A COMPARISON OF PHYSICAL ACTIVITY AMONG WOMEN BASED UPON SEXUAL ORIENTATION

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Purpose: This cross-sectional study examined potential differences in reported past-year leisure time, occupational, total (leisure plus occupational), vigorous and usual household physical activity among 737 women who self-identified as lesbian (n = 405) or heterosexual (n = 332), were 35-55 years of age ($\overline{X}$ = 45.2 ± 5.5), reported their race as either Black (n = 80, 11%) or White (n = 657, 89%), and were recruited for participation in the Epidemiologic STudy of HEalth Risk in women (ESTHER) project at the University of Pittsburgh, PA. Potential differences in predictors of past-year leisure time physical activity between the groups were also examined. **Methods:** Physical activity was assessed through verbal interview using the Modifiable Activity Questionnaire (MAQ) and a composite questionnaire for usual household physical activity. Physical activity, sociodemographic, behavioral and lifestyle variables were compared by sexual orientation using median, Chi-Square and independent t-tests. Predictors of past-year leisure time physical activity were determined using multivariate step-wise logistic regression. **Results**: The groups did not differ by age, race, education, income, employment, or marital or partner status. More heterosexuals (49%) reported children age <18 yrs living in the household compared to lesbians (15%) (p < .001). Body mass index (BMI), cigarette smoking and alcohol use were higher among lesbians (p < .05). There were no differences in reported time (hrs/wk) spent in past-year leisure time, occupational, total, or vigorous physical activity. Usual household physical activity (hrs/wk) was higher among heterosexuals than among lesbians (20.8

vs. 15.7 hrs/wk) ($p < .001$). Predictors of past-year leisure time physical activity included BMI for both groups. Additional predictors for lesbians were smoking status, educational attainment, and current committed marital or partner relationship status. **Conclusions**: Although time (hrs/wk) spent in past-year leisure time, occupational, vigorous and total physical activity were not different between lesbians and heterosexual women, time spent in usual household physical activity was higher among heterosexuals. Lesbians had four predictors of past-year leisure time physical activity while heterosexuals had only one. Therefore, although many aspects of physical activity are similar between lesbians and heterosexuals, some differences in physical activity exist among women based upon sexual orientation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PREFACE

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1.0 INTRODUCTION

1.1 INTRODUCTION

The purpose of this study was to examine potential differences in reported physical activity between lesbians and heterosexual women. This chapter contains the following sections: 1) rationale, 2) purpose, 3) significance, 4) specific aims, and 5) research hypotheses.

1.2 RATIONALE

Physical activity is important to health promotion and disease prevention (USDHHS, 1996, 2000) and is a major determinant of morbidity and all-cause mortality (USDHHS, 1996). Specifically, physical activity has been associated with a reduced risk of developing and dying from coronary heart disease, non-insulin dependent diabetes mellitus, colon cancer, osteoporosis, and hypertension (Pate et al., 1995; USDHHS, 1996). Despite the overwhelming evidence illuminating the benefits of regular physical activity, most Americans fail to obtain the recommended amounts necessary to promote health (CDC, 2003; Pate et al., 1995; USDHHS, 1996).

Differences in physical activity have been found based upon gender. In general, women obtain lesser amounts, engage in different types and have different patterns of physical activity

than men (USDHHS, 1996). Overall, women are less physically active than men at all ages, less likely to engage in vigorous physical activity and are more likely to be physically inactive (Pate et al., 1995; USDHHS, 1996, 2000). Women are also less likely to engage in leisure time physical activity (CDC, 1995, 2003; USDHHS, 2000) and more likely to acquire physical activity through household and occupational means (Brownson et al., 2000; Eyler et al., 1999; Robbins et al., 2001; Speck & Harrell, 2003).

Significant differences in physical activity have been found to exist among subgroups of women. Researchers, for instance, have found that physical activity varies among women based upon demographics including age, race or ethnicity and socioeconomic status. With increasing age, physical activity decreases (King et al., 2000; Nies & Kershaw, 2002; Ransdell & Wells, 1998; Scharff, Homan, Kreuter, & Brennan, 1999; Yusuf et al., 1996) and the proportion of women classified as physically inactive increases (King et al., 2000; Masse et al., 1998; Pate et al., 1995; Robbins et al., 2001; USDHHS, 1996, 2000). Physical activity is lower among minority women than among White women (Brownson et al., 2000; CDC, 2004; Evans & Nies, 1997; Mack et al., 2004; Nies, Vollman, & Cook, 1999; Ransdell & Wells, 1998). Additionally, women from racial and ethnic minorities tend to be the most physically inactive (Eyler et al., 2003; King et al., 2000; Masse et al., 1998). Finally, physical activity tends to be lower among women of lower socioeconomic status as determined by education and/or income. Increased levels of physical activity are associated with higher levels of education (Andersen, Schnohr, Schroll, & Hein, 2000; Brownson et al., 2000; CDC, 1995; Ransdell & Wells, 1998; Walsh, Pressman, Cauley, & Browner, 2001; Yusuf et al., 1996) whereas lower levels of education and income are associated with increased levels of physical inactivity (CDC, 1995; Crespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000; Eyler et al., 2003). As a result of these differences

found among subgroups of women, studying women as a homogeneous group with regard to physical activity research is not recommended (Nies et al., 1999).

Since physical activity has been reported to vary among women based upon demographics such as age, race or ethnicity and socioeconomic status, sexual orientation may be another important correlate of physical activity. Additionally, several behavioral and lifestyle correlates of physical activity including body mass index, cigarette smoking, and alcohol consumption have previously been found to be higher among lesbians than among heterosexual women (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Diamant, Wold, Spritzer, & Gelberg, 2000; Moran, 1996; Valanis et al., 2000). Therefore, factors that predict physical activity may also be different among lesbians than among heterosexual women.

Some potential differences in physical activity among women based upon sexual orientation have already been reported (Aaron et al., 2001; Roberts, Dibble, Nussey, & Casey, 2003). Roberts et al. (2003), for example, found that lesbians were more likely than their heterosexual sisters to exercise at least weekly. Aaron et al. (2001) found that a higher percentage of lesbians reported engaging in vigorous physical activity as compared to women in the general population. Based upon these findings, there is reason to believe that, like other factors and behaviors related to disease risk such as BMI, smoking and alcohol consumption, physical activity may be also different among lesbians compared to heterosexual women.

1.3 PURPOSE

The purpose of this study was to examine potential differences in reported physical activity between lesbians and heterosexual women.

1.4 SIGNIFICANCE

Large gaps exist in the present body of knowledge regarding the health status of lesbians. Since 1994, several organizations including the National Institute of Mental Health, Centers for Disease Control and Prevention, American Public Health Association and the Institute of Medicine have indicated that research which affects the health and health care of gay men and lesbians is inadequate. The Institute of Medicine (IOM) released a report in 1999 regarding the current assessment and future direction of lesbian health (Solarz, 1999). The first research priority listed in the report was to not only gain a better understanding of the physical and mental status of lesbians, but to determine whether there are health problems for which lesbians may be at greater risk.

Differences between lesbians and heterosexual women have already been reported for a number of health-related risk factors. For example, body mass index (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Roberts et al., 2003; Valanis et al., 2000) cigarette smoking (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Diamant et al., 2000; Roberts et al., 2003; Valanis et al., 2000) and alcohol consumption (Aaron et al., 2001; Case et al., 2004; Diamant et al., 2000; Moran, 1996; Valanis et al., 2000) have been found to be higher among lesbians as compared to heterosexual women. Additionally, some have reported higher amounts of vigorous physical activity among lesbians (Aaron et al., 2001; Case et al., 2004). As a result, lesbians may display health-related behaviors that could potentially put them more or less at risk for developing chronic diseases such as cardiovascular disease, type II diabetes, obesity and certain types of cancer as compared with heterosexual women. The implications of these potential differences may mean that intervention strategies, including those for physical activity, should be specifically targeted toward subgroups of women based upon sexual orientation.

1.5 SPECIFIC AIMES

1.5.1 Primary aim

The primary aim of this investigation was to examine potential differences in physical activity among women based upon sexual orientation. The physical activity examined included reported past-year leisure time, occupational, total (leisure time and occupational), vigorous and usual household physical activity.

1.5.2 Secondary aim

The secondary aim of this investigation was to construct models of sociodemographic, behavioral and lifestyle variables that best predict past-year leisure time physical activity based upon sexual orientation. Potential sociodemographic variables included age, race, total household income, educational attainment, employment status, marital or partner relationship status, and whether children under the age of 18 years were currently living in the household. Potential behavioral and lifestyle correlates of physical activity included body mass index, current cigarette smoking, and alcohol consumption.

1.6 RESEARCH HYPOTHESES

The primary hypotheses of this study were that total reported time (hours/week) spent in:

1. Past-year leisure time physical activity is significantly different between lesbians and heterosexual women.
2. Past-year occupational physical activity is significantly different between lesbians and heterosexual women.
3. Past-year total (leisure time plus occupational) physical activity is significantly different between lesbians and heterosexual women.
4. Past-year vigorous physical activity is significantly different between lesbians and heterosexual women.
5. Usual household physical activity is significantly different between lesbians and heterosexual women.

There was insufficient evidence available in the current literature to accurately predict the direction of the differences for physical activity between lesbians and heterosexual women.

The secondary hypothesis of this study was that predictors of past-year leisure time physical activity are different for lesbians than for heterosexual women.

2.0 REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

This chapter reviews 1) physical activity among adults, 2) physical activity among women, 3) correlates of physical activity, and 4) physical activity among lesbians.

2.2 PHYSICAL ACTIVITY AMONG ADULTS

2.2.1 Definition

Physical activity is defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen, Powell, & Christenson, 1985). Physical activity is a complex, multidimensional behavior including energy expenditure, frequency, duration, intensity, mode, weight bearing or non-weight bearing (LaPorte, Montoye, & Caspersen, 1985). In terms of energy expenditure, physical activity is often expressed as the amount of work performed (watts), time period performed (hours and minutes), units of movements (counts), or as a numerical score derived from a questionnaire (Montoye, Kemper, Saris, & Washburn, 1996). Physical activity is commonly classified, by purpose, into four domains: leisure-time (recreation time for hobbies, sport or exercise), occupational (work-related), domestic or household

(housework, yard work, child care, and chores), and transportation (walking or bicycling in order to go somewhere) (CDC:Division of Nutrition and Physical Activity & National Center for Chronic Disease Prevention and Health Promotion, 2007) .

2.2.2 Importance

The importance of physical activity to health promotion and disease prevention is well documented (USDHHS, 1996, 2000). Physical activity is a major determinant of morbidity and mortality (USDHHS, 1996). Of particular significance is the role of physical activity in reducing the risk of coronary heart disease (CHD), the leading cause of death in the United States. Physical inactivity has been found to be a strong and independent risk factor for CHD and as risky as cigarette smoking, high cholesterol and high blood pressure (CDC, 1993; Pate et al., 1995; USDHHS, 1996). Obtaining the recommended amounts of physical activity substantially reduces the risk of developing or dying from coronary heart disease, non-insulin dependent diabetes mellitus, osteoporosis, hypertension, colon and possibly other types of cancer (Pate et al., 1995; USDHHS, 1996). In fact, regular participation in physical activity has been found to significantly reduce the risk of all-cause mortality in both men and women (Andersen et al., 2000; Pate et al., 1995; USDHHS, 1996). As a result, physically active people, on average, tend to outlive inactive people (CDC, 1993; USDHHS, 2000). Additionally, regular physical activity is beneficial in reducing the risk of several other health outcomes including obesity, hip fractures, anxiety and depression (Pate et al., 1995; USDHHS, 1996).

2.2.3 Recommendations

Historically, the benefit of performing vigorous physical activity in order to develop and maintain fitness among healthy adults was highly promoted. The recommendation was that adults engage in physical activity three to five days per week at an intensity of 60%-90% of maximal heart rate, or 50%-85% of maximal oxygen uptake or heart rate reserve, for a duration of 15-60 minutes per session of rhythmical, large muscle group, aerobic activity (USDHHS, 1996). More recently, the health benefits of performing regular, moderate physical activity have been recognized. As a result, the American College of Sports Medicine (ACSM), Centers for Disease Control and Prevention (CDC) and the U.S. Surgeon General's Report on Physical Activity and Health indicated that adults could meet the minimum physical activity recommendation if they accumulate 30 minutes or more of moderate intensity physical activity on most, if not all, days of the week either in a single session or in multiple bouts lasting at least 8-10 minutes each (Pate et al., 1995; USDHHS, 1996). The most recent recommendations released by the American College of Sports Medicine and the American Heart Association state that all healthy adults ages 18-65 need a minimum of 30 minutes of moderate aerobic physical activity on 5 days per week and/or 20 minutes of vigorous, aerobic activity on 3 days per week in addition to resistance exercise on 2 days per week (Haskell et al., 2007).

2.2.4 Prevalence

Despite the overwhelming evidence illustrating the benefits of regular physical activity, most Americans still do not get the recommended amounts necessary to promote (CDC, 2003; USDHHS, 1996, 2000). The Report of the Surgeon General on Physical Activity and Health

stated that 50% of U.S. adults do not get enough physical activity and 25% do not exercise at all (USDHHS, 1996). Recent surveys have indicated little change in the prevalence of physical activity. For example, according to the Behavioral Risk Factor Surveillance System (BRFSS), less than 50% of all adults age 18 years and older reported engaging in moderate physical activity for 30 minutes or more on five or more days per week or vigorous physical activity for 20 or minutes on three or more days per week (CDC, 2004). Similarly, the U.S. Physical Activity Statistics: 2003 State Summary Data reported that the national average for those getting the recommended amounts of physical activity was 45.6%. Insufficient amounts of physical activity were reported by 38.5% and 15.6% reported being inactive (defined as less than 10 minutes of moderate or vigorous activity per week) (CDC, Division of Nutrition and Physical Activity, & National Center for Chronic Disease Prevention and Health Promotion, 2004). Moreover, an alarming new trend emerged with the early release of the National Health Interview Survey (NHIS) data which indicated that the percentage of adults engaging in regular leisure time physical activity decreased from 32.8% in 2003 to 30.2% in 2004. This marked the first time since the late 1990's that regular leisure time physical activity had declined (USDHHS, 2004).

The prevalence of reported vigorous physical activity is even lower. A recent National Health Interview Survey (NHIS) report, for instance, found that 59% of the 2003 U.S. adult population never engages in vigorous leisure time physical activity lasting 10 minutes at a time on three or more days per week (USDHHS, CDC, & NCHS, 2005). Additionally, vigorous leisure time physical activity three, or more days per week, is performed by only 26.3% of the adult population (CDC et al., 2004). Finally, an even smaller 15% reported engaging in vigorous physical activity for 30 minutes or longer on five or more days per week (USDHHS, 2000).

Regarding physical inactivity, in response to the 2003 BRFFS question, "During the past month, did you participate in any physical activities?" 22.8% of the U.S. adult population said, "No" (CDC et al., 2004). In 2005, 23.7% of adults reported no leisure time physical activity (Haskell et al., 2007). Therefore, although research findings have emphasized the importance of regular, moderate and/or vigorous physical activity, most American adults fail to participate at the recommended levels.

2.2.5 Assessment

Physical activity can be assessed by a number of different methods including behavioral observation, mechanical and electronic monitors (accelerometers, heart rate monitors, pedometers), surveys (diary, recall, quantitative history), job classification, physiological markers (fitness components, doubly-labeled water), calorimetry (direct or indirect), or by dietary measures (LaPorte et al., 1985).

Direct measurement of physical activity may involve actual, visual observation of physical activity or the use of electronic devices such as motion detectors (pedometers and accelerometers) which record the individual's movement or their physiological response to movement (heart rate monitors). Since visual observation can be time consuming and costly, the pedometer, or step counter, is the primary means of direct measurement used to monitor body movement. Pedometers provide a good estimate of physical activity when the body movements coincide with vertical displacement of the body's center of gravity (Montoye et al., 1996). Examples of such activities include walking, jumping, running and stepping. Pedometers can underestimate physical activity, however, when vertical displacement of the body does not occur as in activities such as cycling, skating, and rowing (Montoye et al., 1996). Advantages of using

pedometers to measure physical activity include their convenience, ease of use and relative low cost.

A survey, such as a diary or questionnaire, is another commonly used approach for assessing physical activity. In diary assessment, the individual records all physical activity in a defined period of time, usually a day or a week. Although it can provide highly detailed information, it has the potential to alter typical physical activity patterns (Washburn & Montoye, 1986) and can miss seasonal variation in physical activity (LaPorte et al., 1985). Additionally, the detailed diary can be burdensome to both the participant and researcher.

Questionnaires, on the other hand, attempt to measure physical activity by asking respondents to recall and report past, recent or usual participation in activities and/or selected sedentary behaviors over a period of time. Most questionnaires determine the level of physical activity by calculating an average level of energy expenditure expressed in metabolic equivalents (METs) or kilocalories (Kcals) (Washburn & Montoye, 1986). A classification system called "The Ainsworth Compendium of Physical Activities," provides a standardized way of coding physical activities allowing for comparisons across studies (Ainsworth et al., 1993; Ainsworth, Richardson, Jacobs, Leon, & Sternfeld, 1999).

One of the main limitations of the questionnaire lies in the ability of the respondent to remember details of recent and past physical activity. Short-term recall questionnaires may be less affected by forgetfulness. However, they may not reflect seasonal variation in physical activity and therefore, not take into account the individual's typical, regular or usual physical activity over a year-long period (Washburn & Montoye, 1986). An important advantage of the questionnaire is its versatility in administration. It can be conducted via telephone, face-to-face interview, or by a self-administered, mail-in response format. Questionnaires are practical in

cost and convenience, non-reactive (i.e., do not alter behavior), applicable (i.e., designed to suit a particular population) and accurate both in reliability and validity (Montoye et al., 1996). Because the questionnaire is the least expensive and easiest method for collecting physical activity information among large groups of people, the physical activity questionnaire continues to be the most practical and widely used method of assessing physical activity in large population-based studies (Aaron et al., 1995; Kriska & Caspersen, 1997; LaPorte et al., 1985; Montoye et al., 1996; Paffenbarger et al., 1993; Washburn & Montoye, 1986).

There are six national surveys that provide information regarding physical activity among the U.S. population (CDC, Division of Nutrition and Physical Activity, & National Center for Chronic Disease Prevention and Health Promotion, 2007). They include the Behavioral Risk Factor Surveillance System (BRFSS), National Health Interview Survey (NHIS), National Health and Nutrition Examination Survey (NHANES), National Household Travel Survey (NHTS), Youth Risk Behaviors Survey (YRBS) and the School Health Policies and Programs Study (SHPPS). The four national surveys that specifically pertain to adult physical activity are BRFSS, NHIS, NHANES, and NHTS (Table 1). All of these national surveys include short sets of questions that assess or track physical activity among individuals. None of the national surveys use long, detailed physical activity questions as typically found in smaller research study questionnaires.

Many types of physical activity questionnaires containing much more specific and detailed questions have been developed and utilized to better target specific subgroups of the population. Questionnaires differ in complexity, method of administration, amount of time required to administer, amount of detail expected of the respondent, time frame over which the physical activity is assessed, type of measurement scale and outcome that is determined. Since

myriad questionnaires are available for assessing physical activity, the type and appropriateness of the questionnaire to be utilized should be based upon sample size, gender, age, race and ethnicity, as well as socioeconomic status of the target population.

Table 1: Summary of U.S. National Adult Physical Activity Surveys

Survey	Population	Frequency	Mode	Domain(s)
BRFSS	Adults >18 yrs 210,000 respondents in 2001	Ongoing-annual	Telephone Interview	Leisure-time Domestic Transportation
NHIS	Adults 100,00 respondents in 2000	Ongoing-annual	Personal Interview	Leisure-time
NHANES	Adults & children 11,039 respondents in 2001-2002	Ongoing-annual	Interview/ Examination	Leisure-time Domestic Transportation
NHTS	Households > 25,000 respondents	Every 5-7 years	Household Survey	Transportation

Note. BRFSS = Behavioral Risk Factor Surveillance System, NHIS = National Health Interview Survey, NHANES = National Health and Nutrition Examination Survey, NHTS = National Household Transportation Survey. Source: Centers for Disease Control and Prevention (CDC) http://www.cdc.gov/nccdphp/dnpa/physical/health_professionals/data/physical_surveys.htm

2.3 PHYSICAL ACTIVITY AMONG WOMEN

2.3.1 Prevalence

The prevalence of physical activity differs with regard to gender. Overall, men are more physically active than women (USDHHS, 1996). Gender differences in physical activity begin to

emerge during the teen years and women continue to lag behind men in achieving the recommended levels (USDHHS, 1996). Women are less active than men at all ages (USDHHS, 2000). According to the 2003 BRFSS, 44.6% of adult females compared to 49.8% of males engage in moderate physical activity for 30 or more minutes on five or more days per week or vigorous physical activity for 20 or more minutes on three or more days per week (CDC, 2004). A similar trend can be found for past-month physical activity whereby nearly 80% of men reported being active compared to approximately 75% of women. In older adults, age 65+ years, the prevalence of regular leisure time physical activity was found to be 24% for women compared to 37% for men, according to the 1990 NHIS (Yusuf et al., 1996).

Results of smaller studies indicate that 57% of women, age 18-75 years, do not meet the current physical activity recommendations (Scharff et al., 1999). Only 19% reported engaging in adequate levels of physical activities of daily living (i.e., household and occupational-related physical activity) and 12% reported adequate leisure time physical activity (Scharff et al., 1999). Ransdell and Wells (1998) found that the majority of women in their studies were classified as sedentary, defined as expending less than 666 Kcals per week in leisure time physical activity (Ransdell & Wells, 1998).

Not only are women less likely than men to be physically active at moderate levels (USDHHS, 1996), they are also less likely to engage in vigorous physical activity, exercise and sports (Pate et al., 1995). Only 21.2% of women compared to 31.5% of men are vigorously active for 20 or more minutes on three or more times per week according to the 2003 BRFSS (CDC, 2004). Similarly, the NHIS reported that only 23% of women compared to 29% of men engage in vigorous leisure time physical activity on three days per week for 10 or more minutes (USDHHS et al., 2005)

Additionally, physical inactivity is more prevalent among women than among men (CDC, 1995; Pate et al., 1995; USDHHS, 1996, 2000). Results from the NHANES III showed that women had a higher prevalence of leisure time inactivity than men regardless of other factors including race and ethnicity (Crespo et al., 2000). According to the 2003 BRFSS, over 27% of all women reported that they engaged in no leisure time physical activity compared to 21% of men (CDC, 2004). In 2002, females were 14% more likely than men to be categorized as physically inactive (USDHHS, 2004).

2.3.2 Assessment

Some of the gender differences found for physical activity can be attributed, in part, to the physical activity assessment tool and classification used. The early physical activity assessment tools had been developed and validated using White, middle-aged men and emphasized male-oriented leisure time physical activities (Evans & Nies, 1997; Washburn & Montoye, 1986). Women have daily routines that frequently involve home and family responsibilities requiring physical activity, such as caretaking and household chores, which may not be shared by men (Masse et al., 1998). Therefore, the early physical activity assessment tools may not have captured all of the physical activity routinely found in the lives of women. More specifically, they may have been even less reflective of the physical activity found in the lives of minority and older women (Masse et al., 1998).

From 1984-2000 the BRFSS primarily measured only one domain of physical activity: leisure time. Leisure time physical activity usually meant exercise or sport-related physical activity (CDC, 2003). Assessment tools such as the early BRFFS, measuring only leisure time physical activity, may have missed much of the gender-specific activities in which women

engage (Eyler et al., 1997; Speck & Harrell, 2003). Fewer women, overall, report engaging in leisure time physical activity. In fact, more women than men report no leisure time physical activity (USDHHS, 2000). One study found that reported leisure time physical activity among women was low (9-15%) and varied little across the life span (Scharff et al., 1999). The 1992 BRFSS also found that a large proportion of White (56%) and minority (68%) women reported engaging in no leisure-time physical activity (CDC, 1995). Therefore, the findings of earlier investigations may not have been indicative of women's activity patterns.

Beginning in 2001, the BRFSS was expanded to include three physical activity domains: leisure time, domestic, and transportation physical activity. Also, the BRFSS now assesses physical activity of moderate (e.g., vacuuming, gardening, brisk walking, or bicycling) and vigorous (e.g., running, aerobics, or heavy yard work) intensity (CDC, 2003). Additionally, it currently contains questions regarding occupational physical activity, although not included in the physical activity summary score for technical reasons (CDC et al., 2007). This updated, more inclusive version of the BRFSS provides a better tool for assessing the type and amount of physical activity women perform in their daily lives.

When questionnaires include occupational and household physical activity in the overall assessment, a higher proportion of women are classified as being physically active. For example, Eyler et al. (1999) found that 72% of middle aged and older women in various racial and ethnic groups met the criteria for lifestyle physical activity when non-traditional physical activity (household chores and occupational activity) rather than only leisure time activity was included (Eyler et al., 1999). Similarly, three quarters of women studied reported being physically active at the recommended levels when occupational and household physical activity were considered (Brownson et al., 2000). Others found that women achieved higher levels of

physical activity and subsequent health-related benefits when the assessment tool included occupational physical activity (Robbins et al., 2001). For example, even small increases in occupational physical activity were associated with more favorable lipid profiles for women, but not for men (Robbins et al., 2001). Additionally, some found that higher levels of occupational physical activity were associated with lower mortality rates among women (Andersen et al., 2000).

As a result, several questionnaires have been developed for use in targeting subgroups of the population. The College Alumni Questionnaire (CAQ), for instance, was used to study physical activity among a diverse population of urban women (Ransdell & Wells, 1998). Because it includes household and child care related activities, it may be more gender specific for studying physical activity among women. Another example, the Modifiable Activity Questionnaire (MAQ), is an interviewer-administered questionnaire adapted from the Minnesota Leisure Time Activity Survey. It assesses leisure time and occupational physical activity. The MAQ was designed for easy modification which maximizes its ability to assess physical activity in a variety of populations (Kriska & Caspersen, 1997). Since its development, the MAQ has been utilized to accurately and reliably assess physical activity among Pima Indians (Kriska et al., 1990), French men and women (Vuillemin et al., 2000) and adolescents in the U.S. (Aaron et al., 1995; Aaron, Storti, Robertson, Kriska, & LaPorte, 2002).

All in all, these data suggest that men and women have different general patterns of physical activity. Therefore, gender-specific physical activity assessments that include many domains of physical activity are essential to gaining an accurate picture of physical activity among women (Robbins et al., 2001; Speck & Harrell, 2003).

2.4 CORRELATES OF PHYSICAL ACTIVITY

2.4.1 Definition

Since physical activity is a complex part of human behavior, explaining it can be a challenge. No single variable can explain physical activity, just as no one variable can explain any other health behavior. Factors influencing physical activity in positive ways are knows as correlates, antecedents, predictors, facilitators or determinants of physical activity. Correlates of physical activity are variables that are related to physical activity and may have a causal effect.

2.4.2 Importance

Because physical inactivity poses a major threat to public health, it is important to examine factors that influence physical activity (Sallis & Owens, 1999; Speck & Harrell, 2003; USDHHS, 1996). Attempting to understand and explain the factors influencing physical activity has become a popular area of research. In fact, over 300 studies of physical activity determinants have been published (Sallis & Owens, 1999). Identifying non-modifiable correlates of physical activity, such as sociodemographic variables, can help determine groups at risk for physical inactivity and subsequent health risks. Understanding modifiable correlates of physical activity can help to guide intervention studies allowing for the development of more effective strategies to increase levels of physical activity.

A number of correlates are associated with physical activity. Some variables may be a stronger influence for some people than for others. Because it is virtually impossible to consider all of the influencing variables of physical activity, general theories or models have been

developed which focus on categories or groups of variables that are believed to have a significant influence on physical activity.

There is no generally accepted, well-tested theory to predict physical activity, nor is there any consensus about which variables should be tested (Speck & Harrell, 2003). However, five basic theoretical models have been proposed to study and explain correlates of physical activity (Sallis & Owens, 1999). These theoretical models include the Health Belief Model, Theory of Planned Behavior, Transtheoretical Model, Social Cognitive Theory and the Ecological Model. The Health Behavior Model examines psychological variables that influence health behaviors. The Theory of Planned Behavior is a psychological model studying the influence of the perception and beliefs of significant others. The Transtheoretical Model is also known as the Stages of Change Model and includes weighing the benefits and costs of health behaviors. The Social Cognitive Theory is based upon the interaction between intrapersonal, social and physical environmental factors influencing behavior. The Ecological Models examines multiple levels of influence on behavior emphasizing the effects of social systems, public policies and the physical environments (Sallis & Owens, 1999).

Specific variables associated with physical activity can be classified as demographic, psychological, sociological, behavioral, and physical environmental. Demographic, also known as sociodemographic, variables include factors such as gender, age, race, measures of socioeconomic status (e.g., education, income, employment), marital status and whether children under the age of 18 years are living in the household. Psychological variables include attitude, perceived barriers, enjoyment, intention, locus of control, mood disturbances, knowledge, expected benefits, stress, lack of time, and self-efficacy. Sociological variables include social support, social isolation, group cohesion and physician influence. Behavioral

variables include past physical activity, alcohol consumption, smoking, as well as factors related to diet such as weight or body mass index. Physical environmental variables include actual and perceived access to facilities, climate/season, home equipment, program costs, and routine.

2.4.3 Sociodemographic correlates

Commonly investigated soiciodemographic correlates of physical activity are age, race or ethnicity, and measures of socioeconomic status (SES) which may include educational attainment, income, and/or employment status. Marital status is sometimes included as a measure of socioeconomic status among women as it tends to increase the level of total household income and therefore, SES. Other times, marital status is investigated as a separate sociodemographic correlate. Among the female population, physical activity varies with age, race or ethnicity, marital status and measures of socioeconomic status. Additionally, correlates of physical activity have been found to vary within subgroups of women based upon these sociodemographics. Some subgroups of women have been found to be at particular risk for physical inactivity (Brownson et al., 2000; King et al., 2000). As a result, women should not be pooled and studied as a homogeneous group in physical activity research. Instead, physical activity research and interventions should be tailored to women from diverse cultural, racial, socioeconomic and educational backgrounds (Robbins et al., 2001).

2.4.3.1 Age One of the most commonly investigated correlates of physical activity is age. Research indicates that moderate, vigorous, and past-month physical activity decrease with increasing age in U.S. adults (Table 2).

Table 2: Percentages of U.S. Adults Reporting Physical Activity by Age

Age (Years)	Moderate %	Vigorous %	Past-Month [a] %
18-24	58	40	82
25-34	52	33	81
35-44	50	30	79
45-54	45	23	77
55-64	43	19	75
65+	36	12	68

Note. Adapted from the Behavioral Risk Factor Surveillance System www.cdc.gov/brfss/ 2003 data, [a] 2004.

Date from the BRFSS demonstrates that, among adults, the prevalence of moderate physical activity (i.e., 30+ min on five times per week of moderate or 20+ min on three times per week of vigorous) decreases with age (CDC et al., 2004). For instance, moderate physical activity decreased from 58% at age 18-24 years to 36% at age 65 years and older (CDC et al., 2004). The prevalence of vigorous physical activity (20+ minutes per day, three or more times per week) also decreases with age, dropping from 40% among adults 18-24 years old to 12% among those age 65 years and older (CDC et al., 2004). Moreover, a higher percentage of adults report no past-month leisure time physical activity with increasing age. No past-month physical activity rose from 18% among those age 18-34 years to 32% for those 65 years of age and older (CDC, 2004). These reported decreases in physical activity with increasing age are more pronounced among women than among men (USDHHS, 2000). For example, 37% among men

and 23% among women age 65 years and older reported participating in regular, leisure time physical activity (Yusuf et al., 1996).

Several investigators have examined physical activity and age among adult women (Table 3). Age-related decreases in physical activity, as well as increases in physical inactivity, have been reported. Older women perform less physical activity than younger women (King et al., 2000; Nies & Kershaw, 2002; Ransdell & Wells, 1998; Scharff et al., 1999; Yusuf et al., 1996). Women in the oldest age group are the least likely to perform physical activity (Ransdell & Wells, 1998; Scharff et al., 1999). For instance, 28% of the youngest age group (18-29 years) reported performing physical activities of daily living (housework, yard work and/or occupational-related activity) compared to just 11% in the oldest age group (60+ years) (Scharff et al., 1999). The proportion of women reporting adequate levels of moderate leisure time and activities of daily living was twice as high for those under 30 as it was for those over 60 years of age (Scharff et al., 1999).

Table 3: Physical Activity and Age

Study	Sample	Main Findings
Nies & Kershaw (2002)	*N* =198 self-described sedentary women Age=30-60yrs	• As age increased, physical activity level decreased • Performance in one- mile walk time decreased with increasing age
Walsh et al. (2001)	*N* = 9,442 elderly, independent living White women Age = 65+ yrs. (*M* = 71.7 ± 5.3)	• Age related decreases see for all types of physical activity (PA) • Walking most common activity : 51% were current walkers • Intensity: ¾ engaged in low intensity PA, 1/3 in medium to high intensity PA, less than 5 % engaged in high intensity PA • Distance walked in blocks declined with age from 13.1 at 65-69 to 9.3 at 85+ yrs • Frequency of medium to high intensity exercise decreased with each succeeding age group from 36% at 65-69 to 15% at 85+ yrs
Brownson et al. (2000)	*N* = 2,912 US Women's Determinants Study Age = 40+ yrs.	• Out of six physical activity domains: No leisure time PA, Regular PA, Vigorous PA, Occupational PA, Housework, & Composite of all PA, older women were more likely to be in Housework PA category
King et al. (2000)	*N* = 2,912 US Women's Determinants Study Age = 40+yrs	• Older age was significantly ($p < .001$) associated with physical inactivity
Scharff et al. (1999)	*N* = 653 women Age =18-75yrs	• Older women performed less PA than younger women • Women in oldest age group, least likely to perform PA • PADL declined from 27-29% in youngest two age groups to 11% in oldest age group • 57% of all women not meeting recommended levels of PA • 12% meeting recommendations for LTPA • 19% meeting recommendations for PADL
Sternfeld et al.(1999)	*N* = 2,336 ethnically diverse women Age = 20-65 yrs	• Examined 4 physical activity domains: Sport/Exercise, Active Living (other leisure time activities), Occupational and Household/Caregiver • A negative association was found for age and likelihood of being in Sport/Exercise domain
Ransdell & Wells (1998)	*N* = 521 diverse Urban women White, African American, Mexican American Age = 40.5 ± 10 yrs	• The majority of women were sedentary expending $\leq$ 666 Kcals. per week in LTPA • The lowest levels of LTPA were found for women over 40 yrs old.

Note. PA = Physical activity, LTPA = Leisure time physical activity, PADL= Physical activity of daily living.

A similar trend has been found among women of advancing age. Among those 65 years of age and older, age-related decreases were found for all types of physical activity. For example, 56% of women age 65-69 years reported walking for exercise as compared to only 40% of those over age 85 years (Walsh et al., 2001). The prevalence of regular leisure time physical activity decreased with advancing age among older adults. Those 60-74 years of age were twice as likely as those over the age of 75 yrs to engage in regular leisure time physical activity (Yusuf et al., 1996). The lowest level of physical activity was reported for those in the oldest age group.

Another age-related change found for physical activity pertains to domain of physical activity. Older age, for example, is negatively associated with physical activity participation in the sport and exercise domain (Sternfeld, Ainsworth, & Quesenberry, 1999). On the other hand, older age was associated with higher levels of physical activity in the household/caregiver domain (Sternfeld et al., 1999). Those in the oldest age group were the least likely to be active with regard to housework physical activity defined as at least 300 minutes per week of vigorous household chores such as vacuuming/mopping, digging/planting, lifting/carrying and other chores of similar exertion (Brownson et al., 2000).

These decreases in physical activity found for sport and exercise, as well as for housework, may be a function of intensity since participation in vigorous physical activity declines with increasing age. The decline in vigorous physical activity with increasing age is a more pronounced among girls and women than among boys and men (USDHHS, 1996). Among women, older age is associated with the lowest levels of vigorous physical activity. In a study, over 75% of community-dwelling, elderly White women age 65 years and older reported engaging in some type of low-intensity activity (Walsh et al., 2001). Yet, only 33% reported engaging in any medium to high-intensity physical activity. An even smaller 5% reported

engaging in any high-intensity physical activity over the past year. Age-related decreases in both medium and high-intensity exercise were seen with succeeding age groups. For example, the frequency of engaging in any medium or high-intensity physical activity in the past year declined from 36% at age 65-69 years to 15% among those over age 85 years. Also, older women who exercise do so at lower levels and at a decreased frequency than younger women (Scharff et al., 1999). For example, the total number of blocks walked decreased significantly (p <.001) from 13.1 at age 65-69 years to 9.3 among those age 85 years and older (Walsh et al., 2001).

Physical inactivity increases with increasing age among women as well. For instance, physical inactivity increases from 26% among those age 18-34 years to 42% among those age 65 years and older according to the BRFSS (CDC, 1995; Pate et al., 1995). King et al. (2000) also found that older age was significantly associated with physical inactivity. The highest prevalence of physical inactivity was reported among adults 65 years of age and older according to population-based surveys (Robbins et al., 2001). A panel of 53 experts from the Women's Health Initiative determined that women older than 75 years are among the least physically active (Masse et al., 1998). In fact, by age 75, one half of all women engage in no physical activity (USDHHS, 2000). The results of these studies suggest a negative association between physical activity and age.

2.4.3.2 Race and ethnicity Examining the influence of race and ethnicity is another commonly investigated area of physical activity research. Differences in physical activity based upon race and ethnicity have been reported among adults in the United States (Table 4).

Table 4: Physical Activity and Race

Study	Sample	Main Findings
Mack et al. (2004)	*N* = 98,387 men and women from 2000 Behavioral Risk Factor Surveillance System (BRFFS) Age = 18+ years	• More than ½ of women in each race/ethnic category engaged in past month leisure time physical activity (LTPA) (74% White, 60.9% Black, 57.4% Hispanic) • 1/4 to 1/3 reported meeting the recommended physical activity (PA)guidelines (39% White, 30.9 % Hispanic, 29% Black)
Nies & Kershaw (2002)	*N* =198 self-described sedentary women Age = 30-60yrs.	• African American women had poorer performance on the Rockport one-mile walk test than women of European descent
Brownson et al. (2000)	*N* = 2,912 1996-97 US Women's Determinants Study Age = 40+ yrs. African American (AA) American Indian/Alaskan Native (AI/AN), Hispanic (H),White (W)	• Significant variations were seen across all racial/ethnic groups for each index of PA except occupational • For each index, PA tended to be lowest or second lowest for AA and AI/A N • Not all minority women subgroups are less active than White women when all domains of physical activity are taken into consideration • A higher proportion of women are classified as physically active when occupation PA is taken into account • AA less likely to be active in regular exercise category and more likely to be inactive than white women • Occupational PA most common among AI/AN • Housework PA is more common among AI/AN and Hispanic women • AI/AN had highest No LTPA and lowest vigorous PA rate • When a composite PA is used, nearly ¾ of women are physically active
Crespo et al. (2000)	*N* = 18,885 Adult men and women From NHANES III (1998-1994) Women (*n* = 9,609) Age = 20+ years	• Women had a higher prevalence of leisure time PI than men regardless of race/ethnicity • PI is more prevalent among racial/ethnic minorities • PI is lower among Caucasian men and women than among African American (35%) & Mexican American (40%) men and women • PI among women was 23% Caucasian, 41% African American, 45 % Mexican American • Male and female Caucasians between the ages of 70-79 yrs had a lower prevalence of PI than Mexican Americans of any age group

Table 4 (Cont): Physical Activity and Race

Study	Sample	Main Findings
King et al. (2000)	*N* = 2,912 1996-97 US Women's Determinants Study Age = 40+ yrs.25% : White, African American (AA), American Indian/Alaskan Native (AI/AN) and Hispanic	• AA/AI ethnicity was significantly associated with PI • AA/AI (59%) and AA (57%) subgroups had the largest % PA and the smallest PA (8 % and 9% respectively)
Eyler et al. (1999)	*N* = 2,912 Black, Hispanic, American Indian/Alaskan Native (AI/AN), White women from 1996-97 Women's Determinants Study Age = 40+ yrs.	• AI/AN had the highest (46%) of sedentary behavior (no PA in past 2 wks) among all groups; White (30.7%), Hispanic (32%), Black (41.3%) • 17% of Hispanic, 11% White, 10.8% AI/AN, 7.2 % Black met criterion for regular exercise (5X per week, 30+ min.) • 34% Hispanic, 31% White, 18% Black and 19% AI/AN met criteria for cumulative exercise (150 min. exercise/sports or PA hobbies) • Lifestyle activity, a combined total of 300 min accumulated PA/week, was met by 76.9% of all, 81.9% Hispanic, 77.8% AI/AN, 76% White, 71.7% Black women
Sternfeld et al. (1999)	*N* = 2,336 ethnically diverse women Age = 20-65 yrs.	• African American, Hispanic, Asian ethnicity is negatively associated with being in the sport/exercise domain • Being White is positively associated with being at a high level in the sport/exercise domain • Hispanic ethnicity is associated with being in the household/caregiver domain
Ransdell & Wells (1998)	*N* = 521 diverse Urban women White (W), African-American (AA), Mexican American (MA) Age = 40.5 ± 10 yrs.	• Women of color had lowest level of LTPA • A large % of women participated in LTPA one day per week (64% W, 58% MA, 49% AA) • Most frequently LTPA was walking (48% W, 45% AA, 38% MA) • A small % of each group participated in mod-vigorous PA (13% W, 11 MA, 8% AA) • 62% of minority and 54% of White women reported no LTPA • Minority women had a higher level of energy expenditure from heavy cleaning than White women
Yusuf et al. (1996)	*N* = 7,801 1990 National Health Interview Survey (NHIS) Men (*n* =2783) Women (*n* = 5018) Age = 65+ yrs.	• No statistically significant difference in reported LTPA between older Black and White • Women whose race was "other" were 4X more likely to engage in LTPA than Black women

Note. LTPA = Leisure Time Physical Activity, PA = Physical Activity, PI = Physical Inactivity

Physical activity tends to be lower among minority populations than among those who are White. For example, 49.3% of White men and women report participation in moderate physical activity as compared to 34.3% of Black and 9.9% of Hispanic adults (CDC et al., 2004). Since males have been found to have statistically similar levels of physical activity regardless of race and ethnicity (USDHHS, 1996), most of the differences found for physical activity by race and ethnicity may be attributed to differences among women. In fact, several investigators have consistently reported lower levels of physical activity among racial and ethnic minority women than among White women (CDC et al., 2004; Crespo et al., 2000; Nies et al., 1999; Ransdell & Wells, 1998).

Results of national surveys including the BRFSS, for example, show that 74% of White, 60.9% of Black and 57.4% of Hispanic women reported past-month leisure time physical activity (Mack et al., 2004). Data from the Women's Determinants Study indicated that physical activity levels were lower for African American and American Indian/Alaskan Native women than for White women (Brownson et al., 2000). In another study, more White women (39%) were found to be meeting physical activity recommendations than minority women (30.9% Hispanic and 29% Black) (Mack et al., 2004). Using measures of physical fitness an indirect measure of regular participation in physical activity, women of European descent had an overall better performance on the Rockport one-mile walk test than did African American women (Nies et al., 1999).

The likelihood of participation in a specific physical activity domain also seems to vary with race and ethnicity. For example, minority women were among those with the lowest levels of leisure time physical activity as reported by Ransdell and Wells (1998). Sternfeld et al. (1999) found that being in the sport and exercise physical activity domain was negatively associated

with being in the non-White race category (i.e., African American, Hispanic or Asian). Being White, on the other hand, was positively associated with being in the highest level of the sport and exercise domain (Sternfeld et al., 1999). Minority women were more likely to obtain their physical activity through occupational physical activity compared to White women (Brownson et al., 2000). Since leisure time physical activity tends to be inversely related to occupational physical activity, higher levels of occupational physical activity reported among minority women may help to account for some of the lower levels of leisure time physical activity reported by these same women. Regarding household physical activity, amounts reported among Hispanic, American Indian and Alaskan Native women (Brownson et al., 2000) were higher than amounts among White or Black women. Others, like Sternfeld et al. (1999) also found a significantly higher level of physical activity in the household/caregiver domain among Hispanic women. Additionally, a higher level of energy expenditure from heavy cleaning was found for minority women as compared to White women (Ransdell & Wells, 1998).

The prevalence of vigorous physical activity among women also seems to vary by race and ethnicity. According to the Surgeon General's report (USDHHS, 1996), White non-Hispanic females had higher levels of vigorous physical activity (49%) than Black non-Hispanic females (41%). Ransdell and Wells (1998) found that only 11% of Mexican American and 8% of African American compared to 13% of White women living in an urban setting participated in moderate to vigorous physical activity for at least 30 minutes on most days of the week. African American women and American Indians/Alaskan Native women were found to have lowest prevalence of vigorous activity (8%) (Brownson et al., 2000).

Physical inactivity is more prevalent among racial and ethnic minority women than among White women. In fact, many have found that minority women are among the least

physically active (Eyler et al., 2003; Masse et al., 1998). Ransdell and Wells (1998) found that 62% of minority women reported no leisure time physical activity compared to 54% of White women. In examining data from NHANES III, Crespo et al. (2000) reported that physical inactivity was more prevalent among African American (41%) and Mexican American (45%) than among Caucasian women (23%). The BRFSS reported that 42.7% of the women in the no leisure time physical activity category were African American followed by Hispanic (37.4%) compared to 28.2% of White women (CDC, 1995). According to the Women's Determinants Study, American Indian/Alaskan Native (59%) and African American (57%) women had the largest percentages of inactivity (King et al., 2000). Sedentary behavior, defined as no leisure time physical activity in the past two weeks, was highest for American Indian/Alaskan Native (46%) followed by African American (41.3%), Hispanic (32%) and White (30%) women (Eyler et al., 1999). Brownson et al. (2000) reported that American Indians/Alaskan Natives had the highest proportion of no leisure time activity. All in all, minority women are less physically active than White women. These data suggest a significant association between race and ethnicity and physical activity among women.

2.4.3.3 Socioeconomic status Socioeconomic status is another common area of research when it comes to the investigation of physical activity correlates. Some common measures of SES include education, income, employment and sometimes, marital status. Physical activity has been found to vary with measures of socioeconomic status (SES) (Table 5).

Table 5: Physical Activity and Measures of Socioeconomic Status

Study	Sample	Main Findings
Nies & Kershaw (2002)	*N* =198 sedentary women Age = 30-60 yrs	• Performance on the Rockport one-mile walk test increased with increasing income
Walsh et al. (2001)	*N* = 9,442 elderly, Independently living White women Age = 65+ yrs. (*M* = 71.7 ± 5.3)	• Walking for exercise was independently associated with greater than high school education (52% vs. 48%, $p < .01$) • Greater than high school education had 34% and less than high school education had 23% participation in medium -high intensity PA ($p < .01$) • Marital status not independently associated with walking for exercise
Brownson et al. (2000)	*N* = 2,912 1996-97 U.S. Women's Determinants Study Age = 40+ yrs	• Being active during leisure time increased with increasing education. • College graduates had higher occupational physical activity and lower housework PA • Choice of activity varied with socio-demographics • Walking was the most common activity in those with lower income and lower education • Not being married has a lower level of housework PA
Crespo et al. (2000)	*N* = 18,885 (9,609 women) Adult men and women From NHANES III (1988-1994) Age = 20+ yrs	• Higher level of physical inactivity among those with less education for all racial/ethnic groups • Caucasian women had lower prevalence of leisure time inactivity than African American Women in every education category • In every income group, Caucasian men and women had lower prevalence of leisure time inactivity than African American or Mexican American men and women • People below poverty line had a higher prevalence of inactivity than those above
King et al. (2000)	*N* = 2,912 From 1996-97 U.S. Women's Determinants Study Age = 40+ yrs, 25% from each: White, African American, American Indian/Alaskan Native and Hispanic	• Less education significantly associated with inactivity

Table 5 (Cont): Physical Activity and Measures of Socioeconomic Status

Study	Sample	Main Findings
Scharff et al. (1999)	*N* = 653 women Age 18-75 yrs	• In oldest age group (65+ years), women with > than 12 yrs. of education were more likely to perform LTPA than those less than12 yrs. of education • Married women under age 30 had increased physical activity of daily living (PADL) and decreased PADL among those age 50-59 yrs
Sternfeld et al. (1999)	*N* = 2,336 ethnically diverse women Age = 20-65 yrs	• Women with less than college degree had higher levels of household/caregiver PA • High school education or less was associated with an increased levels of PA in the occupational domain • Being married negatively associated with having high levels of PA in sport and exercise domain
Ransdell & Wells (1998)	*N* = 521 diverse, Urban women: White, African-American, Mexican American Age = 40.5 ± 10 yrs	• Inverse relationship between yrs of education and LTPA energy expenditure • Women with college degree more likely to be highly active than those without • Education alone predicts LTPA classification (high or low) with 68% accuracy • Education was the only significant predictor of high level of LTPA among White women (p <.01) • Less than college education was associated with lowest level of LTPA • Women without college degree more likely to be sedentary • No relationship between LTPA and income
Yusuf et al. (1996)	*N* = 7801 (2,783 men & 5,018 women) 1990 National Health Interview Survey (NHIS) Age = 65+ yrs	• Women with 12+ years education were twice as likely as women with less than 12 years education to engage in regular LTPA • Men with 12+ years were 40% more likely to engage in regular LTPA than men with less

Note. PA=Physical Activity, PADL= Physical Activity of Daily Living, LTPA=Leisure Time Physical Activity.

Education level is typically used as a primary indicator of SES because of its strong association with other SES indicators and its relative stability over adulthood (King et al., 2000). Overall, physical activity has been found to be positively associated with level of education. Results of

national surveys indicate that higher levels of physical activity are reported among those with higher levels of education. For example, BRFSS data demonstrated that 52.6% of college graduates report engaging in moderate physical activity compared to 35.4% of those with less than a high school education (CDC et al., 2004). Similarly, the NHIS reported that one fourth of adults with advanced degrees engage in physical activity compared to just one seventh of those with less than a high school degree (USDHHS, 2000). Other national surveys such as the 1996-97 US Women's Determinants Study also indicate that being physically active during leisure time is positively associated with increasing education (Brownson et al., 2000). The 1990 NHIS found that women with 12 or more years of education were twice as likely to engage in regular physical activity as compared to women with less than 12 years of education (Yusuf et al., 1996).

A similar trend was reported among older women in that those in the oldest age group (65+ years) with 12+ years of education were more likely to perform leisure time physical activity than those with less education (Scharff et al., 1999). Walsh et al. (2001) found that having greater than a high school education was one factor independently associated with walking for exercise among elderly White women.

Amount and/or level of physical activity is associated with level of education. Greater amounts of leisure time physical activity participation are seen in women with higher levels of education (Andersen et al., 2000). Education level was also found to predict classification of leisure time physical activity into a high or low category with 68% accuracy (Ransdell & Wells, 1998). Women with a college degree are less likely to be sedentary and more likely to be highly active (Ransdell & Wells, 1998). On the other hand, those having less than a college degree had the lowest levels of physical activity (Ransdell & Wells, 1998). The BRFSS data reported that participation in physical activity at the recommended levels was 17.4% among those with less

than a high school education, 23.8% among those with a high school education and 33.5% among those with a college education according (CDC, 1995). Education, along with income, has been found to be a strong predictor of participation in health–enhancing levels of physical activity (i.e., vigorous physical activity for 20 minutes per day on three or more times per week) (CDC, 1995). Education alone has been found to be an important factor associated with higher intensity exercise among elderly women in that those having greater than a high school education were significantly more likely to participate in medium to high intensity physical activity than those having less than a high school education (Walsh et al., 2001).

The type or domain of physical activity participation among women also seems to vary with level of education. A decreased likelihood of participation in sports and exercise and an increased likelihood of participation in occupational physical activity was associated with a high school education or less (Sternfeld et al., 1999). Also, women with less than a college degree were more likely to be in the highest quartile for the household/caregiver physical activity domain (Sternfeld et al., 1999). Having a high school diploma or less was associated with being in the highest quartile of the occupational physical activity domain (Sternfeld et al., 1999). Walsh et al. (2001) reported that individuals with less than a college education may be more likely to have strenuous jobs involving manual labor and therefore may be more likely to get physical activity through occupational means. Brownson et al. (2000), however, found that women who were college graduates had an increased likelihood of obtaining high levels of physical activity through occupational means and a decreased likelihood of obtaining high levels of physical activity through housework.

An inverse relationship exists among women regarding physical inactivity and education. For instance, less education was significantly associated with physical inactivity (King et al.,

2000). Ransdell and Wells, 1998, also reported that women without a college degree were more likely to be sedentary. Additionally, Crespo et al. (2000) reported higher levels of physical inactivity among racially and ethnically diverse women having who had low levels of education.

The relationship between physical activity and income has also been investigated. Women in the lowest income category (< $14,999) were the least likely (21.4%) while women in the highest income category (> $50,000) were the most likely (34.9%) to report regular physical activity (CDC, 1995). In one study, performance on an aerobic fitness walking test, as a measure of physical activity, was better among women with a higher income (Nies & Kershaw, 2002). Eyler et al. (2003) found a higher prevalence of physical inactivity among low income populations of women. Those living below the poverty line had a higher prevalence of physical inactivity than those living above it (Crespo et al., 2000). Ransdell and Wells (1998), conversely, found no relationship between income and leisure time physical activity.

2.4.3.4 Marital status Marital status is a sociodemographic correlate of physical activity that is sometimes examined as part of socioeconomic status, especially among women, since being married tends to increase the level of total household income and consequently SES. Marital status has been found to be associated with certain aspects of physical activity. In general, being married is associated with lower, whereas being single is associated with higher levels of leisure time physical activity (Schmitz, French, & Jeffery, 1997). Ransdell and Wells (1998) reported that marital status was the most important predictor of higher levels of leisure time physical activity among minority women but not among White women. Also, being married has been found to be associated with higher levels of physical activities of daily living (i.e., housework, yard work and occupational physical activity) for women under 30 years old, but lower levels for women 50-59 years old (Scharff et al., 1999). In addition, there was a decreased likelihood of

acquiring physical activity through sport and exercise and an increased likelihood of acquiring physical activity through occupational means for married women (Sternfeld et al., 1999). In another study, being single was associated with a decreased likelihood of acquiring physical activity through housework (Brownson et al., 2000). Among older women, marital status was not independently associated with walking for exercise (Walsh et al., 2001).

2.4.3.5 Children living in the household Another sociodemographic correlate of physical activity is having children under the age of 18 years living within the household. Having children living in the household has been associated with increased odds of performing physical activities of daily living (PADL) which includes childcare, work in the home, home repair and yard work (Scharff et al., 1999). In fact, having children living in the household was associates with a 6-fold increase in PADL among women ages 30-39 years. Also, having children living in the household was found to be a significant predictor of PADL among women 40-49 years of age (Scharff et al., 1999). Among ethnically diverse women, having children living in the household was positively associated with the likelihood of being in the highest quartile of household/caregiver physical activity (Sternfeld et al., 1999). These data suggest that physical activity varies among women with respect to sociodemographic correlates such as age, race and ethnicity, measures of socioeconomic status including educational attainment, income, as well a marital status and having children < 18 years of age living in the household.

2.4.4 Behavioral and lifestyle correlates

In addition to sociodemographics, behavior and lifestyle factors including body mass index (BMI), cigarette smoking, and alcohol consumption have been investigated as possible correlates

of physical activity. Researchers investigating the relationship between physical activity and other health factors such as smoking, drinking and body mass have reported mixed results. Although Blair et al. (1985) concluded that the correlations between physical activity and other health behaviors tended to be low or insignificant, the relationship of these factors to physical activity continues to be investigated (de Bourdeaudhuij & van Oost, 1999).

Of particular importance is that data suggests that these health-related factors vary with sexual orientation among women. Specifically, body mass index, rates of cigarette smoking and alcohol consumption have been found to be higher among lesbians than among heterosexual women (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Diamant et al., 2000; Moran, 1996; Valanis et al., 2000). It is not known whether these differences may influence physical activity among lesbians.

2.4.4.1 Body mass index A commonly used indicator of body composition is body mass index (BMI). BMI is a ratio of weight to height. Quetelet's index (body weight in kilograms divided by height in meters squared) is the most frequently used BMI (ACSM, 2001; USDHHS, 1996, 2000). Other techniques of measuring body composition, such as bioelectrical impedance analysis (BIA), hydrostatic weighing and the sum of skinfold measurements, are more precise than BMI in measuring percent fat, but are more expensive, time consuming, and more difficult to administer in large population-based studies (Brooks, Fahey, & White, 1996). Since BMI has been found to be moderately correlated with percent body fat (r = .80) (Brooks et al., 1996; USDHHS, 1996) and because height and weight measurements are readily available, BMI is widely used to estimate body composition in epidemiologic studies (USDHHS, 1996).

A primary reason for conducting body mass index calculation is to determine disease risk associated with being overweight and/or obese. According to the guidelines set forth by the

National Heart Lung and Blood Institute (NHLBI) and appearing in their Executive Summary Report of the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults (ACSM, 2001; National Heart, 1998), a body mass index of < 25.0 is classified as normal, 25.0-29.9 is overweight and ≥ 30.0 is obese. Being overweight or obese is associated with greater risk of acquiring chronic diseases and disorders such as coronary heart disease, hypertension, obesity, lipid disorders, type II diabetes mellitus, stroke, gall bladder disease, osteoarthritis, sleep apnea and other respiratory problems as well as certain types of cancers (ACSM, 2000, 2001). As a result, BMI can be a useful tool for estimating disease risk in large population-based studies.

According to the 2003 NHIS data, only 19% of the U.S. adult population is in the healthy range for BMI, 36% are overweight but not obese and 23% are obese (USDHHS et al., 2005). Taken together, 59% of adults, 18 years of age and older, are at risk for developing chronic diseases and disorders based upon their body mass index. With regard to gender, more women are in the healthy range for BMI than men at 46% and 32% respectively (USDHHS et al., 2005). Additionally, BMI varies among racial and ethnic subgroups of women. For example, NHIS data shows that 46% of White women, 35% of Hispanic and 30% of Black women are in the healthy range for BMI. On the other hand, 21% of White, 27% of Hispanic and 32% of Black women are considered to be obese (USDHHS et al., 2005).

In general, body mass index is negatively associated with physical activity. Several cross-sectional studies have consistently reported lower BMI, weight, and sum of skinfold measurements among people with higher levels of physical activity (USDHHS, 1996). Women who are physically active have reported significantly lower BMIs and body weights than those who are physically inactive (Speck & Harrell, 2003). Mack et al. (2004) found that past-month leisure time physical activity among women was significantly negatively associated with being

obese. Having a higher BMI was negatively associated with performing adequate amounts of physical activity of daily living and leisure time activity among women age 30-39 years (Scharff et al., 1999). Also, having a high BMI was negatively associated with the likelihood of having a high sport and exercise index (Sternfeld et al., 1999). Randell and Wells (1998), on the other hand, found that BMI was not a predictor of leisure time physical activity among White or minority women.

Some investigators have examined the relationship between body mass index and sexual orientation among women (Table 6). Most have reported body mass index to be higher among lesbians than among heterosexual women (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Roberts et al., 2003; Valanis et al., 2000).

Koh (2000), conversely, found no difference between lesbians and heterosexual women 36-41 years old for BMI calculated from self-reported heights and weights obtained from an anonymous questionnaire available at doctor's offices and clinics. Case et al. (2004) and Roberts et al. (2003) found higher waist to hip ratios (WHR) in addition to elevated BMIs among lesbians compared to heterosexual women. Roberts et al. (2003) found that lesbians had a greater average waist circumference (34.2 in) and WHR (0.82) than those of their heterosexual sisters (32.4 and 0.80 respectively) ($p < .001$). People who store fat in their abdominal area are at greater risk for developing a variety of health problems including hypertension, type II diabetes, hyperlipidemia, coronary artery disease, and premature death (ACSM, 2000, 2001). Among women, a WHR greater than or equal to 0.76 is independently associated with increased risk of developing cardiovascular disease and type II diabetes (ACSM, 2000). A WHR of greater than 0.82 among women is considered to be very high risk for developing these diseases (ACSM, 2000).

Table 6: Body Mass Index among Lesbians

Study	Sample	Main Findings
Case et al. (2004)	*N* = 90,823 women from NHSII *n* = 694 lesbians Age=32-51 yrs	• Lesbians had 20% greater prevalence of overweight (BMI = 25.0 - 29.99) and 50% obesity (BMI $\geq$ 30.0)
Diamant & Wold (2003)	*N* = 4,135 women from 1999 Los Angeles County Health Survey (LACHS) *n* = 43 lesbians, *n* = 69 bisexual Age = 18-64 yrs	• Lesbians had the highest rate of obesity (24.4% vs. 18.4%) and overweight (36.6% vs. 26.0%) ($p < .05$)
Roberts et al. (2003)	*N* = 648 (324 lesbians & 324 heterosexual sisters closest in age) Age = 40+ yrs	• Average BMI measurements were significantly greater in lesbians(26.5) than in heterosexual sisters (25.4) ($p = .016$)
Aaron et al. (2001)	*N* = 1010 self-identified lesbians compared to women in 1998 CDC's BRFSS sample Age = 18+ yrs	• Overweight (BMI $\geq$ 27.3) was higher in lesbians (47.8%) compared to women in the 1998 BRFSS sample (31.6%)
Koh (2000)	*N* = 1,304 Age 36-41 yrs. Lesbians (*n* = 524) bisexual (*n* = 143)	• No significant difference in BMI between lesbians (25.62) and heterosexual women (26.17)
Valanis et al. (2000)	*N* = 93,311 from 1997-98 WHI post-menopausal women Age = 50-79 yrs 97% hetero, 0.6% adult lesbian (*n* = 309) and lifetime lesbians (*n* = 264), 0.8% bisexual (*n* = 740)	• Lesbians were more likely to be overweight or obese (BMI $\geq$ 27.3): • 45.6 % Heterosexual • 47.5% Bisexual • 50.9% Adult lesbians • 51.1% Lifetime lesbians

The higher BMI, WHR and waist circumference found for lesbians may indicate greater risk for having or acquiring chronic diseases. Since body composition has not been specifically measured in these studies, it is hard to determine whether the increased body mass index among lesbians is

due to an increased amount of lean tissue or increased amount of body fat. Nevertheless, the results of these studies suggest that body mass index varies with sexual orientation among women and may be associated with a differential affect on physical activity.

2.4.4.2 Cigarette smoking Another health-related behavior and possible correlate of physical activity is cigarette smoking. Cigarette smoking is related to a plethora of chronic respiratory and cardiovascular diseases and disorders as well as cancers. The prevalence of current cigarette smoking in the U.S. according to the BRFSS and NHIS is approximately 22-23% overall among adults and 19-20.8% among women (CDC, 2004; USDHHS et al., 2005).

Cigarette smoking has been found have a weak, inverse relationship with participation in physical activity (Blair, Jacobs, & Powell, 1985; Pate et al., 1995). Current smoking has been found to be positively associated with having a higher level of physical activity obtained through the occupational domain (Sternfeld et al., 1999). Smoking was not found to be a significant predictor of leisure time physical activity (Ransdell & Wells, 1998). Among older adults age 65 years and older, an inverse relationship was found for current smoking and leisure time physical activity (Yusuf et al., 1996).

A number of researchers have investigated differences in cigarette smoking based upon sexual orientation among women (Table 7). In general, most researchers have found a higher prevalence of current smoking among lesbians compared to heterosexual women (Case et al., 2004; Diamant & Wold, 2003; Aaron et al., 2001; Diamant et al., 2000; Valanis et al., 2000; Hughes et al., 1997; Moran, 1996).

Table 7: Cigarette Smoking among Lesbians

Study	Sample	Main Findings
Case et al. (2004)	*N* = 90,823 women from the Nurses Health Study II (NHSII) (*n* = 694 lesbians) Age = 32-51 yrs	• Lesbians had a higher prevalence of current smoking (19% vs.11%) in heterosexual women and 13% of all U.S. women with 16 or more yrs of education, 60% greater history of past smoking
Diamont & Wold (2003)	*N* = 4135 women from 1999 Los Angeles County Health Survey (LACHS) (*n* = 43 lesbian, n = 69 bisexual) Age = 18-64 yrs	• Lesbians had significantly higher rates of current tobacco use than heterosexuals 27.9% vs. 13.9% ($p < .001$)
Roberts et al. (2003)	*N* = 648 (*n* = 324 lesbians & 324 heterosexual sister closest in age) Age = 40+ yrs	• Lesbians significantly more likely (61% vs. 51%, $p < .01$) than heterosexuals to have ever smoked, no difference current smoking, but sisters significantly more likely (7% vs. 15%) to live with a smoker ($p = .003$)
Aaron et al. (2001)	*N* = 1010 self-identified lesbians compared to women in 1998 CDC's BRFSS sample Age = 18+ yrs	• Higher prevalence of current smoking in lesbians (35.5%) than in BRFSS sample (20.5%)
Diamant et al. (2000)	*N* = 4697(*n* = 51 lesbians & 336 bisexual) Age = 18-59 yrs	• 1/3 of lesbians current tobacco users and significantly more likely to report both current and past use of tobacco
Koh (2000)	*N* = 1,304 lesbian (*n* = 524) bisexual (*n* = 143) Age = 36-41 yrs	• No differences in rates of smoking between groups based upon sexual orientation (16.5%)
Valanis et al. (2000)	*N* = 93,311 from 1997-98 Women's Health Initiative (WHI) postmenopausal women 5 groups: 97% heterosexual, .6% adult & lifetime lesbians,.8% bisexual, 1.5% no adult sex. Age = 50-79 yrs	• Lesbians had the lowest rates of "never smoked" 36.5% in lifetime and 30% in adult lesbians vs. 50% of heterosexuals. 53.5% lifetime and 55.7% of adult lesbians were past smokers vs. 42.8% of heterosexuals. • Lesbians more likely to be current smokers • (10% & 14 % in lifetime and adult lesbians vs. 7.2 % heterosexuals)
Moran (1996)	*N* =186 lesbians from Canadian softball league Age = 20-40 yrs	• 59% of lesbians were nonsmokers vs. 65% of Canadian women, 3% of lesbians were heavy smokers vs. 2% of Canadian women

Note. CDC= Centers for Disease Control and Prevention, BRFSS = Behavioral Risk Factor Surveillance System

Roberts et al. (2003) and Koh (2000), on the other hand, found no difference in current smoking based upon self-report. Roberts et al., (2003) reported that the lack of a difference in smoking rates found among women in their sample may have been due to the older age and higher level of educational attainment among the lesbian group as compared to the heterosexual group. Both older age and higher levels of education are associated with decreased rates of cigarette smoking.

In the Koh (2000) study, sexual orientation was based upon self-report and defined a single question, "How do you define your sexual orientation?" which did not take into consideration behavior or attraction as part of the definition. Therefore the classification of sexual orientation may not have matched the behavior of the women sampled. Additionally, since the sample was generated from anonymous questionnaires available at doctor's offices and clinics, it included women who already seek preventative care and who may not be representative of women in the general population.

In addition to current smoking some researchers have found that lesbians are more likely than heterosexual women report a history of past smoking (Roberts et al., 2003; Diamant et al., 2000; Valanis et al., 2000). Also, in one study, lesbians were less likely to live with a smoker than were their heterosexual sisters (7% vs. 15% respectively, p =.003) (Roberts et al., 2003). Overall, these data suggest that behaviors related to cigarette smoking vary among women based upon sexual orientation. It is not known whether these differences may affect physical activity.

2.4.4.3 Alcohol consumption Another behavioral and lifestyle factor that may correlate with physical activity is alcohol consumption. Research has shown that some alcohol consumption may be beneficial to health and is associated with a decreased risk of heart disease (Mukamal, Ding, & Djousse, 2006) and insulin insensitivity (Greenfield et al., 2003). On the other hand, alcohol consumption has also been found to be a risk factor for certain types of cancers including

liver, mouth, throat and esophagus and associated with other types of health risks including accidents, injuries, homicide, suicides, abuse, and addiction (USDHHS, CDC, Division of Adult and Community Health, & National Center for Disease Prevention and Health Promotion, 2006). Excessive alcohol use also contributes to chronic diseases of the liver, pancreas, stomach and cardiovascular system (USDHHS et al., 2006).

The NHIS reports that 47% of adults age 18 years and older are regular drinkers, while 13% are current, infrequent drinkers (USDHHS et al., 2005). Only 25% of the adult population reports being life-time abstainers. Men are more likely than women to be regular, current drinkers while women are more likely to be current, infrequent drinkers or lifetime abstainers (USDHHS et al., 2005). The prevalence of heavy alcohol use (defined by BRFFS as 1 drink per day for women and 2 drinks per day for men) in the U.S. is 5.9% overall and 4.5% for women (CDC, 2004).

Although alcohol use and cigarette smoking appear to correlate well with each other (de Bourdeaudhuij & van Oost, 1999), most report a weak or mixed association between alcohol consumption and physical activity (Blair et al., 1985; Sallis & Owens, 1999). Ransdell and Wells (1998) found that drinking alcohol was not a predictor of leisure time physical activity among women. Greenfield et al. (2003) reported that alcohol consumption was unrelated to the prevalence of regular physical activity.

Most of the research regarding alcohol use and sexual orientation among women has reported that lesbians have a higher prevalence of alcohol consumption as compared to heterosexual women (Table 8).

Table 8: Alcohol Consumption among Lesbians

Study	Sample	Main Findings
Case et al. (2004)	*N* = 90,823 women from Nurses Health Study II (NHSII) (*n* = 694 lesbians) Age = 32-51 yrs	• Lesbians had a higher prevalence of drinking, were more likely to report alcohol intake ≥15.0 g/day, twice as likely to report heavy drinking (≥ 60 drinks per month)
Aaron et al. (2001)	*N* = 1010 self-identified lesbians compared to women in 1998 CDC's BRFSS sample Age = 18+ yrs	• Lesbians had a higher prevalence of current alcohol use than BRFSS sample. Lesbian non-abstainers 57.5% vs. 44.6% in BRFSS sample • 4.7% lesbians were classified as heavy drinkers (60 or more drinks per month) compared to 1.1% of BRFSS sample
Diamant et al. (2000)	*N* = 4697, Lesbians (n= 51) Bisexual (*n* =336) Age = 18-59 yrs	• 75% of all lesbians vs. 50% heterosexuals acknowledged any drinking • Lesbians were significantly more likely to report drinking alcohol frequently and in greater quantities (3 or more drinks daily)
Koh (2000)	*N* = 1304, Lesbians (n= 524), Bisexual (*n* = 143) Age = 36-41 yrs	• No differences in heavy drinking among women of different sexual orientation (13.1%)
Valanis et al. (2000)	*N* = 93,311 from 1997-98 Women's Health Initiative (WHI) postmenopausal women: heterosexual (97%), adult & lifetime lesbians (0.6%),bisexual (0.8%), no adult sex (1.5%) Age = 50-79 yrs	• Lesbian more likely to use alcohol and more of it • 9.9% of heterosexuals were non drinkers compared to 7.1% and 1.1% of lifetime and adult lesbians. 19.6% adult and 24.3% of lifetime lesbians were past drinkers vs. 18.2% in heterosexual women • 14.0% and 18.5% of adult and lifetime lesbians were heavy drinkers (≥ 7 drinks per week) vs. 12.0% in heterosexual women
Moran (1996)	*N* =186 lesbians from Canadian softball league Age = 20-40 yrs	• Lesbians less likely to use "no alcohol" (13% vs. 16% in overall Canadian female population) • 8% Lesbians classified as heavy drinkers (> 14 drinks/wk) compared to 2% in general female population

Note. CDC= Centers for Disease Control and Prevention, BRFSS = Behavioral Risk Factor Surveillance System

For instance, Aaron et al. (2001) found a lower prevalence of abstainers among lesbians. Specifically, a higher percentage of lesbians (57.5%) reported being non-abstainers compared to women in the general population from the 1998 BRFSS sample (44.6%). Diamante et al. (2000) found that 75% of lesbians compared to 50% of heterosexuals acknowledged any drinking.

Valanis et al. (2000) found that 7.1% of lifetime lesbians and only 1.1% of adult lesbians (age 45+ yrs.) were abstainers compared to 9.9% of heterosexual women. Among Canadian women, the percentage of abstainers among lesbian was 13% vs. 16% found in the overall female population but was not statistically significant (Moran, 1996).

Similarly, lesbians have been found to be heavier drinkers than heterosexual women. Most of the research indicates that lesbians are heavy drinkers regardless of the criteria for heavy drinking (Aaron et al., 2001; Case et al., 2004; Diamant et al., 2000; Moran, 1996; Valanis et al., 2000). In addition, some of the highest levels of alcohol consumption have been found among lesbians.

Koh (2000), on the other hand, found no difference in heavy drinking among women of differing sexual orientation with all groups at around 13%. This sample was taken from a survey available in doctor's offices and clinics which may not make the results representative of the general population of women. All in all, the results from most studies suggest that alcohol consumption varies with sexual orientation among women and lesbians may have higher rates than heterosexual women. It is not know whether the higher rates of alcohol use among lesbians affect physical activity.

Behavioral and lifestyle factors such as body mass index, cigarette smoking and alcohol consumption have been found to influence physical activity. These studies indicate that there are differences between lesbians and heterosexual women with regard to these factors. Therefore, higher BMIs, rates of cigarette smoking and alcohol consumption may exert a differential influence on physical activity among lesbians compared to heterosexual women. Additionally, although the association between sociodemographics and physical activity has been examined extensively among the overall population, among women and among subgroups of women, no

one has reported examining their association among subgroups based upon sexual orientation or specifically among lesbians.

2.5 PHYSICAL ACTIVITY AMONG LESBIANS

Although research regarding physical activity among women is expanding, some subgroups of the female population, including lesbians, remain underrepresented. Few have examined physical activity and sexual orientation among women. Even with limited available research, some differences in physical activity between lesbians and heterosexual women have been reported.

2.5.1 Definition of lesbian

In order to understand and compare findings of research based upon sexual orientation, it is necessary to have a definition of lesbian. In scientific research, there are generally three recognized components of sexuality: attraction, behavior and identity. Therefore, a lesbian is defined as a woman who is attracted to women, engages in sexual behavior with women, and/or who reports herself to be lesbian (O'Hanlan et al., 2004). Each of these dimensions can be assessed for a specific time frame (i.e., past, current/recent or lifetime) since each dimension can vary over time (Brogan, Frank, Elon, & O'Hanlan, 2001). Researchers have used various criteria in determining sexual orientation. Some have focused only on one aspect such as sexual identity or sexual behavior. Others have combined two or more components. Differences in defining sexual orientation can make comparisons of research findings difficult.

2.5.2 Importance

Since a number of health-related risk factors have been found to be associated with sexual orientation, the Institute of Medicine (IOM) released a report recommending more research in the area of lesbian health (Solarz, 1999). The first research priority in the report was to better understand the physical and mental status of lesbians and to determine health risks that may increase and/or protective factors that may reduce their risk. This recommendation was based upon the conclusion that large gaps exist in the present body of knowledge regarding lesbian health. As a result, the investigation of health-related risk factors among lesbians has recently emerged as an important area of study.

Researchers investigating the relationship between sexual orientation and socially patterned behavioral risk factors have reported some differences between lesbians and heterosexual women. As previously stated, lesbians tend to have a higher body mass index as well as higher rates of cigarette smoking and alcohol consumption (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Diamant et al., 2000; Moran, 1996; Valanis et al., 2000). These findings suggest that lesbians may display a greater prevalence of several health-related behaviors that may put them more at risk for developing chronic diseases such as cardiovascular disease, diabetes, obesity and cancers. Physical activity is also related to the development of these diseases and has been found to be a protective factor. If other behavioral risk factors such as body mass index, cigarette smoking and alcohol consumption differ between lesbians and heterosexual women, then physical activity could differ as well.

2.5.3 Physical activity

At present, very few studies have reported examining physical activity among women based upon sexual orientation. The findings from studies examining physical activity and sexual orientation among women have been mixed (Table 9). Some have reported no differences in physical activity between lesbians and heterosexual women. For example, Aaron et al. (2001) found no differences for reported past-month physical activity between lesbians and BRFSS sample of women. Koh et al. (2000) also found no differences when asking lesbians and heterosexual women whether they participated in regular aerobic exercise defined as 20 minutes of aerobic exercise per session with at least three sessions per week. Additionally, Valanis et al. (2000) found no differences between heterosexuals, bisexuals and lesbians age 50-79 years with 50%-57% in each group reporting little or no exercise defined as fewer than two times per week.

On the other hand, some differences in physical activity among women based upon sexual orientation have been reported. For instance, Roberts et al. (2003) found that lesbians were more likely than heterosexual women to exercise at least weekly although no differences in the number of times per week, length of exercise session or vigor were found. Aaron et al. (2001), however, found that a higher percentage of lesbians reported engaging in vigorous physical activity as compared to women in the BRFSS sample. Similarly, Case et al. (2004) reported that 10% more lesbians than heterosexual women reported strenuous exercise at least once a week. Vigorous physical activity is known to be protective against cardiovascular and other chronic diseases (USDHHS, 1996). If lesbians have higher levels of vigorous physical activity, they may be at a decreased risk for developing certain diseases. The results of these studies suggest that some differences in physical activity may exist among women based upon sexual orientation.

Table 9: Physical Activity among Lesbians

Study	Sample	Main Findings
Case et al. (2004)	*N* = 90,823 women from NHSII lesbians (*n* = 694) Age = 32-51 yrs	• 10% more lesbians than heterosexual women reported strenuous exercise once a week • Lesbians slightly more likely to participate in active exercise
Roberts et al. (2003)	*N* = 648 lesbians (*n* = 324) heterosexual sister closest in age (*n* = 324) Age = 40+ yrs	• Lesbians more likely to exercise weekly (80.8% vs. 72.2%, $p < .01$) • No differences found for the number of times per week, length of session or vigor
Aaron et al. (2001)	*N* = 1010 self-identified lesbians compared to women in 1998 CDC's BRFSS sample Age = 18+ yrs	• Lesbians more likely to have participated in vigorous activity • 63.2% lesbians reported "no regular, vigorous activity" (defined as 3days per week causing the body to sweat or heart to beat fast) vs. 86.8% of BRFSS sample) • No difference in sedentary behavior with 1/3 in both groups reporting no physical activity in past month
Koh (2000)	*N* = 1,304 lesbians (n = 524), bisexuals (*n* = 143) Age = 36-41 yrs	• No difference were found between lesbian and heterosexual women for regular aerobic exercise 20 min, three times per week
Valanis et al. (2000)	*N* = 93,311 from 1997-98 WHI postmenopausal women: heterosexual (97%), adult & lifetime lesbians (0.6%), bisexual (0.8%), no adult sex (1.5%) Age = 50-79 yrs	• No difference were found for frequency and duration of walking at various speeds or vigor or for strenuous or moderate exercise with 50-57% in each group reporting little or no exercise (fewer than 2 days per week)
Moran (1996)	*N* =195 Toronto, Canada softball league, lesbians (*n* = 186) Age = 20-40 yrs	• 37% of lesbians exercise 3 or more hours per week, 35% got 1-3 hrs. per week and 20% got less than 1 hour per week

2.6 LITERATURE REVIEW SUMMARY

Physical activity is an important factor affecting morbidity and mortality. Unfortunately, most American adults do not get the recommended amounts of physical activity necessary for health promotion and disease prevention.

Differences in physical activity have been found between men and women. In general, women are less physically active, more physically inactive and perform less leisure time physical activity as well as less vigorous physical activity than men.

Among women, differences in physical activity have been found within subgroups based upon age, race and ethnicity, and measures of socioeconomic status. Generally, physical activity is lower among women who are older, from racial and ethnic minorities and have lower socioeconomic status based upon lower levels of education, and/or income. Being married and/or having children under the age of 18 living in the household is generally negatively associated with leisure time physical activity and positively associated with household physical activity. The affects of marital status on physical activity may vary among subgroups of women based upon age, race and ethnicity. Therefore, physical activity may also differ based upon sexual orientation.

Behavioral and lifestyle factors which may affect physical activity include body mass index, cigarette smoking and alcohol consumption. Differences in these factors have been found between lesbians and heterosexual women. Whether physical activity is affected by the higher levels of BMI, cigarette smoking and alcohol consumption found among lesbians has not yet been reported. Since these behavioral and lifestyle factors vary with sexual orientation, then physical activity may potentially vary as well.

Finally, research regarding health behaviors and disease risk among lesbians is currently lacking. For these reasons, physical activity among lesbians needs further investigation. At present, no studies specifically examining reported past-year leisure time, occupational, total (leisure time and occupational), vigorous and usual household physical activity among lesbians have been reported.

3.0 METHODS

3.1 INTRODUCTION

The purpose of this study was to examine potential differences in reported physical activity between lesbians and heterosexual women. This chapter addresses the following: 1) sample, 2) clinical procedures, 3) data collection, and 4) data analysis.

3.2 SAMPLE

The sample used in this cross-sectional study included self-identified lesbians and heterosexual women recruited for participation in the Epidemiologic STudy of HEalth Risk in women (ESTHER) project at the University of Pittsburgh, Pennsylvania.

3.2.1 ESTHER inclusion criteria

Females 35 years of age or older and free from coronary heart disease were eligible for participation in the ESTHER study. A telephone screening took place to determine eligibility for participation in the study (APPENDIX A). During the screening process, sexual orientation was determined by self-identification as either lesbian or heterosexual and by romantic/sexual

partners. Lesbian was defined as those who self-identify as not heterosexual and who have had only or primarily (≥50%) women as romantic/sexual partners during the past five years. Heterosexual was defined as those who self-identify as heterosexual or straight and who had only male romantic/sexual partners since 18 years of age.

3.2.2 ESTHER exclusion criteria

Women were excluded from the ESTHER study if they were younger than 35 years of age or if they had ever been diagnosed with angina pectoris, suffered a sustained myocardial infarction, or had undergone surgical intervention for coronary heart disease. Also, women who identified as not heterosexual but have had < 50% women as romantic/sexual partners in the past 5 years were excluded from participation in the study. Additionally, women who identified as heterosexual but had women as romantic/sexual partners since the age of 18 years were excluded from participation in the study.

3.2.3 Recruitment

3.2.3.1 Lesbians Since lesbians represent a very small percentage, estimated to be 2-4 % of the adult U.S. female population and 1.87% of the adult female population in Allegheny County (Aaron, Chang, Markovic, & LaPorte, 2003) and are dispersed throughout the general population, a population-based sample would have been difficult, costly and time consuming. Also, since lesbians vary in the degree to which they are "out," sampling only those lesbians who are open about their sexual identity may not have been representative of the entire lesbian population. In an attempt to include a broader, more representative sample of lesbians,

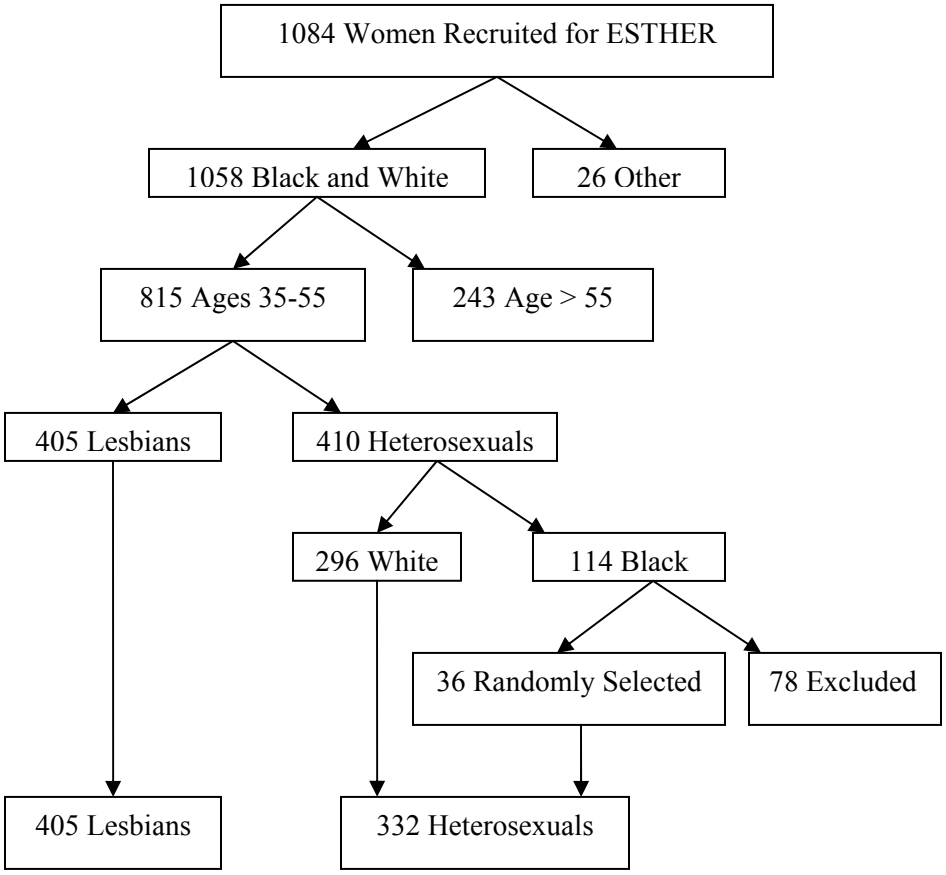
recruitment took place through multiple sampling methods which included network, snowball and location sampling. Specific sources for lesbian recruitment included community mailing lists, social, political and religious organizations, attendance at community events, newsletters and brochures placed at selected businesses as well as radio and print advertisements.

An additional recruitment method included use of a mailing list obtained from women who had previously participated in a pilot study. The pilot study consisted of an anonymous health survey which included a separate, postage paid return card. If participants wished to be contacted for additional studies they returned the card providing their name, address, telephone number and email address. All women in the pilot study database ($n > 800$) received an invitation to participate in ESTHER (D.J. Aaron, personal communication, July 24, 2006). The creation of this contact database was part of a protocol previously approved by the University of Pittsburgh Institutional Review Board (IRB #971068). Even though a variety of sampling methods were used, a limitation of this study is that the results may only be representative of lesbians who are willing to disclose their sexual identity and/or have some connection to the community.

3.2.3.2 Heterosexuals Recruitment of heterosexual women took place through similar outlets and included health fairs, events, word of mouth, networking, friend referrals, and mass advertising at the University of Pittsburgh, PA.

3.2.4 Study sample

The sample used in this study included 737 lesbians and heterosexual women who participated in ESTHER project (N = 1084), reported their race as either Black or White and were between the ages of 35 to 55 years of age ($\overline{X}$ = 45.2 ± 5.5). A diagram illustrating the way in which the study sample was determined is displayed below.



First, only women recruited for ESTHER who reported their race as either Black or White (n = 1058) were included. Women who reported their race as Asian, Native American or other were of insufficient numbers for separate analysis and combining them would have been inappropriate. When the sample containing only Black and White women was examined by age and sexual orientation, the heterosexual group had a significantly greater mean age (50.3 ± 10.5

years) compared to the mean age of the lesbian group (48.0 ± 7.8 years) (t = 4.04, p < .001). When age was limited to the range of 35-55 years (n = 815), the mean age of the lesbians (n = 405) (45.2 ± 5.3 years) was not significantly different than the mean age of the heterosexual women (n = 410) (45.1 ± 5.7 years) (t = .29, p = .772).

The study sample, now containing 815 women between the ages of 35-55 years, was racially disproportionate in that the lesbian group (n = 405) was 10.9% Black (n = 44) and 89.1% White (n = 361) while the heterosexual group (n = 410) was 27.8% Black (n = 114) and 72.2% White (n = 296). Since the sample contained a significantly higher percentage of Black, heterosexual women (χ^2 = 37.42, p < .001), in order to make both groups proportionate by race, a random sample (n = 36) was selected from the 35-55 year old Black heterosexual women (n = 114). The Black heterosexual women not randomly selected (n = 78) were excluded from this study sample.

The final sample for this study was comprised of 737 Black and White women between the ages of 35-55 ($\overline{X}$ = 45.2 ± 5.5 years). The lesbian group (n = 405) had a mean age of 45.2 ± 5.3 years and was 10.9% Black (n = 44) and 89.1 % White (n = 361). The heterosexual group (n = 332) had a mean age of 45.1 ± 5.7 years and was 10.8% Black (n = 36) and 89.2% White (n = 296). In this final sample, the lesbians and heterosexuals were not significantly different with regard to age (t = .14, p = .887) or race (χ^2 = .00, p = .993). Equating the groups with respect to age and race was necessary since both factors have been found to be strong correlates of physical activity.

3.3 CLINIC PROCEDURES

The protocol for this study was approved by the Institutional Review Board at the University of Pittsburgh (IRB #0404147). Participants were asked to attend two clinic visits. The first clinic visit took place at the Clinical Research Center of Magee Womens Hospital (Craft Avenue, Pittsburgh, PA). Lasting about three hours, the visit included a verbal and written review and signing of the informed consent (APPENDIX B), measurements of resting heart rate (radial pulse), blood pressure (using a standard sphygmomanometer after five minutes of seated rest), height (in), weight (kg), sagittal diameter (cm), waist circumference (cm), and hip circumference (cm) which were recorded on the clinic exam form (APPENDIX C). Height in feet and inches was entered into the leg-to-leg bioelectrical impedance analysis (BIA; Tanita Corporation, Arlington Heights, IL) to obtain estimates of percent body fat and body mass index (BMI) (kg/m2). Waist to hip ratio (WHR) was calculated from direct measurements taken of body circumferences. Additionally, participants had their blood drawn in order to screen for glucose and cholesterol, were given a light snack, and then were asked to complete five written questionnaires regarding demographic and psychosocial factors (APPENDIX D), overall health, gynecological health, physical activity, eating habits, and substance abuse (APPENDIX E). Lesbians were given a sixth questionnaire regarding sexual orientation. Two verbal interviews took place, one regarding medications taken within the past two weeks and the other regarding physical activity. The physical activity interview (APPPENDIX F) was used to assess many aspects of physical activity including past-year leisure time, vigorous, occupational, total (a composite of leisure time and occupational physical activity), and usual household physical activity. The Modifiable Activity Questionnaire (MAQ) (Kriska, 1997; Kriska et al., 1990) was used to assess past-year leisure time, occupational, vigorous, and total physical activity, while an

additional questionnaire was used to assess usual household physical activity. Take home instructions for recording a three-day physical activity log and food diary, a pedometer (Digiwalker, Accusplit Stopwatch Co., San Jose, CA) and additional questionnaires were given to each participant at the end of their first visit and were returned at their second visit. Before participants left the clinical research center, the second visit was scheduled.

The second visit took place one or more weeks after the first visit allowing participants time enough to log their physical activity and food intake for three days (two week days and one weekend day). The second visit lasted about one hour and took place at the University of Pittsburgh, Department of Epidemiology's Heath Studies Office (130 North Bellefield Avenue, Pittsburgh, PA). During this visit, participants returned the pedometer, had their food and physical activity logs reviewed, height and weight measured, and underwent a dual energy x-ray absorptiometry (DXA) scan of the whole body, hip and lumbar spine (L1-L4) (Hologic QDR4500A, Hologic, Inc., Bedford, MA).

Approximately four to six weeks after the second visit, each participant received mailed results of their anthropometric measurements, body composition, blood pressure, blood lipids, blood glucose, bone mineral density, diet and physical activity. Participants were notified immediately, however, if any alert values for blood pressure, cholesterol, glucose, or bone mineral density were found.

3.4 DATA COLLECTION

All measurements and data were collected by trained research specialists and graduate student researchers who followed a standard protocol defined in the Manual of Operations and

Procedures (MOOP). The MOOP contained all data collection forms, a glossary of terms, coding schemes, guidelines for standardizing the data collection as well as data management procedures. Quality control was achieved through the training and testing of all staff by the same ESTHER study principal investigator and supervision by the project manager.

3.4.1 Sociodemographic correlates

Sociodemographic characteristics such as age, race, educational attainment, total household income, marital or partner status, and whether children < 18 years old were currently living in the household were assessed via a written questionnaire (APPENDIX D). Age (35-55 years) was evaluated as a continuous variable and was also collapsed into four age groups: 35-39 years, 40-44 years, 45-49 years, and ≥ 50 years. Other variables were dichotomized into the following groups: race (White or Black), educational attainment ≥ bachelor's degree (yes or no), total household income ≥ $40,000 (yes or no), employment status defined as currently employed either part-time or full time (yes or no), marital or partner status defined as currently in a committed relationship (yes or no), and children < 18 years of age currently living in the household (yes or no).

3.4.2 Behavioral and lifestyle correlates

Behavioral and lifestyle factors included body mass index, cigarette smoking, and alcohol consumption and were assessed during the clinic exam (APPENDIX E) and the substance abuse questionnaire (APPENDIX F).

3.4.2.1 Body mass index Body mass index (BMI), defined as body weight in kilograms divided by height in meters squared (kg/m^2), was calculated from measured height and then entered into the bioelectrical impedance analyzer (BIA) during the clinic exam (APPENDIX C). Standing height (in) without shoes was measured using the average of two measures that varied less than 0.5 inches obtained from a wall-mounted Harpendon stadiometer and then converted to feet and inches to be entered into the BIA. BMI was examined as a continuous variable and was also collapsed into the following three categories: normal weight (BMI < 25.0), overweight (BMI = 25.0-29.9) and obese (BMI ≥ 30.0) based on the Clinical Guidelines of the National Heart, Lung and Blood Institute (1998).

3.4.2.2 Cigarette smoking Current cigarette smoking (yes or no) was assessed via a written substance abuse questionnaire (APPENDIX E).

3.4.2.3 Alcohol consumption Alcohol use was also assessed using the written substance abuse questionnaire (APPENDIX E). Level of alcohol use was determined by a questionnaire taken from the National Study of Health and Life Experiences (NSHLEW) which included quantity and frequency of alcohol use (Hughes & Wilsnack, 1997). Alcohol consumption, over the past 12 months, was converted to ounces of ethanol. First, the number of drinks per day was calculated by multiplying drinking quantity and frequency. Next, the number of ounces of alcohol per day was calculated by multiplying the number of drinks per day by 0.6 (the average ethanol across different types of drinks). Alcohol consumption in ounces of ethanol per day was examined as a continuous variable and also collapsed into four categories based upon level of drinking: abstainer (0 oz. of ethanol/day), light (> 0 < 0.22 oz. of ethanol/day), moderate (0.22 - 0.99 oz ethanol/day), and heavy (≥1.0 oz ethanol/day).

3.4.3 Physical activity

Past-year leisure time, occupational, total (leisure time plus occupational), vigorous and household physical activity were assessed during the physical activity interview (APPENDIX F). The Modifiable Activity Questionnaire (MAQ) is an interviewer questionnaire which was used to assess past-year leisure time and occupational physical activity each expressed in hours per week on average over the past year. The MAQ is a valid and reliable instrument used to successfully determine past-year physical activity in a variety of population subgroups (Aaron et al., 1995; Kriska, 1997; Kriska et al., 1990; Vuillemin et al., 2000). Past-year total physical activity was calculated from summing the hours per week of leisure time and occupational physical activity. Past-year vigorous physical activity was calculated from summing hours per week spent in only the higher intensity reported leisure time physical activities from the MAQ. Vigorous was defined as physical activities with metabolic equivalents > 6 METs, in agreement with criteria set forth by the Behavioral Risk Factor Surveillance System and American College of Sports Medicine. An additional questionnaire was utilized to assess usual household physical activity. More detailed explanations of each measure of physical activity can be found in the following sections.

3.4.3.1 Past-year leisure time physical activity (hours/week) Leisure time physical activity was assessed using the MAQ as part of the physical activity interview (APPENDIX F). In order to determine regular participation in past-year leisure time physical activity, participants were asked to identify all of the leisure time activities in which they had participated ten or more times over the past year. The participants were shown a comprehensive list of 34 different physical activities from which to choose. Participants also had the opportunity to add other physical

activities that did not appear on the list provided but in which they had participated on a regular basis (i.e., 10 or more times) over the past year. On the response sheet, the interviewer checked off all of the physical activities from the list and/or wrote in all of the added activities reported by the participant that fit the criteria of regular. Next, the interviewer listed, on the response sheet, each activity from the list provided and any others that may have been added.

The frequency and duration for each activity listed was estimated by determining the months of the year, the number of days per week and the number of minutes per day, on average, that each activity was performed. The average number of hours per week over the past year for each reported regular leisure time physical activity was calculated using an equation whereby the numerator was the number of months multiplied by 4.3 weeks per month multiplied by the number of days per week multiplied by the number of minutes per time and the denominator was 60 minutes per hour multiplied by 52 weeks per year (Aaron et al., 1995). The hours per week for all activities were summed to determine the total time in hours per week spent in regular leisure time physical activity, on average, over the past year.

3.4.3.2 Past-year occupational physical activity (hours/week) Occupational physical activity was also assessed as part of the MAQ during the physical activity interview (APPENDIX F). During this part of the physical activity interview, participants were asked to identify all jobs held over the past year for > 1 month each. For each job title entered, the average job schedule was estimated from the reported number of months per year, days per week, and hours per day worked as well as time spent sitting in a typical work day over the past year.

Occupational physical activity was further divided into categories “A” light, “B” moderate, or “C” heavy/hard. Category A (light) primarily involved job activities such as standing still without heavy lifting and short distance walks usually indoors. Category B

(moderate) included job activities that required an effort similar to that of continuous walking, usually outdoors and some heavier lifting and had an average estimated metabolic equivalent of 4 METs. Category C (heavy or hard) involved job activities with energy requirements similar to that of running, heavy lifting, or digging and had an average estimated metabolic equivalent of 7 METs. To determine in which category of physical activity the participant belonged, they were asked to choose one of the three categories (A, B or C) that best described their usual level of physical activity during the hours at work in which they were not sitting. This was done for each job held longer than 1 month over the past year. If unemployed, retired, disabled, student or a homemaker, a different part of the form was filled out whereby the job schedule was considered to be 5 days per week, for 8 hours per day. These participants were also asked how many hours out of an 8-hour day they usually spend sitting and which category (A, B or C) best described what they were doing when they are not sitting. In this way, all 12 months of the past year were accounted for in the occupational physical activity calculation (Kriska, 1997; Kriska et al., 1990).

Occupational physical activity above the level of light (i.e., moderate and hard) was calculated separately for each job held over the past year. The formula used to calculate them was similar to the formula used for calculating leisure time physical activity. The number of months per year, multiplied by 4.3 weeks per month, multiplied by the number of days per week, multiplied by hours per day, divided by 60 minutes per day, then multiplied by 52 weeks per year for each job at each physical activity level (moderate or hard). Moderate and hard occupational physical activity were then combined to provide an overall estimate of the average hours per week spent in occupational physical activity at a level above light during the past year.

3.4.3.3 Past-year total (leisure time plus occupational) physical activity (hours/week) Past-year total physical activity was a composite of past-year leisure time and past-year occupational physical activity. Total physical activity was the sum, in hours per week, of reported leisure time, moderate and hard occupational physical activity, on average, over the past year.

3.4.3.4 Past-year vigorous physical activity (hours/week) Vigorous physical activity performed on average over the past year was calculated from the total amount of time that the participant reported spending in the higher intensity leisure time physical activities listed in the MAQ (APPENDIX F). The intensity of each leisure time activity listed in the MAQ was determined using the general range of estimated intensities provided by the Compendium of Physical Activities (Ainsworth et al., 1999). A metabolic equivalent (MET) is equal to resting metabolic rate or 3.5 milliliters of oxygen per kilogram of body weight per minute (USDHHS, 1996). Any physical activity having a MET value of greater than 6 (i.e. more than 6 times that of the resting metabolic level) is considered to be vigorous according to Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM). Physical activities included were aerobics, basketball, mountain bicycling, stationary bicycling, street bicycling, kick boxing, racquetball or squash, rock climbing, running, ice skating, roller skating or blading, cross country skiing, lap swimming and tennis. To determine the total hours per week spent in vigorous physical activity, on average, over the past year, the hours per week spent in each reported regular past-year leisure time physical activity with a metabolic equivalent of > 6 METs were summed.

3.4.3.5 Usual household physical activity (hours/week) Household physical activity was assessed by as part of the physical activity interview (APPENDIX F). The verbally administered

questionnaire included 15 different types of physical activities involving housework and chores: shopping, laundry, light housework, heavy housework, food preparation, food service, dishwashing, light home repair, heavy home repair, child care, caretaking of older or disabled persons, pet care, light yard work or gardening, lawn mowing and heavy yard work. Participants were asked to estimate the total amount of time that they usually spent performing each type of household activity during a typical week. The reported time spent in hours per week engaging in all 15 types of household physical activities was summed to obtain an estimate of the total time spent in usual household physical activity.

3.5 DATA ANALYSIS

The data obtained for all variables was summarized and described. Sociodemographic, behavioral and lifestyle characteristics as well as physical activity and predictors of physical activity were compared between lesbians and heterosexual women using independent t-tests for normally distributed data, median tests for skewed data and Chi-square tests for categorical data. Body mass index, alcohol consumption and physical activity were examined using nonparametric statistics since the data was positively skewed. Analyses included median and Chi-Square tests to determine whether statistically significant differences existed between the groups. Multivariate stepwise logistic regression was used to determine predictors of leisure time physical activity for the lesbians and for the heterosexuals. All analyses were performed using the SPSS 15.0 for Windows Statistical Package (2006) (SPSS, Inc., Chicago, IL).

3.5.1 Primary aim

The primary aim of this investigation was to determine whether differences in physical activity exist between lesbians and heterosexual women. Results from the MAQ for reported past-year leisure time, occupational, total (leisure plus occupational), and vigorous physical activity (hours/week) as well as results from a separate questionnaire for usual household physical activity (hours/week) were compared between the two groups using nonparametric statistics. Nonparametric statistics were utilized since physical activity data was highly, positively skewed such that large numbers of people reported very low levels of physical activity and a very few people reported extremely high levels of physical activity.

3.5.2 Secondary aim

The secondary aim of this investigation was to construct separate models that best predict level of past-year leisure time physical activity for lesbians and for heterosexual women. The dependent variable was level of past-year leisure time physical activity determined by taking the entire distribution of leisure time physical activity (hours/week) obtained from the lesbians and the heterosexual women and dividing it into tertiles (lowest, middle and highest). Separate stepwise logistic regression models were constructed for lesbians and for heterosexual women. Ten independent variables were considered in the analysis and included age, race, total household income, current employment status, educational attainment, marital or partner status, children < 18 years of age currently living in the household, body mass index (BMI), current cigarette smoking, and alcohol consumption. The final models for lesbians and heterosexual women were summarized and described.

4.0 RESULTS

4.1 INTRODUCTION

The purpose of this study was to examine potential differences in reported physical activity between lesbians and heterosexual women. This chapter addresses the results of analyses for 1) sociodemographic characteristics, 2) behavioral and lifestyle characteristics, and 3) physical activity.

4.2 SOCIODEMOGRAPHIC CHARACTERISTICS

The study sample was comprised of 737 women who self-identified as lesbian (n = 405) or heterosexual (n = 332). Sociodemographic characteristics included age, race, educational attainment, total household income, current employment status, current marital or partner relationship status and children under the age of 18 years currently living in the household. The sociodemographics of the two groups were compared using Chi-Square tests for categorical, t-tests for continuous, normally distributed and median tests for skewed, continuous data (Table 10).

Table 10: Sociodemographic Characteristics of Sample

Characteristic	Total (N = 737)	Lesbian (n = 405)	Heterosexual (n = 332)	Test statistic (t or χ^2)	p-value
Age: ($M \pm$ SD)	45.2 ± 5.5	45.2 ± 5.3	45.1 ± 5.7	t = 0 .14	.887
Age Group:					
% 35- 39 yrs.	17	17	18	$\chi^2 = 0.58$	.901
% 40- 44 yrs.	28	28	28		
% 45- 49 yrs.	30	30	30		
% ≥ 50 yrs.	25	25	24		
Race:					
% Black	11	11	11	$\chi^2 = 0.00$	.993
% White	89	89	89		
Education: ≥ Bachelors Degree					
% Yes	64	67	61	$\chi^2 = 3.43$	.064
% No	36	33	39		
Income: ≥ $40, 000					
% Yes	70	71	69	$\chi^2 = 0.29$	.588
% No	30	29	31		
Total (n)	(725)	(402)	(323)		
Working full or part-time:					
% Yes	83	83	83	$\chi^2 = 0.00$	.950
% No	17	17	17		
Total (n)	(736)	(405)	(331)		
Current relationship status:					
% Yes	73	75	70	$\chi^2 = 2.27$	.132
% No	27	25	30		
Total (n)	(736)	(405)	(331)		
Children < 18 yrs. living in household:					
% Yes	30	15	49	$\chi^2 = 99.04$	< **.001**
% No	70	85	51		
Total (n)	(713)	(392)	(321)		

Note. Row with Total (n) indicates missing values.

All women in the sample were 35-55 years of age. The mean age for the entire sample was 45.2 ± 5.5 years. The mean age of the lesbian group was 45.2 ± 5.3 years which did not differ significantly from the mean age of the heterosexual group ($\overline{X}$ = 45.1 ± 5.7 yrs) (t = .14, p = .887). For race, the overall sample was 11% Black (n = 80) and 89% White (n = 657) and there was no difference in race between the lesbian and heterosexual groups (χ^2 = .00, p = .993). The educational level of the groups was not significantly different with 67% of lesbians and 61% of heterosexual women reported attaining a bachelor's degree or higher (χ^2 = 3.43, p = .064). Total household income reported by lesbians and heterosexual women was not different with 71% of lesbians and 69% of heterosexual women reported a total household income of greater than or equal to $40,000 per year (χ^2 = .29, p = .588). Also, lesbians and heterosexual women did not differ in current employment status with 83% of women from both groups reporting being currently employed either part or full time (χ^2 = 0.00, p = .950). Additionally, no significant difference was found between lesbians and heterosexuals for current relationship status with a high percentage from both groups (75% and 70% respectively) reporting that they were currently in a committed relationship (χ^2 = 2.27, p = .132). The only significant difference found between the two groups for the sociodemographic characteristics examined was the percentage who reported having children under the age of 18 years currently living within the household. Forty nine percent of the heterosexuals compared to just 15% of the lesbians reported children under the age of 18 years currently living in their household (χ^2 = 99.04, p < .001).

4.3 BEHAVIORAL AND LIFESTYLE CHARACTERISTICS

Behavioral and lifestyle characteristics included body mass index, cigarette smoking and alcohol consumption and were compared between lesbians and heterosexual women using median tests for continuous and Chi-Square tests for categorical variables (Table 11).

Table 11: Behavioral and Lifestyle Characteristics of Sample

Characteristic	Overall (N = 737)	Lesbian (n = 405)	Heterosexual (n = 332)	Statistic (χ^2)	p-value
Body Mass Index:					
Mean	28.83	29.49	28.02		
SD	7.40	7.62	7.05		
Median	27.00	28.00	26.00	8.39	**.004**
Minimum	17.80	18.10	17.80		
Maximum	61.00	61.00	55.30		
Total (n)	(736)	(405)	(331)		
Current Cigarette Smoking:					
% Yes	14	16	11		
% No	86	84	89	4.43	**.035**
Total (n)	(729)	(403)	(326)		
Alcohol Use (average oz of ethanol/day):					
Mean	1.84	2.11	1.49		
SD	3.89	4.44	3.03		
Median	0.40	0.40	0.38	0.71	.401
Minimum	0.00	0.00	0.00		
Maximum	43.33	43.44	30.33		
Total (n)	(718)	(398)	(320)		
Non-abstainers Alcohol Use (average oz of ethanol/day):					
Mean	2.35	2.84	1.81		
SD	4.26	4.95	3.25		
Median	0.80	1.30	0.60	8.50	**.004**
Minimum	0.03	0.03	0.03		
Maximum	43.33	43.44	30.33		
Total (n)	(561)	(296)	(265)		

Note. Row Total *n* indicates missing values.

Lesbians had a significantly higher median body mass index (BMI) (28.0 kg/m^2) than heterosexual women (26.0 kg/m$^{2)}$ ($\chi^2 = 8.39$, $p = .004$). BMI was collapsed into the following categories: normal (< 25.0 kg/m^2), overweight (25.0-29.9 kg/m^2) and obese (≥ 30.0 kg/m^2) based upon the Clinical Guidelines of the National Heart, Lung and Blood Institute (1998). A significant difference was found for BMI category based upon sexual orientation ($\chi^2 = 8.93$, $p = .012$) (Figure 1). A lower percentage of lesbians (34%) had a BMI in the normal range compared to heterosexual women (41%). Fewer lesbians (25%) than heterosexuals (29%) were classified as overweight. However, 41% of lesbians compared to just 30% of heterosexuals were classified as obese.

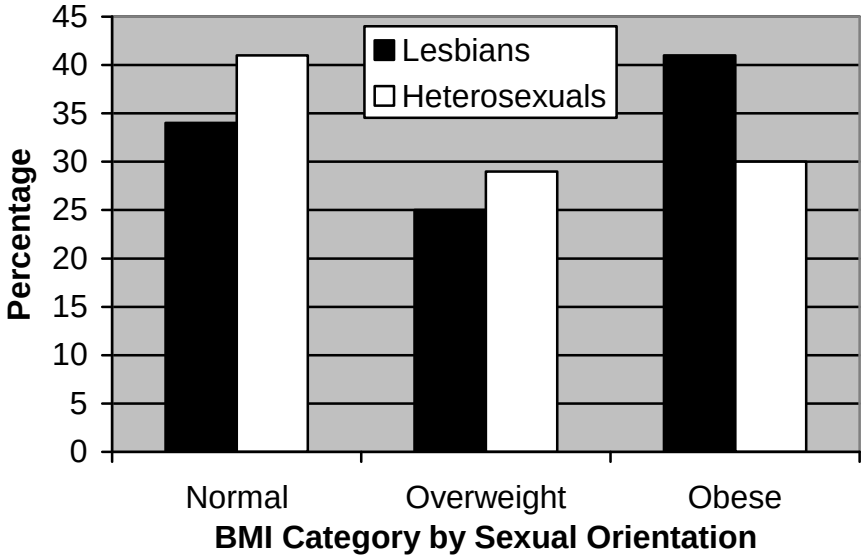


Figure 1: Category of Body Mass Index by Sexual Orientation

Current cigarette smoking status was also different between lesbians and heterosexual women (Table 11). A significantly higher percentage of lesbians (16%) compared to heterosexual women (11%) reported current cigarette smoking ($\chi^2 = 4.43$, $p = .035$).

Alcohol use (average oz of ethanol/day) was not significantly different between lesbians and heterosexual women when the entire sample (n = 718) was considered (Table 11). For example, lesbians reported a median of .40 compared to .38 ounces of ethanol per day reported by heterosexual women (χ^2 = .71, p = .401). Average amount of alcohol (oz of ethanol/day) was collapsed into 4 categories or levels: abstainer (0 oz. of ethanol/day), light (> 0 < 0.22 oz. of ethanol/day), moderate (0.22 - 0.99 oz ethanol/day), and heavy (≥1.0 oz ethanol/day). A significant difference was found for level of alcohol use between the two groups of women (χ^2 = 16.05, p = .001) (Figure 2). A higher percentage of lesbians (26%) reported abstaining from alcohol compared with heterosexual women (17%). A lower percentages of lesbians reported light (20%) and moderate (16%) drinking compared with heterosexual women who reported 28% and 21% in the light and moderate range respectively. A higher percentage of lesbians (39%) reported heavy drinking compared with 33% of heterosexual women.

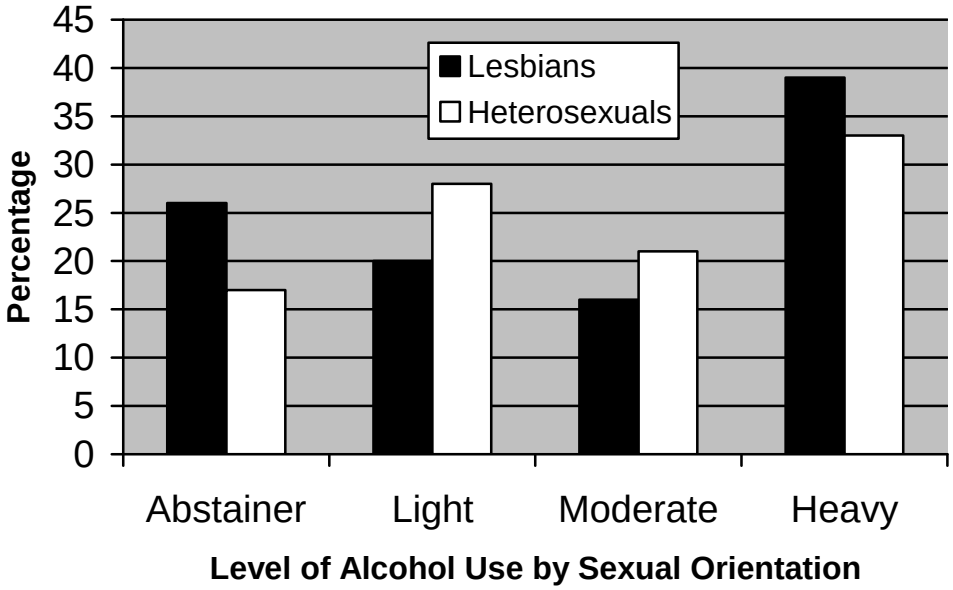


Figure 2: Level of Alcohol Use by Sexual Orientation

When only the non-abstainers (n = 561) were examined, lesbians reported a significantly higher average median amount of alcohol use (1.30 oz of ethanol per day) compared with heterosexuals (.60 oz of ethanol/day) (χ^2 = 8.50, p = .004) (Table 11). Non-abstainers were also examined by level of alcohol use (Figure 3).

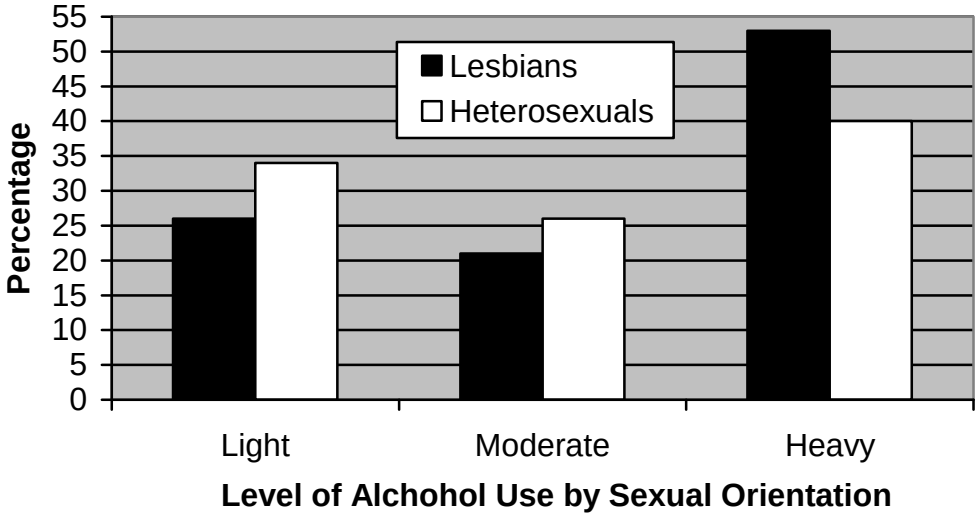


Figure 3: Level of Alcohol Use among Non-Abstainers by Sexual Orientation

Level of alcohol use was significantly different between lesbians and heterosexual women (χ^2 = 8.58, p = .014). A higher percentage of heterosexual women reported light (34%) and moderate (26%) alcohol use compared with lesbians at 26% and 21% respectively. Additionally, 53% of lesbians compared with 40% of heterosexual women reported heavy drinking.

4.4 PHYSICAL ACTIVITY

To determine whether differences in physical activity existed based upon sexual orientation, past-year leisure time, occupational, total (leisure and occupational), vigorous, and usual

household physical activity was compared between lesbians and heterosexual women. Since the physical activity data was found to be positively skewed such that many women reported little or no physical activity while a few reported very high levels, the median (hours/week) for each measure of physical activity was compared by sexual orientation using a median test.

4.4.1 Past-year leisure time physical activity

Regular reported past-year leisure time physical activity was compared between lesbians and heterosexual women. Regular leisure time physical activity was defined as those physical activities from the Modifiable Activity Questionnaire (MAQ) in which participants reported engaging 10 or more times during the past year. The majority of women (92%) in the overall sample reported some regular past-year leisure time physical activity.

4.4.1.1 Types of leisure time activities The percentages of women reporting regular participation in each of 34 different types of leisure time physical activities were examined by sexual orientation using Chi-square tests (Table 12). The three most commonly reported leisure time physical activities were walking (76%), cardio machines (40%) and weight training (39%).

Significant differences in the percentages of lesbians and heterosexual women reporting regular participation were found for 12 of the 34 leisure time physical activities. A significantly higher percentage of lesbians reported regular participation in mountain biking, street biking, golf, hiking, racquetball/squash, softball and kayaking compared to heterosexual women. On the other hand, a significantly higher percentage of heterosexual women reported regular participation in aerobics, dance class, kickboxing, Pilates and yoga compared to lesbians.

Table 12: Percentages of Reported Leisure Time Physical Activities

Physical Activity	Overall (N = 736) %	Lesbians (n = 405) %	Heterosexuals (n = 331) %	χ^2	p-value
Walking	76	74	78	1.88	.170
Cardio Machines	40	43	38	2.09	.148
Weight Training	39	42	36	2.61	.106
Hiking	22	27	16	15.28	< **.001**
Street Bicycling	20	23	16	5.53	**.019**
Running	17	17	17	0.00	.095
Swimming Laps	17	18	15	1.30	.254
Yoga	17	13	20	6.33	**.012**
Aerobics	17	10	25	26.97	< **.001**
Stationary Bicycling	14	15	13	0.38	.538
Bowling	8	9	7	0.48	.489
Golf	8	11	4	12.88	< **.001**
Pilates	8	4	12	18.50	< **.001**
Basketball	6	5	7	0.99	.320
Mountain Bicycling	6	8	4	5.92	**.015**
Softball	5	7	2	10.02	**.002**
Tennis	5	5	3	1.89	.169

Table 12 (Cont): Percentages of Reported Leisure Time Physical Activities

Physical Activity	Overall (*N*= 737) %	Lesbians (*n* = 405) %	Heterosexuals (*n* = 332) %	χ^2	*p*-value
Dance Class	4	3	6	5.77	**.016**
Kayaking	4	6	1	10.30	**.001**
Roller Skating/Blading	4	3	5	2.92	.088
Water Aerobics	4	3	4	0.86	.354
Kickboxing	3	2	6	9.04	**.003**
Horseback Riding	2	2	1	1.08	.299
Racquetball/Squash	2	4	1	3.86	**.049**
Rowing	2	2	2	0.43	.511
Cross Country Skiing	2	2	1	1.97	.161
Downhill Skiing	2	2	2	0.03	.872
Tai-Chi	2	2	3	0.45	.504
Volleyball	2	2	2	0.15	.703
Canoeing	1	1	1	0.00	.974
Ice Skating	1	1	2	2.57	.123
Water Skiing	1	1	1	0.05	1.000
Soccer	1	1	1	0.46	.662
Rock Climbing	0	1	0	2.46	.257

The 22 leisure time physical activities for which the percentage of reported participation was not significantly different by sexual orientation included basketball, stationary biking, bowling, canoeing, cardio machines, horseback riding, rock climbing, rowing, running, ice skating, roller

skating/blading, cross country skiing, downhill skiing, water skiing, soccer, swimming laps, tai chi, tennis, volleyball, walking, water exercise and weight training.

4.4.1.2 Amount of leisure time physical activity A median test was used to determine whether reported past-year leisure time physical activity (hrs/wk) was different between lesbians and heterosexual women (Table 13).

Table 13: Past-Year Leisure Time Physical Activity (hrs/wk)

	Overall (N = 737)	Lesbians (n = 405)	Heterosexuals (n = 332)	χ^2	p-value
Mean	4.46	4.63	4.25		
SD	4.52	4.54	4.49		
Median	3.31	3.43	3.06	0.63	.426
Minimum	0.00	0.00	0.00		
Maximum	38.45	37.58	38.45		

Lesbians reported a median of 3.43 hrs/wk of past-year leisure time physical activity which was not significantly different from the 3.06 hrs/wk reported by heterosexual women ($\chi^2 = .63$, $p = .426$).

4.4.2 Past-year occupational physical activity

The reported hours per week of past-year occupational physical activity was compared between lesbians and heterosexual women. Occupational physical activity was subdivided into the total

number of hours per week spent in one of three categories: light, moderate and heavy or hard for each job held over the past 12 months. Light occupational physical activity was defined as those job activities which consisted mostly of standing still without heavy lifting and involved some short distance walking that took place primarily indoors. Moderate occupational physical activity was defined as performing job activities requiring an effort similar to that of continuous outdoor walking and/or some heavy lifting (i.e., MET level ≈ 4). Examples of occupations reported as involving moderate physical activity included such jobs as massage therapist, food demonstrator, physical educator, archeologist, electrician, food server, chiropractor, athletic trainer and nurse. Hard occupational physical activity was defined as job activities requiring energy expenditures similar to that of running, heavy lifting and/or digging (i.e., MET level ≈ 7). Some examples of occupations reported as involving hard physical activity included such jobs as gardener, contractor, caterer, personal aide, organic farmer, merchandise replenisher, courier, paramedic, basketball official and soccer referee. The types of occupational physical activity of interest in this study were those classified as above the level of light (i.e., moderate and hard). Therefore, total past-year occupational physical activity was calculated by summing only those hours per week of moderate and hard or heavy occupational physical activity for every job held during the past 12 months.

Past-year occupational physical activity (hrs/wk) by sexual orientation is displayed in Table 14. The median hours per week of total occupational physical activity reported by lesbians and heterosexual women was zero and not significantly different ($\chi^2 = .48$, $p = .488$).

Table 14: Total Past-Year Occupational Physical Activity (hrs/wk)

	Overall (N = 737)	Lesbians (n = 405)	Heterosexuals (n = 332)	χ^2	p-value
Mean	5.36	6.02	4.55		
SD	11.23	11.88	10.35		
Median	0.00	0.00	0.00	0.48	.488
Minimum	0.00	0.00	0.00		
Maximum	54.58	49.62	54.58		

Since majority of women in the study (n = 556) reported no occupational physical activity classified above the level of light, the analysis was repeated with only those women who reported doing any moderate and/or hard occupational physical activity (n = 181). The results are displayed in Table 15. Among those women who reported any moderate and/or hard occupational physical activity, the overall median was 20.7 hrs/wk. While lesbians reported a median 24.0 hrs/wk and heterosexuals reported 18.2 hrs/wk, no statistically significant difference was found between the groups among women reporting > 0 hrs/wk of total past-year occupational physical activity ($\chi^2 = 1.30$, $p = .255$).

Table 15: Total Past-Year Occupational Physical Activity > 0 hrs/wk

	Overall (n = 181)	Lesbians (n = 104)	Heterosexuals (n = 77)	χ^2	p-value
Mean	21.81	23.43	19.62		
SD	12.45	11.90	12.91		
Median	20.67	24.00	18.19	1.30	.255
Minimum	0.50	0.50	0.62		
Maximum	54.58	49.62	54.58		

Potential differences in the percentages of women reporting any occupational physical activity above the level of light was examined by sexual orientation. There was no difference between the lesbian and the heterosexual groups in the percentage of women who reported any occupational any moderate and/or occupational physical activity (χ^2 = 0.61, p = .435) (Table 16).

Table 16: Percentages Reporting Any Moderate and/or Hard Occupational Physical Activity

	Overall (N = 737)	Lesbian (n = 405)	Heterosexual (n = 332)	χ^2	p-value
% Yes	25	26	23	0.61	.435
% No	75	74	77		

4.4.2.1 Past-year moderate occupational physical activity Moderate occupational physical activity (hrs/wk) was compared between lesbians and heterosexual women using a median test

(Table 17). For the overall sample, the median reported hours per week of moderate occupational physical activity was zero and not significantly different between the groups (χ^2 =.29, p = .588).

Table 17: Past-Year Moderate Occupational Physical Activity (hrs/wk)

	Overall (N = 737)	Lesbians (n = 405)	Heterosexuals (n = 332)	χ^2	p-value
Mean	4.79	5.31	4.15		
SD	10.81	11.36	10.07		
Median	0.00	0.00	0.00	0.29	.588
Minimum	0.00	0.00	0.00		
Maximum	54.58	49.62	54.58		

Since most women in the overall sample reported no moderate occupational physical activity, the data was re-examined with only those women who reported any hours per week of moderate physical activity (n = 161). Still, no statistically significant difference was found based upon sexual orientation among women reporting > 0 hrs/wk of moderate occupational physical activity (χ^2 = .79, p = .375) (Table 18).

Table 18: Past-Year Moderate Occupational Physical Activity > 0 hrs/wk

	Overall (n = 161)	Lesbians (n = 92)	Heterosexuals (n = 69)	χ^2	p-value
Mean	21.92	23.39	19.96		
SD	12.62	12.07	13.17		
Median	21.58	24.50	19.10	0.79	.375
Minimum	0.50	0.50	0.62		
Maximum	54.58	49.62	54.58		

4.4.2.2 Past-year hard occupational physical activity Hard occupational physical activity (hrs/wk) was compared between lesbians and heterosexual women using a median test (Table 19). Median hard occupational physical activity (hrs/wk) reported by women in the overall sample was zero and not significantly different (χ^2 = .38, p = .539).

Table 19: Past-Year Hard Occupational Physical Activity (hrs/wk)

	Overall (N = 737)	Lesbians (n = 405)	Heterosexuals (n = 332)	χ^2	p-value
Mean	0.57	0.71	0.40		
SD	3.81	4.36	3.00		
Median	0.00	0.00	0.00	0.38	.539
Minimum	0.00	0.00	0.00		
Maximum	45.89	45.89	34.73		

Since very few women reported any hours per week of hard occupational physical activity (n = 22), the data was examined again using only those women reporting any hard occupational physical activity (hrs/wk) (Table 20). Although lesbians reported 16.4 hrs/wk and heterosexuals reported 14.2 hrs/wk, the difference in median hours per week between the two groups was not statistically significant ($\chi^2 = .00$, $p = 1.00$).

Table 20: Past-Year Hard Occupational Physical Activity > 0 hrs/wk

	Overall (n = 22)	Lesbians (n = 14)	Heterosexuals (n = 8)	χ^2	p-value
Mean	19.01	20.36	16.64		
SD	11.90	12.69	10.75		
Median	16.02	16.44	14.22	0.00	1.000
Minimum	3.97	4.65	3.97		
Maximum	45.89	45.89	34.73		

Of note is that two women (lesbians) from the entire sample reported hours per week in both moderate and hard occupational activity for separate jobs they held over the past 12 months. This accounts for the discrepancy found when comparing the number of women reporting hard occupational activity (n = 22) (Table 20) and moderate occupational physical activity (n = 161) (Table 18) to the total number of women reporting any occupational physical activity above light (n = 181) displayed in Table 15.

4.4.3 Past-year total physical activity

Past-year total (leisure time plus occupational) physical activity was compared between lesbians and heterosexual women. The hours per week of reported past-year leisure time and reported past-year occupational (moderate and hard) physical activity were combined to form a composite of past-year total physical activity (hrs/wk). Only 43 women (6%) reported no hours per week of past-year total physical activity which meant that they did no regular leisure time nor moderate or hard occupational physical activity over the past 12 months. A median of 5.3 hrs/wk of total physical activity was reported by lesbians compared to 4.2 hrs/wk reported by heterosexual women which was not significantly different ($\chi^2 = 2.79$, $p = .095$) (Table 21).

Table 21: Past-Year Total (Leisure Time and Occupational) Physical Activity (hrs/wk)

	Overall ($N = 737$)	Lesbians ($n = 405$)	Heterosexuals ($n = 332$)	χ^2	p-value
Mean	9.82	10.65	8.80		
SD	12.46	12.81	11.97		
Median	4.71	5.33	4.22	2.79	.095
Minimum	0.00	0.00	0.00		
Maximum	73.18	59.44	73.18		

4.4.4 Past-year vigorous physical activity

Past-year vigorous physical activity (hrs/wk) was compared between lesbians and heterosexual women. Vigorous physical activity was defined as those leisure time physical activities from the

Modifiable Activity Questionnaire (MAQ) that had a MET value > 6 according to the most recent Ainsworth Compendium of Physical Activities (2000). Activities from the MAQ with a metabolic equivalent > 6 METs included aerobics, basketball, mountain bicycling, stationary bicycling, street bicycling, kick boxing, racquetball/squash, rock climbing, running, ice skating, roller skating/blading, cross country skiing, lap swimming, and tennis. Time spent in vigorous physical activity was calculated by summing the hours per week of all reported regular past-year leisure time physical activities with a MET value > 6. Regular meant that women reported participating in that particular physical activity 10 or more times over the past year. The amount of time (hrs/wk) that lesbians and heterosexual women reported spending in physical activity considered to be vigorous (i.e., > 6 METs) was compared using a median test (Table 22).

Table 22: Past-Year Vigorous Physical Activity (hrs/wk)

	Overall (N = 737)	Lesbians (n = 405)	Heterosexuals (n = 332)	χ^2	p-value
Mean	1.06	1.07	1.05		
SD	1.91	1.93	1.89		
Median	0.33	0.37	0.29	0.34	.561
Minimum	0.00	0.00	0.00		
Maximum	22.58	22.58	16.46		

The median amount of time spent in vigorous physical activity > 6 METs was not significantly different between lesbians (0.37 hrs/wk) and heterosexual women (0.29 hrs/wk) ($\chi^2 = .34$, $p = 0.561$). Since many women (n = 296) in the overall sample reported no hours per week of regular

vigorous the median test was repeated including only those women who reported any hours of vigorous physical activity (n = 440) (Table 23). Again, no difference in medians were found for women reporting > 0 hrs/wk of vigorous physical activity (χ^2 = .01, p = .924).

Table 23: Past-Year Vigorous Physical Activity > 0 hrs/wk

	Overall (n = 440)	Lesbians (n = 244)	Heterosexuals (n = 196)	χ^2	p-value
Mean	1.77	1.77	1.78		
SD	2.20	2.22	2.18		
Median	1.06	1.05	1.06	0.01	.924
Minimum	0.04	0.07	0.04		
Maximum	22.58	22.58	16.46		

The percentages of women reporting participation in any vigorous physical activities 10 or more times over the past year are displayed in Table 24.

Table 24: Percentages Reporting Any Past-year Vigorous Physical Activity

	Overall (N = 737)	Lesbian (n = 405)	Heterosexual (n = 332)	χ^2	p-value
% Yes	60	60	59	0.11	.793
% No	40	40	41		

There was no difference based upon sexual orientation with 60% of the women from both groups reported participating in regular vigorous physical activity (i.e., leisure time physical activities > 6 METs, 10 or more times in the past year) ($\chi^2 = 0\ .11$, $p = .793$).

4.4.5 Usual household physical activity

Usual household physical activity performed in a typical week was compared between lesbians and heterosexual women to determine whether a difference existed. Usual household physical activity was assessed using a questionnaire which was a composite of 15 different types of household-related chores.

4.4.5.1 Types of household physical activities Percentages of women reporting any participation (hrs/wk) in each of 15 different types of household physical activity are displayed in Table 25. The most common household physical activities were light housework, shopping, laundry, food preparation and dishwashing with each reported by over 90% of the women in the sample.

Differences in reported percentages based upon sexual orientation were found for 9 types of household physical activities. For instance, a significantly higher percentage of heterosexual women reported shopping, laundry, light housework, and childcare, whereas a significantly higher percentage of lesbians reported both light and heavy home maintenance and repair, pet care, lawn mowing and heavy yard work. There were no differences in the percentages of lesbians and heterosexuals reporting food preparation, dishwashing, heavy housework, light yard work, food service, or elderly care.

Table 25: Percentages of Reported Household Physical Activities

Physical Activity	Overall (N = 736) %	Lesbians (n = 405) %	Heterosexuals (n = 331) %	χ^2	p-value
Light Housework	98	97	99	5.28	**.022**
Shopping	96	94	98	6.04	**.014**
Laundry	94	91	98	14.40	< **.001**
Food Preparation	92	91	93	1.04	.308
Dishwashing	92	90	93	1.35	.246
Heavy Housework	86	84	89	3.22	.073
Light Yard Work	67	68	66	0.51	.475
Food Service	66	64	68	1.42	.234
Heavy Yard Work	62	69	53	20.76	< **.001**
Pet Care	55	62	46	20.63	< **.001**
Light Home Repair	53	60	44	18.22	< **.001**
Heavy Home Repair	45	50	38	10.94	**.001**
Lawn Mowing	37	48	24	44.27	< **.001**
Childcare	22	16	29	19.23	< **.001**
Elderly Care	9	8	11	0.74	.389

4.4.5.2 Amount of household physical activity To determine the amount of time spent in usual household physical activity in a typical week, the hours per week of the 15 types of household physical activity were totaled. Median hours per week of usual household physical activity were compared between lesbians and heterosexuals using a median test (Table 26).

Table 26: Usual Household Physical Activity (hrs/wk)

	Overall (N = 736)	Lesbians (n = 405)	Heterosexuals (n = 331)	χ^2	p-value
Mean	22.42	20.40	24.88		
SD	17.51	16.37	18.53		
Median	17.75	15.67	20.83	14.73	< **.001**
Minimum	0.08	0.08	1.50		
Maximum	125.50	120.73	125.50		

Since the maximum time spent in usual household physical activity was reported to be over 120 hour per week for lesbians and over 125 for heterosexual women, household physical activity may be over estimated by women in both groups. In fact, 87 women reported spending > 40 hrs/wk and 29 reported spending > 60 hrs/wk in household physical activity. The median reported hrs/wk of usual household physical activity was significantly higher among heterosexual women (20.8 hrs/wk) than among lesbians (15.7 hrs/wk) ($\chi^2 = 14.73$, $p < .001$).

A higher percentage of heterosexuals (49%) reported having children under the age of 18 years living in the household compared to lesbians (15%). To determine whether having children living in the household may have accounted for the higher amount of usual household physical

activity among heterosexuals, the median (hr/wk) of household physical activity was compared between all women who reported having children under the age of 18 years living in the household with all of those who reported that they did not. Usual household physical activity was significantly higher among those women who reported having children < 18 yrs of age living in the household (24.0 hrs/wk) compared to those who reported not (15.7 hrs/wk) ($\chi^2 = 33.79$, $p < .001$).

Usual household physical activity among women reporting having children under the age of 18 yrs living in the household was also examine by sexual orientation. No significant differences in usual household physical activity was found between lesbians (19.9 hrs/wk) and heterosexuals (23.5 hrs/wk) who reported having children living < 18 yrs of age living in the household ($\chi^2 = 1.06$, $p = .304$). Therefore, the significant difference found between lesbians and heterosexuals for amount of usual household physical activity (hrs/wk) may have been a result of the higher percentage of heterosexuals reporting having children under the age of 18 yrs living in the household.

4.4.6 Sociodemographic factors and leisure time physical activity

The relationship between each sociodemographic factor and past-year leisure time physical activity (median hrs/wk) was examined among women in the overall sample and by sexual orientation using median tests (Table 27). The sociodemographic factors found to be significantly associated with leisure time activity (median hrs/wk) in the overall sample were race, education, and total household income.

Table 27: Median Past-Year Leisure Time Physical Activity (hrs/wk) by Sociodemographic and Sexual Orientation

Variable	Overall (N = 737)	χ^2	p-value	Lesbians (n = 405)	χ^2	p-value	Hetero-sexuals (n = 332)	χ^2	p-value
Age:									
35-39	2.58	1.33	.723	3.60	2.21	.530	2.40	4.17	.243
40-44	3.39			3.35			3.40		
45-49	3.47			3.81			2.95		
≥ 50	3.23			3.10			3.47		
Race:									
White	3.47	4.78	**.029**	3.69	3.03	.082	3.31	3.62	.057
Black	1.80			2.23			1.18		
Education ≥ Bachelors Degree:									
Yes	3.70	12.11	**.001**	3.85	9.24	**.002**	3.45	1.89	.170
No	2.53			2.48			2.85		
Income ≥ $40,000:									
Yes	3.62	6.12	**.013**	3.72	3.09	.079	3.39	2.33	.127
No	2.91			2.67			2.91		
Total (*n*)	(725)			(402)			(323)		
Employment Status:									
Yes	3.31	0.02	.895	3.56	0.01	.912	3.04	0.10	.749
No	3.25			3.18			3.25		
Total (*n)*	(736)			(405)			(331)		
Relationship Status:									
Yes	3.24	1.36	.243	3.23	2.68	.102	3.25	0.04	.838
No	3.69			4.47			3.06		
Total (*n*)	(736)			(405)			(331)		
Children < 18 yrs. living in household:									
Yes	2.90	3.48	.062	2.95	0.99	.319	2.90	0.53	.468
No	3.47			3.68			3.39		
Total (*n*)	(713)			(392)			(321)		

Note: A row total *n* indicates that the variable has missing values.

Leisure time physical activity was significantly associated with race and ethnicity. White women had a higher median (3.47 hrs/wk) of leisure time physical activity compared to Black women (1.80 hrs/wk)($\chi^2 = 4.78$, $p = .029$). Also, leisure time physical activity was positively associated with educational attainment. For example, women with a Bachelor's degree or higher had a higher median (3.70 hrs/wk) of leisure time physical activity compared to those with less than a Bachelor's degree (2.53 hrs/wk) ($\chi^2 = 12.11$, $p = .001$). In addition, leisure time physical activity was positively associated with income. For instance, women with a total household income equaling $40, 000 or greater reported a significantly higher median (3.62 hrs/wk) of leisure time physical activity compared to those whose total household income was under $40,000 per year (2.91 median hrs/wk) ($\chi^2 = 6.12$, $p = .013$). On the other hand, age, current employment status, current relationships status and having children < 18 years of age currently living in the household were not significantly associated with reported past-year leisure time physical activity among women in the overall sample.

Among lesbians, level of educational attainment was significantly, positively associated with higher levels of leisure time physical activity. For example, lesbians with a Bachelor's degree or higher reported a significantly higher median 3.85 hrs/wk of leisure time physical activity compared to a median of 2.48 hrs/wk reported by lesbians without a Bachelor's degree ($\chi^2 = 9.24$, $p = .002$). None of the sociodemographic factors were significantly associated with reported past-year leisure time physical activity among heterosexual women.

4.4.7 Behavioral and lifestyle factors and leisure time physical activity

The relationship between each behavioral and lifestyle factor and past-year leisure time physical activity (median hrs/wk) was also examined among women in the overall sample and by sexual orientation using median tests. The factors examined included body mass index (BMI), current cigarette smoking, and level of alcohol consumption (Table 28).

Table 28: Median Past-Year Leisure Time Physical Activity (hrs/wk) by Behavioral and Lifestyle Factor and Sexual Orientation

Variable	Overall (N = 737)	χ^2	*p*-value	Lesbians (n = 405)	χ^2	*p*-value	Heterosexuals (n = 332)	χ^2	*p*-value
BMI:									
Normal	4.32	38.32	< **.001**	4.59	34.18	**.001**	4.05	11.00	**.004**
Overweight	3.60			4.31			2.98		
Obese	2.32			2.44			2.07		
Total (n)	(736)			(405)			(331)		
Current Smoker:									
Yes	2.33	2.56	.110	2.26	2.57	.109	2.77	0.51	.474
No	3.43			3.70			3.27		
Total (n)	(729)			(403)			(326)		
Alcohol Use:									
Abstainer	2.98	10.01	**.019**	3.33	9.16	**.027**	2.73	5.84	.119
Light	3.37			3.29			3.40		
Moderate	2.48			3.75			2.63		
Heavy	3.84			4.09			3.64		
Total (n)	(718)			(398)			(320)		

Note: A row total *n* indicates that the variable has missing values.

Among women in the overall sample, BMI and level of alcohol use were the factors significantly associated with leisure time physical activity (median hrs/wk) ($\chi^2 = 38.32$, $p < .001$ and $\chi^2 = 10.00$, $p = .019$ respectively). Among lesbians, BMI and level of alcohol use were also significantly associated with the median hr/wk of past-year leisure time physical activity ($\chi^2 = 34.18$, $p < .001$ and $\chi^2 = 9.16$, $p = .027$ respectively). Among heterosexual women, BMI was the only behavioral and lifestyle factor that was significantly associated with past-year leisure time physical activity (hrs/wk) ($\chi^2 = 11.00$, $p = .004$).

BMI appeared to be the behavioral and lifestyle variable most significantly associated with reported past-year leisure time physical activity among women in the overall sample, lesbians and heterosexuals. Women in the overall sample classified as having a normal BMI had a higher median (hrs/wk) of past-year leisure time physical activity (4.32) compared to those classified as obese (2.32). Among lesbians in the normal range for BMI, a median of 4.59 hrs/wk of leisure time physical activity was reported compared to 2.44 hrs/wk among those classified as obese. Heterosexuals classified as having a normal BMI reported 4.05 hrs/wk of leisure time physical activity compared to a median of 2.07 hrs/wk among those classified as obese.

Women in the overall sample and by sexual orientation who were classified as heavy drinkers reported the highest levels of past-year leisure time physical activity compared to women classified in the other 3 categories of alcohol use. Among lesbians, level of alcohol use was significantly associated with leisure time physical activity ($\chi^2 = 9.16$, $p = .027$). For instance, lesbians classified as heavy drinkers reported 4.09 hrs/wk of leisure time physical activity compared to lesbians classified as abstainers (3.33 hrs/wk), light drinkers (3.29 hrs/wk) or moderate drinkers (3.75 hrs/wk).

4.4.8 Level of past-year leisure time physical activity

Level of past-year leisure time physical activity was determined by dividing the total hours per week of past-year leisure time physical activity found for the entire sample into tertiles: lowest, middle and highest using 33% (1.97 hrs/wk) and 66.5% (4.94 hrs/wk) as the cut points. The percentage and number of women reporting leisure time physical activity in each tertile for the overall sample and by sexual orientation is displayed in Table 29.

Table 29: Tertile Percentages of Leisure Time Physical Activity by Sexual Orientation

Tertile	Overall (N = 737)	Lesbians (n = 405)	Heterosexuals (n = 332)	χ^2	p-value
% Lowest (n)	33 (243)	31 (126)	35 (117)		
% Middle (n)	33.5 (247)	33 (132)	35 (115)	3.25	.197
% Highest (n)	33.5 (247)	36 (147)	30 (100)		

Chi-Square was used to determine whether a significant difference in the percentages of reported past-year leisure time physical activity by tertile existed between lesbians and heterosexual women. No differences were found in the percentages of lesbians and heterosexual women classified into the lowest (≤ 1.97 hrs/wk), middle (1.98-4.94 hrs/wk) or highest (≥ 4.95 hrs/wk) tertile of leisure time physical activity ($\chi^2 = 3.25$ $p = .197$).

4.4.9 Predictors of past-year leisure time physical activity

Multivariate stepwise logistic regression was used to construct models of the sociodemographic, behavioral and lifestyle variables that best predicted level of past-year leisure time physical activity. Separate models were constructed for lesbians and for heterosexual women. Factors eligible to be entered into the models included age (yrs), BMI (kg/m^2) and alcohol use (oz of ethanol/day) as continuous variables and race (White = 1, Black = 0), total household income category $\geq$ 40,000 (Yes = 1 or No = 0), employment status (working full or part time) (Yes = 1 or No = 0), educational level $\geq$ bachelor's degree (Yes = 1 or No = 0), current committed relationship status (Yes = 1 or No = 0), children < 18 years of age living in the household (Yes = 1 or No = 0), and current smoking status (Yes = 1 or No = 0) as categorical variables.

The subpopulations used in the stepwise logistical regression analysis contained samples of 381 out of a possible 405 for lesbians and 297 out of a possible 332 for the heterosexual women as some women had variables with at least one missing value which were not included in the final analysis. Variables significant in predicting level of past-year leisure time physical activity by sexual orientation as well as their order of entry are displayed in Table 30.

Table 30: Variables and Entry Order of Past-Year Leisure Time Physical Activity Predictors

Variable	Lesbians	Heterosexuals
Continuous:		
Age (yrs)		
Body Mass Index (kg/m^2)	1	1
Alcohol Consumption (ounces of ethanol/day)		
Categorical:		
Race (White or Black)		
Total Household Income ≥ $ 40,000 (Yes or No)		
Currently Employed (Yes or No)		
Education ≥ Bachelor's Degree (Yes or No)	3	
Current Smoker (Yes or No)	2	
Currently in a Committed Marital or Partner Relationship (Yes or No)	4	
Children < 18 yrs. old living in Household (Yes or No)		
Model Chi-Square	47.26, $p <$ **.001**	11.51, $p =$ **.003**

Body mass index (BMI) ($\chi^2 = 23.87$, $p < .001$), current smoking status ($\chi^2 = 11.19$, $p = .004$), educational attainment ($\chi^2 = 6.14$, $p = .046$) and current marital or partner relationship status ($\chi^2 = 6.06$, $p = .048$) were significant in predicting leisure time physical activity among lesbians. BMI was the only significant predictor of leisure time physical activity among heterosexual

women ($\chi^2 = 11.51$, $p = .003$). The numbers and percentages of lesbians classified correctly into level of leisure time physical activity using the model are displayed in Table 31.

Table 31: Past-Year Leisure Time Physical Activity Tertile Classification among Lesbians

	Predicted (*n*)			
Observed (*n*)	Lowest	Middle	Highest	% Correct
Lowest	54	26	35	47
Middle	25	29	71	23
Highest	28	28	85	60

Overall, the model correctly classified 44% of the lesbians into level of leisure time physical activity. The model was best at predicting lesbians belonging in the highest tertile of leisure time physical activity since 60% of lesbians in this group were correctly classified. The model had the lowest percentage of correct classification for lesbians belonging in the middle tertile of leisure time physical activity (23%).

Among heterosexuals, the number and percentages classified into the correct level of leisure time physical activity are displayed in Table 32. Overall, 41% of the heterosexual women were correctly classified into level of leisure time physical activity. The model was best at correctly classifying heterosexual women who belonged in the middle tertile of leisure time physical activity (64%). The model had the lowest percentage of correct classification among heterosexual women belonging in the highest tertile of leisure time physical activity (7%).

Table 32: Past-Year Leisure Time Physical Activity Tertile Classification among Heterosexuals

	Predicted (*n*)			
Observed (*n*)	Lowest	Middle	Highest	% Correct
Lowest	50	46	7	49
Middle	32	66	5	64
Highest	26	59	6	7

Another way of reporting findings of multivariate logistic regression is in terms of odds ratios (OR) and 95% confidence intervals (CI) (Table 33). For both lesbians and heterosexual women, having a lower BMI (kg/m^2) increased the odds of being in the middle versus lowest and highest versus lowest tertile of leisure time physical activity (LTPA) given that the other predictors are also in the model. Since BMI was entered as a continuous variable, the odds ratios and confidence intervals were based upon a one unit (kg/m^2) increase in BMI. Thus, in order to better illustrate the affect of BMI on the odds of being in the middle or highest compared to the lowest tertile of LTPA, the OR for BMI was adjusted for a 5 unit (kg/m^2) increase in BMI. Therefore, using the adjusted BMI, the odds of a lesbian with a lower BMI being in the middle versus lowest tertile of LTPA was 4.8 times greater than the odds of a lesbian with a higher BMI being in the middle versus lowest tertile of LTPA.

Table 33: Odds Ratios (OR) and Confidence Intervals (CI) of Past-Year Leisure Time Physical Activity (LTPA) Predictors

	Middle vs. Lowest Tertile of LTPA OR (95% CI)	Highest vs. Lowest Tertile of LTPA OR (95% CI)
Lesbians:		
Body Mass Index[a]	4.80 (4.63, 4.97)	4.64 (4.47, 4.81)
Non-Smoker	2.99 (1.40, 6.37)	2.19 (1.10, 4.34)
Bachelor's Degree or higher	2.11 (1.18, 3.79)	1.72 (0.98, 3.03)
Not in Committed Marital or Partner Relationship	1.62 (0.84, 3.12)	2.16 (1.16, 4.03)
Heterosexuals:		
Body Mass Index[a]	4.76 (4.58, 4.96)	4.67 (4.47, 4.88)

Note. [a]OR is adjusted for a five unit increase in kg/m^2.

Additionally, the odds of a lesbian with a lower BMI being in the highest versus lowest LTPA tertile was 4.6 times the odds of a lesbian with a higher BMI being in the the highest versus the lowest tertile LTPA. Similar odds ratios for adjusted BMI were found among heterosexual women. For example, the odds of a heterosexual woman with a lower BMI being in the middle versus the lowest and the highest versus the lowest LTPA tertile was 4.76 and 4.67 times greater than the odds of a heterosexual woman with a higher BMI being in those respective tertiles.

Cigarette smoking was the second most important predictor of past-year leisure time physical activity level among lesbians. The odds of a lesbian non-smoker being in the middle versus the lowest LTPA tertile was almost 3 times greater than that of a lesbian smoker. The odds of a lesbian non-smoker being in the highest versus the lowest tertile of LTPA was 2.19 times greater than that of a lesbian smoker.

Educational level was the third most important variable that predicted leisure time physical activity among lesbians. Compared with lesbians without a bachelor's degree, lesbians with a bachelor's degree or higher were about twice as likely to be in the middle versus lowest and the highest versus lowest tertile of LTPA.

The fourth and final predictor of leisure time physical activity among lesbians was current committed marital or partner relationship status. The odds of a lesbian not currently in a committed relationship of being the middle versus lowest LTPA tertile was 1.62 times that of the odds of a lesbian in a current committed relationship being in the middle versus lowest LTPA tertile. The odds of a lesbian not in a current committed marital or partner relationship being in the highest versus lowest LTPA tertile was twice as high as the odds of a lesbian in a current committed relationship being in the highest versus lowest LTPA tertile. All in all, predictors of past-year leisure time physical activity were different among women based upon sexual orientation since lesbians had four predictors and heterosexuals had only one.

5.0 DISCUSSION

5.1 INTRODUCTION

The purpose of this investigation was to examine potential differences in reported physical activity between lesbians and heterosexual women. The primary hypotheses were that reported past-year leisure time, occupational, total (leisure plus occupational), vigorous and usual household physical activity would be significantly different between lesbians and heterosexual women. The secondary hypothesis was that the sociodemographic, behavioral and lifestyle predictors of leisure time physical activity would be different for lesbians than for heterosexual women. This chapter addresses: 1) discussion of findings 2) conclusions and 3) recommendations for future research.

5.2 DISCUSSION OF FINDINGS

5.2.1 Past-year leisure time physical activity

It was hypothesized that past-year leisure time physical activity (hrs/wk) would be different between lesbians and heterosexual women. Since others have found differences in leisure time physical activity among women based upon sociodemographics which included age (Brownson

et al., 2000; King et al., 2000; Ransdell & Wells, 1998; Scharff et al., 1999; Schmitz et al., 1997; Sternfeld et al., 1999; Walsh et al., 2001; Yusuf et al., 1996) race and ethnicity (Brownson et al., 2000; Crespo et al., 2000; Eyler et al., 1999; King et al., 2000; Mack et al., 2004; Ransdell & Wells, 1998; Sternfeld et al., 1999) and socioeconomic status (Brownson et al., 2000; Crespo et al., 2000; Ford et al., 1991; King et al., 2000; Ransdell & Wells, 1998; Scharff et al., 1999; Sternfeld et al., 1999; Yusuf et al., 1996) it was hypothesized that sexual orientation might also influence leisure time physical activity. The findings of this investigation indicate that no difference in median hours per week of past-year leisure time physical activity exist between lesbians and heterosexual women.

Although there is currently a lack of research investigating leisure time physical activity by sexual orientation, the findings of this investigation are consistent with the findings of a few others who have reported no difference in physical activity between lesbians and heterosexual women (Aaron et al., 2001; Koh, 2000; Valanis et al., 2000). For example, Valanis et al. (2000), found no difference in the percentage of lesbians and heterosexual women who reported no exercise (50-57%) or in the frequency and duration of walking and other moderate or strenuous exercise lasting 20 or more minutes. Koh (2000) did not find a difference between lesbians and heterosexuals in regular aerobic physical activity defined as 20 minutes of aerobic exercise per session with at least 3 sessions per week assessed by a self-administered, anonymous, written survey. Aaron et al. (2001) found no difference in the prevalence of past-month sedentary behavior between lesbians and a sample of women from the Behavioral Risk Factor Surveillance System. Although Roberts et al. (2003) reported no differences in the number of times per week or length of time exercised, lesbians were more likely than their heterosexual sisters to report exercise at least weekly (80.8% vs. 72.2%).

Since the present investigation may be one of the first to specifically examine past-year leisure time physical activity among lesbians using the Modifiable Activity Questionnaire (MAQ), it is difficult to say unequivocally whether there is no difference in regular leisure time physical activity between lesbians and heterosexual women or if the absence of an effect could be attributed in part by the way in which regular leisure time physical activity was defined and assessed using the MAQ.

Although the total time (hrs/wk) spent in past-year leisure time physical activity did not vary by sexual orientation in the present investigation, differences in reported participation of some specific leisure time physical activities were found between lesbians and heterosexual women. For example, lesbians compared to heterosexuals had significantly higher percentages who reported regular participation in mountain biking, street bicycling, golf, hiking, racquetball/squash, softball and kayaking. On the other hand, heterosexuals compared to lesbians, had significantly higher percentages reporting regular participation in aerobics, dance class, kick boxing, Pilates and yoga. These findings suggest that a higher percentage of lesbians compared to heterosexuals may be more likely to participate in activities that are less structured (street bicycling, mountain biking, kayaking, hiking), more competitive (racquetball/squash, softball, golf) occur primarily outdoors (except for racquetball/squash), may be more time-consuming, and can be performed independently, with a partner, or in small groups (except for softball). These findings also suggest that a higher percentage of heterosexuals compared to lesbians may be more likely to participate in structured, less competitive, indoor activities which may be less time-consuming and can be performed in a class at a fitness club or at home by way of instructional videos. More heterosexuals than lesbians reported having children < 18 years of age living at home which may have affected their choices of physical activities.

Others have reported that participation in physical activity varies among subgroups of the population based upon sociodemographics including gender (CDC, 2003; Ford et al., 1991; USDHHS, 1996, 2000; Yusuf et al., 1996) age (Brownson et al., 2000; USDHHS, 1996; Walsh et al., 2001) socioeconomic status (Brownson et al., 2000; Ford et al., 1991), as well as race and ethnicity (Brownson et al., 2000). The findings of this investigation suggest that participation in specific physical activities also varies among women by sexual orientation.

Another important point is that the median amount of time spent in past-year leisure time physical activity among women in the overall sample was 3.31 hrs/wk. If converted to minutes per day, these women were spending close to 40 minutes per day on 5 days per week in leisure time physical activity. This amount of physical activity seems to be meeting the minimum recommendations recently set forth by the American College of Sports Medicine (ACSM) and the American Heart Association(AHA) which state that all healthy adults ages 18-65 yrs need at least 30 minutes of moderate, aerobic physical activity on five days of the week (Haskell et al., 2007).

5.2.2 Past-year occupational physical activity

It was hypothesized that past-year occupational physical activity (hrs/wk) would be different between lesbians and heterosexual women. Although others have reported differences in occupational physical activity based upon sociodemographics such as age (Brownson et al., 2000), race and ethnicity (Sternfeld et al., 1999) and socioeconomic status (Ford et al., 1991), the expected differential affect of sexual orientation on past-year occupational physical activity was not supported in this investigation. No differences were found between lesbians and heterosexual women for median hours per week of moderate, hard or total occupational physical activity.

In this investigation, very few women overall (25%) reported any moderate (22%) or hard (3%) occupational physical activity. Seventy five percent of the women in this study (n = 556) reported no occupational physical activity above the level of light. In contrast to these findings, Ford et al. (1991) found that, among women of both high and low socioeconomic status, occupational physical activity constituted the second highest category of energy expenditure next to household physical activity. Higher levels of occupational physical activity have been found to be associated with lower levels of education (Sternfeld et al., 1999) and income (Crespo et al., 2000). In this investigation, a high percentage of women had a Bachelor's degree or greater (63%) and a total household income equal to $40,000 or more (70%) which may have helped to account for the low levels of moderate and hard occupational physical activity. The results of this investigation suggest that women of similar age, educational attainment and income as those in this study, may not acquire a substantial amount of physical activity through occupational means.

5.2.3 Past-year total (leisure time plus occupational) physical activity

It was hypothesized that total (leisure time plus occupational) physical activity (hrs/wk) would be different between lesbians and heterosexual women. The results of this investigation failed to support this hypothesis since total physical activity did not vary by sexual orientation. Since leisure time and occupational physical activity were similar between lesbians and heterosexual women, it is not surprising that no differences were found by sexual orientation when these two measures were combined.

More women reported being active, however, when leisure time was combined with occupational physical activity. To begin with, only 6% of the women in this study reported no

leisure or occupational physical activity (n = 43). Also, more total time (hrs/wk) was reportedly spent in physical activity when leisure time and occupational physical activity were combined. For example, the reported median hours per week of total physical activity was 4.7 compared to just 3.3 median hours per week for leisure time alone. The amount of time per week reportedly spent in physical activity when leisure time and occupational physical activity were combined was calculated to be 56 minutes per day on 5 days per week, an increase over the 40 minutes per day on 5 days per week calculated for the median hours per week spent in leisure time physical activity alone. These findings may indicate that the women in this investigation are exceeding the minimum recommendations set forth by the ACSM and the AHA (Haskell et al., 2007) which may lead to increased health benefits. These findings are in agreement with Eyler et al. (1999) and Brownson et al. (1999) who reported that nearly 75% of women were physically active at the levels recommended by the 1996 Surgeon General's Report (USDHHS, 1996) when a composite of occupational and household physical activity, in addition to leisure time, were included in the assessment.

Therefore, although there was no difference between lesbians and heterosexual women in the amount of time per week spent in total physical activity in this investigation, the inclusion of leisure time plus occupational physical activity may give a better estimate of the overall amount of time that women spend in physical activity. Consequently, this finding helps to emphasize the importance of including all types of physical activity that women may perform, during their daily routine, in the assessment rather than limiting it to only leisure time physical activity.

5.2.4 Past-year vigorous physical activity

It was hypothesized that reported past-year vigorous physical activity (hrs/wk) would be different among lesbians than among heterosexual women. The findings of the present investigation, however, suggest that no difference in reported past-year vigorous physical activity exists between lesbians and heterosexuals. This finding is consistent with the findings of Roberts et al. (2003) who reported no difference in vigor between lesbians and their heterosexual sisters. On the contrary, Case et al. (2004) reported that lesbians were 10% more likely than heterosexual women from the Nurse's Health Study II (ages 32-51 years) to report participating in strenuous exercise at least once a week or more. Aaron et al. (2001) reported that lesbians were less likely (63.2%) to report no regular vigorous activity compared to women in the 1998 Behavioral Risk Factor Surveillance System (86.3%).

It is important to point out that although 60% of the women in the current investigation reported engaging in regular vigorous physical activity, the criteria for regular vigorous physical activity was physical activities > 6 METs performed 10 or more times over the past year. Therefore, women in this study were considered to be vigorously active if they participated in vigorous activity just once a month during 10 months of the past year. As a means of comparison, another way of defining regular vigorous physical activity used by Behavioral Risk Factor Surveillance System (BRFSS) is participating in 20+ minutes of vigorous physical activity on 3 or more days per week (CDC et al., 2004). Only 23.9% of women reported participating in regular vigorous physical activity as defined the BRFSS questionnaire. So, although a high percentage of the women in this investigation reported regular vigorous physical activity over the past year, regular vigorous physical activity in this case does not necessarily constitute being vigorously physically active on a daily, weekly or even monthly basis.

Another important point is that the amount of time (hrs/wk) reportedly spent in regular vigorous physical activity in this investigation was considerable low. For instance, the median hours per week of vigorous physical activity reported by women in the overall sample was 0.33 which is equivalent to only about 20 minutes per week. The most current recommendations state that healthy adults need a minimum of 30 minutes of moderate, aerobic physical activity on 5 days and/or a minimum of 20 minutes of vigorous, aerobic physical activity on 3 days per week. Increased health benefits may be gained from acquiring even higher amounts of vigorous physical activity (Haskell et al., 2007; USDHHS, 1996). The median 20 minutes per week found in this study may not be enough vigorous physical activity to significantly improve health or decrease disease risk. Of more concern is that 40% of the women in this study reported no regular vigorous physical activity over the past year.

Based on these findings, it can be stated that lesbians and heterosexuals report similar amounts of past-year vigorous physical activity and that this level is low. The low levels found in this investigation may be due in part by the way in which regular vigorous physical activity was defined in the assessment. There may have been women who regularly participate in a variety of leisure time physical activities > 6 METs throughout the year but no one physical activity 10 or more times in the past year, therefore failing to meet the reportable criteria used in this investigation. It is difficult to compare the findings of this investigation to those of others due to lack of a standardized way of defining vigorous physical activity.

5.2.5 Usual household physical activity

It was hypothesized that usual household physical activity would be different between lesbians and heterosexual women. This hypothesis was supported by the findings of this investigation

since heterosexual women had a significantly higher median (hrs/wk) of usual household physical activity compared to lesbians (20.8 vs. 15.7 hrs/wk). Others have reported differences in household physical activity based upon sociodemographics including age (Brownson et al., 2000; Scharff et al., 1999; Sternfeld et al., 1999), race and ethnicity (Brownson et al., 2000; Ransdell & Wells, 1998; Sternfeld et al., 1999) and socioeconomic status (Brownson et al., 2000; Ford et al., 1991; Sternfeld et al., 1999). The findings of this investigation suggest that household physical activity may also be influenced by sexual orientation.

The findings of the present investigation are also in agreement with others in that the time reportedly spent in usual household physical activity (17.8 hrs/wk) was higher than the time reportedly spent in leisure time physical activity (3.31 hrs/wk). Scharff et al. (1999) and Ford et al. (1991) reported that, among women in their investigation, household physical activity was the most reported type and accounted for the highest amount of energy expenditure of any type of physical activity. It should also be noted that neither the size of the home nor yard were not taken into consideration during the assessment of household physical activity in this investigation. Both of these factors may affect the overall amount (hrs/wk) of usual household physical activity.

Also worth mentioning is that usual household physical activity in the present investigation appears to be overestimated. For instance, maximums of 120.7 and 125.3 hours per week were reportedly spent in usual household physical activity by lesbians and heterosexuals respectively. Also, 87 women, or 12% of the study sample, reported spending in excess of 40 hours per week in household physical activity. It could be that women are not cognizant of time they actually spend in household physical activity or perhaps they performed multiple tasks during the same period of time yet reported the hours per week for each separately. For these

reasons, the household physical activity questionnaire utilized in this investigation may need to be examined for its ability to accurately assess household physical activity.

A possible explanation for the difference in household physical activity found by sexual orientation in this investigation may be attributed to the significantly higher percentage of heterosexuals (49%) who reported having children under the age of 18 years currently living in the household compared to lesbians (15%). Many of the household physical activities listed in the questionnaire utilized in this investigation, such as shopping, laundry, food preparation, washing dishes, and childcare, may require greater amounts of time when more people including children under the age of 18 years are living in the household. To examine this issue further, the amount of usual household physical activity (hrs/wk) was compared between women who reported having children living in the household to those who reported that they did not. A significantly higher amount (hrs/wk) of household physical activity was reported among those women, regardless of sexual orientation, who reported having children under the age of 18 years living in the household. This finding is supported by Scharff et al. (1999) who reported that having children 17 years of age and younger at home increased a woman's odds of performing adequate amounts (30 minutes of physical activity on most days) of physical activities of daily living (PADL) which included child care, work in the home, home repair and yard work. In fact, there was a six-fold increase in PADL among women 30-39 years of age who had children at home. Also, having children age 12 years and younger at home was predictive of PADL among women 40-49 years of age. Sternfeld et al. (1999) also reported that among ethnically diverse women, having children at home was positively associated with the likelihood of being in the highest quartile for household/caregiver physical activity. Therefore, the higher percentage of heterosexuals having children under the age of 18 yrs living in the household compared to

lesbians could have contributed to the significantly higher amount of time spent in usual household physical activity found among heterosexuals in our investigation.

Another possible reason that household physical activity was higher among heterosexuals than among lesbians could be related to traditional gender role expectations. There was no difference in the percentage of lesbians and heterosexuals who reported being in a committed marital or partner relationship (70% and 75% respectively) but the dynamics of the relationship may affect usual household physical activity. Perhaps in lesbian relationships, both women are more likely to share the household responsibilities whereas in traditional heterosexual relationships, larger portions of the household duties may be the responsibility of the women. A point of discussion during the Women's Health Initiative exploratory meeting in 1995 was that women hold multiple roles within in the family that help to determine their level of physical activity and which must be taken into account in physical activity assessment (Masse et al., 1998). Similarly, differences may exist in the marital or partner relationship roles and responsibilities regarding household physical activity based upon sexual orientation.

Differences were also found in the types of household physical activities commonly reported by sexual orientation. For example, a higher percentage of lesbians reported lawn mowing, heavy yard work, pet care, heavy and light home repair and maintenance compared to heterosexuals; roles generally reserved for males in traditional, heterosexual relationships. On the other hand, a higher percentage of heterosexuals reported shopping, childcare, laundry, and light housework compared to lesbians. The ways in which these differences by sexual orientation impact usual household physical activity and potentially level of vigor are not yet known.

5.2.6 Sociodemographic correlates of physical activity

The sociodemographic correlates of physical activity examined in this investigation included age, race, educational attainment, total household income, employment status, marital or partner status and children under the age of 18 years currently living in the household. The main findings of this investigation were that sociodemographic correlates of physical activity including age, race, educational attainment, total household income, employment status, marital or partner status, were not significantly different between lesbians and heterosexuals. It was important that the two groups did not differ on these sociodemographic factors as many of these variables have been found to be important correlates of physical activity (USDHHS, 1996). A significantly higher percentage of heterosexual women compared to lesbians, however, reported having children under the age of 18 years living in the household. It appears as though the higher percentage of heterosexual women reporting having children under the age of 18 yrs currently living in the household may have contributed to the significantly higher amount of household physical activity found for heterosexual women in this investigation.

5.2.7 Behavioral and lifestyle correlates of physical activity

The behavioral and lifestyle correlates examined in this study included body mass index (BMI), cigarette smoking and alcohol consumptions. The findings of this investigation indicated that measures of all three behavioral and lifestyle factors were significantly higher among lesbians than among heterosexual women.

Body mass index was significantly higher among lesbians than among heterosexual women in this investigation. This finding is consistent with Roberts et al. (2003) who reported

that lesbians had a significantly higher mean BMI (26.5 kg/m^2) compared to the mean BMI found for heterosexuals (25.4 kg/m^2). Several others have reported that lesbians have a higher percentage of overweight and obesity compared to heterosexuals (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Valanis et al., 2000). Conversely, Koh (2000) found no difference in BMI between lesbians and heterosexual women. BMI in their investigation was calculated from self-reported height and weight, whereas BMI in the present investigation was based upon actual measurement of height and weight.

Also, the present investigation found that lesbians had a significantly higher rate of current cigarette smoking compared to heterosexuals (16% vs. 11 %). This finding is supported by others who found that rates of current cigarette smoking were higher among lesbians compared to heterosexuals (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Diamant et al., 2000; Valanis et al., 2000). On the other hand, Roberts et al. (2003) and Koh (2000) reported no difference in rates of current smoking between lesbians and heterosexual women. In the Roberts et al. (2003) study, the lesbians compared to the heterosexuals were older, had higher levels of education, personal income and full-time employment, all of which are associated with a decreased likelihood of cigarette smoking. In the Koh (2000) study, perhaps the lack of a difference was due to the assessment method which utilized a self-administered, anonymous questionnaire left in doctor's offices and clinics. As a result, the lesbians and heterosexuals sampled in their investigation may have been different than those found in the present investigation and in general population.

Additionally, in the current investigation, lesbians reported consuming a significantly higher amount of alcohol compared to heterosexuals. This finding is also in agreement with others who found that alcohol use, including heavy drinking, was higher among lesbians than

heterosexual women (Aaron et al., 2001; Case et al., 2004; Diamant & Wold, 2003; Diamant et al., 2000; Hughes & Wilsnack, 1997; Moran, 1996; Valanis et al., 2000). In contrast, Koh (2000) again found no difference between lesbians and heterosexuals for alcohol use with both at around 13%. These findings regarding behavioral and lifestyle correlates of physical activity and sexual orientation are in agreement with the findings of others who suggest that lesbians may be at greater risk for developing certain types of chronic diseases.

5.2.8 Predictors of past-year leisure time physical activity

It was hypothesized that predictors of past-year leisure time physical activity would be different for lesbians than for heterosexual women. The findings of the current investigation support this hypothesis. The predictors examined included age, race, educational attainment, total household income, employment status, current martial or partner relationship status, having children under age 18 years currently living in the household, body mass index (BMI), current cigarette smoking status and alcohol consumption.

The findings indicate that predictors of past-year leisure time physical activity among lesbians included BMI, current cigarette smoking status, educational attainment and current marital or partner relationship status. BMI was the only significant predictor of leisure time physical activity among heterosexual women. Although others have investigated predictors of leisure time physical activity among subgroups of women based upon age (Ransdell & Wells, 1998; Scharff et al., 1999; Walsh et al., 2001), race and ethnicity (Ransdell & Wells, 1998; Sternfeld et al., 1999), and socioeconomic status (Brownson et al., 2000; Ford et al., 1991) no investigations examining predictors of leisure time physical activity based upon sexual orientation have been reported.

Body mass index was the most significant predictor of past-year leisure time physical activity found for lesbians and heterosexual women in this investigation. Lesbians and heterosexuals who had lower BMI's were likely to be in the middle or upper vs. the lowest tertile of leisure time physical activity as compared to those with higher BMI's. Other have found BMI to be inversely related to physical activity (Schmitz et al., 1997), negatively associated with the likelihood of having a high sport/exercise index (Sternfeld et al., 1999), walking for exercise, or participating in medium to high intensity physical activity (Walsh et al., 2001). Brownson et al. (2000) reported that being overweight was significantly associated with no leisure time activity. Conversely, Ransdell and Wells (1998) reported that BMI was not a significant predictor of leisure time physical activity among a diverse sample of urban women age 40 ± 10.5 year of age.

Current cigarette smoking was the second most significant predictor of past-year leisure time physical activity among lesbians in this investigation. Although cigarette smoking in general is reported to be only weakly inversely related to participation in physical activity (Blair et al., 1985; Pate et al., 1995; Sallis & Owens, 1999), some have found it to be a significant predictor of leisure time physical activity among women. For example, women who are current cigarettes smokers report being less likely to engage in leisure time physical activity (Yusuf et al., 1996), walk for exercise (Walsh et al., 2001), or have a high sport and exercise index (Sternfeld et al., 1999), and more likely to report no leisure time activity (Brownson et al., 2000) compared to non-smokers. Ransdell and Wells (1998), however, reported that current cigarette smoking was not a predictor of leisure time physical activity for any of the racially diverse groups of women in their investigation.

Also, the finding that educational attainment was a significant predictor of past-year leisure time physical activity among lesbians is consistent with the findings of others who

reported that higher levels of education were associated with an increase in leisure time physical activity (Schmitz et al., 1997), a higher sport and exercise index (Sternfeld et al., 1999), more vigorous physical activity (Walsh et al., 2001), and less leisure time physical inactivity (Crespo et al., 2000). That education was a significant predictor among lesbians but not among heterosexuals is consistent with the findings of others who have reported education to be associated with physical activity participation among some subgroups of women but not among others. For instance, Scharff et al. (1999) reported that education was a signficicant predictor of leisure time physical activity among women age 60 years or older but not among younger women. Also, Ransdell and Wells (1998) found that education was the only significant predictor of leisure time physical activity among White women but was not significant among racial and ethnic minority women. In fact, among White women, education predicted level of leisure time physical activity into the high or low category with 68% accuracy. Moreover, White women with a college degree were significantly more likely to be highly active than those without.

Lastly, marital or partner status was found to be an important predictor of leisure time physical activity among lesbians but not among heterosexuals in the present investigation. Others have found that marital status predicted physical activity among some subgroups of women. For example, marital status was the most important predictor of high levels of past-year leisure time physical activity among minority women age 40 ± 10.5 years (Ransdell & Wells, 1998). Conversely, Crespo et al. (2000) reported that marital status was not related to the prevalence of leisure time inactivity among women of different racial and ethnic groups. In another study, being married predicted higher levels of physical activities of daily living among women under 30 years old but lower levels among women 50-59 year of age (Scharff et al., 1999). Walsh et al. (2001) reported that marital status was not independently associated with walking for exercise

among elderly White women. The findings of the current investigation that being in a committed marital or partner relationship predicted lower levels of leisure time physical activity among lesbians was in agreement with the findings of Schmitz et al. (1997). They reported that being married was consistently associated with lower levels of leisure time physical activity among women 37 ±10.7 years of age. A point that may be worth making is that the present investigation did not differentiate between being in a current committed marital or partner relationship and living with a partner or spouse which may have complicated the interpretation of the findings.

Past studies have indicated that predictors of leisure time physical activity among women are affected by differences in sociodemographics. The findings of the current investigation suggest that sexual orientation is another sociodemogrpahic that affects predictors of leisure time physical activity warranting further investigation.

5.2.9 Strengths and limitations

One strength this investigation is that it may be one of the first to examine the influence of sexual orientation among women on a variety of physical activity measures including past-year leisure time, occupational, total, vigorous and usual household physical activity. Another is that it may be one of the first to investigate sexual orientation and predictors of leisure time physical activity. Also, data were obtained by way of standardized interviews and clinical procedures making this investigation different from many other related studies. For example, the physical activity interview was conducted via the Modifiable Activity Questionnaire which has been found to be a valid and reliable tool for assessing past-year leisure time physical activity in a variety of sub-populations (Aaron et al., 2001; Kriska et al., 1990; Vuillemin et al., 2000). Also, body mass index was calculated from direct measurements of height and weight. An additional

strength of this investigation is that recruitment took place through a variety of sampling methods resulting in a fairly large sample of self-reported lesbians and heterosexual women.

The present investigation is not without limitations, however. To begin with, the physical activity assessment tool utilized may not have reflected all of the leisure time physical activities in which the participants may have engaged since the Modifiable Activity Questionnaire (MAQ) asks participants to indicate only those leisure time physical activities in which they participated 10 or more times in the past year. Therefore, there may have been a variety of leisure time physical activities in which participants had engaged but which fell short of the criteria of 10 or more times per year. Also, this study contained only a limited number of women reporting any moderate or hard occupational physical activity. Additionally, since the MAQ and the other questionnaires utilized in this investigation relied on self-report, they were subject to recall bias. The study sample was limited in its diversity as it was comprised of 89% White and only 11% Black women between the ages of 35-55 years who were of a relatively high level of socioeconomic status based upon education, total household income and employment status and may only be representative of women of similar sociodemographics. However, the sociodemographics of this sample are similar to samples recruited in other lesbian health studies. Also, due to the sampling techniques used in recruiting lesbians in this investigation, the results may only be representative of lesbians who are willing to disclose their sexual identity and/or have some connection to the community. Finally, the cross-sectional nature of this investigation prevents making inferences regarding causality.

5.3 CONCLUSIONS

Since reported time (hrs/wk) spent in past-year leisure time, occupational, total (leisure time plus occupational) and vigorous physical activity were not significantly different between lesbians and heterosexual women, it can be concluded that there are more similarities than differences in physical activity among women based upon sexual orientation. A few differences in physical activity between lesbians and heterosexual women were found, however. These findings may have important implications when it comes to developing effective intervention strategies for women.

Also, the median reported hour per week of past-year leisure time physical activity was 3.31 among women in the overall sample, equaling only about 40 minutes of moderate physical activity on 5 days per week. Therefore, it can be concluded that these women appear to be meeting or exceeding the most recent recommendations made by the American College of Sports Medicine and the American Heart Association for healthy adults 18-65 years of age of acquiring a minimum of 30 minutes of moderate, aerobic physical activity on 5 days per week (Haskell et al., 2007).

Additionally, it can be concluded that the women in this investigation may be attaining only very low levels of vigorous physical activity since 60% of the sample reporting a median of less than 20 minutes of vigorous physical activity per week while the remaining 40% reported none. These women appear not to be meeting the most recent recommendations which state that all healthy adults ages 18-65 years need a minimum of 20 minutes of vigorous, aerobic physical activity on 3 days per week in combination with or in lieu of 30 minutes of moderate, aerobic physical activity on 5 days per week (Haskell et al., 2007). The results of this study indicate that

intervention strategies should be aimed at increasing the amounts of moderate and vigorous leisure time physical activity among women.

The findings of this study also indicate that while a high percentage of women from both groups reported participation in many of the same types of leisure time physical activities including walking, weight training and use of cardio machines, some differences were found between the groups in the percentages who reported participating in specific types of leisure time physical activities. For this reason, intervention strategies for effectively increasing the level of physical activity among women should consider providing a variety of physical activities choices that may appeal to women of differing sexual orientations.

It can also be conclude that the majority of women in this investigation do not acquire any moderate or hard occupational physical activity. In light of this finding, intervention strategies for women could be aimed at increasing opportunities for physical activity participation in the workplace.

Since past-year total (leisure time plus occupational) physical activity yielded greater amounts of physical activity per week than leisure time alone, investigations of physical activity among women should include assessment of both leisure time and occupational physical activity. Additionally, it is important to include measurement of household physical activity in the overall physical activity assessment of women since the greatest amount of time (hrs/wk) spent in physical activity was reported for household physical activity among the women in this investigation. The amount of time reported for household physical activity (17.8 hrs/wk) was 5 times greater than the amount of time reported for leisure time physical activity (3.3 hrs/wk).

The finding that usual household physical activity was significantly higher among heterosexual women than among lesbians may be attributed to two factors. One may be the

significantly higher percentage of heterosexuals who reported having children under the age of 18 years currently living within their households. Having children in the household is associated with an increase in the number of hours per week spent in usual household physical activity. The other may be that lesbian and heterosexual relationships have different role expectations regarding household duties and responsibilities which may in turn influence the amount and specific types of overall household physical activity they acquire.

Since body mass index, cigarette smoking and alcohol consumption were found to be higher among lesbians than among heterosexual women, consistent with the findings of others, it can be concluded that lesbians may be at an increased risk for developing certain chronic diseases including cardiovascular diseases and cancers. It was hypothesized that since behavioral and lifestyle factors such as BMI, cigarette smoking and alcohol consumption have been found to differ based upon sexual orientation, then so might physical activity. Additionally, since BMI, cigarette smoking, and alcohol consumption are correlates of physical activity, it is possible that if these factors vary by sexual orientation, then differences in physical activity by sexual orientation may be found. The findings of this investigation, however, did not support this hypothesis since most measures of physical activity were not different between lesbians and heterosexual women even though BMI, cigarette smoking and alcohol consumption were different.

Lastly, it should be noted that predictors of past-year leisure time physical activity were different for lesbians than for heterosexual women. Although body mass index was the most significant predictor of leisure time physical activity for both groups, lesbians had three additional predictors. It is not clear why traditional predictors such as cigarette smoking, level of education and marital or partner relationship status were significant predictors for lesbians but

not for heterosexuals. Based upon these findings, planners of physical activity intervention strategies should take into account that these and other potential variables may have a differential affect on physical activity among women based upon sexual orientation.

5.4 RECOMMENDATIONS FOR FUTURE RESEARCH

Based upon the limitations and findings of this investigation, recommendations for future research regarding sexual orientation and physical activity include:

1. Using different criteria for regular leisure time physical activity, other than as defined by the MAQ as "10 or more times in the past year" in order to better ascertain usual levels of leisure time physical activity regularly performed in typical a week or month rather than past-year.
2. Using different criteria for vigorous physical activity other than as defined as "those leisure time physical activities > 6 METs which have been performed 10 or more times in the past year better" in order to better assess the amount of vigorous physical activity regularly performed on a weekly or monthly basis rather than past-year.
3. Using more objective measures of physical activity assessments by way of activity monitors such as pedometers or accelerometers and thereby eliminating recall bias of the questionnaire in examining the relationship between sexual orientation and physical activity.
4. Assessing measures of physical fitness, such as maximal oxygen uptake and body fat percentage, as a means of comparing physical activity levels by sexual orientation.

5. Conducting studies that demonstrate the validity and reliability of the household physical activity questionnaire.
6. Modifying the household physical activity questionnaire in such a way as to assess past-year household physical activity (hours per week) rather than "usual household physical activity in a typical week" so that it may be included in the total physical activity assessment along with leisure time and occupational physical activity.
7. Investigating further the influences of children under the age of 18 living in the household as well as family and partner relationship roles and responsibilities on household physical activity among women of differing sexual orientations.
8. Exploring whether the differences found for participation in specific types of leisure time and household physical activities by sexual orientation produce differential amounts of vigorous physical activity.
9. Investigating other categories and types of physical activity correlates such as psychological (attitudes, perceived barriers, enjoyment, intention, locus of control, mood disturbances, knowledge, expected benefits, stress, lack of time, and self-efficacy) and sociological (social support, social isolation, group cohesion, physical influence) by sexual orientation.
10. Examining physical activity as well as predictors of physical activity by sexual orientation in age groups younger than 35 years and older than 55 years of age.
11. Investigating the influences of race and ethnicity by sexual orientation on physical activity by examining a more racially and ethnically diverse sample of women.
12. Examining the relationship between physical activity and sexual orientation among men.

APPENDIX A

RECRUITMENT/SCREENING FORM

RECRUITMENT/SCREENING FORM: "Epidemiologic Study of Health Risk in Women"

1. Thank you for your interest in our study. My name is _____ and I would briefly like to tell you about this research study.

2. We are interested in recruiting 1000 women who are at least 35 years of age to participate in this study. The study will focus on examining risk factors for heart disease and how these risk factors may cluster together in different groups of women based on life style differences such as smoking, exercise and eating habits, and also things like race and sexual orientation. We will be testing your body fat, blood pressure, cholesterol, blood sugar, and other blood tests that measure your risk of heart disease. We will also be assessing how much physical activity you do and the types and amounts of food you eat by asking you to keep a 3-day food record and to wear a pedometer and armband that will track your physical activity. We will also measure the density of your bones. In addition we will ask you to fill out several questionnaires about your medical history and other health indicators. This will require that you attend two clinic visits in Oakland at days and times that are convenient for you and complete several questionnaires at home and bring them back to our office at your second visit. The length of the first clinic visit is 3 hours and the second visit is about an hour.

3. You will be paid $50 for participating in the study and you will receive the results from your physical tests.

4. I've just given you a lot of information, do you have any questions?

5. In order for me to determine your eligibility to participate in the study, I will need to ask you some screening questions. I will ask you a few questions about your demographic background and questions about your physical health and medical history. Your participation in this phone screen is voluntary. You may refuse to answer any of the questions asked. Your responses to these questions are confidential. The average time to complete this Phone Screen is less than 5 minutes.

Before we begin, do I have your permission to ask you these questions?

[Record the caller's assent at the top of the next page, and sign your name]

Phone Screen Interview

The caller gives verbal permission to conduct the Phone Screen: _____ YES _____ NO

Verbal Assent was given to: _____
Recruiter's Signature

Date: _____

How did you hear about the study? ***(NOTE: read all responses and check all that apply.)***

- ☐ Newspaper Advertisement (Specify): _____
- ☐ Newsletter (Specify) _____
- ☐ Received recruitment letter or mailing
- ☐ Word of mouth
- ☐ Brochure (From where): _____
- ☐ Other (Specify): _____

1. Age: _____ (≥ 35 yrs) 2. Date of Birth: ____/____/_____ **If 2004: born in 1969 – turn 35 If 2005: born in 1970 – turn 35 If 2006: born in 1971 – turn 35**

3. Which of the following best describes your racial/ethnic heritage? ***(NOTE: Read all responses and check all that apply)***

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African-American
- ☐ Hispanic or *Latina*
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White
- ☐ Other (Specify:_____)

4. Have you ever been told by a doctor or other medical person that you have any of the following conditions?

		If "yes", Specify:
a. Angina	☐ Yes ☐ NO	_____
b. Heart Attack	☐ Yes ☐ NO	_____

5. Have you ever had any of the following procedures? If "yes", Specify:

a. Coronary Artery Bypass Surgery	☐ Yes ☐ NO	_____
b. Balloon Angioplasty/PTCA	☐ Yes ☐ NO	_____
c. Other surgical procedure involving the coronary arteries	☐ Yes ☐ NO	_____

6. Are you presently being treated by a physician or health care provider for any other health problem?

☐ Yes ☐ No If "yes", specify: _____

I mentioned before that one of the lifestyle differences we are looking at is sexual orientation. Now I would like to ask you a few questions about how you identify yourself.

7. How do you identify your sexual orientation?

☐ Heterosexual or Straight
Ask question #8 only)

8. Since age 18, have your sexual partners been…

☐ **Only men**
☐ Both men and women
☐ Only women

☐ Bisexual (Ask question #9 only)
☐ Lesbian or Gay (Ask question #9 only)
☐ Other (Specify) _____ Ask question #9)

9. Over the past five years, has your emotional, physical, and romantic attractions been towards

☐ **Only women**
☐ **Primarily women**
☐ Women and men equally *(ask question #10)*
☐ Primarily men
☐ Only men

10. Over the past five years have your relationships been

☐ **Only women**
☐ **Primarily women**
☐ Women and men equally
☐ Primarily men
☐ Only men

ELIGIBLE:

Heterosexual Women = Heterosexual (#7) + Only Men (#8)

Lesbian Women = Bisexual (#7) + Primarily Women OR Only Women (#9)
Lesbian (#7) + Primarily Women OR Only Women (#9)
Other (#7) + Primarily Women OR Only Women (#9)

Eligible based on telephone screen? ☐ Yes ☐ No

IF INELIGIBLE:

11. If we find that you are ineligible for this research study, can we contact you for other studies related to heart disease, cancer or risk factors for these diseases, such as physical activity, diet or weight loss?

_____Yes _____No → No further info collected.

↓

Contact Tracking Form

** THIS PAGE IS COMPLETED ONLY IF THE RESPONDANT IS NOT ELIGIBLE FOR THE STUDY AT THIS TIME BUT AGREES TO BE CONTACTED FOR PARTICIPATION IN FUTURE STUDIES AS DESCRIBED ABOVE. **

Date: ___/___/____ **Staff Member Completing Form:** _____

Name: _____ *Date of Birth:* _____ *(Staff member to copy from page 2)*

Street Address: _____

City: _____ State: _____ Zip Code:_____ *Form 13: Y N*

Home Phone: _____ Work Phone: _____

Email Address: _____

Scheduled for First Clinic Visit:

Date: _____/_____/_____ Time: _____ am/pm Staff Member: _____

How will you be coming to your appointment?

	Parking Permit	Bus Pass	Which Zone?		
Do you need…?	O	O	One	Two	Three

IF INELIGIBLE DUE TO:

B. AGE:

"Thank you for your interest in the study and your time. I'm sorry but you are not currently within the age criteria for this study. (If they will become eligible during the next three years) May we contact you at a later date when you will be eligible? Thank you again for your interest in this research."

C. HEALTH HISTORY:

"Thank you for your interest in the study and your time. I'm sorry but due to your health history you are not eligible for this study. Thank you again for your interest in this research."

D. SEXUAL ORIENTATION IF CLEAR:

"Thank you for your interest in the study and your time. I am sorry but you are not eligible according to the criteria that the investigators have given me. Thank you again for your interest in this research."

E. SEXUAL ORIENTATION IF UNCLEAR:

"Thank you for your interest in the study and your time. I will give your questionnaire to the primary investigators to determine your eligibility for the study. One of them should be getting back to you within the next few days. Thank you again for your interest in this research."

APPENDIX B

INFORMED CONSENT

University of Pittsburgh

School of Education
Department of Health and Physical Activity

Approval Date: November 16, 2005
Renewal Date: November 15, 2006
Modification Approval Date: May 17, 2006
University of Pittsburgh
Institutional Review Board
IRB #0404147
125 Trees Hall
Pittsburgh, PA 15261
412-383-6743
Fax: 412-648-7092

CONSENT TO ACT AS A SUBJECT IN A RESEARCH STUDY

TITLE: Epidemiologic Study of Health Risk in Women (ESTHER)

INVESTIGATORS:

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School of Education
University of Pittsburgh
(412) 648-8759

SOURCE OF SUPPORT: National Institutes of Health (NIH), National Heart, Lung and Blood Institute

Participant's Initials: _____

DESCRIPTION:

You are being asked to participate in this study because you are at least 35 years old and have never been diagnosed with coronary heart disease. The purpose of this study is to examine if the risk factors for heart disease differ in women based on several lifestyle characteristics. A total of **1300 women** will be enrolled in this study from the Pittsburgh area. You will be asked to attend two clinic visits.

At the first visit lasting approximately three hours, you will be asked to come to the Magee-Womens Clinical Research Center which is located at Magee-Womens Hospital in Pittsburgh, PA. You will fast (no food or drink except water) for at least 8 hours before your scheduled visit. The following procedures will be performed during your clinic visit.

Your blood pressure and radial pulse (heart rate) will be taken after you have been seated and resting quietly for five minutes. A blood sample (less than 4 tablespoons) will be taken from a vein in your arm and analyzed for lipid, glucose, and insulin levels. After the blood draw, you will be given a light snack, including juice or coffee. A number of body measurements will be taken. These include height, weight, waist and hip circumference, and abdominal thickness (the distance between the abdomen and back). You will also be asked to step on a scale that uses bioelectrical impedance analysis (BIA) to quickly estimate your percent body fat. BIA is a common method of assessing body composition that involves passing a small electric current through your body and measuring the impedance or resistance to the current flow. You will not feel the electric current. BIA is extremely safe and is currently available for home use. You will complete several questionnaires about your medical history, lifestyle characteristics, psychological characteristics, and other health behaviors such as tobacco and alcohol use. The questionnaires should take less than an hour to complete. You may choose not to answer any question that you are not comfortable with.

At the completion of your clinic visit you will receive instructions for completing a three day food record and wearing a step counter and an armband that will measure your physical activity. You will be asked to record your food intake and wear the step counter and armband for a period of three days. We will ask you to return the step counter and food record when you attend your second clinic visit to have your bone mineral density (BMD) and body composition (amount of lean [muscle] and fat mass) measured (see paragraph below).

At the second clinic visit, you will be asked to bring the 3-day food record, step counter, and armband with you. The research assistant will review the records with you during this visit to make sure they are complete. You will be asked to undergo hip, lower spine, and whole body dual energy x-ray absorptiometry (DXA) scans. These DXA scans involve a very small amount of radiation and will be used to measure the bone mineral density (BMD), or the amount of bone tissue, in your hip, spine, and whole body. The whole body DXA scan will also measure the amount of lean (muscle) and fat mass you have. During the scanning, you will be asked to lie quietly on a special x-ray table for about 15 minutes. This visit will take place at the University of Pittsburgh's Health Studies Office (130 N. Bellefield Ave., Pittsburgh, PA 15213) and will take approximately 1 hour to complete.

Participant's Initials: _____

We will contact you once a year throughout the course of the study to update your contact information and health history. We will send you a short questionnaire to complete and return to us in the postage-paid envelope that will be provided to you. This questionnaire will take less than 10 minutes to complete. Also, you may be able to participate in future studies related to this one that might focus on heart disease, cancer, endocrine (metabolic) disorders, and factors that may be associated with sexual orientation. For this reason, Dr. Aaron and/or her co-workers may try to contact you during the next 10 years to tell you about these other projects. They may ask if you are willing to give a telephone interview, fill out a mailed questionnaire, or attend another clinic visit(s) during which you would undergo physical measures or give another blood specimen. They would explain what any additional project activities were before you would agree to volunteer.

☐ I do *not* agree to be contacted for future studies.

☐ I do agree to be contacted for future studies.

You will be mailed the results of the blood tests, body and bone density measurements, food records and assessment of physical activity within 4-6 weeks of your clinic visit. An explanation of each test will be provided as well as average or normal values if available.

Genetic Testing and Storage of Samples:

During this study, blood and saliva samples will be collected. The leftover samples may be useful for future research related to heart disease, cancer, disorders related to body metabolism and hormones, and factors related to sexual orientation. If genetic testing is done you will not be informed of the results. The samples will be stored in Dr. Roberts's laboratory for both the current and future studies. You can request the samples be destroyed anytime or request that they not be released to others. Please check one of the following:

1. _____ I do *not* agree to have my sample genetically tested/stored for possible future testing.

2. _____ I agree to allow my sample to be stored for possible future testing and research studies about heart disease, cancer, disorders related to body metabolism and hormones, and genetic and biological factors that may be associated with sexual orientation as long as there are no identifiers (no names or number that can link the sample back to me) attached to the sample.

3. _____ I agree to allow my sample to be genetically tested/stored for future testing and research studies about heart disease, cancer, disorders related to body metabolism and hormones, and genetic and biological factors that may be associated with sexual orientation with identifiers (names or numbers on the samples) linking name to the sample.

Participant's Initials: _____

4. _____ I agree to allow my sample to be stored with identifiers (names or numbers on the samples) linking name to the sample, only if my consent is obtained before any future testing is done.

RISKS AND BENEFITS:

RISKS:

The risk of giving a blood sample may include fainting, temporary local discomfort, bleeding, bruising, or rarely, an infection. To minimize risk, these procedures will be conducted by a trained phlebotomist. There is a minimal risk of emotional discomfort associated with completing the questionnaires as the nature of some of the questions is personal and answering them might be stressful or embarrassing to some people. You may choose to not respond to such questions.

Bone Density and Body Composition: Participation in this study involves exposure to radiation. The amount of radiation exposure associated with these procedures is addressed in the table below. (Note: A mrem is a unit of radiation dose).

Procedure	Area of Body Exposed	Radiation Dose per Procedure	Total # Procedures to Complete Study	Total Radiation Dose to Complete Study
Whole Body DXA	Whole body	1.5 mrem	1	1.5 mrem
Hip DXA	Hip*	20 mrem	1	20 mrem
Spine DXA	Spine*	20 mrem	1	20 mrem

*Other areas of the body receive minimal exposure

For comparison, radiation workers are permitted, by federal regulation, a maximum single organ radiation exposure of 50,000 mrem per year. There is no minimal level of radiation exposure that is recognized as being totally free of risk of causing genetic mutations (abnormal cells) or cancer. However, the risk associated with the radiation exposure received from participation in this study is considered to be low and comparable to everyday risks. If you are pregnant or think that you could be pregnant, or if you are trying to get pregnant, you will be excluded from having the DXA scans. If you are a woman of childbearing age and report that you have had at least one menstrual cycle in the past 12 months, you will be asked to undergo a urine pregnancy test prior to (the morning of) the DXA scanning. If the test is positive, you will be excluded from having the DXA scans.

BIA: The BIA may interfere with certain implanted devices that you might have. If you have an implanted device, such as a cardiac defibrillator, you will not participate in the BIA measure.

Armband: The armband may interfere with certain implanted devices that you might have. If you have an implanted device, such as a pacemaker, you will not wear the armband body monitor. You may also experience mild skin irritation or redness at the site where the

Participant's Initials: _____

armband is worn. Keeping the device and your arm clean and removing the armband for brief (no more than 30 minutes) periods every day will help prevent this from happening.

There are no risks associated with the measurements of blood pressure and other body measurements.

BENEFITS:
You may receive no direct benefit from participation in this study. However, you will receive important information regarding your current health status including blood pressure, cholesterol, glucose, body composition, and dietary and physical activity habits. You will not receive any health counseling in this study.

ALTERNATIVE TREATMENTS:

Because this is a study involving the assessment of risk factors for heart disease, alternative treatments do not apply.

COSTS AND PAYMENTS:

You will not be charged for any of the tests done at your study visit. You will receive $50.00 for participating in this study and the costs of parking will be paid by the study. You will receive a check when you complete the second clinic visit.

NEW INFORMATION:

Any new information developed during the course of this research, which may relate to your willingness to participate, will be provided to you.

CONFIDENTIALITY:

All records pertaining to your involvement in this research study will be stored in a locked file cabinet in the study office located in Trees Hall. A case number will indicate your identity on these records. This information will be accessible to the investigators and their research study staff listed on the first page of this document. Individuals from the agencies funding this research may review your records as part of their ongoing audit of this project. Any information about you or your hospital treatment will be handled in a confidential (private) manner consistent with other hospital medical records. You will not be specifically identified in any publication of research results. However, in unusual cases, your research records may be inspected by appropriate government agencies, such as the US Food and Drug Administration, or be released in response to an order from a court of law. All research records will be kept for a minimum of seven years following closure of this study.

USE OF YOUR PERSONAL MEDICAL RECORD INFORMATION FOR RESEARCH PURPOSES

TYPES OF MEDICAL INFORMATION INCLUDED IN THIS RESEARCH STUDY
To take part in this research study, you are being asked to give permission for the researchers listed above to use your personal health/medical information collected as part of

Participant's Initials: _____

this research project The researchers are asking permission to use information collected during your two clinic visits and information recorded at home between the two visits, including answers on questionnaires, body measurements (height, weight, sagittal diameter, percent body fat, waist and hip circumferences), blood pressure, pulse, carbon monoxide, dietary intake (3-day food record and food frequency), 3-day physical activity record, step counter (pedometer), armband, bone density and body composition from DXA scan, and biochemical measures done on the blood sample that is collected. The information will be used for the purpose of collecting data on cardiovascular disease, cancer, osteoporosis, gynecological conditions, and metabolic disorders. Participation in the study will result in health and medical information that will become a part of your participant chart and will be kept indefinitely at the research office located at University of Pittsburgh, Department of Health, Physical Education, Recreation, and Dance, 125 Trees Hall, Pittsburgh, PA, 15261.

WHO WILL SEE YOUR MEDICAL INFORMATION?

In addition to the investigators listed on the first page of this authorization (consent) form and their research staff, the following individuals will or may have access to identifiable information (which may include your identifiable medical information) related to your participation in this research study:

- Authorized representatives of the University of Pittsburgh Research Conduct and Compliance Office may review your identifiable research information (which may include your identifiable medical information) for the purpose of monitoring the appropriate conduct of this research study.
- In unusual cases, the investigators may be required to release identifiable information (which may include your identifiable medical information) related to your participation in this research study in response to an order from a court of law. If the investigators learn that you or someone with whom you are involved is in serious danger or potential harm, they will need to inform, as required by Pennsylvania law, the appropriate agencies.
- Authorized people sponsoring this research study, NIH, because they need to make sure that the information collected is correct, accurate and complete, and to determine the results of this research study.
- Authorized representatives of the UPMC hospitals or other affiliated health care providers may have access to identifiable information (which may include your identifiable medical information) related to your participation in this research study for the purpose of (1) fulfilling orders, made by the investigators, for hospital and health care services (e.g., laboratory tests, diagnostic procedures) associated with research study participation; (2) addressing correct payment for tests and procedures ordered by the investigators; and/or (3) for internal hospital operations (i.e. quality assurance).

YOUR RIGHT TO SEE YOUR OWN MEDICAL INFORMATION

You are allowed to see any research information that becomes a part of your medical records. However, no information will be added to your medical record as a result of your

participation in this research study. If you would like a copy of your reports, please speak with the research staff and they will give you a copy.

REFUSING TO GIVE PERMISSION TO RESEARCHERS TO USE YOUR MEDICAL INFORMATION

Permission to use and disclose your health/medical information for the purpose of this research study is voluntary. You do not have to let the researchers look at your health/medical information. However, if you do not give written permission for the researcher's use and disclosure of your health/medical information, you will not be able to participate in this research study.

Whether or not you give permission for the researchers to use your health/medical information, your medical care at this and any other UPMC hospital or doctor's office will be the same. Whether or not you give permission for researchers to use your health/medical information, your current and/or future relationship with the University of Pittsburgh will be unaffected.

WITHDRAWAL OF PERMISSION

At any time during the research study, you may withdraw (take away) your permission to let the researchers use and disclose your personal health/medical information for the purpose of this research study. However, if you withdraw your permission, you will not be able to continue in the research study. Any personal health/medical information recorded for, or resulting from, your participation in this research study before the date that you officially withdrew your permission may continue to be used and disclosed for the purposes of the research study as already described.

To officially withdraw your permission, you must send a letter to the principal investigator (listed on the first page of this consent form) saying that you decided to take back your permission and giving the date on which you wrote the letter.

Withdrawing permission for your personal health/medical information to be used for the research study will not change the medical care you currently or in the future receive at any UPMC hospital or doctor's office. Your decision to withdraw your permission will have no effect on your current or future relationship with the University of Pittsburgh.

FOR HOW LONG WILL THE MEDICAL INFORMATION BE USED?

The investigators may continue to use and disclose the health/medical information gathered for the purposes of this research study for an indefinite period of time.

RIGHT TO WITHDRAW:

You do not have to take part in this research study and, should you change your mind, you can withdraw from the study at any time. Your identifiable or medical information recorded for, or resulting from, your participation in this research study prior to the date that you formally withdrew your consent may continue to be used and disclosed by the investigators for the purposes stated above.

To formally withdraw your consent for participation in this research study you should provide a written and dated notice of this decision to the Principal Investigator of this research study at the address listed on the first page of this form.

Participant's Initials: _____

Your decision to withdraw your consent for participation in this research study will have no affect on your current or future relationship with the University of Pittsburgh. Your decision to withdraw your consent for participation in this research study will have no affect on your current or future medical care at a UPMC hospital or affiliated health care provider or your current or future relationship with a health care insurance provider.

You may be removed from the research study by the investigators in the event that you no longer meet the eligibility criteria.

CONFLICT OF INTEREST:

Your doctor may be an investigator in this research study, and as an investigator, is interested both in your medical care and in the conduct of this research. Before entering this study or at any time during the research, you may discuss your care with another doctor who is in no way associated with this research project. You are not under any obligation to participate in any research study offered by your doctor.

COMPENSATION FOR ILLNESS OR INJURY:

University of Pittsburgh researchers and their associates who provide services at UPMC (UPMC) recognize the importance of your voluntary participation in their research studies. These individuals and their staffs will make reasonable efforts to minimize, control, and treat any injuries that may arise as a result of this research. If you believe that you are injured as a result of the research procedures being performed, please contact immediately the Principal Investigator or one of the co-investigators listed on the first page of this form. Emergency medical treatment for injuries solely and directly related to your participation in this research study will be provided to you by the hospitals of UPMC. It is possible that UPMC may bill your insurance provider for the costs of this emergency treatment, but none of these costs will be charged directly to you. If your research-related injury requires medical care beyond this emergency treatment, you will be responsible for the costs of this follow-up care unless otherwise specifically stated below. There is no plan for monetary compensation. You do not, however, waive any legal rights by signing this form.

COMMERCIALIZATION:

This research may result in the development of commercially valuable products or discoveries. You will not be able to financially benefit from any commercial products resulting from this research.

Participant's Initials: _____

****

VOLUNTARY CONSENT:

All of the above has been explained to me and all of my current questions have been answered. I understand that I am encouraged to ask questions about any aspect of this research study during the course of this study, and that such future questions will be answered by the researchers listed on the first page of this form.

Any questions which I have about my rights as a research participant will be answered by the Human Subject Protection Advocate of the IRB Office, University of Pittsburgh (1-866-212-2668).

By signing this form, I agree to participate in this research study. A copy of this consent form will be given to me.

_____ _____
Signature Date

I certify that I have explained to the nature and purpose of this research study to the above-named individual(s), and I have discussed the potential benefits and possible risks of study participation. Any questions that the individual(s) have about this study have been answered, and we will always be available to address future questions as they arise.

_____ _____
Printed Name of Person Obtaining Consent Role in Research Study

_____ _____
Signature of Person Obtaining Consent Date

Participant's Initials: _____

APPENDIX C

CLINICAL EXAM FORM

Participant ID: Examiner ID _____

Date of Clinic Visit _____ / _____ / _____
MM DD YYYY

CLINIC EXAMINATION FORM

Ask the following question: "Do you have any electrical devices, such as a pacemaker, in your body?" If participant responds, "yes", then exclude from BIA measure and record reason.

Wait 5 minutes before measurements. Participant is to sit quietly for 5 minutes with feet flat on the floor (legs uncrossed) and is to refrain from talking during the measurements.

COUNT TO "10" SLOWLY WITH ARM RAISED BETWEEN EACH BLOOD PRESSURE READING.

RADIAL PULSE

☐ **Not Completed** **Reason:** _____

Measurement 1 ___ ___ ___ bpm in 30 sec Measurement 2 ___ ___ ___ bpm in 30 sec

Enter the number of beats counted in 30 seconds. Do not calculate beats per minute.

BLOOD PRESSURE

☐ **Not Completed** **Reason:** _____

Cuff Size ___ ___ ___.___ cm

☐Small ☐Regular ☐Large ☐Other: _____

Arm Used ☐Right ☐Left ☐Explain why right arm wasn't used: _____

_____

_____

_____

Pulse Obliteration Level

Palpated Systolic ___ ___ ___ mmHg

+ ADD 30*

** Add +30 to Palpated Systolic to obtain Maximum Inflation Level.*

Maximum Inflation Level ___ ___ ___ +mmHg

+If MIL is ≥ 300 mmHg, repeat (MIL) *MIL. If MIL is still ≥ 300 mmHg, terminate blood pressure measurements.*

Sitting Blood Pressure	Measure 1	Measure 2	Measure 3
Systolic	_____ mmHg	_____ mmHg	_____mmHg
Diastolic	_____ mmHg	_____ mmHg	_____mmHg

NOTE:

- *If M1 and M2 (systolic or diastolic) differ > 10 mm, do M3.*
- *If M1 and M2 are ≥ 140/90, advise participant to contact her primary health care provider to let him/her know the value. Document discussion below:*

_____ *Name of Nurse/Research Staff*

_____ *Date of alert value discussion*

WEIGHT

☐ **Not Completed** **Reason:** _____

___ ___ ___ . ___ kg

NOTE: This measure is in kg, not in pounds

STANDING HEIGHT

☐ **Not Completed** **Reason:** _____

Measurement 1 ___ ___ ___ . ___ in.

Measurement 2 ___ ___ ___ . ___ in.

BIA Height: _____ ft _____ in

Difference between M1 and M2 ___ ___ ___ . ___ in.

** If M1 and M2 differ by more than 0.5 inches, repeat measurements.*

Measurement 3 ___ ___ ___ . ___ in.

Measurement 4 ___ ___ ___ . ___ in.

BIA

☐ **Not Completed** **Reason:** _____

NOTE: Does participant have electrical devices in her body? _____Yes _____No
If yes, she should be excluded from BIA and reason noted above.

Standard Mode		**Athletic Mode**	
Fat (%)	___ ___ ___ . ___	Fat (%)	___ ___ ___ . ___
Fat Mass (lb)	___ ___ ___ . ___	Fat Mass (lb)	___ ___ ___ . ___
Fat Free Mass (lb)	___ ___ ___ . ___	Fat Free Mass (lb)	___ ___ ___ . ___
BMI	___ ___ ___ ___		

Note to examiner: Please remember to attach BIA printout below.

NOTE: Perform sagittal diameter measure prior to waist circumference measure.

SAGITTAL DIAMETER

☐ **Not Completed** **Reason:** _____

Measurement 1 _____ _____ . _____ cm

Measurement 2 _____ _____ . _____ cm

Difference between M1 and M2 _____ _____ . _____ cm

** If M1 and M2 differ by > 1.0 cm, do M3 and M4.*

Measurement 3 _____ _____ . _____ cm

Measurement 4 _____ _____ . _____ cm

WAIST CIRCUMFERENCE

☐ **Not Completed** **Reason:** _____

Measurement 1 ___ ___ ___ . ___ cm

Measurement 2 ___ ___ ___ . ___ cm

Difference between M1 and M2 ___ ___ ___ . ___ cm

** If M1 and M2 differ by more than 1.0 cm, repeat measurements.*

Measurement 3 ___ ___ ___ . ___ cm

Measurement 4 ___ ___ ___ . ___ cm

HIP CIRCUMFERENCE

☐ Not Completed Reason: _____

Measurement 1 ___ ___ ___ . ___ cm

Measurement 2 ___ ___ ___ . ___ cm

Difference between M1 and M2 ___ ___ ___ . ___ cm

** If M1 and M2 differ by > 1.0 cm, do M3 and M4.*

Measurement 3 ___ ___ ___ . ___ cm

Measurement 4 ___ ___ ___ . ___ cm

Armband

☐ Not Given Reason: _____

Armband #_____

Note: If participant has electrical devices in her body, she cannot wear the armband.

Magee Researchers should complete this form and remove it after the participant's Magee visit. The completed form should then be placed into the participant's Bellefield appointment folder.

Date Given: ____/____/_____ (MM DD YYYY) Date Returned: ____/____/_____ (MM DD YYYY)

Handedness: ☐Right ☐Left

Smoker: ☐Yes ☐No

Note: These are the only (2) items that the researcher needs to ask the participant.

Cuff Size: ___ ___ ___ . ___ cm Medium: 21.6cm – 41.9cm Large: 41.9cm – 62.2cm

Cuff Given: ☐Medium ☐Large

Date of Birth: ____/____/_____ (MM DD YYYY)

Height:_____ ft _____ in

Weight: ___ ___ ___. ___ kg

After the participant's DXA appointment, please hand this form to the Data Manager.

APPENDIX D

DEMOGRAPHICS QUESTIONNAIRE

ID #:

1. **Which of the following categories comes closest to the type of place where you presently live? (The city of Pittsburgh would be categorized as a large city.)**

   - ❑ In open country but not on a farm
   - ❑ On a farm
   - ❑ In a small city or town (under 50,000 residents)
   - ❑ In a medium-size city (50,000 – 250,000 residents)
   - ❑ In a suburb near a large city
   - ❑ In a large city (> 250,000 residents)

2. **Which of the following describes your primary residence?**

   - ❑ Own house/condo/townhouse
   - ❑ Rent house/condo/townhouse
   - ❑ Rent apartment
   - ❑ Other (specify): _____

3. **How many people, including yourself, live at your primary residence on a permanent basis?**

   A. Number of adults (age 18 or older) ____
   B. Number of children (under age 18) ____ Please list ages _____

4. **Which of the following best describes your current employment status?**

   - ❑ Working full-time for pay
   - ❑ Working part-time for pay
   - ❑ Unemployed and looking for work
   - ❑ Keeping house exclusively, not looking for work
   - ❑ Retired or disabled
   - ❑ Not looking for work, for other reasons
   - ❑ Working full and part-time for pay
   - ❑ Working multiple part-time jobs for pay

5. **Approximately how many hours per week do you work for pay?**

   - ❑ Do not currently work for pay
   - ❑ 1-10 hours/week
   - ❑ 11-20 hours/week
   - ❑ 21-30 hours/week
   - ❑ 31-40 hours/week
   - ❑ 41-60 hours/week
   - ❑ 61 hours or more a week

ID #:

6. **What kind of work did/do you normally do? Please list your occupation or job title.**

_____

7. **Which of the following categories represents your total household income from all sources?**

- ❑ Less than $15,000
- ❑ $15,000 - $24,999
- ❑ $25,000 - $39,999
- ❑ $40,000 - $59,999
- ❑ $60,000 - $74,999
- ❑ $75,000 or more

8. **Including income from all sources, how much of the total household income do you provide?**

- ❑ None
- ❑ Less than half
- ❑ About half
- ❑ More than half
- ❑ All

9. **How would you describe your household income?**

- ❑ Not enough to meet basic needs
- ❑ Enough to meet basic needs
- ❑ More than enough to meet basic needs

10. **What is the highest grade or year of school you have completed?**

- ❑ Less than 12 years
- ❑ High school diploma or GED
- ❑ Some college. 2-year degree or diploma, technical school
- ❑ Bachelor's degree
- ❑ Graduate or professional degree

ID #:

11. Which of these categories best describes your race? Please mark only one.

- ❑ Black
- ❑ Native American
- ❑ Asian or Pacific Islander
- ❑ White
- ❑ Other (specify): _____

12. Are you of Hispanic or Latino origin or descent?

- ❑ Yes
- ❑ No

13. What is your date of birth (MM/DD/YYYY)? ___ ___ / ___ ___ / ___ ___ ___ ___

14. How do you define your sexual identity?

- ❑ Only heterosexual
- ❑ Mostly heterosexual
- ❑ Bisexual
- ❑ Mostly lesbian/gay/homosexual
- ❑ Only lesbian/gay/homosexual
- ❑ Other (specify): _____

15. What is your current relationship status?

- ❑ In a committed relationship for _____years _____ months
- ❑ Not in a committed relationship
- ❑ Other (specify): _____

APPENDIX E

SUBSTANCE ABUSE QUESTIONNAIRE

ID#:

1. Do you currently smoke cigarettes?

1 ❑ Yes

0 ❑ No

2. Have you smoked at least 100 cigarettes in your entire life?
(Note: 100 cigarettes is equal to 5 packs)

1 ❑ Yes 0 ❑ No [***Go to Question 3***]

A. How old were you when you first started smoking cigarettes fairly regularly?

_____ years of age

B. Before quitting, how long did you smoke?

_____ years _____ months

C. How long has it been since you have smoked?

1 ❑ 0-3 months
2 ❑ 4-6 months
3 ❑ 7-11 months
4 ❑ 1-2 years
5 ❑ 3-5 years
6 ❑ more than 5 years

D. Which method(s) did you use when you quit smoking?

1 ❑ A stop-smoking program
2 ❑ Nicotine patch, gum or lozenge
3 ❑ Gradually cut down and then stopped
4 ❑ Stopped cold turkey
5 ❑ Medication (e.g., Zyban)
6 ❑ Other (specify): _____

[***Go to Question 3***]

A. How many cigarettes do you smoke a day?

_____ Number of cigarettes per day
OR
_____ Number of cigarettes per month if not a daily smoker

B. How old were you when you first started smoking cigarettes fairly regularly?

_____ years of age

C. How long have you smoked?

_____ years _____ months

ID#:

3. Do you currently smoke cigars?

1 ❑ Yes 0 ❑ No *[Go to Question 4]*

A. in the last 30 days, how often did you smoke cigars?

1 ❑ Everyday
2 ❑ Several times per week
3 ❑ Once per week
4 ❑ Less than once per week
-8 ❑ Don't know/Not sure

4. Does your partner/spouse smoke cigarettes?

1 ❑ Yes 0 ❑ No 2 ❑ Do not have a partner/spouse

5. Does anyone regularly smoke cigarettes inside your home?

1 ❑ Yes 0 ❑ No *[Go to Question 6]*

A. On average, how many hours per week are you *exposed to* cigarette, cigar, or pipe smoke *in your home* because of smoking by others? *(WRITE 0 IF LESS THAN 1 HOUR/WEEK)*

___ hours/week

6. Do you now work in a space where people smoke cigarettes on a regular basis?

1 ❑ Yes 0 ❑ No *[Go to Question 7]*

A. On average, how many hours per week are you *exposed to* cigarette, cigar, or pipe smoke *in a small space other than your home*, such as friends or relatives homes, office, or car, because of smoking by others? *(WRITE 0 IF LESS THAN 1 HOUR PER WEEK)*

___ hours/week

ID#:

7. Was there ever a time when you drank any alcoholic beverages?

1 ☐ Yes

0 ☐ No

A. So, you have never had more than a drink or two in your whole life?

0 ☐ Correct, never drank [***Continue with Question 15***]
1 ☐ Not correct, did drink [***Continue with Question 7B***]

B. How long have you been drinking OR did you drink alcoholic beverages?

_____ years _____ months

8. Did you drink <u>any</u> alcoholic beverages in the <u>last 12 months</u>?

1 ☐ Yes

0 ☐ No

A. If you did not drink alcohol in the past 12 months, how long has it been since you drank any alcoholic beverage?

_____ years _____ months

B. People have many reasons for not drinking alcoholic beverages. Which of the following reasons apply to you? Check all that apply.

1 ☐ Religious reasons
2 ☐ Fitness or weight control
3 ☐ Pregnancy
4 ☐ Other health reasons
5 ☐ No social occasion when drinking occurred
6 ☐ Concerned about drinking too much
7 ☐ Recovered or recovering alcoholic for _____ years _____ months
8 ☐ Other reasons (specify): _____

CONTINUE WITH QUESTION 15

9. Thinking back over the <u>last 12 months</u>, about how regularly did you drink alcoholic beverages?

0 ☐ Never in those 12 months
1 ☐ 1 to 3 times in 12 months
2 ☐ 4 to 7 times in 12 months
3 ☐ 8 to 11 times in 12 months
4 ☐ 1 to 3 times a month
5 ☐ Once or twice a week
6 ☐ 3 to 4 times a week
7 ☐ 5 times a week or more

ID#:

10. Again, as you think back over the last 12 months, about how many drinks would you have on a typical day when you drank? Please write a number in the space below. A standard drink is 4-5 ounces of wine, a 12 ounce bottle of beer, or one ounce (shot) of liquor or distilled spirits.

_____ number of drinks

11. During the last 12 months, how often did you have 6 or more drinks of wine, beer, or liquor in a single day?

0 ❑ Never in those 12 months
1 ❑ 1 to 3 times in 12 months
2 ❑ 4 to 7 times in 12 months
3 ❑ 8 to 11 times in 12 months
4 ❑ 1 to 3 times a month
5 ❑ Once or twice a week
6 ❑ 3 to 4 times a week
7 ❑ 5 times a week or more

12. How many drinks does it take to make you high? _____ number of drinks

13. During the last 12 months, have you found that you have to drink more to get the same effect?

1 ❑ Yes 0 ❑ No

14. About how often in the last 12 months, did you drink enough to feel drunk - - that is, where drinking noticeably affected your thinking, talking, or behavior?

0 ❑ Never in those 12 months
1 ❑ 1 to 3 times in 12 months
2 ❑ 4 to 7 times in 12 months
3 ❑ 8 to 11 times in 12 months
4 ❑ 1 to 3 times a month
5 ❑ Once or twice a week
6 ❑ 3 to 4 times a week
7 ❑ 5 times a week or more

15. Thinking back over the last 12 months, about how often did your partner/spouse drink alcoholic beverages?

0 ❑ Never in those 12 months
1 ❑ 1 to 3 times in 12 months
2 ❑ 4 to 7 times in 12 months
3 ❑ 8 to 11 times in 12 months
4 ❑ 1 to 3 times a month
5 ❑ Once or twice a week
6 ❑ 3 to 4 times a week
7 ❑ 5 times a week or more
-8 ❑ Do not have a partner/spouse

ID#:

16. In the last 12 months, how often were you in places where other people were drinking, even if you were not drinking, such as clubs, bars, restaurants, parties, or at home?

0 ❑ Never in those 12 months
1 ❑ 1 to 3 times in 12 months
2 ❑ 4 to 7 times in 12 months
3 ❑ 8 to 11 times in 12 months
4 ❑ 1 to 3 times a month
5 ❑ Once or twice a week
6 ❑ 3 to 4 times a week
7 ❑ 5 times a week or more

17. Thinking back over the last 30 days, about how regularly did you drink alcoholic beverages such as wine, beer, or liquor?

0 ❑ Did not drink any alcoholic beverages in past month
1 ❑ Once in the last month
2 ❑ 2 or 3 times in the last month
3 ❑ 1 or 2 days a week
4 ❑ 3 or 4 days a week
5 ❑ 5 or 6 days a week
6 ❑ Every day
7 ❑ More often than once a day

18. Again, as you think back over the last 30 days, about how many drinks would you have on a typical day when you drank? Please write a number in the space below.

_____ number of drinks

19. How regularly are alcoholic beverages kept around your house?

0 ❑ Never
1 ❑ Rarely
2 ❑ Sometimes
3 ❑ Usually

APPENDIX F

PHYSICAL ACTIVITY INTERVIEW

GENERAL PHYSICAL ACTIVITY ASSESSMENT

We are interested in two types of physical activity: vigorous and moderate. Vigorous activities cause large increases in breathing or heart rate while moderate activities cause small increases in breathing or heart rate.

1. *Now, thinking about the moderate physical activities you do in a usual week, do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increases in breathing or heart rate?*

❑ Yes ❑ No

A. How many days per week do you do these moderate activities for at least 10 minutes at a time?

_____ days per week

B. On days that you do moderate activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?

_____ hours and _____ minutes per day

2. *Now thinking about the vigorous physical activities you do in a usual week, do you do vigorous activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?*

❑ Yes ❑ No

A. How many days per week do you do these vigorous activities for at least 10 minutes at a time?

_____ days per week

B. On days that you do vigorous activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?

_____ hours and _____ minutes per day

ID #:

USUAL HOUSEHOLD PHYSICAL ACTIVITY

3. *How much time (minutes/hours) do you spend doing each of the following during a* ***typical week****?* Please use a "0" to indicate no minutes or hours.

	Minutes	Hours
A. Shopping (e.g., grocery, clothes, etc)		
B. Laundry (time loading, unloading, hanging, folding, carrying)		
C. Light housework (tidying, dusting, sweeping, collecting trash in home, polishing, indoor gardening, ironing)		
D. Heavy housework (vacuuming, mopping, scrubbing floors and walls, moving furniture, boxes or garbage cans)		
E. Food preparation (10 or more minutes in duration): (chopping, stirring, moving about to get food items, etc)		
F. Food service (10 or more minutes in duration): setting table, carrying food, serving food		
G. Dish washing (10 or more minutes in duration): clearing table, washing/drying dishes, putting dishes away)		
H. Light home repair (small appliance repair, light home maintenance/repair)		
I. Heavy home repair (painting, carpentry, washing/polishing car)		
J. Child care (active playing, lifting, carrying, pushing stroller)		
K. Caretaking of older or disabled person (lifting, pushing wheelchair)		
L. Pet Care (walking*, bathing, grooming) *Do not include walking for exercise		
M. Light yard work or gardening (planting, weeding, digging, hoeing)		
N. Lawn mowing (walking only)		
O. Heavy yard work (clearing walks/driveways, sweeping, snow shoveling, raking)		

ID #:

PAST YEAR LEISURE-TIME PHYSICAL ACTIVITY

Now we are going to ask you think about any leisure-time sports or recreational activities you participate in. I want you to think back to _____ (month/year). Make sure you include all individual and team recreational activities or sports that you participated in during the last year from _____ (month/year) through _____ (month/year). Please look at this list and tell me which activities you have participated in at least 10 times in the past year.

*1*___	Aerobics	*10*___	Golf	*19*___	Running	*28*___	Tai Chi
*2*___	Basketball	*11*___	Hiking	*20*___	Skating (Ice)	*29*___	Tennis
*3*___	Bicycling (Mountain)	*12*___	Horseback Riding	*21*___	Skating (Roller/Blading)	*30*___	Volleyball
*4*___	Bicycling (Stationary)	*13*___	Kayaking	*22*___	Skiing (Cross Country)	*31*___	Walking for Exercise*
*5*___	Bicycling (Street)*	*14*___	Kick Boxing	*23*___	Skiing (Downhill)	*32*___	Water Aerobics
*6*___	Bowling	*15*___	Pilates	*24*___	Skiing (Water)	*33*___	Weight Training
*7*___	Canoeing	*16*___	Racquetball/Squash	*25*___	Soccer	*34*___	Yoga
*8*___	Cardio-machines	*17*___	Rock Climbing	*26*___	Softball		
*9*___	Dance Class	*18*___	Rowing	*27*___	Swimming Laps		

Others: (*Are there any other activities that you did at least 10 times in the past year that were not included in the list I just read?*)
1. _____ 2. _____. 3. _____ 4. _____ 5. _____

***(a)** Beginning with _____(month/year) tell me which months of the past year you participated in _____. **(b)** Approximately how many days per week did you participate in this activity? **(c)** On average, how many minutes per day did you participate in this activity?* **[Repeat for each activity.]**

		(a)												(b)	(c)
Activity	**# of Months**	**Past Year Activity**												**Average # Days/Week**	**Average # Minutes/Day**
		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**		

*** Note: Walking and/or biking to and from work should not be included in this section.**

ID #:

PAST YEAR OCCUPATIONAL PHYSICAL ACTIVITY

The purpose of this next section is to obtain an estimate of the non-leisure physical activities that you have performed over the past year, from __ _____ _____, (month/year) to _____ _____, (month/year).

1. Were you employed for all 12 months of the past year? ***(YES, complete Section 1; NO, go to question 2)***

2. Did you have a job for longer than one month (4 weeks) over the past year? ***(YES, complete Sections 1 & 2; NO, complete Section 2 below)***

SECTION 1

List all jobs that you held for more than one month (4 weeks) over the past year. [If more than 4, please list the 4 longest jobs.]	*How many months out of the past year did you work at this job?*	*Did you walk or bike to and from this job each day?* [If YES, how many total minutes did it take you for a round trip? If NO, enter 0.]	*During a typical week at this job, what was your AVERAGE job schedule?* **Job Schedule**		*Of the total number of "hours/day" that you worked at this job, how much of this time was usually spent sitting?*	*During the time that you were not sitting, what types of activities were you doing?* [Determine which **one** of the 3 categories below (A, B, C) **best** describes the job activities that participant would do when they were not sitting?]
Job Title	**Months**	**Minutes Bike/Walk**	**Days/Week**	**Hours/Day**	**Hours Sitting**	**Category**
1.						
2.						
3.						
4.						

SECTION 2

For the _____ months that you were not employed (whether a homemaker, unemployed, a student, retired, etc), *during a typical 8-hour day at home (weekday), how many of those 8 hours would you usually spend sitting?* ____

During the time that you were not sitting or doing any type of recreational activities or sports, what types of activities were you doing? [Determine which **one** of the 3 activity categories (A, B, C) [show list] **best** describes what the participant was doing when they were not sitting?] _____

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