey. The survey will not be used to identify you.

All of the information obtained from the surveys will be compiled for group analysis and not individual analysis. I'd really appreciate it if you would not talk to each other or on a cell phone when taking this survey. You should answer all questions to the best of your ability. Please be completely honest and as accurate as possible because it is essential to the integrity of the study.

Again, please accept my sincere thanks for assisting me as I attempt to identify factors associated with the severity and frequency of hot flashes!

APPENDIX B**Women's Health Survey (WHS)**

WOMEN'S HEALTH SURVEY

Please answer all questions to the best of your ability:

1. Age (years)
 - a. 40-44
 - b. 45-49
 - c. 50-54
 - d. 55-59
 - e. 60 & over

2. Ethnicity
 - a. White
 - b. African-American
 - c. Hispanic
 - d. Asian/Pacific Islander
 - e. Other

Please answer the following questions regarding your **usual** behavior in **the last month**.

3. Are you a smoker?
 - a. Yes
 - b. No

4. Do you currently take any medications to treat menopausal symptoms?
 - a. Yes
 - b. No

5. Are you currently using any alternative therapies to treat menopausal symptoms (e.g. black cohosh, dong quai root, ginseng, kava, red clover, soy)?
 - a. Yes
 - b. no

6. What is your current reproductive stage?
 - a. Pre-menopausal (regular menstrual cycle)
 - b. Peri-menopausal (last menstrual period within the last 3 months)
 - c. Menopausal (last menstrual period within the last year)
 - d. Naturally Post-menopausal (last menstrual period more than 12 months ago)
 - e. Post-menopausal due to surgery or chemotherapy/radiation

7. Have you ever had a menopausal hot flash? (An episode of flushing, sweating, and a sensation of heat, often accompanied by palpitations and a feeling of anxiety, and sometimes followed by chills)
 - a. Yes
 - b. No

8. In the last week, how many hot flashes have you had?
- a. 0
 - b. 1-3
 - c. 4-6
 - d. 7-9
 - e. 10-12
 - f. More than 12
9. In the last week, how would you rate the usual severity of the hot flashes? **1** being **very mild** (a warm sensation without sweating or disruption of normal activity) and **10** being **very severe** (heat sensation with sweating that may have interrupted daily activities)?
- a. Did not experience hot flashes
 - b. 1
 - c. 2
 - d. 3
 - e. 4
 - f. 5
 - g. 6
 - h. 7
 - i. 8
 - j. 9
 - k. 10
10. In the last week, how many times did you participate in **30 minutes** of aerobic physical activity (running, swimming, hiking, walking, etc.)?
- a. 0
 - b. 1-2
 - c. 3-4
 - d. 5-6
 - e. 7-8
 - f. More than 8
11. How intense would you rate your participation in aerobic activity?
- a. Don't participate
 - b. Light (don't break a sweat)
 - c. Moderate (break a light sweat, heart rate increased)
 - d. Heavy (break a sweat, heart rate very increased)
12. How many times per week do you participate in **30 minutes** of strength exercises (weight lifting, Pilates)?
- a. 0
 - b. 1-2
 - c. 3-4
 - d. 5-6
 - e. 7-8
 - f. More than 8
13. How intense would you rate your participation in strength exercises?
- a. Don't participate
 - b. Light (don't break a sweat)
 - c. Moderate (break a light sweat, heart rate increased)
 - d. Heavy (break a sweat, heart rate very increased)

14. In the last week, how many times did you consume **caffeinated coffee** (8 fluid ounce serving)?
- | | |
|----------|--------------------------|
| a. Never | e. 10-12 |
| b. 1-3 | f. 13-15 |
| c. 4-6 | g. 16-18 |
| d. 7-9 | h. More than 18 per week |
15. How many times did you consume **energy drinks** (e.g. Red Bull, Sobe; 12 fluid ounce serving) per week?
- | | |
|----------|--------------------------|
| a. Never | e. 10-12 |
| b. 1-3 | f. 13-15 |
| c. 4-6 | g. 16-18 |
| d. 7-9 | h. More than 18 per week |
16. In the last week, how many times did you consume **caffeinated hot tea** (8 fluid ounce serving)?
- | | |
|----------|--------------------------|
| a. Never | e. 10-12 |
| b. 1-3 | f. 13-15 |
| c. 4-6 | g. 16-18 |
| d. 7-9 | h. More than 18 per week |
17. In the last week, how many times did you consume **iced tea** (8 fluid ounce serving)?
- | | |
|----------|----------|
| a. Never | e. 10-12 |
| b. 1-3 | f. 13-15 |
| c. 4-6 | g. 16-18 |
| d. 7-9 | |
18. In the last week, how many times did you consume **caffeinated soda** (e.g. Coke, Pepsi, etc., 12 fluid ounce serving)?
- | | |
|----------|--------------------------|
| a. Never | e. 10-12 |
| b. 1-3 | f. 13-15 |
| c. 4-6 | g. 16-18 |
| d. 7-9 | h. More than 18 per week |
19. In the last week, how many times did you consume **hot chocolate** or **cocoa** (8 fluid ounce serving)?
- | | |
|----------|--------------------------|
| a. Never | f. 13-15 |
| b. 1-3 | g. 16-18 |
| c. 4-6 | h. More than 18 per week |
| d. 7-9 | |
| e. 10-12 | |

20. In the last week, how many times did you consume **dark chocolate** (at least 1 ounce serving)?
- | | |
|----------|--------------------------|
| a. Never | e. 10-12 |
| b. 1-3 | f. 13-15 |
| c. 4-6 | g. 16-18 |
| d. 7-9 | h. More than 18 per week |
21. In the last week, how many times did you take **caffeine pills** (e.g.no-doz, vivarin, 1-200 mg pill)?
- | | |
|----------|-----------------|
| a. Never | d. 7-9 |
| b. 1-3 | e. 10-12 |
| c. 4-6 | f. More than 12 |
22. In the last week, how many times did you take **caffeinated diet pills**?
- Never
 - 1-3
 - 4-6
 - 7-9
 - 10-12
 - More than 12

23. Born outside United States? _____yes _____no
24. How long have you been residing in U.S.?
a. Less than 10 years
b. Less than 20 years
c. Other _____(please write years resided in U.S.)

25. State you height and weight in the space provided:

Height: _____ inches

Weight: _____ pounds

Office Use Only:

BMI: _____

APPENDIX C

Women's Health Survey (WHS) in Spanish

ENCUESTA DE SALUD DE LA MUJER

Por favor, conteste todas las preguntas a lo mejor de su capacidad:

1. Edad (años)

a. 40-44	c. 50-54	e. 60 años o más
b. 45-49	d. 55-59	

2. Etnicidad

a. Blanca	d. Asiático / Islas del Pacífico
b. Afro-americanos	e. Otros
c. Hispanos	

Por favor conteste las siguientes preguntas con respecto a su comportamiento habitual en el último mes.

3. ¿Es usted fumador?

a. Sí	b. No
-------	-------

4. ¿Esta tomando algún medicamento para tratar síntomas de la menopausia?

a. Sí	b. No
-------	-------

5. Si usted actualmente está usando cualquier terapia alternativa para tratar las síntomas de la menopausia (por ejemplo, el cohosh negro, raíz de dong quai, ginseng, kava, trébol rojo, la soja)?

a. Sí	b. No
-------	-------

6. ¿Cuál es su estado reproductivo actual?
 - a. Antes de la menopausia (ciclo menstrual regular)
 - b. Peri-menopausia (último periodo menstrual en los últimos 3 meses)
 - c. La menopausia (última menstruación en el último año)
 - d. Naturalmente, después de la menopausia (última menstruación hace más de 12 meses)
 - e. Después de la menopausia debido a la cirugía o la quimioterapia de radiación

7. ¿Ha tenido alguna vez un bochorno debido a la menopausia? (Un episodio de rubor, sudoración y sensación de calor, a menudo acompañado de palpitaciones y sensaciones de ansiedad, y a veces de escalofríos)

a. Sí	b. No
-------	-------

8. En la última semana, cuantos sofocos ha tenido?

a. 0	d. 7-9
b. 1-3	e. 10-12
c. 4-6	f. Más de 12

9. En la última semana, ¿cómo calificaría la gravedad habitual de los sofocos? 1 es muy suave (una sensación de calor sin sudor o la interrupción de la actividad normal) y 10 muy graves (sensación de calor con sudoración que haya interrumpido sus actividades diarias)?
- | | |
|----------------------|-------|
| a. No tuve bochornos | g. 6 |
| b. 1 | h. 7 |
| c. 2 | i. 8 |
| d. 3 | j. 9 |
| e. 4 | k. 10 |
| f. 5 | |
10. En la última semana, ¿cuántas veces participo en 30 minutos de actividad física aeróbica (correr, nadar, caminar, etc)?
- | | |
|--------|-------------|
| a. 0 | d. 5-6 |
| b. 1-2 | e. 7-8 |
| c. 3-4 | f. Más de 8 |
11. ¿Qué tan intenso calificaría su participación en la actividad aeróbica?
- No participe
 - Ligero (sin sudar)
 - Moderado (sudar ligeramente, aumento del ritmo cardíaco)
 - Fuerte (sudando, frecuencia cardíaca muy aumentada)
12. ¿Cuántas veces a la semana participa en 30 minutos de ejercicios de fuerza (pesas, pilates)?
- | | |
|--------|-------------|
| a. 0 | d. 5-6 |
| b. 1-2 | e. 7-8 |
| c. 3-4 | f. Más de 8 |
13. ¿Qué tan intenso calificaría su participación en ejercicios de fuerza?
- No participo
 - Ligero (no sudo)
 - Moderado (un sudor ligero, aumento del ritmo cardíaco)
 - Fuerte (sudando, ritmo cardíaco muy aumentado)
14. En la última semana, ¿cuántas veces consume cafeína del café (8 onzas)?
- | | |
|----------|-------------------------|
| a. Nunca | e. 10-12 |
| b. 1-3 | f. 13-15 |
| c. 4-6 | g. 16-18 |
| d. 7-9 | h. Más de 18 por semana |
15. ¿Cuántas veces consume bebidas energéticas (por ejemplo, Red Bull, Sobe, 12 onzas) por semana?
- | | |
|----------|--------|
| a. Nunca | c. 4-6 |
| b. 1-3 | d. 7-9 |

- e. 10-12
- f. 13-15
- g. 16-18
- h. Más de 18 por semana

16. En la última semana, ¿cuántas veces consumio cafeína, en té caliente (8 onzas)?

- a. Nunca
- b. 1-3
- c. 4-6
- d. 7-9
- e. 10-12
- f. 13-15
- g. 16-18
- h. Más de 18 por semana

17. En la última semana, ¿cuántas veces tomo té helado (8 onzas)?

- a. Nunca
- b. 1-3
- c. 4-6
- d. 7-9
- e. 10-12
- f. 13-15
- g. 16-18

18. En la última semana, ¿cuántas veces tomo refrescos con cafeína (por ejemplo, Coca-Cola, Pepsi, etc, 12 onzas líquidas)?

- a. Nunca
- b. 1-3
- c. 4-6
- d. 7-9
- e. 10-12
- f. 13-15
- g. 16-18
- h. Más de 18 por semana

19. En la última semana, ¿cuántas veces usted tomo chocolate o cacao (8 onzas)?

- a. Nunca
- b. 1-3
- c. 4-6
- d. 7-9
- e. 10-12
- f. 13-15
- g. 16-18
- h. Más de 18 por semana

20. En la última semana, ¿cuántas veces comio chocolate negro (al menos 1 onzas)?

- a. Nunca
- b. 1-3
- c. 4-6
- d. 7-9
- e. 10-12
- f. 13-15
- g. 16-18
- h. Más de 18 por semana

21. En la última semana, ¿cuántas veces tomo píldoras de cafeína (eg. No-doz, Vivarin, 1 - 200 mg pildora)?

- a. Nunca
- b. 1-3
- c. 4-6
- d. 7-9
- e. 10-12
- f. Más de 12

22. En la última semana, ¿cuántas veces tomo pildoras de cafeína para adelgazar?

- a. Nunca
- b. 1-3
- c. 4-6
- d. 7-9
- e. 10-12
- f. Más de 12

23. Nacio fuera de Los Estados Unidos? _____ Sí _____ No

24. ¿Cuánto tiempo ha sido residente de Los Estados Unidos?

a. Menos de 10 años

b. Menos de 20 años

c. Other _____ (por favor escriba los años de residencia en Los Estados Unidos)

25. Afirme su altura y su peso en el espacio facilitado:

Altura: pulgadas _____

Peso: libras _____

Sólo para uso oficial:

IMC:

..... _____

APPENDIX D

Letter of Permission

Distribution of Surveys at the Work and/or Business Establishment



Letter of Permission for Research

The Effect of Body Mass Index, Physical Activity, and Caffeine Consumption on Hot Flashes in Hispanic Women

Principal Investigator: Olga Suchshinskaya

I have had an opportunity to read, review and ask questions about the “*The Effect of Body Mass Index, Physical Activity, and Caffeine Consumption on Hot Flashes in Hispanic Women*” research project as part of the informed consent process. I understand that part of the research involves the distribution of Women’s Health Surveys at my work and/or business establishment to women qualified for the study participant criteria. The following information was described to me by the researcher and in the informed consent form:

- The type or types of instruments to be used;
- How this research was to be used in the research project;
- Who would have access to it;
- What safeguards were to be used;
- What privacy and security precautions would be used (if applicable);
- That I have the right to withdraw from the study at any time; and
- That I can receive a copy of the informed consent form for my records.

As such, I agree to allow the researcher to use my work and/or business establishment as part of the above named research project.

For questions about your rights as a research subject, please contact the Director, Office of Research Integrity, Ball State University, Muncie, IN 47306, (765) 285-5070 or at irb@bsu.edu.

Date

Signature

Printed Name

APPENDIX E

Participant Consent Form

FOR FAMILY AND CONSUMER SCIENCE RESEARCH

Information for Participants: Consent Form

Study Title Effect of Body Mass Index, Physical Activity and Caffeine Consumption on Hot Flashes in Hispanic Women

Study Purpose and Rationale

The purpose of this research is intended to assess the effects of BMI, physical activity and caffeine consumption on the frequency and severity of hot flashes in Hispanic peri-menopausal and menopausal women. The objective of this research is to evaluate caffeine intake, level of physical activity and weight and height information which will assist in determining correlation between those factors and how severe and frequent hot flashes occur.

Inclusion/Exclusion Criteria

To be eligible to participate in this study, you must have menopause (no menstrual period for 12 consecutive months) or have peri-menopause (last menstrual period within last 3 months), be a non-smoker, and be literate at the eighth grade reading level in either Spanish or English. You should also not be taking any medication or supplements that disrupt or effect hormonal levels.

Participation Procedures and Duration

You will be requested to answer a survey to the best of your abilities and, if randomly chosen, to be measured for height and weight. It will take approximately 15-20 minutes to complete the survey and, if chosen, measurements.

Data Confidentiality or Anonymity

All information obtained in connection with this study will remain anonymous and no identifying information such as names will appear in any publication or presentation of the data. I plan to disclose the results but not your name for publication purposes so that the information obtained may contribute to total nutrition knowledge and may be put to practical use.

Storage of Data

Surveys will be collected from you and placed into a sealed envelope. Data will be stored in a locked filing cabinet in the researcher's office for three years and will then be shredded. The data will also be entered into a software program and stored on the researcher's password-protected computer for three years and then deleted. Only members of the research team will have access to the data.

Risks or Discomforts

The only anticipated risk from participating in this study is that you may not feel comfortable answering some of the questions. You are unlikely to experience any physical, psychological, or social risks. You will not experience any harm by participating in this survey. However, if you feel that you are experiencing any problems or discomfort due to participation in this study you may withdraw at any time.

Who to Contact Should You Experience Any Negative Effects from Participating in this Study

Should you experience any feelings of anxiety, there are counseling services available to you through the Ball State Counseling Center in Muncie, 765-285-1736.

Benefits

Your participation in this study will provide a variety of benefits: i.) You will have the opportunity to see the cumulative results of the research ii.) The data analysis will indicate if certain level of physical activity, caffeine intake and BMI correlates with how severe and/or how often women

experiences hot flashes and iii.) You will be a major contributor to scientific research that will assist other women on how to alternatively handle menopausal symptoms, namely, hot flashes.

Voluntary Participation

Your participation in this study is completely voluntary and you are free to withdraw your permission at any time for any reason without penalty or prejudice from the investigator. Please feel free to ask any questions of the investigator before signing this form and at any time during the study.

IRB Contact Information

For one's rights as a research subject, you may contact the following: For questions about your rights as a research subject, please contact the Director, Office of Research Compliance, Ball State University, Muncie, IN 47306, (765) 285-5070 or at irb@bsu.edu.

Study Title Effect of Body Mass Index, Physical Activity, and Caffeine Consumption on Hot Flashes in Hispanic Women

Consent

By participating and completing the survey, study participants are giving their consent.

Researcher Contact Information

Principal Investigator:

Olga Suchshinskaya, Graduate Student
Family and Consumer Sciences
Ball State University
Muncie, IN 47306
Telephone: 765-414-7319
Email: osuchshinsk@bsu.edu

Faculty Supervisor

Faculty Supervisor:

Dr. Jay Kandiah
Family and Consumer Sciences
Ball State University
Muncie, IN 47306
Telephone: 765-285-5922
Email: jkandiah@bsu.edu

APPENDIX E

IRB Letter

Determination of Status

APPENDIX F

CITI Collaborative Institutional Training Initiative Certificate

Certificate of Completion: Olga Suchshinskaya

CITI Collaborative Institutional Training Initiative

IRB Members - Basic/Refresher Curriculum Completion Report Printed on 10/3/2010

Learner: Olga Suchshinskaya (username: oysuchshinsk)

Institution: Ball State University

Contact Information Department: Family and Consumer Sciences

Email: oysuchshinsk@bsu.edu

IRB Members - Basic/Refresher: This Basic Course is appropriate for IRB or Ethics Committee

Stage 1. Basic Course Passed on 10/03/10 (Ref # 5047001)

Elective Modules	Date Completed	Score
Introduction	10/03/10	no quiz
Belmont Report and CITI Course Introduction	10/03/10	3/3 (100%)
Students in Research - SBR	10/03/10	10/10 (100%)
History and Ethical Principles - SBR	10/03/10	4/4 (100%)
History and Ethical Principles	10/03/10	7/7 (100%)
Defining Research with Human Subjects - SBR	10/03/10	5/5 (100%)
The Regulations and The Social and Behavioral Sciences - SBR	10/03/10	5/5 (100%)
Basic Institutional Review Board (IRB) Regulations and Review Process	10/03/10	5/5 (100%)
Assessing Risk in Social and Behavioral Sciences - SBR	10/03/10	5/5 (100%)
Informed Consent - SBR	10/03/10	5/5 (100%)
Informed Consent	10/03/10	4/4 (100%)
Privacy and Confidentiality - SBR	10/03/10	3/3 (100%)
Social and Behavioral Research for Biomedical Researchers	10/03/10	4/4 (100%)
Records-Based Research	10/03/10	2/2 (100%)
Genetic Research in Human Populations	10/03/10	2/2 (100%)
Research With Protected Populations - Vulnerable Subjects: An Overview	10/03/10	4/4 (100%)
Research with Prisoners - SBR	10/03/10	4/4 (100%)
Vulnerable Subjects - Research with Prisoners	10/03/10	4/4 (100%)
Research with Children - SBR	10/03/10	4/4 (100%)
Vulnerable Subjects - Research Involving Minors	10/03/10	3/3 (100%)
Research in Public Elementary and Secondary Schools - SBR	10/03/10	4/4 (100%)
Vulnerable Subjects - Research Involving Pregnant Women and Fetuses in Utero	10/03/10	3/3 (100%)
International Research - SBR	10/03/10	3/3 (100%)

[www.citiprogram.org/.../stage.asp?refkeyID=6496296-FD16-4726-8249-0014&ID=432-697460&module=30442\(10/3/2010%2010:1\)](http://www.citiprogram.org/.../stage.asp?refkeyID=6496296-FD16-4726-8249-0014&ID=432-697460&module=30442(10/3/2010%2010:1))

Report

International Research	10/03/10	1/1 (100%)
Internet Research - SBR	10/03/10	4/4 (100%)
Group Harms: Research With Culturally or Medically Vulnerable Groups	10/03/10	3/3 (100%)
FDA-Regulated Research	10/03/10	5/5 (100%)
Human Subjects Research at the VA	10/03/10	3/3 (100%)
Research and HIPAA Privacy Protections	10/03/10	6/6 (100%)
Workers as Research Subjects-A Vulnerable Population	10/03/10	4/4 (100%)
Hot Topics	10/03/10	no quiz
Conflicts of Interest in Research Involving Human Subjects	10/03/10	2/2 (100%)
The IRB Member Module - "What Every New IRB Member Needs to Know"	10/03/10	6/6 (100%)
You want to be an IRB Community Member, Now what?	10/03/10	5/5 (100%)
Ball State University	10/03/10	no quiz