HEALTH-RELATED CHARACTERISTICS AMONG LESBIAN AND HETEROSEXUAL WOMEN ENROLLED IN THE ESTHER (EPIDEMIOLOGIC STUDY OF HEALTH RISKS) PROJECT

by

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This dissertation took steps towards filling major research gaps in lesbian health in the form of three manuscripts evaluating epidemiologic evidence for health disparities. Although the health disparities explored were not closely related, each was based upon analysis of data collected as part of the ESTHER (**E**pidemiologic **ST**udy of **HE**alth **R**isk in Women) Project, a large cross-sectional study examining risk factors for coronary heart disease (CHD) among lesbian and heterosexual women living in the Pittsburgh, Pennsylvania area. Data were collected between 2003 and 2006, and these analyses were completed in 2009. The first manuscript examined differences in complementary and alternative medicine (CAM) use between lesbian and heterosexual women. Lesbians were more likely to have used CAM in their lifetime and within the past 12 months when compared to heterosexual women. Among women who had used CAM within the past 12 months, the types of CAM reported did not vary by sexual orientation. The second manuscript investigated the association between lesbian sexual orientation, sexual abuse history, and adulthood obesity. Lesbian sexual orientation and a history of childhood sexual abuse (CSA) perpetrated by a family member were each independently associated with current adulthood obesity. The third manuscript explored potential differences in the prevalence and associated factors of polycystic ovary syndrome (PCOS) by sexual orientation. A small sample size limited the power of the analysis to confirm statistical difference in PCOS prevalence or

associated factors; however, meaningful trends were observed. If the observed trends are reflective of the larger population, lesbians may exhibit differences in PCOS determinate factors, have higher rates of PCOS, and may be more likely to be diagnosed with PCOS compared to heterosexual women. The public health significance of this dissertation was to explore potential health-related differences that may exist between heterosexual and lesbian women in the areas of CAM, obesity, and PCOS research. Findings contributed to the literature on health disparities and provided further support for a greater focus on lesbian health, including public health training, education, screenings, and interventions to better serve the lesbian population.

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PREFACE

I would like to extend my greatest thanks and appreciation to all those individuals in academia and my personal life who supported me while I earned my Ph.D. in epidemiology. I first want to thank the principal investigators of the ESTHER (**E**pidemiologic **ST**udy of **HE**alth **R**isk in Women) Project who provided me with guidance and the opportunity to work on a large coronary heart disease (CHD) research project: Dr. Nina Markovic (academic advisor and committee chair), Dr. Michelle Danielson, and the late Dr. Deborah Aaron. They each had mentioned that the ESTHER Project began as a discussion over drinks, outlined on a napkin. Their collaboration, persistence, and belief in improving lesbian health turned their idea into a nationally funded research project that made my education in public health and this dissertation possible. I am sad that Dr. Deborah Aaron will not be able to witness the contributions that the ESTHER Project will make to women's health, her presence is greatly missed. I would also like to acknowledge the ESTHER research team: Melissa Brusoski, Susie Barnes, Jane Cole, Karen Delfine, Denise Edmonds, Falvia Laun, Sonita Pittrell, and Reality Price. They were dedicated research professionals and a pleasure with whom to work. I would also like to express my gratitude to my committee members, Dr. Michelle Danielson, Dr. Nina Markovic, Dr. Alicia Matthews, Dr. Evelyn Talbott, and Dr. Ada Youk, for sharing their knowledge and research expertise. Their direction has helped shape my knowledge of conducting, analyzing, and publishing epidemiological work. I would also like to thank Brinda Kalro, MD who was the

1.0   INTRODUCTION

Numerous reports by prestigious institutions including the National Institute of Mental Health (NIMH), Centers for Disease Control and Prevention (CDC), American Public Health Association (APHA) and the Institute of Medicine (IOM) have concluded that the state of healthcare knowledge concerning gays, lesbians, and bisexuals (GLB) is insufficient.[1] Although there is a growing body of published literature addressing lesbian women's health status, large gaps in the literature exist. Studies to establish how and why health and disease risk factors; disease prevalence rates; and prevention, intervention, and treatment needs may differ by sexual orientation are necessary to improve the health and well-being of sexual minority groups. Such studies would better inform healthcare providers and guide effective public health programs, improving the health of lesbian women.

By focusing on potential health disparities that may exist between lesbian and heterosexual women, this dissertation seeks to contribute to the literature and document the health status of lesbian women. Three epidemiologic manuscripts are presented, each based on data collected as part of the ESTHER (**E**pidemiologic **ST**udy of **HE**alth **R**isk in Women) Project. The first manuscript describes potential differences in complementary and alternative medicine (CAM) use between lesbian and heterosexual women.   The second manuscript examines the relationship between sexual orientation, lifetime sexual abuse, and current

adulthood obesity. The final manuscript explores the prevalence and associated factors of polycystic ovary syndrome (PCOS) by sexual orientation group.

Before the three manuscripts will be presented, a background with an introduction on lesbian health barriers, lesbian health research, and the ESTHER Project will be discussed.

1.1   LESBIAN HEALTH BARRIERS

Like other minority populations, lesbians are part of a socially stigmatized group where inequalities and health barriers are clearly present and may influence overall health and wellbeing.[1] [2]   Some health-related concerns include economic barriers, no or inadequate insurance coverage, lack of lesbian partner recognition,[3] and lack of lesbian-specific health promotion interventions.[2]   Many lesbians do not have the same health-related benefits or privileges as heterosexuals. Lesbians are less likely to be insured than heterosexual women, partly because health insurance coverage cannot be obtained through partners; and lesbian partners can be denied hospital visitation rights and the ability to make medical decisions for ill partners.[3] [4] Lesbian households are likely to have lower average incomes than heterosexual partnered households, [5] [6] reflective of a lower pay scale for women in general.[7] Many traditional healthcare programs do not incorporate the specific health needs of lesbian populations, potentially because of the invisibility, thus lack of recognition, of this population.[8]   These barriers result in fewer health opportunities for lesbians, and may help explain why published findings indicate that lesbians are less likely to use preventative health services compared to heterosexual women.[9-14]

Not all lesbians assume that healthcare settings are safe and that they will be treated with equality. Research findings indicate that lesbians have had negative interactions within the healthcare system. Nearly 27% of gays and lesbians have reported perceived discrimination in a healthcare setting because of their sexual orientation.[15] Some lesbians have reported fears about coming "out" to physicians,[16] which may have been confirmed by lesbians who sensed they were treated differently after disclosing their sexual orientation to a primary care physician.   It is difficult to determine the rate at which perceived discrimination based on sexual orientation can be proven; however, some published data supports these reports.   In 1982 approximately 22.9% of physicians who completed the Heterosexual Attitudes Towards Homosexuality (HATH) Scale demonstrated scores that reflected homophobia.[17]   A follow-up study conducted nearly two decades later found that although this rate had decreased, some physicians still presented homophobic attitudes towards patients (rate unreported).[18]

Even when homophobia is not an issue, many physicians assume that patients are heterosexual and live heterosexual lives [19]; however, with 2% to 6% of women in the United States reportedly engaging in sexual activity with other women, healthcare professionals are giving care to lesbians whether they know it are not. [3]   Prior studies report that many lesbians feel that their healthcare has been hindered by this heterosexual assumption.[10]   Many physicians are supportive of lesbians; however, they cannot give women lesbian-specific health advice if patients do not reveal their sexual orientation. Some lesbians are not aware of how a lesbian sexual orientation can influence an individual's general health.   Perhaps reflective of the current state of knowledge regarding lesbian health, some may think that homosexuality does not influence health any differently than what heterosexuality influences health. Therefore since they do not feel their sexuality is a pressing health issue, they do not present their sexual

orientation to their primary healthcare providers. These barriers are obstacles that must be overcome in order to improve health education and the overall health of lesbians.

1.2   LESBIAN HEALTH RESEARCH

Next a brief discussion on lesbian health research history, barriers to research, research findings, and future research directions will be shared.

1.2.1   History of Lesbian Research

Interest in lesbian health disparities and health across the lifespan began to emerge in the mid 1980s; prior to this, much lesbian research reflected attempts to explain why women became homosexual and explorations of psychological and social functioning.   In 1985 the first national lesbian health study was conducted, examining a broad range of lesbian health issues. Since then lesbian health research has been expanding, notably increasing after a round-table discussion in 1994 that provided a lesbian health agenda and research priorities to the United States Department of Health and Human Services.[20]

1.2.2   Barriers to Lesbian Health Research

Like many other types of research focus areas, lesbian health research is influenced by political pressures, community attitudes, and funding availability. Researchers, regardless of sexual orientation or gender, may hesitate to conduct lesbian health research because of the potential

negative impact that working with this socially stigmatized group could have on their careers. There are few institutions that financially support lesbian health research. Other valid fears include potential lack of funding, and/or mentors with knowledge or who are willing to work with lesbian populations.[1]

Lesbian health research faces methodological barriers that make it difficult to conduct large scale studies. Lesbian health research is often criticized for its lack of comparison groups, non-probability sampling methods, and lack of standard measurements of sexual orientation.[21] Sexual minority groups of women are often difficult to recruit; and are considered to be a "hidden population" as they are as heterogeneous as heterosexual women, reflecting a broad diversity as defined by socio-economic status, race/ethnicity, and other demographic factors. Because lesbian studies are often drawn from convenience samples, they do not represent the broad diversity of *all* lesbians. The majority of published lesbian studies represent women who are: Caucasian, between the ages of 25 and 40, middle class, and well educated. Thus, future research needs to capture potential health differences among lesbians of different age groups, racial/ethnic minority groups, socioeconomic classes, and geographic locations.[21]

A significant barrier to generating comparative samples is related to the operationalization of "lesbian". This term is defined inconsistently across studies. Many studies have used one or a combination of definitions covering same-sex attraction, sexual behavior, or self identification; however, these also have multiple ways of being defined, and therefore, are not mutually exclusive or perfectly correlated.

1.2.3 Discoveries of Lesbian Health Research

Studies show that compared to heterosexual women, lesbians consistently report higher rates of the following health-related risk factors: body mass index,[13 14 22-24] cigarette smoking, [4 13 14 22-24] and alcohol consumption.[4 12 13 22 25]   Despite being heavier, lesbians are more likely to report vigorous activity.[13 14 22 24 26 27] Findings from studies focused on mental health disorders, such as depression and anxiety, have produced mixed results; however, it is recognized that social stigmatization, homophobia, and gay-related violence[28] may foster development of certain conditions such as depression and anxiety.[29] A recent meta-analysis found that lesbians and bisexual women had a higher lifetime and 12 month prevalence of depression and anxiety disorders, and risk of alcohol and drug dependence compared to heterosexual women.[30] Certain health-related characteristics differ by sexual orientation, specifically lesbians are less likely to give birth to children and use oral contraceptives, and have more barriers to healthcare than heterosexual women.[2] Furthermore, lesbians are more likely to report perceived discrimination in a medical establishment,[15] not attend regular health screenings, [31] and not use programs available to the general public.[9-14] Although cohort studies have not been reported, the higher rates of the health risk factors and behaviors noted above may elevate lesbians' risk for developing diseases like diabetes, heart disease, and/or some cancers (ovarian and breast) which implicates a need for interventions to be targeted towards different sexual minority groups of women.

1.2.4   Future Directions of Lesbian Health Research

In 1999 the Institute of Medicine (IOM) released an assessment report on the current state and future directions of lesbian health. Three noted research priorities for future research among lesbians were to: (1) "better understand the physical and mental health status of lesbians and to determine whether there are health problems for which lesbians are at higher risk as well as conditions for which protective factors operate to reduce their health risk"; (2) "understand how to define sexual orientation in general and lesbian sexual orientation in particular and to better understand the diversity of the lesbian population" and (3) "to identify possible barriers to access to mental and physical health care services for lesbians and ways to increase their access to these services."[1]   In the *Healthy People 2010 Companion Document for Lesbian, Gay, Bisexual, and Transgender (LGBT) Health* future lesbian health research directions were also addressed, [2] many of which are similar to IOM recommendations, such as better sexual orientation screening tools and a broader representation of lesbian subpopulations. Detailed recommendations were provided specifically for: data and information systems; services; education and training; policy changes for on specific lesbian health concerns; and diseases such as obesity, violence, and cancer. Another noted goal was to conduct longitudinal studies.[2]   To date the majority of published studies concerning lesbians have been cross-sectional, which produce descriptive reports, lacking the data required to assess causality. Longitudinal cohort studies are necessary to better examine the impact of how sexual orientation influences health across a lifespan.

2.0   THE ESTHER PROJECT

Figure 1. *The ESTHER Project's Logo*

The ESTHER Project began as a cross-sectional survey collecting general health information on sexual minority women living in the Pittsburgh, Pennsylvania area.   Data collected through self-administered anonymous surveys allowed investigators to document potential differences and health trends between lesbian and heterosexual women. Their findings provided supportive data for a more comprehensive cross-sectional study examining risk factors for coronary heart disease (CHD) funded by the National Heart, Lung and Blood Institute (NHLBI).

2.1   CROSS-SECTIONAL ESTHER SURVEY

The intent of the ESTHER Project pilot study was to describe the general health status of sexual minority women living in the Pittsburgh, Pennsylvania area.   A total of 1,158 women completed

anonymous surveys between February and September in 1998. The survey collected information including but not limited to: socio-demographic information, current nutrition and body size, mental health factors, and diagnosis of specific health conditions. Approximately 97.7% of the sample self identified as homosexual/gay/lesbian. Results from this study indicated that lesbian women demonstrated higher rates of specific health risk factors compared to heterosexual women including overweight, cigarette use, alcohol consumption, and heavy alcohol consumption compared to a representative sample of heterosexual women.[13]

2.2   CROSS-SECTIONAL ESTHER CLINICAL EXAMINATION STUDY

Data from the ESTHER survey supported the need for a more intensive clinical investigation of potential differences in the prevalence and risk factors for CHD. The specific aims of this study were to: (1) determine if the prevalence of CHD risk factors differed by sexual orientation, and (2) assess potential overall patterns and clustering of risk factors, comparing lesbian and heterosexual women. A diverse sample of 1084 women were recruited and consented into the study between 2003 and 2006; approximately half (N=503) were lesbian women. Participants qualified for the ESTHER Project if they were heterosexual or lesbian, at least 35 years old, and had no previous history of heart disease (angina, heart attack, and stroke). Sexual orientation was based on a combination of features including same-sex attraction, sexual behavior, and self-identification. Participants were scheduled for two clinic visits at University of Pittsburgh-related facilities. The first clinic visit consisted of: (1) a series of standardized questionnaires; (2) a two week medicine history review; (3) a physical activity interview; (4) clinical and anthropometric measurements including blood pressure, waist and hip circumference, height,

weight, and bioelectrical impedance assessment of body composition, and (4) fasting venipuncture for analyses of lipid profiles, glucose, insulin, and measures of inflammation. Participants returned for a second clinical visit, having completed a 3-day food diary, 3-day pedometer assignment, nutrition questionnaire, and take home questionnaires. The second clinic visit provided a Dual Energy X-ray Absorptiometry (DXA) scan of the hip, spine, and whole body to measure bone mineral density and body composition.

For individuals interested in learning more about lesbian health and how health patterns and disparities differ by sexual orientation, this dataset has great potential for unlocking many unanswered research questions. The ESTHER Project investigators, research staff, and participants made this dissertation and the future work resulting from this study possible.

3.0   PAPER ONE: SEXUAL ORIENTATION AND USE OF COMPLEMENTARY AND ALTERNATIVE MEDICINE (CAM): WOMEN ENROLLED IN THE ESTHER PROJECT

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3.1   ABSTRACT

Objectives: The prevalence of complementary and alternative medicine (CAM) use in the United States has steadily increased since the 1990's to the current rate. Very little information exists on how CAM use may differ based on sexual orientation. Aims of this study were to determine the prevalence of CAM use in a community sample of women, identify the most common types of CAM use in the past 12 months, and to identify correlates of CAM use. Further aims were to determine whether and how CAM use may differ based on sexual orientation. Study hypotheses were that the prevalence of CAM use would differ by sexual

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orientation such that lesbians would be more likely to use CAM compared to heterosexual women.

Methods: Analyses were based on a large community based sample of healthy adult women (Total N=879, N=479 lesbians) women enrolled in the **E**pidemiologic **ST**udy of **HE**alth **R**isk in Women (ESTHER) Project, a cross-sectional study that examined risk factors for heart disease conducted between 2003-3006 in Pittsburgh, PA.   Chi squared and Fisher's exact tests, and univariate and multiple logistic regression analyses were implemented for analytical purposes.

Results: Among ESTHER participants the prevalence of ever used CAM was 49.8% and used CAM within the past 12 months was 42.4%. When compared to heterosexual women, lesbians were more likely to have ever used CAM (Adjusted Odds Ratio (AOR) = 1.68 [95% Confidence Interval [CI]: 1.23, 2.28]) and to have used CAM in the past 12 months (AOR = 1.44 [CI: 1.06, 1.97]). Significant correlates of ever used CAM and used CAM within the past 12 months were similar: a lesbian sexual orientation, being Caucasian, having a higher education level, reporting perceived discrimination in a medical establishment, living in a large city, having higher ratings of spirituality, and having a history of a diagnosed mental health disorder. Having a healthcare provider that provides usual care was also significantly related to CAM use in the past 12 months. Among women who used CAM within the past 12 months, the types of CAM used did not differ based on sexual orientation except that heterosexual women were significantly more likely to have participated in yoga than lesbian women.

Conclusions: Sexual orientation is an important factor associated with understanding lifetime and past 12 month CAM use. Because of the high prevalence of CAM use found in this study and knowing that some CAM therapies interfere with conventional medicine, medical

practitioners should be encouraged to inquire about the CAM practices of their female patients, particularly lesbians.

3.2   INTRODUCTION

Complementary and alternative medicine (CAM) refers to a variety of health practices considered outside the traditional domain of conventional western medicine.[32] Since the 1990s rates of CAM use among Americans have increased steadily to the present estimated rate of 38%. [32-34] In 1997 it was estimated that the total cost of CAM therapies in the United States ranged between $36-$46 billion.[35] The extant research suggests that CAM use is associated with individual attempts to improve general health[35] or to treat specific health conditions such as back pain[36] or migraines.[37] Research also indicates that CAM is often used among people with more life-threatening illnesses such as cancer [38] [39] and the Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS).[40] [41]

Types of CAM use defined by the National Center for Complementary and Alternative Medicine (NCCAM) include but are not limited to the following: whole medical systems (homeopathy, naturaopathy, traditional Chinese medicine, and Ayurveda); mind-body medicine (meditation, prayer, mental healing, and creative therapies using art, music, or dance as outlets); biologically based practices (herbs, herbal products, foods, and vitamins); manipulative and body-based practices (chiropracty, osteopathy, and massage); energy medicine (biofield therapies and bioelectromagnetic–based therapies).[32]

Rates of participation in CAM therapies and the factors influencing decisions to initiate CAM use vary based on demographic variables. For example, current statistics suggest that

women between the ages of 30 and 64 years are the primary consumers of CAM.[42] In 1999 US women spent approximately $600 million on CAM therapies to relieve menopausal symptoms alone.[43] Motivation to use CAM therapies has also been found to differ by race and ethnicity. A study by Chao et al. found that when women were asked what influenced their decision to use CAM, non-Hispanic Caucasian women noted personal beliefs, Mexican-American women cited the high cost of conventional medicine, and African American women reported something they read or heard on the radio or television.[44]

Sexual orientation is another demographic factor that may influence overall prevalence rates and motivation for engagement in CAM use. London et al. examined the use of an alternative therapist in the past 6 months among gay, lesbian, and heterosexual individuals with HIV/AIDS. Combining the sexual orientation groups, researchers found that gay and lesbian patients were more likely to use CAM therapists than heterosexual patients (Adjusted Odds Ratio [AOR] = 1.95; 95% Confidence Interval [CI] = 1.25, 3.05).[41] Another study by Matthews and her colleagues examined the relationship between lesbian sexual orientation and CAM use among a community sample of women. They found that lesbians were significantly more likely to have ever used CAM therapies compared to their heterosexual counterparts (p=.039). Other predictors of lifetime CAM use included less health-related worry (p=.019) and perceived discrimination in a healthcare setting (p=.014).[42] In a study examining health histories and activities, lesbian women had higher mean scores on alternative dietary practices and the use of meditation/relaxation techniques when compared to heterosexual women; however these factors were not specifically defined as CAM use.[45]

Numerous factors may contribute to higher levels of CAM use among lesbians. For example, lesbians may face unique barriers to accessing culturally competent and appropriate

healthcare services that may increase the likelihood of engagement in CAM therapies including lower rates of health insurance coverage,[46] lower average income levels, and higher rates of actual or perceived discrimination in health care settings.[42 47] Lesbians are also believed to have a higher prevalence of health-related conditions that have been associated with increased CAM use such as depression and anxiety.[30] Furthermore, because lesbians often go through a "coming out" process they have already gone outside the "conventional box" in a sense. This experience may make them more open-minded about using unconventional medicine or therapies than heterosexual women.

Preliminary data suggests that sexual orientation may play a role in the level of engagement in and the factors influencing CAM use among women. However, additional research is needed to confirm these earlier results and to address limitations of previous studies examining the relationship between CAM use and sexual orientation including small sample sizes, definitions of lesbian sexual orientation, and definitions of CAM. The specific aim of the current study was to estimate the prevalence and correlates of CAM use among a large community-based sample of women enrolled in a women's health research project (The ESTHER Project). Differences in lifetime and past year CAM use and specific CAM modalities were assessed. In addition, correlates of CAM use were examined by sexual orientation. Based on the available literature, it was hypothesized that lesbians would be more likely to use CAM than heterosexual women and that the predictors of CAM use would differ by sexual orientation.

3.3 METHODS

3.3.1 Study Design and Data Collection

The sample population for this analysis was selected from 1084 participants (N=503 lesbians) enrolled in the ESTHER (**E**pidemiologic **S**tudy of **HE**alth **R**isk in Women) Project at the University of Pittsburgh between 2003 and 2006. The purpose of the ESTHER Project was to conduct a cross-sectional study that examined differences in risk factors for heart disease among women in the Pittsburgh, Pennsylvania area. Participants in the ESTHER Project were recruited using a variety of methods shown to increase recruitment of hard-to-reach populations: news and radio advertisements; health events; lesbian, gay, bisexual and transgender (LGBT) events and socials; and The University of Pittsburgh broadcast phone-message system. Trained research staff conducted recruitment/screening calls and scheduled those who met eligibility criteria for two clinic visits as part of study participation. The first visit was conducted at Magee Women's hospital where a series of questionnaires, a physical activity interview, a two week medicine history interview, and blood draws were completed. The second visit included a review of a completed 3-day food diary and a Dual Energy X-ray Absorptiometry (DXA) scan of the hip, spine, and whole body. Participants were paid $50 for their time and participation. All information used in this analysis was obtained from the recruitment call forms and questionnaires completed at the first clinic visit.

3.3.2 Study Population

Participants were eligible to participate in the ESTHER Project if they were age 35 or older, identified as a lesbian or heterosexual woman, and had no previous history of heart disease (angina, heart attack, and stroke). All instruments and the study protocol were approved by the Institutional Review Board at the University of Pittsburgh. A signed written consent form was obtained from each participant.

To solve the issue of disproportionate numbers of older heterosexuals compared to older lesbians only individuals who were <65 years of age were included in the present analysis. African American heterosexuals were randomly selected in the same proportion as African American lesbians recruited into the study because of disproportionately low accrual rates of African American lesbians. A total of 879 women were selected for analysis: 38 African American lesbians, 441 Caucasian lesbians, 32 African American heterosexuals, and 368 Caucasian heterosexuals. Because of missing values the sample size for ever used CAM was N=878 and CAM use within the past 12 months was N=877.

3.3.3 Measures

Dependent Variables

History of CAM Use: History of CAM was examined in three ways. The question, "*Have you ever sought help from any type of alternative health services, such as traditional healing, acupuncture, massage, or herbal therapies? EXCLUDE CLERGY AND CHIROPRACTORS*" was used to determine if participants had ever used CAM. The question, "*Have you ever sought help from any type of alternative health services in the last 12 months?*" was used to determine if

CAM was used in the previous year. If a participant answered yes to this question she was asked to select the types of CAM used in the past 12 months: acupuncture, aromatherapy, biofeedback, herbal medicine, homeopathy, hypnosis, massage, meditation, reiki, relaxation techniques, therapeutic touch, yoga, and other.

Independent Variables

All independent variables for analysis were selected based on previous research and included demographic, health-related, and psychosocial variables.[35 38 41 42 48-51]

Demographics: Sexual orientation, age, and race were obtained from screening/recruitment forms. Other demographic factors including years of education, total household income, health insurance coverage, and primary residence (large city, not large city) were taken from the questionnaires completed at the first clinic visit.

Sexual Orientation: Heterosexuals were defined as those who self-identified as heterosexual or straight *and* only had male sexual partners since the age of 18. Lesbians were defined as those who did not identify as heterosexual or straight; *and* only had emotional, physical, and romantic attractions within the past 5 years towards only or primarily women; *or* whose relationships within the past 5 years had been with only or primarily women.

Discrimination in a Medical Establishment: Three discrimination items based on race, gender, and sexual orientation examined perceived discrimination in a medical establishment. A fourth variable was created that combined these into an "ever discriminated" variable. Although each factor was examined separately, the new combined variable was used in the regression analysis.

Spirituality: Spirituality was measured with a scaled item ranging from 1 to 5 (1 - not spiritual at all to 5 - very spiritual) that asked the question, *"To what extent do you consider yourself to be*

a spiritual person?" For analytical purposes, spirituality was categorized as follows: not at all or somewhat spiritual (1-3), spiritual (4), and very spiritual (5).

Self-Rated Health Status: Self-rated health status was determined from the question, *"In general, how would you characterize your health?"* For the purposes of our analysis these responses were categorized into three options: excellent (excellent, very good), good (good), and poor (fair, poor, and very poor).

Routine Checkups: Participants' healthcare behaviors were examined by using the following two measures: (1) *Ábout how long has it been since you last visited a doctor for a routine checkup?"* (Within the past 12 months; greater than one year to less than two years ago; and greater than or equal to 2 years ago, or don't know) and (2) *"Do you have a clinic, doctor, nurse, or physician's assistant who provides your usual health care?"* (Yes/No).

Health-Related Conditions and Illnesses: The ESTHER Project created a list of diseases and conditions that were thought or known to be related to cardiovascular disease (CVD) or suspected to differ between lesbian and heterosexual women. Participants were asked if they were ever given diagnoses by a healthcare provider of any of the listed conditions. This list was used to examine if certain types of diseases or illnesses were associated with CAM use. For purposes of analysis these illnesses were categorized into several groups: heart-related conditions (high blood pressure, high cholesterol, high triglycerides, obesity, diabetes, angina, heart attack, heart disease, stroke); cancer (breast cancer, lung cancer, ovarian cancer, cervical cancer, other cancer (specified); autoimmune disorders (over- or underactive thyroid, arthritis, osteoporosis/osteopenia, and autoimmune disease [e.g., lupus, rheumatoid arthritis]); respiratory illnesses (asthma, emphysema or chronic bronchitis); and mental health diagnoses (eating disorder [anorexia, bulimia], depression, anxiety). Stomach ulcers could not be placed in any of

the categories so it was examined alone. In addition to this list, participants were also asked if a healthcare provider had ever diagnosed them with HIV/AIDS. Since HIV/AIDS has been associated with CAM use in other studies [40][41][52] we also investigated HIV/AIDS in our analysis. For CAM use within the past 12 months depression was also assessed by using the 10-item Center for Epidemiologic Studies Depression Scale (CES-D 10). A score >10 suggests a clinically significant level of psychological distress.[53][54]

3.3.4 Statistical Analysis

Categorical variables were analyzed using Chi squared and Fisher's exact tests and univariate analyses for comparison of proportions and statistical significance. Variables included in regression models had p-values <0.25 in the univariate analyses. Tests of collinearity were performed and variables that had a variance inflation factor (VIF) of greater than 10 were removed. Backwards logistic regression models were used to examine the association between sexual orientation and CAM use adjusting for potential confounders. Statistical significance for multiple logistic regression models was defined as p <0.05. No significant and relevant interactions were found. The Hosmer-Lemeshow statistic was used to evaluate the overall model fit. All statistical analyses were performed using the SAS system for Windows, version 9.2 (SAS Institute, Cary, North Carolina).

3.4 RESULTS

The sample was 92.0% (N=809) Caucasian and 8.0% (N=70) African American. Overall participants were highly educated with 65.3% of the sample having a bachelor's degree or higher. Approximately half the sample were identified as lesbian (54.5%, N=479). Age, being African American, and household income did not significantly differ by sexual orientation. The mean age of heterosexual women was 47.8 years and for lesbians was 47.4 years. Approximately 49.8% (N=437, 274 Lesbian) of the ESTHER participants reported they had used CAM services in their lifetime and about 42.4% (N=372, 227 lesbian) reported CAM use in the past 12 months.

3.4.1 Univariate Analyses

Lesbians were significantly more likely to have ever used CAM (57.3% vs. 40.8%; p <0.0001) and to have used CAM in the past 12 months (47.6% vs. 36.3%; p<0.001) when compared to heterosexual women (Tables 1 & 2). Additional demographic variables significantly associated with ever having used CAM included: older age, Caucasian race, higher education, and residence in a large city. Other factors significantly associated with having ever used CAM included: perceived discrimination in a medical establishment, having a provider of usual healthcare, and endorsement of higher levels of spirituality. Significant self-reported medical conditions associated with ever used CAM were mental health related disorders, respiratory disorders, and stomach ulcers. Autoimmune disorders approached significance (p=0.057) for a lifetime history of CAM use. Having a history of cancer, HIV/AIDS, or hearth related conditions was not associated with lifetime CAM use.

Univariate results for CAM use within the past 12 months were very similar to ever having used CAM except that age and having been diagnosed with a respiratory disorder were not significantly associated with CAM use. Autoimmune disorders (p=0.079) also approached significance for history of past year CAM use. Of the women who reported CAM use within the past 12 months (N=372) there was little difference in the types of CAM used among heterosexual and lesbian women (Table 3). The only significant difference in CAM modality used was higher rates of yoga (p=0.002) among heterosexual women compared to lesbians. Relaxation techniques (p=0.063) and aromatherapy (p=0.053) approached significance with heterosexual women using these modalities slightly more than lesbians. The most common CAM modalities used by women were massage (71.4%), yoga (31.9%), meditation (25.4%), and herbal medicines (24.1%).

3.4.2 Multivariate Analyses

Multivariate logistic regression analysis concluded that sexual orientation (AOR = 1.68, 95% CI [1.23, 2.28]) was an independent predictor of having ever used CAM after adjusting for potential covariates (Table 4). Other significant covariates associated with ever having used CAM included Caucasian race, more years of education, perceived experience of discrimination in a medical establishment, residence in a large city, being very spiritual, and having a history of a diagnosed mental health disorder. Age was not a significant predictor of ever having used CAM. No meaningful interactions were found. The Hosmer-Lemeshow Goodness of Fit Test showed the main effects model is a good fit for the data (p=0.517).

Logistic regression analysis for CAM use within the past 12 months produced similar results. Lesbians were more likely to have used CAM in the past 12 months (AOR = 1.44, 95%

CI [1.06, 1.97] when compared to heterosexual women. Factors significantly associated with CAM use in the past 12 months were similar to ever used CAM except for education. Although education level was significant in both, some college was not considered to be significantly different from having a high school degree or less. No meaningful interactions were found. The Hosmer-Lemeshow Goodness of Fit Test showed the main effects model is a good fit for the data (p=0.88).

3.5   DISCUSSION

This analysis investigated CAM use among heterosexual and lesbian women in the Pittsburgh, PA area. History of CAM use was measured by individual self-reports of having ever used CAM and having used CAM in the past 12 months. Of those who used CAM in the past 12 months specific CAM modalities used were examined. The overall prevalence of ever used CAM was 49.8% and used CAM in the past 12 months was 42.4%, which fall within the range reported by other studies.[34 35 48 55 56] After adjusting for other covariates, sexual orientation was found to be an independent predictor of CAM use ever and within the past 12 months. This complements research published by Matthews et al. who found that a lesbian sexual orientation was a predictor of CAM use.[42] Our results resembled the outcome of other studies in that CAM use was associated with: Caucasian women[51 57 58]; increasing years of education[35 51 59]; and perceived experience of discrimination in a medical establishment.[42] Being very spiritual was associated with CAM use (ever/past 12 months) in our study. This was similar to other studies

that found CAM use to be associated with religiosity,[60] prayer for health-related reasons,[35 49 61] or spirituality.[49]

Our results diverge from some published studies in several ways. Age as a predictor of CAM use has revealed mixed results.[51] Our results did not find age to be a significant predictor of CAM use after adjusting for other covariates. This could be due to the limited age range (35 to 65) in the ESTHER Project which overlaps with the average age range of CAM users.[42] Although people who reside in large cities have an equal[62] or higher rate of CAM use[35] it has not been proven to be a significant predictor of CAM use. This analysis found that those who lived in large cities were more likely to use CAM (ever and past 12 months) than those who did not live in large cities. Results also showed that those who had a provider of usual healthcare, compared to those who did not, were more likely to use CAM within the past 12 months. When the history of health conditions was considered, having a mental health disorder was found to be associated with CAM use (ever and within the past 12 months). This concurs with other studies that examined this relationship. [63 64] Significant (unadjusted) associations with having a history of autoimmune and respiratory disorders were found, however these were not considered to be significant after adjusting for other covariates. Unlike many studies, our analysis did not find associations between having been diagnosed with cancer or HIV/AIDS and CAM use (ever and past 12 months). This may be due to the small number of individuals in our study who had been diagnosed with cancer (n=62) or HIV/AIDS (n=11).

3.6   LIMITATIONS

It is difficult to compare CAM studies because there has been no standard set of CAM modalities used in research, and even when studies have similar lists of CAM options they are often grouped differently for analytical purposes. Our results should be taken with caution when compared` to other studies. The present analysis did not include chiropractic services or religious prayer in the definition of CAM, which both typically increase the prevalence of CAM use. CAM studies also vary in the following ways: the timeline selected to examine CAM use [34] [42] [48]; whether CAM is defined by self-prescribed use[34] [48] or by a CAM practitioner[40]; whether participants use CAM in conjunction with or in place of conventional medicine[34] [48]; and if the subject population is from a general[34] [48] or clinical population.[40] [62]

This study has a few limitations. Lesbians in our analysis represent women who were comfortable revealing their sexual orientation and romantic/sexual relationships. Therefore study results represent "out" lesbians. Also, it should be assumed that lesbian couples were in the present study. This may represent a sample bias because lesbian couples may have more similar responses to each other compared to the rest of the sample.   In addition, our results primarily describe CAM use among older Caucasian women. Although the study included African American women, they only accounted for 8.0% of the total sample and no other minority groups were represented. Lastly, because the data were taken from a cross-sectional study, we can only describe associations and cannot predict why women decide to use CAM. A longitudinal study describing CAM use over time would be more appropriate to answer this question.

3.7   CONCLUSIONS

The results of this study indicate that lesbians are more likely to have ever used CAM and to have used CAM in the past 12 months when compared to heterosexual women. Therefore sexual orientation may play a role in understanding why some women choose to use CAM. Since it is known that some CAM modalities may interfere with the effectiveness or may even have adverse health effects when used with conventional medicine, it is important for healthcare practitioners to inquire about CAM use when treating health conditions, particularly among lesbians. Future studies are needed to determine how lesbians use CAM differently than heterosexual women, their reasons for use across time, and how their use of CAM impacts their health. Two suggestions would be to more thoroughly examine how specific lesbian health barriers affect CAM use and to determine if lesbians use CAM more often in conjunction with or in place of conventional medicine than their heterosexual counterparts.

3.8   PAPER 1 TABLES

Table 1. Demographic and Health Characteristics and Unadjusted Odds Ratios of Lifetime History of Complementary and Alternative Medicine Use Among Lesbian and Heterosexual Women Enrolled in the ESTHER Project, Pittsburgh, PA, 2003-2006

VARIABLE	EVER USED (N=878)			
	NO (N, %)	YES (N, %)	OR (95% CI)*	*P*
Sexual Orientation (N=878)				**<0.0001**
Heterosexual	237 (59.3)	163 (40.8)	Baseline	
Lesbian	204 (42.7)	274 (57.3)	**1.95 (1.49, 2.56)**	
Age (N=878)				**0.034**
35-39	69 (54.8)	57 (45.2)	Baseline	
40-44	118 (57.8)	86 (42.2)	0.88 (0.56, 1.38)	
45-49	103 (47.8)	113 (52.3)	1.33 (0.86, 2.06)	
50-54	66 (42.3)	90 (57.7)	**1.65 (1.03, 2.65)**	
55-65	85 (48.3)	91 (51.7)	1.30 (0.82, 2.05)	
Race (N=878)				**<0.0001**
Caucasian	389 (48.1)	419 (51.9)	Baseline	
African American	52 (74.3)	18 (25.7)	**0.32 (0.19, 0.56)**	
Education (N=878)				**<0.0001**
HS or Less	73 (78.5)	20 (21.5)	Baseline	
Some College	124 (58.5)	88 (41.5)	**2.59 (1.47, 4.56)**	
Bachelors	100 (46.1)	117 (53.9)	**4.27 (2.43,7.49)**	
Graduate	144 (40.5)	212 (59.6)	**5.37 (3.14,9.20)**	
Household Income (N=862)				0.110
< $25K	67 (54.0)	57 (46.0)	Baseline	
$25K -39K	71 (48.6)	75 (51.4)	1.24 (0.77, 2.01)	
$40-59K	105 (55.0)	86 (45.0)	0.96 (0.61, 1.52)	
$60K-75K	44 (39.6)	67 (60.4)	**1.79 (1.07, 3.01)**	
> $75K	143 (49.3)	147 (50.7)	1.21 (0.79, 1.84)	
Self-Reported Health Status (N=878)				0.944
Excellent	245 (50.3)	242 (49.7)	Baseline	
Good	150 (49.7)	152 (50.3)	1.03 (0.77, 1.37)	
Poor	46 (51.7)	43 (48.3)	0.95 (0.60, 1.49)	

Table 1. Continued

VARIABLE	EVER USED (N=878)			
	NO (N, %)	YES (N, %)	OR (95% CI)*	*P*
Last Routine Doctor's Visit (N= 878)				0.464
≤ 1 Year Ago	332 (51.5)	313 (48.5)	Baseline	
>1 to 2 Years Ago	62 (46.3)	72 (53.7)	1.23 (0.85, 1.79)	
> 2 Years or Don't Know	47 (47.5)	52 (52.5)	1.17 (0.77, 1.79)	
Have Provider of Usual Care? (N=877)				**0.001**
No	99 (61.9)	61 (38.1)	Baseline	
Yes	341 (47.6)	376 (52.4)	**1.79 (1.26, 2.54)**	
Perceived Discriminated in a Healthcare Establishment (N=878)				**<0.0001**
No	405 (53.6)	350 (46.4)	Baseline	
Yes	36 (29.3)	87 (70.7)	**2.80 (1.85, 4.23)**	
Health Insurance Coverage (N=876)				0.656
Uninsured	36 (52.9)	32 (47.1)	Baseline	
Insured	405 (50.1)	403 (49.9)	1.12 (0.68, 1.84)	
Residence (N=878)				**<0.0001**
Large City	297 (41.7)	201 (58.3)	Baseline	
Not Large City	144 (55.7)	236 (44.3)	**0.57 (0.43, 0.75)**	
Spirituality (N=823)				**<0.001**
Somewhat or Not at all	176 (54.3)	148 (45.7)	Baseline	
Spiritual	154 (52.0)	142 (48.0)	1.10 (0.80, 1.50)	
Very Spiritual	76 (37.4)	127 (62.6)	**1.99 (1.39, 2.84)**	
Diagnosed with:				
Heart Related Condition (N=875)				0.240
No	240 (52.2)	220 (47.8)	Baseline	
Yes	200 (48.2)	215 (51.8)	1.17 (0.90, 1.53)	
Cancer (N=863)				0.829
No	339 (49.8)	402 (50.2)	Baseline	
Yes	30 (48.4)	32 (51.6)	1.06 (0.63, 1.78)	
Autoimmune Disorder (N=876)				0.057
No	278 (52.9)	248 (47.2)	Baseline	
Yes	162 (46.3)	188 (53.7)	1.30 (0.99, 1.71)	
Respiratory Disorder (N=875)				**0.017**
No	373 (52.0)	345 (48.1)	Baseline	
Yes	65 (41.4)	92 (58.6)	**1.53 (1.08, 2.17)**	

Table 1. Continued

VARIABLE	EVER USED (N=878)			
	NO (N, %)	YES (N, %)	OR (95% CI)*	P
Mental Health Related Condition (N=876)				**<0.0001**
No	270 (57.5)	220 (42.6)	Baseline	
Yes	170 (41.9)	236 (58.1)	1.87 (1.43, 2.45)	
HIVAIDS (N=876)				0.381
No	434 (50.2)	431 (49.8)	Baseline	
Yes	7 (63.6)	4 (36.4)	0.58 (0.17, 1.98)	
Ulcers (N=875)				**0.016**
No	421 (51.1)	403 (48.9)	Baseline	
Yes	17 (33.3)	34 (66.7)	**2.09 (1.15, 3.80)**	

*CI (Confidence Interval); OR (Odds Ratio)

Table 2. Demographic and Health Characteristics and Unadjusted Odds Ratios of Complementary and Alternative Medicine Use in the Past 12 Months Among Lesbian and Heterosexual Women Enrolled in the ESTHER Project, Pittsburgh, PA, 2003-2006

VARIABLE	CAM USE IN PAST 12 MONTHS (N=877)			
	NO (N, %)	YES (N, %)	OR (95% CI)	P
Sexual Orientation (N=877)				**<0.001**
Heterosexual	255 (63.8)	145 (36.3)	Baseline	
Lesbian	250 (52.4)	227 (47.6)	**1.60 (1.22, 2.10)**	
Age (N=877)				0.479
35-39	76 (60.3)	50 (39.7)	Baseline	
40-44	123 (60.6)	80 (39.4)	0.99 (0.63, 1.56)	
45-49	127 (58.8)	89 (41.2)	1.07 (0.68, 1.67)	
50-54	87 (55.77)	69 (44.2)	1.21 (0.75, 1.94)	
55-65	92 (52.3)	84 (47.7)	1.38 (0.87, 2.21)	
Race (N=877)				**<0.0001**
Caucasian	444 (55.0)	363 (45.0)	Baseline	
African American	61 (87.1)	9 (12.9)	**0.18 (0.09, 0.37)**	
Education (N=877)				**<0.0001**
HS or Less	77 (82.8)	16 (17.2)	Baseline	
Some College	145 (68.4)	67 (31.6)	**2.22 (1.21, 4.10)**	
Bachelors	115 (53.0)	102 (47.0)	**4.27 (2.34, 7.78)**	
Graduate	168 (47.3)	187 (52.7)	**5.36 (3.01, 9.54)**	
Household Income (N=861)				0.313
< $25K	76 (61.3)	48 (38.7)	Baseline	
$25K -39K	78 (53.4)	68 (46.6)	1.38 (0.85, 2.24)	
$40-59K	116 (60.7)	75 (39.3)	1.02 (0.64, 1.63)	
$60K-75K	56 (50.5)	55 (49.6)	1.56 (0.93, 2.61)	
> $75K	167 (57.8)	122 (42.2)	1.16 (0.75, 1.78)	

Table 2. Continued

VARIABLE	CAM USE IN PAST 12 MONTHS (N=877)			
	NO (N, %)	YES (N, %)	OR (95% CI)	*P*
Self-Reported Health Status (N=877)				0.720
Excellent	274 (56.4)	212 (43.6)	Baseline	
Good	178 (58.9)	124 (41.1)	0.90 (0.67, 1.21)	
Poor	53 (59.6)	36 (40.5)	0.88 (0.55, 1.39)	
Last Routine Doctor's Visit (N= 877)				0.423
< 1 Year Ago	367 (57.0)	277 (43.0)	Baseline	
>1 to 2 Years Ago	75 (56.0)	59 (44.0)	1.04 (0.72, 1.52)	
> 2 Years or Don't Know	63 (63.6)	36 (36.4)	0.76 (0.49, 1.17)	
Have Provider of Usual Care? (N=876)				**<0.001**
No	112 (22.2)	47 (29.6)	Baseline	
Yes	392 (54.7)	325 (45.3)	**1.98 (1.36, 2.86)**	
Perceived Discriminated in a Healthcare Establishment (N=877)				**0.003**
No	450 (59.6)	305 (40.4)	Baseline	
Yes	55 (45.1)	67 (54.9)	**1.80 (1.22, 2.64)**	
Health Insurance Coverage (N=875)				0.338
Uninsured	43 (63.2)	25 (36.8)	Baseline	
Insured	462 (57.3)	345 (42.8)	1.28 (0.77, 2.14)	
Residence (N=877)				**<0.0001**
Large City	169 (49.1)	175 (50.9)	Baseline	
Not Large City	336 (63.0)	197 (37.0)	**0.57 (0.43, 0.75)**	
Spirituality (N=823)				**<0.0001**
Somewhat or Not at all	207 (63.9)	117 (36.1)	Baseline	
Spiritual	172 (58.1)	124 (41.9)	1.28 (0.92, 1.76)	
Very Spiritual	86 (42.4)	117 (57.6)	**2.41 (1.68, 3.45)**	
Currently Depressed (N=874)				0.522
No	406 (57.8)	297 (42.3)	Baseline	
Yes	33 (62.3)	20 (37.7)	0.83 (1.05, 3.28)	
Diagnosed with:				
Heart Related Condition (N=874)				0.204
No	274 (59.6)	186 (40.4)	Baseline	
Yes	229 (55.3)	185 (44.7)	1.19 (0.91, 1.56)	
Cancer (N=862)				0.525
No	459 (57.4)	341 (42.6)	Baseline	
Yes	33 (53.2)	29 (46.8)	1.18 (0.71, 1.99)	

Table 2. Continued

VARIABLE	CAM USE IN PAST 12 MONTHS (N=877)			
	NO (N, %)	YES (N, %)	OR (95% CI)	*P*
Autoimmune Disorder (N=875)				0.079
No	315 (60.0)	210 (40.0)	Baseline	
Yes	189 (54.0)	161 (46.0)	1.28 (0.97, 1.68)	
Respiratory Disorder (N=874)				0.572
No	415 (57.9)	302 (42.1)	Baseline	
Yes	87 (55.4)	70 (44.6)	1.11 (0.78, 1.57)	
Mental Health Related Condition (N=875)				**<0.001**
No	297 (63.2)	173 (36.8)	Baseline	
Yes	207 (51.1)	198 (48.9)	**1.64 (1.25, 2.15)**	
HIVAIDS (N=875)				0.320
No	497 (57.5)	367 (41.9)	Baseline	
Yes	8 (72.7)	3 (27.3)	0.51 (0.13, 1.93)	
Ulcers (N=875)				**0.034**
No	481 (58.4)	342 (41.6)	Baseline	
Yes	22 (43.1)	29 (56.9)	**1.85 (1.05, 3.28)**	

*CI (Confidence Interval); OR (Odds Ratio)

Table 3. Comparison of Complementary and Alternative Medicine (CAM) Modality Rates Among Lesbian and Heterosexual Women Who Used CAM in the Past 12 Months, ESTHER Project, Pittsburgh, PA, 2003-2006

Alternative Service	Total (N=372) N (%)	Lesbian (N=227) N (%)	Heterosexual (N=145) N (%)	*P*
Acupuncture	27 (7.3)	20 (8.8)	7 (4.9)	0.159
Aromatherapy	31 (8.4)	14 (6.2)	17 (11.9)	0.053
Biofeedback	4 (1.1)	4 (1.8)	0 (0)	0.162
Herbal Medicines	89 (24.1)	55 (24.2)	34 (23.8)	0.921
Homeopathy	0 (0)	0	0	NA
Hypnosis	13 (3.5)	9 (4.0)	4 (2.8)	0.553
Massage	264 (71.4)	168 (74.0)	96 (67.1)	0.154
Meditate	94 (25.4)	56 (24.2)	39 (27.3)	0.513
Reiki	45 (12.2)	31 (13.7)	14 (9.8)	0.268
Relaxation	75 (20.3)	39 (17.2)	36 (25.2)	0.063
Healing Touch	25 (6.8)	18 (7.9)	7 (4.9)	0.258
Yoga	118 (31.9)	59 (26.0)	59 (41.3)	**0.002**
Other	63 (17.0)	36 (15.9)	27 (18.9)	0.451

Table 4. Adjusted Odds Ratios of Lifetime History and Past 12 Month Complementary and Alternative Medicine Use Among Lesbian and Heterosexual Women, ESTHER Project, Pittsburgh, PA, 2003-2006

VARIABLE	EVER USED		USED PAST 12 MONTHS	
	AOR (95% CI)*	*P*	AOR (95% CI)	*P*
Age		0.062		0.557
35-39	Baseline		Baseline	
40-44	0.92 (0.55, 1.52)		1.16 (0.69, 1.93)	
45-49	1.67 (1.01, 2.77)		1.28 (0.77, 2.13)	
50-54	1.38 (0.81, 2.37)		1.03 (0.60, 1.78)	
55-65	1.41 (0.83, 2.38)		1.47 (0.87, 2.48)	
Sexual Orientation		0.001		0.021
Heterosexual	Baseline		Baseline	
Lesbian	1.68 (1.23, 2.28)		1.44 (1.06, 1.97)	
Race	Baseline	<0.001	Baseline	<0.0001
Caucasian	0.31 (0.16, 0.59)		0.17 (0.08, 0.38)	
African American				
Education **HS or Less**	Baseline	<0.0001	Baseline	<0.0001
Some College	2.21 (1.22, 4.39)		1.71 (0.88, 3.33)	
Bachelors	3.77 (2.00, 7.13)		3.16 (1.63, 6.11)	
Graduate	4.16 (2.26, 7.64)		3.54 (1.89, 6.64)	
Perceived Discriminated in a Healthcare Establishment		<0.001		0.036
No	Baseline		Baseline	
Yes	2.48 (1.53, 4.03)		1.63 (1.03, 2.57)	
Residence **Large City**	Baseline	0.004	Baseline	0.002
Not Large City	0.63 (0.46, 0.86)		0.62 (0.45, 0.84)	
Spirituality		<0.001		<0.0001
Somewhat or Not at all	Baseline		Baseline	
Spiritual	1.03 (0.73, 1.45)		1.21 (0.86, 1.72)	
Very Spiritual	2.27 (1.50, 3.44)		2.74 (1.83, 4.10)	
Have Provider of Usual Care? **No**	_____	_____	Baseline	0.005
Yes			1.81 (1.89, 2.76)	
Mental Health Related Condition **No**	Baseline	0.013	Baseline	0.043
Yes	1.48 (1.09, 2.02)		1.48 (1.09, 2.02)	

* CI (Confidence Interval); AOR (Adjusted Odds Ratio)
CAM use ever adjusted for: **Age, race, sexual orientation,   reported discrimination in a healthcare establishment, residence, spirituality, and previous mental health diagnosis**
Past 12 Month CAM adjusted for: **Age, race, sexual orientation, reported discrimination in a healthcare establishment, residence, spirituality, have provider of usual care, and previous mental health diagnosis**

4.0 PAPER TWO: OBESITY, SEXUAL ABUSE, AND SEXUAL ORIENTATION: WOMEN ENROLLED IN THE ESTHER PROJECT

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4.1 ABSTRACT

Objectives: Prior studies indicate that women who have experienced childhood sexual abuse (CSA) are at greater risk for obesity. Published research shows that lesbians have higher rates of both self-reported sexual abuse (SA) and adult overweight/obesity when compared to heterosexual women; however, this association has not been fully explored. Our aim was to investigate the association between SA history and current adulthood obesity among women who participated in the ESTHER (**E**pidemiologic **ST**udy of **HE**alth **R**isk in Women) Project. The ESTHER Project (2003-2006) included 1084 women who were 35 years of age and older, half self-identified as lesbian (n=504). **Methods:** Three self-reported sexual abuse measures were

used. CSA was assessed by asking respondents whether they were sexually abused by a family member or non-family member prior to age 18. Adult sexual abuse (ASA) asked about forced sexual activity after age 18. Obesity was defined as having a BMI $\geq$ 30 and differences between obese and non-obese women were explored. Chi squared and Fisher's exact tests, and univariate and multiple logistic regression analyses were implemented for analytical purposes.

Results: Logistic regression analysis adjusting for potential confounders revealed that having less education than a bachelors' degree, a lower household income, African American race, lesbian sexual orientation, reported CSA by a family member, and history of a mental health diagnosis were associated with current obesity in adulthood.

Conclusions: Physicians and health programs need to recognize that a lesbian sexual orientation and having a history of childhood sexual abuse perpetrated by a family member are associated with a heavy body mass.

4.2   INTRODUCTION

Adulthood obesity rates in the United States increased from 13% to 32% between the 1960s and 2004[65] and accounted for approximately 9.1% ($78.5 billion) of medical expenditures in 1998.[66] Obesity, the leading cause of preventable death, is associated with health conditions such as hypertension, cardiovascular disease, diabetes mellitus, and some cancers.[67] [68] The etiology of obesity is complex and multidimensional involving genetic, environmental, and individual factors, which make obesity prevention, treatment, and weight maintenance programs complex. A better understanding of the risk factors leading to obesity is greatly needed. Over the past decade scientists have been trying to better understand the psychosocial components that

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contribute to obesity, and have found that obese individuals are more likely to have a history of depression, anxiety, suicidal thoughts and ideation, and disordered eating.[69] Mounting research has been published examining the relationship between sexual abuse (SA) and obesity among adult women.[69-73] The majority of findings concur that a small, positively correlated association between childhood sexual abuse (CSA) and obesity exists.[69] There is a lack of published studies that specifically examine the relationship between adult sexual abuse (ASA) and adulthood obesity.

Some researchers believe that obesity may be used by female SA survivors as an adaptive strategy to avoid sex in relationships and/or to deter potential sexual predators. They hypothesize that a higher body weight is maintained because the SA survivor does not want to be viewed as a sexual object.[69] Following this theory researchers have found that some women with SA histories have a "barrier weight" where weight is lost or gained to become less attractive and/or to have a different sized body than the one they had at the onset or time of sexual victimization. Some women with SA histories who begin to lose weight experience post-traumatic stress disorder symptoms as they approach the weight they were when they were sexually abused, which obviously can interfere with weight loss plans.[69] If the theory that obesity is used as an adaptive strategy by SA survivors is correct, obese women with SA histories may be less motivated to lose weight which could lead either to reduced weight loss attempts or unsuccessful weight loss.[69 74]

A number of research studies have found that lesbians have higher rates of obesity [14 75 76] and report higher rates of CSA [77-79] and ASA [77 80] when compared to heterosexual women. Only one published study exists that examines the association of adulthood obesity and CSA among lesbians. In a community sample of lesbians Aaron and colleagues found that CSA was

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significantly associated with body weight, with those who experienced CSA being more likely than those who did not to be obese (BMI 30.0 to 39.9) or severely obese (BMI ≥40)after adjusting for age, race/ethnicity, and education.[71]   A limitation of their study is that they did not have a heterosexual comparison group.

To our knowledge there are no published reports that directly examine the association between CSA, ASA, and current adulthood obesity in a large population of lesbian and heterosexual women. This study's primary objective was to explore demographic and mental health risk factor differences in adulthood obesity among lesbian and heterosexual women enrolled in the **E**pidemiologic **ST**udy of **HE**alth **R**isk (ESTHER) Project. Specific aims were to: (1) determine differences between sexual orientation and current adulthood obesity (2) examine potential differences between SA history and current adulthood obesity and (3) to determine correlates of current adulthood obesity adjusting for sexual orientation, SA history, and other potential covariates.

4.2.1   Study Design and Data Collection

The following analysis was based on information collected among heterosexual (N=581) and lesbian (N=503) women enrolled in the ESTHER Project at the University of Pittsburgh between 2003 and 2006. The purpose of the ESTHER Project was to conduct a cross-sectional study analyzing heart disease risk factors among women living in the Pittsburgh, Pennsylvania area. Participants were recruited through various methods known to help recruit hard-to-reach populations such as local newspaper and radio advertisements; health events; lesbian, gay, bisexual, and transgender (LGBT) events and social engagements; and The University of Pittsburgh broadcast phone-message system. Recruitment/screening calls were performed by

trained research staff who scheduled two clinic visits at the University of Pittsburgh for those who met the study eligibility criteria. At the first visit participants completed study questionnaires, physical activity and medical history interviews, and a fasting venipuncture. At the second clinic visit participants reviewed their completed food diaries with research staff and underwent a Dual Energy X-ray Absorptiometry (DXA) scan of the hip, spine, and whole body Participants were reimbursed $50 for their time and participation. All information used in this analysis was obtained from the recruitment call forms, study questionnaires, and clinical measurements. Study instruments and protocol were approved by the University of Pittsburgh's Institutional Review Board (IRB). Signed consent forms were obtained from each participant.

4.2.2 Study Population and Data Reduction

Women met eligibility criteria if they self-identified as a lesbian or heterosexual woman, were at least 35 of age, and had no previous history of heart disease (angina, heart attack, or stroke). The final sample included women who were less than age 65 to solve the problem of disproportionate numbers of older heterosexuals compared to older lesbian women. African American heterosexuals were randomly selected in the same proportion as African American lesbians recruited into the study because of disproportionately low accrual rates of African American lesbians. Data from 879 women were used for the present analysis: 38 African American lesbians, 441 Caucasian lesbians, 32 African American heterosexuals, and 368 Caucasian heterosexuals.

4.2.3 Measures

Dependent Variable

Obesity: The National Heart Lung and Blood Institute (NHLBI)-defined cutoff categories were used to measure body mass index (BMI): <18.5 (underweight), 18.5 to 24.9 (normal), 25.0 to 29.9 (overweight), 30.0 to 34.9 (mildly obese); 35.0 to 39.9 (severely obese) and ≥ 40 (morbidly obese). The World Health Organization (WHO)-defined cutoff points are identical to the NHLBI guidelines except that the three obesity categories are given different titles: Obesity Class 1, Obesity Class 2 and Obesity Class 3.[67] For the purposes of our analysis we compared women who were obese to those who were not obese and defined obesity as having a BMI ≥ 30. BMI was calculated as weight in kilograms divided by the square of height in meters [weight (kg)/height (m)2]. The height and weight measurements used to calculate BMI were taken at the first clinic visit.

Independent Variables

Demographics: Age, race, and sexual orientation were obtained from the recruitment interview. Household income, years of education, and current relationship status were obtained from the demographics questionnaire distributed at the first clinic visit.

Sexual Orientation: Sexual orientation was based on self-reported sexual orientation, sexual behavior, and romantic attraction at time of screening. Participants were classified as either being heterosexual or lesbian. Heterosexuals were defined as those who self-identified as heterosexual or straight _and_ only had male sexual partners since the age of 18. Lesbians were defined as those who did not identify as heterosexual or straight _and_ whose emotional, physical, and romantic attractions within the past 5 years have been towards only or primarily women _or_ whose relationships within the past 5 years have been towards only or primarily women.

Sexual Abuse: SA was assessed by self report through three measures in a written questionnaire. CSA was assessed by asking respondents whether they were sexually abused by a family member or non-family member prior to the age of 18 while ASA asked about forced, unwanted sexual activity after age 18. From these sexual abuse history measures a fourth SA measure was created, lifetime history of SA (SA-Ever), based on reported SA before and after age 18.

Past History of Mental Health Diagnoses: Respondents were asked if they had ever been diagnosed by a medical professional with depression, anxiety, and/or an eating disorder. For the purpose of this analysis, these factors were combined into one dichotomous variable of ever having been diagnosed with a mental health disorder.

Current CESD Depression Score: The 10-item Center for Epidemiologic Studies Depression Scale (CES-D 10) was used to assess current depression at the time of participants' first clinic visit. A score >10 suggests a clinically significant level of psychological distress.[53] [54]

4.2.4 Statistical Analysis

Categorical variables were analyzed using chi squared tests and continuous variables were examined using t-tests. The factors used in regression analysis held p-values of ≤ 0.25 in the univariate analysis. Collinearity tests were performed and those that had a VIF (Variance Inflation Factor) >10 were removed. Multivariate logistic regression models were used to determine the correlates of obesity (BMI ≥ 30). Statistical significance for multiple logistic regression models was defined as p<0.05. Statistically significant interactions were considered in the final models. The Hosmer-Lemeshow statistic was used to evaluate the overall model fit.

All statistical analyses were performed using the SAS system for Windows, version 9.2 (SAS Institute, Cary, North Carolina).

4.3   RESULTS

Overall the sample was highly educated, 65.3% (N=574) having completed a bachelors degree or higher and almost half (46.5%, N=320) had a household income of $60K or higher (Table 5). The mean age of the sample was 47.6 ($\pm$ 7.3) years. The majority of women were Caucasian (92.0%, N= 809) with only 8.0% (N=70) being African American. Approximately half the sample were lesbians (N=479, 54.5%) and the majority of women were in committed relationships (70.7%, N=621). According to NHLBI BMI standard-cutoff points, 35.2% (N=310) of women in the ESTHER Project were obese (BMI$\geq$30) at the time of their first clinic visit. Approximately 50.3% of women in our sample reported being sexually abused in their lifetime, 23.4% reported sexual abuse under the age of 18 by a family member, 23.5% reported sexual abuse under the age of 18 by a non-family member, and 34.4% reported forced, unwanted sex after the age of 18.

4.3.1   Obesity Status among ESTHER Participants

Univariate Analysis

Univariate analyses (Table 6) revealed that women who were obese (BMI $\geq$30) did not differ by age or relationship status compared to non-obese women. Obese women, however, were more likely to be lesbian (Odds Ratio (OR)=1.57 [95% Confidence Interval [CI]: 1.81, 2.08]), African

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American (OR=4.56, [2.69, 7.71]), have a lower household income (p<.0001), and have fewer years of education (P<.0001) than their non-obese counterparts. All SA variables were univariately associated with obesity: SA-Ever (1.43, [CI: 1.07, 1.92]), CSA by a family member (2.06, [1.48, 2.86]), CSA by a non-family member (1.53 [1.10, 2.13]), and ASA (1.34, (1.03, 1.87)]. Obese women were also more likely than non-obese women to be currently depressed (OR=2.32 [1.32, 4.07]) and have higher rates of ever being diagnosed with a mental illness (OR=1.63 [1.23, 2.16]).

Multivariate Analyses

A lesbian sexual orientation remained a predictor of obesity in bivariate analysis, when also adjusting for each SA measure separately; however, not all SA measures were significantly associated with obesity (Table 7). Only reported CSA by a family member (OR=1.94 [CI: 1.39, 2.71]) and reported CSA by a non-family member (OR=1.41 [CI: 1.01, 1.98]) were associated with being obese. ASA and SA-Ever, were not significantly related to obesity when also adjusting for sexual orientation.

Four multivariate logistic regression models (Tables 8 and 9) were performed to determine if sexual orientation and SA variables were associated with obesity after adjusting for demographic and mental health variables. In all models, being African American, lesbian sexual orientation, education less than a bachelors' degree, and a previous mental health diagnosis were significantly associated with obesity. Likewise, each model revealed that women having a household income greater than $75K were less likely to be currently obese. Current relationship status was not significantly associated with obesity in any model. CSA by a family member was the only significant SA predictor of obesity (Adjusted Odds Ratio (AOR)=1.56 [CI: 1.09, 2.24]). Age was not a significant predictor of obesity in any of the logistic regression models; however,

it was forced into the models because it is a known predictor of obesity. For each model, the Hosmer-Lemeshow Goodness of Fit Test showed that main effects model was a good fit for the data.

4.4   DISCUSSION

The purpose of this analysis was to investigate risk factors of obesity in a large community-based sample of lesbian and heterosexual women in the Pittsburgh, Pennsylvania area. Specific aims were to interpret differences in current adulthood obesity status by sexual orientation and SA history and to determine if sexual orientation and history of sexual abuse were associated with obesity after adjusting for specific demographic and mental health variables. Demographic and mental health factors considered for analysis included: age, race, sexual orientation, education, household income, current relationship status, history of ever having a mental health diagnosis, and history of sexual abuse.

We found that a lesbian sexual orientation was independently related to adulthood obesity after accounting for selected covariates. These results are consistent with the current literature concluding that lesbians have higher rates of obesity than heterosexual women. [13] [14] [22-24] Although all SA measures were univariately associated with obesity, bivariate analyses showed that only the two CSA measures were significantly related to obesity. CSA by a family member was strongly significant (p<0.001) while reported CSA by a non-family member was marginally significant (p=.046). After adjusting for all other demographic and mental health variables, only CSA by a family member was independently associated with obesity (p=0.015). The relationship between obesity and CSA by a non-family member was not significant. This finding

is similar to published studies which have found an association between obesity and CSA in groups of women. [69 71 73 74] This study was able to add to obesity-related lesbian health research literature by suggesting that the relationship of the perpetrator to the CSA victim could help explain the association between CSA and adulthood obesity.

The non-significant association between adulthood obesity and ASA may explain the lack of published literature on this topic. It is extremely important to clarify the (1) age sexual abuse occurred and (2) relationship of the sexual perpetrator to the SA survivor. Our results indicate that that SA-Ever may be a non-significant predictor of obesity because reported ASA minimized the association between obesity and SA-Ever in our population.

As expected, these results also resembled the outcome of other studies in that race, [65 67 81] socio-economic status (years of education and household income), [65 82] and mental health history [74] are independently associated with obesity. This analysis found that women who reported a household income of $75K or greater or had a graduate degree were less likely to be obese. African American women and women who reported a history of a mental health diagnosis were more likely to be obese than Caucasian women or women who were never given a mental health diagnosis. Studies have produced mixed results on the association between obesity and relationship/marital status.[83 84] This analysis concluded that relationship status did not predict a significant association with obesity status. Although age is a known risk factor for obesity [65] we did not find an association, which may be explained by the narrow age-range of our sample (35 to 65).

4.5   LIMITATIONS

Comparing the relationship of sexual abuse history, lesbian sexual orientation, and current adulthood obesity across studies is complex; largely because of varying definitions of sexual abuse and lesbian sexual orientation. This also applies to the present analysis. Our conclusions are limited to the general definitions of SA that were used, specifically that severity or duration of sexual victimization was not measured. In addition, it is unknown how each woman defined sexual abuse: attempted SA, verbal SA, physical SA or a combination of these acts. Despite the lack of specific details of our SA measures it can be argued that if a woman reported SA in her lifetime, no matter the severity or duration of SA, her reported SA events(s) may have some impact on her mental and physical health. Another bias, common across SA studies, is that not all women who have experienced SA may have felt comfortable reporting it which means the prevalence of SA may actually be higher in this sample. Being silent about SA is not uncommon. In a study of community sample of lesbians conducted by Roberts et al., 52.1% of those experiencing SA indicated that they had never told anyone about their SA experience.[85]

Several other important limitations should be considered when interpreting our findings. Because this is a cross-sectional study, findings only represent data collected at one point in time. Longitudinal studies are needed to further explore the association between demographic and mental health factors and obesity over time. In addition, it is important to acknowledge that lesbians represented in this analysis are "out" to some degree; results describe women comfortable with reporting their sexual orientation. Conclusions are also limited to lesbian and heterosexual women; therefore, do not represent women with questioning or bisexual sexual identities. This sample also mainly represents older adult women who are well educated, largely middle-class, and primarily Caucasian.

4.6   CONCLUSIONS

Our findings help fill the research gap in published literature that reports on the relationship of sexual orientation, history of sexual abuse, and current adulthood obesity. Importantly, we have found that sexual orientation and CSA perpetrated by a family member are both independently associated with current adulthood obesity after adjusting for other demographic and mental health factors. Other predictors of obesity using multiple logistic regression were: African American race, education less than a graduate degree, household income less than $75K, and history of a mental health diagnosis (depression, anxiety, and eating disorders).

From our analysis it is clear that a lesbian sexual orientation is independently associated with obesity; however, the effects of SA on current adulthood obesity are less understood. In univariate and bivariate analyses, many of our SA measures were significantly associated with obesity; however, this was not the case after adjusting for other covariates. Although lifetime history of SA, CSA by a non-family member, and ASA were not significantly associated with current adulthood in obesity after adjusting for other factors, an association may still exist, especially for those who may have experienced SA revictimization. These non-significant outcomes may be partly the result of our research definitions of SA. Therefore, further investigation is needed examining how obesity may be influenced by SA history among lesbian and heterosexual women.

Our study findings suggest that there is a need for physicians and weight programs to consider how a lesbian sexual orientation and/or a history of SA may impact weight gain and loss. This is especially the case for lesbians and women with a history of CSA perpetrated by a family member. Future research is needed to explore the specific needs of sexual minority women and women who have experienced SA. Furthermore, a greater understanding of the

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association between sexual orientation, sexual abuse history, and obesity is needed among subpopulations of women (younger women, racial/ethnic minorities, and lower socio-economic groups).

4.7   PAPER 2 TABLES

Table 5. Rates of Demographic and Mental Health Factors of Lesbian and Heterosexual Women Enrolled in the ESTHER Project, Pittsburgh, PA, 2003-2006

Variable	Total Population (N=879) N (%)
Age (N=879)	
34-39	126 (14.3)
40-44	204 (23.2)
45-49	216 (24.6)
50-64	156 (17.8)
55-65	177 (20.1)
Race (N=879)	
Caucasian	809 (92.0)
African American	70 (8.0)
Sexual Orientation (N=879)	
Heterosexual	400 (45.5)
Lesbian	479 (54.5)
Education (N=879)	
HS or Less	93 (10.6)
Some College	212 (24.1)
Bachelors	218 (24.8)
Graduate	356 (40.5)
Education (N=879)	
<BS	305 (34.7)
>BS	574 (65.3)
Household Income (N= 863)	
<$25	125 (14.5)
$25K-$39K	146 (16.9)
$40K-$59K	191 (22.1)
$60K-$74K	111 (12.9)
$75+	209 (33.6)

Table 5. Continued

Variable	Total Population (N=879) N (%)
In a Committed Relationship (N= 878)	
Yes	621 (70.7)
No	257 (29.3)
Previous Mental Health Diagnosis (Depression, Anxiety, Eating Disorder) (N= 876)	
No	470 (53.7)
Yes	406 (46.4)
CESD Score – Currently Depressed (N=821)	
No	704 (93.0)
Yes	53 (7.0)
SA Lifetime History of Sexual Abuse (Ever) (N=821)	
No	408 (49.7)
Yes	413 (50.3)
CSA by a Family member (N=822)	
No	630 (76.6)
Yes	192 (23.4)
CSA by a Non-Family Member (N=822)	
No	629 (76.5)
Yes	193 (23.5)
ASA (N=821)	
No	539 (65.7)
Yes	282 (34.4)
NHLBI Body Mass Index (N=879)	
Underweight (BMI <18.5)	12 (1.4)
Normal (BMI 18.5-24.9)	303 (34.5)
Overweight (BMI 25- 29.9)	254 (28.9)
Mildly Obese (BMI 30-34.9)	153 (17.4)
Severely Obese (BMI 35-40)	86 (9.8)
Morbidly Obese (BMI > 40)	71 (8.1)
Currently Obese (N=879)	
Not Obese (BMI <30)	569 (64.7)
Obese (BMI $\geq$30)	310 (35.3)
Variable (N)	**Total Mean (SD)**
Recruitment Age (N=879)	47.6 (7.3)
CESD Depression Score (N=872)	6.3 (5.0)

Table 6. Comparison and Unadjusted Odds Ratios of Demographic and Mental Health Factors by Current Adulthood Obesity Status Among Lesbian and Heterosexual Women Enrolled in the ESTHER Project, Pittsburgh, PA, 2003-2006

VARIABLE	BMI (KG/M2)			
	BMI <30 (N=569) N (%)	BMI ≥ 30.0 (N=310) N (%)	UNADJUSTED OR, (95% CI)	*P*
Age*	47.6 (7.4)	47.5 (7.3)	0.99 (0.98, 1.02)	0.840
Age				0.821
34-39	83 (65.9)	43 (34.1)	Baseline	
40-44	131 (64.2)	73 (35.8)	1.08 (0.68, 1.72)	
45-49	139 (64.4)	77 (35.7)	1.07 (0.67. 1.70)	
50-64	96 (61.5)	60 (38.5)	1.21 (0.74, 1.97)	
55-65	120 (67.8)	57 (32.2)	0.92 (0.57, 1.49)	
Race				<0.0001
Caucasian American	547 (67.6)	262 (32.4)	Baseline	
African American	22 (31.4)	48 (68.6)	4.56 (2.69, 7.71)	
Sexual Orientation				0.002
Heterosexual	281 (70.3)	119 (29.8)	Baseline	
Lesbian	288 (60.1)	191 (39.9)	1.57 (1.81, 2.08)	
Education				<0.0001
High School or Less	52 (55.9)	41 (44.1)	Baseline	
Some college	108 (50.9)	104 (49.1)	1.22 (0.75, 1.99)	
BA	150 (68.8)	68 (31.2)	0.58 (0.35, 0.95)	
Graduate	259 (72.8)	97 (27.3)	0.48 (0.30, 0.76)	
Household Income				<0.0001
<$25	65 (52.0)	60 (48.0)	Baseline	
$25K-$39K	91 (62.3)	55 (37.7)	0.66 (0.40, 1.06)	
$40K-$59K	118 (61.8)	73 (38.2)	0.67 (0.43, 1.06)	
$60K-$74K	65 (58.6)	46 (41.4)	0.77 (0.46, 1.28)	
$75+	222(76.6)	68 (23.5)	0.33 (0.21, 0.52)	
In a Committed Relationship				0.480
Yes	407 (65.5)	214 (34.5)	Baseline	
No	162 (63.0)	95 (37.0)	1.11 (0.82, 1.51)	
Previous Mental Health Diagnosis (Depression, Anxiety, Eating Disorder)				<.0.001
No	328 (69.8)	142 (30.2)	Baseline	
Yes	238 (58.6)	168 (41.4)	1.63 (1.23, 2.16)	
CESD Score – Currently Depressed				.003
No	475 (67.5)	229 (32.5)	Baseline	
Yes	25 (47.2)	28 (52.8)	2.32 (1.32, 4.07)	
Lifetime History of Sexual Abuse (Ever)				.015
No	284 (69.6)	254 (61.5)	Baseline	
Yes	124 (30.4)	157 (38.5)	1.43 (1.07, 1.92)	

Table 6. Continued

CSA by a Family member					<0.0001
	No	438 (69.5)	192 (30.5)	Baseline	
	Yes	101 (52.6)	91 (47.4)	2.06 (1.48, 2.86)	
CSA by a Non-Family					0.12
Member	**No**	427 (67.9)	202 (32.1)	Baseline	
	Yes	112 (58.0)	81 (42.0)	1.53 (1.10, 2.13)	
ASA					0.33
	No	367 (68.1)	172 (31.9)	Baseline	
	Yes	171 (60.6)	111 (39.4)	1.34 (1.03, 1.87)	

* Mean (Standard Deviation)

Table 7. Comparison and Adjusted Odds Ratios of Factors Related to Obesity by Sexual Orientation and Type of Sexual Abuse, ESTHER Project, Pittsburgh, PA, 2003-2006

VARIABLE	BMI (KG/M2)				OR (L:H)	*P*	OR (ABUSED YES:NO)	*P*
	BMI <30 (%) (N=569)		BMI >30 (%) (N=310)		OR (95% CI)		OR (95% CI)	
	H	L	H	L				
Lifetime History of Sexual Abuse (Ever)					1.45 (1.08, 1.95)	0.015	1.34 (1.00, 1.80)	0.051
No	164 (61.4)	120 (44.3)	62 (55.9)	62 (36.1)				
Yes	103 (38.6)	151 (55.7)	49 (44.1)	110 (64.0)				
CSA by a Family member					1.40 (1.04, 1.88)	0.028	1.94 (1.39, 2.71)	<0.001
No	236 (88.4)	202 (74.3)	81 (73.0)	111 (64.5)				
Yes	31 (11.6)	70 (25.7)	30 (27.0)	61 (35.5)				
CSA by a Non-Family Member					1.44 (1.07, 1.94)	0.017	1.41 (1.01, 1.98)	0.046
No	229 (85.8)	198 (72.8)	94 (84.7)	108 (62.8)				
Yes	38 (14.3)	74 (27.2)	17 (15.3)	64 (37.2)				
ASA					1.48 (1.10, 1.99)	0.010	1.32 (0.97, 1.79)	0.074
No	196 (73.4)	171 (63.1)	77 (69.4)	95 (55.3)				
Yes	71 (26.6)	100 (36.9)	34 (30.6)	77 (44.8)				

Table 8. Adjusted Odds Ratios (Models 1-3) of Factors Associated with Current Adulthood Obesity, ESTHER Project, Pittsburgh, PA, 2003-2006

	Model 1 (AOR, 95% CI)	*P*	Model 2 (AOR, 95% CI)	*P*	Model 4 (AOR, 95% CI)	*P*
Age *	0.99 (0.98, 1.02)	0.981	0.99 (0.98, 1.02)	0.941	0.99 (0.98, 1.02)	0.999
Race		<0.001		<0.001		<0.001
African American	Baseline		Baseline		Baseline	
Caucasian American	2.87 (1.59, 5.17)		3.02 (1.68, 5.43)		3.02 (1.68, 5.43)	
Sexual Orientation		0.027		0.014		0.012
Heterosexual	Baseline		Baseline		Baseline	
Lesbian	1.44 (1.04, 1.98)		1.50 (1.09, 2.07)		1.51 (1.10, 2.08)	
Education		0.006		0.003		0.003
High School or Less	Baseline		Baseline		Baseline	
Some college	1.09 (0.62, 1.91)		1.10 (0.63, 1.93)		1.09 (0.62, 1.92)	
BA	0.60 (0.33, 1.07)		0.58 (0.32, 1.03)		0.59 (0.33, 1.05)	
Graduate	0.57 (0.32, 0.99)		0.55 (0.31, 0.97)		0.55 (0.31 0.96)	
Household Income		0.007		0.012		0.009
<$25	Baseline		Baseline		Baseline	
$25K-$39K	0.80 (0.47, 1.4)		0.79 (0.46, 1.37)		0.79 (0.46, 1.37)	
$40K-$59K	0.93 (0.55, 1.57)		0.91 (0.54, 1.54)		0.91 (0.54, 1.54)	
$60K-$74K	1.11 (0.61, 2.02)		1.08 (0.59, 1.96)		1.11 (0.61, 2.02)	
$75+	0.48 (0.27, 0.84)		0.49 (0.28, 0.85)		0.49 (0.28, 0.85)	
Relationship Yes	Baseline	0.586	Baseline	0.629	Baseline	0.669
No	0.90 (0.62, 1.31)		0.91 (0.63, 1.32)		0.92 (0.64, 1.33)	
History of Mental Health Diagnosis		0.036		0.021		0.023
No	Baseline		Baseline		Baseline	
	1.41 (1.02, 1.94)		1.46 (1.06, 2.01)		1.45 (1.05, 2.00)	
Yes						
CSA by a Family member No		0.015	————	———	————	———
	Baseline					
Yes	1.56 (1.09, 2.24)					
CSA Non-Family member No	————	———	Baseline	0.612	————	———
			1.10 (0.76, 1.59)			
Yes						
ASA No	————	———	————	———	Baseline	0.517
Yes					1.11 (0.80, 1.55)	

Table 8. Continued

* Continuous variable
Model 1: Adjusted for age, race, sexual orientation, education, household income, relationship status, history of previous mental health diagnosis, and CSA by a family member and interactions
Model 2: Adjusted for age, race, sexual orientation, education, household income, relationship status, history of previous mental health diagnosis, and CSA by a non-family member
Model 3: Adjusted for age, race, sexual orientation, education, household income, relationship status, history of previous mental health diagnosis, and ASA by a family member

Table 9. Adjusted Odds Ratios (Models 4) of Factors Associated with Current Adulthood Obesity, ESTHER Project, Pittsburgh, PA, 2003-2006

	Model 4 (SA-Ever) (Adjusted OR, 95% Confidence Interval)	p-value
Age *	0.99 (.98, 1.02)	0.985
Race		<0.001
African American	Baseline	
Caucasian American	3.01 (1.67, 5.40)	
Sexual Orientation		0.015
Heterosexual	Baseline	
Lesbian	1.49 (1.08, 2.06)	
Education		0.003
High School or Less	Baseline	
Some college	1.09 (0.62, 1.92)	
BA	0.59 (0.33, 1.05)	
Graduate	0.55 (0.31, .96)	
Household Income		0.009
<$25	Baseline	
$25K-$39K	0.79 (0.46, 1.36)	
$40K-$59K	0.91 (0.54, 1.54)	
$60K-$74K	1.10 (0.60, 2.00)	
$75+	0.48 (0.28, 0.85)	
Relationship		0.660
Yes	Baseline	
No	0.92 (0.64, 1.33)	
History of Mental Health Diagnosis		0.027
No	Baseline	
Yes	1.44 (1.04, 1.98)	
Lifetime History of Sexual Abuse (N=)		0.380
No	Baseline	
Yes	1.15 (0.84, 1.59)	

* Continuous variable

Model 4: Adjusted for age, race, sexual orientation, education, household income, relationship status, history of previous mental health diagnosis, lifetime history of sexual abuse (ever)

5.0   PAPER THREE: POLYCYSTIC OVARY SYNDROME (PCOS) AND SEXUAL

ORIENTATION: WOMEN ENROLLED IN THE ESTHER PROJECT

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5.1   ABSTRACT

Objectives: Polycystic ovary syndrome (PCOS), the most common endocrine disorder occurring in 4% to 10% of reproductive-age women, is associated with adverse health outcomes such as infertility, cardiovascular disease, and Type II Diabetes.   Despite physician suspicions that lesbians may have higher rates of PCOS than heterosexual women, only two published studies with conflicting results exist.   The aim of this study was to explore polycystic ovary syndrome (PCOS) among heterosexual and lesbian women in a general, healthy population of women.

Methods: Women who participated in the ESTHER Project (**E**pidemiologic **ST**udy of **HE**alth **R**isk in Women, 2003-2006) were invited to participate in this study. Analysis was based on self-reported information collected through the ESTHER Project, a mailed questionnaire, and

blood assays. The total sample used for analysis included 117 lesbians and 100 heterosexuals who were between ages 35 and 45.

Results: Although not significant, lesbians had higher rates of having a research diagnosis of PCOS (9.6% and 4.0%, p=.110) and of being previously diagnosed with PCOS by a medical professional (7.8% and 2.0%; p=.053) compared to heterosexual women. Lesbians had higher rates of hirsutism and reported history of polycystic ovaries (PCO), and slightly higher testosterone and androstenedione concentrations compared to heterosexuals; however, none were significant. Compared to non-PCOS women, those with PCOS had significantly higher androstenedione (p<0.0001) and testosterone (p<0.001) concentrations and lower SHBG (p<0.0001) concentrations; and higher rates of oligomenorrhea (p=0.006), hirsutism (p<0.0001), and reported history of PCO (p<0.0001). PCOS-related factors among women who had PCOS did not significantly differ by sexual orientation; however, lesbians had higher rates of self-reported PCO history compared to heterosexuals.

Conclusion: This study was the first to examine PCOS rates by sexual orientation in a general population of women. Due to a small sample size definitive differences could not be confirmed for PCOS status by sexual orientation; however, if the trends observed are reflected in the larger population, then lesbian populations may: (1) have a higher prevalence of PCOS, (2) differ in the determinate factors of PCOS, and (3) be more likely to be diagnosed with PCOS by medical professionals than heterosexual women.

5.2   INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common endocrine disorder occurring in 4% to 10% of reproductively aged women in the general population.[86-88] It is associated with an increased risk of infertility, cardiovascular disease (CVD), endometrial cancer (EC), and Type II diabetes.[89] The theory that a lesbian sexual orientation is associated with specific biological determinants, such as elevated levels of androgen concentrations, has been used to support the hypothesis that higher rates of polycystic ovaries (PCO) and PCOS may occur in lesbian compared to heterosexual women.[86][87] It is currently unclear if the prevalence or symptoms of PCOS differ by sexual orientation. The two published studies that examined this association have revealed conflicting results.

Agrawal and colleagues' reported that compared to heterosexual women, lesbian women had higher rates of PCO (80% and 32%) and PCOS (38% and 14%). They found that among women with PCOS, lesbians had significantly higher rates of oligomenorrhea/amenorrhea; elevated concentrations of serum testosterone and androstenedione; and lower sex hormone-binding globulin (SHBG) than their heterosexual counterparts. Similar results were found among women with PCO; however androstenedione levels did not significantly differ by sexual orientation.[86] In contrast, De Sutter and colleagues revealed that rates of PCO, PCOS, and oligomenorrhea/amenorrhea did not significantly differ by sexual orientation.[87] Biochemical/clinical hyperandrogenism results were not reported due to missing data in patient files. More research examining the association between PCOS and sexual orientation is greatly needed.

If PCOS does occur more frequently among lesbians than among heterosexual women, lesbians may be at greater risk for PCOS-related health concerns. Primary care physicians

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should be aware of this potential health concern. The purpose of this study was to further examine the relationship between sexual orientation and PCOS in a general population of women. Our aim was to determine if the prevalence and features of PCOS differed by sexual orientation.

5.3   METHODS

5.3.1   Study Design and Data Collection

All women aged 35 to 45 enrolled in the **E**pidemiologic **ST**udy of **HE**alth **R**isk in Women (ESTHER) Project (2003-2006) were eligible to participate in our study. The ESTHER Project was a large (N=1084) cross-sectional study that examined risk factors for heart disease among lesbian and heterosexual women in the Pittsburgh, Pennsylvania area. Inclusion criteria for the ESTHER Project included: self-identification as a heterosexual or lesbian woman, no previous history of heart disease (angina, heart attack, and stroke), and at least 35 years of age. Study information used for our analysis was obtained from ESTHER Project recruitment call forms, self-administered questionnaires, clinical measurements, and blood assays. In addition to ESTHER data, we collected detailed information on lifetime menstrual history, medical history, and hormone use, and ran hormone assays on stored blood samples.

Mailing and telephone recruitment strategies were used to enroll women in this PCOS study. A total of 401 women aged 35 to 45 were mailed study invitations and questionnaires in April and July of 2008. After the second mailing, recruitment phone calls and interviews were made with women who did not respond. After recruitment ended, hormone assays (total

testosterone, androstenedione, and SHBG were completed. All study instruments and protocol were approved by the University of Pittsburgh's Institutional Review Board (IRB). Signed consent forms were obtained from each participant.

5.3.2 Study Population

Women met eligibility criteria for our study if they were between the ages of 35 and 45, had at least one ovary, and displayed no menopausal symptoms. Women who had normal hormone (testosterone and androstenedione) levels and were currently taking oral contraceptives (OCs) at the time of the blood draw were ineligible. OCs are used to regulate hormone levels and menstrual cycles and would have interfered with making a PCOS diagnosis. Of the 401 women eligible for our study, 251 (63% response rate) agreed to participate. A total of 31 women were disqualified because they did not meet study criteria, therefore our analysis was based on a total of 217 women (lesbian, N=117; heterosexual N=100). Although this sample size did not provide sufficient power to detect statistically significant differences between lesbian and heterosexual women, meaningful trends were observed.

5.3.3 Measures

Polycystic Ovarian Syndrome (PCOS)

The Rotterdam 2003 criteria for PCOS is widely used by medical professionals and researchers to identify PCOS. Using this criteria, PCOS is diagnosed when at least two of the following three criteria are met: (1) biochemical and/or clinical hyperandrogenism, (2) oligo- or anovulation and (3) polycystic ovaries after exclusion of known disorders (Cushing's syndrome,

androgen-secreting tumors, and congenital adrenal hyperplasias).[90] For the purposes of our study PCOS cases were identified by a reproductive endocrinologist using a modified version of the 2003 Rotterdam Criteria. Our modified version was based primarily on self-reported information: presence of adult acne; excessive hair growth; menstrual history; and history of being diagnosed with PCO, Cushing's syndrome, androgen-secreting tumors, and/or congenital adrenal hyperplasias. Hormonal assays were completed to determine biochemical hyperandrogenism.

Biochemical hyperandrogenism was identified by elevated testosterone and androstenedione concentrations. All blood assays were conducted by the Nutrition Laboratory in Graduate School of Public Health at the University of Pittsburgh. Total testosterone was measured using the commercial enzyme immunoassay (EIA) kit (DSL-10-4000) bought from Diagnostic Systems Laboratories (Webster, Texas). The expected testosterone values, using this protocol, for women 30 to 40 years old range from <0.1 to 2.2 ng/ml and in women 40 to 50 years old from <0.1 to 0.90 ng/ml. Lab results indicated consistently high testosterone levels throughout the study population. The reason for these high values was unclear. The low (0.5 ng/ml) and high (5.0 ng/ml) control samples provided with the kit were validated and within the anticipated physiological range. The duplicate values were in good agreement and all high study values were repeated and confirmed. Information provided with the protocols indicated that cross-reactivity of the antibody with other analyses was low; however, it cannot be ruled out that a component in the matrix was interfering with the antibody employed. A legitimate procedure administered in situations like this, and with our sample size, is to use one standard deviation away from the sample mean as the new cutoff point.[91] In our case the cutoff value indicating a high testosterone value was $\geq$ 3.4 ng/ml, which was given to us by the University of Pittsburgh's

Nutrition Laboratory. Androstenedione was measured using an enzyme-link immunosorbent assay (ELISA) developed by the American Laboratory Products Company (ALPCO, #11-ANRHU-EO1; Salem, NH). The expected value for androstenedione in women is 1.4 ng/ml (range: 0.3 to 2.4 ng/ml). Women with androstenedione levels >2.4 were considered to have elevated androstenedione concentrations, and considered for PCOS diagnosis.

Clinical hyperandrogenism was based on self-reported current adult acne and hirsutism (excessive hair growth) collected by the ESTHER Project. Hirsutism was determined using the modified Feriman-Gallway scale in which women marked seven body areas (0 to 4) according to their hair density.[92] Having a score of 8 or higher indicated excessive hair growth (hirsutism). The standard definition of oligomenorrhea, menstrual periods more than 40 days apart and/or menstruating less than 9 times per year, was used for study purposes. Menstrual history information was collected through ESTHER questionnaires and our mailed questionnaire. Medical professionals use ultrasound technology and strict diagnostic guidelines to screen for PCO among patients. Because diagnostic ultrasounds were beyond the scope of this study, self reported PCO history was used to help determine PCOS cases. PCO history was obtained using ESTHER data and PCOS exclusion etiologies were obtained through the mailed questionnaire.

Demographic and PCOS-Related Factors

Demographic information (race, age, sexual orientation, ever given birth to a child, education, and household income) was obtained from baseline screening/recruitment forms and ESTHER Project questionnaires. Heterosexuals were defined as those who self-identified as heterosexual or straight _and_ only had male sexual partners since the age of 18. Lesbians were defined as those: who did not identify as heterosexual or straight _and_ whose emotional, physical,

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and romantic attractions within the past 5 years had been towards only or primarily women *or* whose relationships within the past 5 years had been with only or primarily women.

Aside from demographics, PCOS-related factors were analyzed to help better understand potential differences between lesbian and heterosexual women: reported family history of PCOS, reported infertility diagnosis, sex hormone-binding globulin (SHBG) concentrations, and body max index (BMI). The mailed questionnaire also asked women if they ever had been diagnosed with PCOS by a medical professional. Reported family history of PCOS and infertility diagnoses were obtained through self-administered questionnaires collected by the ESTHER Project.

SHBG concentrations were analyzed at the same time the androstenedione and testosterone assays were prepared, and were measured using an ELIZA procedure developed by ALPCO (#11-SHB HU-E01; Salem, NH). The expected value for SHBG in women is 50 nmol/L (range: 15 to 120 nmol/L).   Reported family history of PCOS and previous infertility diagnosis were obtained through ESTHER questionnaires. The height and weight measurements used to calculate BMI were taken by the ESTHER Project during the first clinic visit. BMI was calculated as weight in kilograms divided by the square of height in meters [weight (kg)/height (m)2]. The National, Heart Lung and Blood Institute (NHLBI)-defined cutoff categories were used to measure body mass index (BMI): <18.5 (underweight), 18.5 to 24.9 (normal), 25.0 to 29.9 (overweight), 30.0 to 34.9 (mildly obese); 35.0 to 39.9 (severely obese) and $\geq$ 40 (morbidly obese).[67]   For the purposes of this analysis, the following BMI categories were created: <25 (underweight/normal); 25.0 to 29.9 (overweight) and $\geq$30.0 (obese).

5.3.4   Statistical Analysis

Fisher's exact tests and Chi squared tests were performed to determine differences between categorical variables. For comparison of continuous variables, the Exact Wilcoxon and Wilcoxon rank sum tests were used. A p-value <0.05 was used to determine statistical significance. All statistical analyses were performed using the SAS system for Windows, version 9.2 (SAS Institute, Cary, North Carolina).

5.4   RESULTS

Overall the median age of women in the study was 41.0 years (Table 10). Most women had a bachelors degree or higher (N=133, 61.9%), a household income greater than $40K (N=139, 64.7%), and reported currently being in a committed relationship (N=164, 76.6%). The racial/ethnic composition of the study was 85.1% (N=183) Caucasian, 12.6% (N=27) African American, 0.93% (N=2) Asian, 0.93% (N=2) Native American, and 0.47% (N=1) who identified as "other". Racial/Ethnic background (p<0.0001) and having given birth to a child (p<0.0001) were the only two demographic factors that significantly varied between heterosexual and lesbian women. Significantly more African American heterosexuals participated in the study than African American lesbians (N=22, 22.0% and N=5, 4.4%).

5.4.1 Diagnosis of PCOS

Approximately 7.0% (N=15) of the sample was given a research diagnosis of PCOS. The majority 40.0% (N=6) of PCOS cases were identified by means of reported PCO history and clinical hyperandrogenism. The remaining cases were acknowledged as follows: 20.0% (N=3) PCO history and biochemical hyperandrogenism; 20.0% (N=3) PCO history and both clinical and biochemical hyperandrogenism; 13.3% (N=2) oligomenorrhea and biochemical hyperandrogenism; and 6.7% (N=1) PCO history, oligomenorrhea and clinical hyperandrogenism. Using our PCOS diagnostic criteria, lesbians were found to have higher rates of PCOS than heterosexuals (N=11, 9.6% and N=4, 4.0%); however, this difference was not statistically significant (P=0.110). Of the 15 women who were given a research diagnosis of PCOS, 93.3% (N=14) were Caucasian and slightly more than half reported being given a PCOS diagnosis by a medical professional (53.3%, N=8).

5.4.2 Comparison of PCOS-Related Factors between Heterosexual and Lesbian Women

Heterosexual women were found to have higher rates of oligomenorrhea (N=19, 19.0% and N=9, 7.8%; p=0.015); however, after accounting for age no significant difference was found. Having a history of PCO (N=13, 11.3% and N=6, 6.0%) and hirsutism (N=29, 25.2% and N=15, 15.0%) did not differ significantly by sexual orientation, however, lesbians had higher reported rates than heterosexuals. Similarly, although not significant, lesbians had higher rates of elevated testosterone (N=10, 8.7% and N=6, 6.0%) and androstenedione (N=11, 9.6% and N=6, 6.0%) concentrations, and higher rates of being obese (N= 43, 37.4% and N=33, 33.0%) than heterosexuals. Heterosexual women had a higher rate of being diagnosed with infertility

compared to lesbians (N=6, 6.0% and N=2, 1.74%), but this was not significant. Regardless of PCOS diagnosis, lesbians had higher reported rates of being given a previous PCOS diagnosis by a medical professional compared to heterosexuals (N=9, 7.8% and N=2, 2.0%, p = .053), which approached significance. Rates of adult acne and family history of PCOS were similar between heterosexual and lesbian women.

5.4.3 Comparison of Non-PCOS and PCOS Women

As expected when compared to non-PCOS women those with PCOS had significantly higher median androstenedione (p<0.0001) and testosterone concentrations (p<0.0001), and lower SHBG concentrations (p<0.0001) (Table 11). Women with PCOS had significantly higher rates of oligomenorrhea (p=0.006), hirsutism (p<0.0001), PCO history (p<0.0001), and family history of PCOS (p=.013) compared to non-PCOS women. Women without PCOS had higher rates of reported childbirth than women with PCOS (P=.015). Although not significant, there was a trend for women with PCOS to be more overweight and obese compared to non-PCOS women. The results found no significant association between adult acne by research PCOS diagnosis.

5.4.4 Comparison of PCOS Status by Sexual Orientation

Of the women who did not have PCOS, lesbians had significantly lower rates of oligomenorrhea (N=6, 5.8 % and N=16, 16.7%; p=.014) (Table 12); however, this was not significant after accounting for age. Lesbians were less likely to have given birth (N=18, 16.4% and N=74, 77.1%; <0.0001) than heterosexual women. There were no other significant differences found among non-PCOS women by sexual orientation group; however, potential trends were noted.

Although not significant, non-PCOS lesbians had higher rates of having a BMI$\geq$30 (N=39, 37.5% and N=30, 31.3%), hirsutism (N=19, 18.3% and N=11, 11.5%), and slightly higher median concentrations of testosterone (1.53 and 1.63) and androstenedione (1.52 and 1.62) than non-PCOS heterosexuals. Lesbians had a lower rate of a reported infertility diagnosis (N=2, 1.9% and N=5, 5.2%), however this was not significant. Rates of PCO diagnosis, current adult acne, and a family history of PCOS did not vary by sexual orientation among non-PCOS women.

No significant differences were found between lesbian and heterosexual women who had a research PCOS diagnosis. Non-significant trends for factors related to PCOS were noted. Lesbians with PCOS had higher reported rates of PCO diagnoses (N=8, 72.7% and N=2, 50.0%) and being overweight (N=5, 45.5% and N=1, 25.0%) than heterosexual women; but heterosexuals with PCOS had higher rates of being obese (N=3, 75.0% and N=4, 36.4%) and having given birth (N=2, 50.0% and N=0, 0%). Rates of oligomenorrhea, current adult acne, family history of PCOS, and infertility; and median concentrations of androstenedione, testosterone, and SHBG did not significantly differ between lesbian and heterosexual women with PCOS.

5.5   DISCUSSION

The purpose of this study was to explore prevalence rates of PCOS and associated factors in a sample of heterosexual and lesbian women. The two published studies exploring this potential relationship were conducted among patients in fertility clinics. Fertility clinics are a logical setting to explore this research question because: (1) physicians are exposed to a higher percentage of women with PCOS than found in the general population and (2) many lesbians

trying to conceive use fertility services. Although logical, this setting could introduce a research bias because lesbians and heterosexual women may use fertility clinics for different reasons. Often lesbians who use fertility clinic services do not have infertility concerns; they seek fertility clinics to obtain sperm and/or for physician advice and services to become pregnant. Many heterosexual women attend fertility clinics because either they and/or their male partners have fertility problems. Therefore, we should expect to see a lower prevalence of PCOS among lesbians compared to heterosexual women who attend fertility clinics. Surprisingly, neither study came to this conclusion.

Agrawal and colleagues reported that lesbians were significantly more likely to have PCOS (38% and 14%; p<.0001) while De Sutter and colleagues reported no significant difference in PCOS status by sexual orientation group (8.0% lesbian and 8.7% heterosexual). Regarding determinants of PCOS, Agrawal et al. revealed that lesbians with PCOS had significantly higher rates of oligomenorrhea/amenorrhea (P<.0001), acne (P<.0001), and hirsutism (P<.0001); and higher mean androstenedione (P<.001) and testosterone (P<.01) and lower SHBG (P<.001) concentrations than heterosexuals with PCOS. They did not share how PCO varied by PCOS status. De Sutter et al. found no significant differences in rates of PCO and olig-amenorrhoea between lesbian and heterosexual women with PCOS; they did not discuss biochemical and clinical hyperandrogenism because of missing data from patient files.

Although our study is based on a small sample of women with only fifteen women identified as having PCOS, and lacked the power to detect statistically significant differences in PCOS prevalence between lesbian and heterosexual women, meaningful trends were observed. Results should be interpreted with caution. The prevalence of PCOS found among this sample (7.0%) falls within the expected range reported by most studies (4.0% to 10.0%, respectively).[86-]

[88]   Overall, results showed that lesbians had higher rates of having a research PCOS diagnosis compared to their heterosexual counterparts (9.6% and 4.0%, respectively). Lesbians also had higher rates than heterosexuals of having been previously diagnosed with PCOS by a medical professional (7.8% and 2.0%). Interestingly, among women who had been diagnosed with PCOS by a medical professional (N=11), about 82% (N=8) were lesbian; this difference approached significance (p = 0.053). When examined even closer, among women who reported being previously diagnosed with PCOS and were given a research PCOS diagnosis, 75% (N=6) were lesbian. Among women who had reported a history of PCOS but did not meet our study criteria of PCOS, 100% (N=3) were lesbian. This leads us to the question, are lesbians possibly being diagnosed more frequently because they have PCOS and/or because they have particular characteristics that would make medical professionals more likely to diagnose them with PCOS? Perhaps lesbians have certain characteristics or features that may make physicians more likely to diagnose them with PCOS. Conclusions to these questions cannot be made based on our data; however, future research studies could examine these hypotheses.

Potential differences in PCOS-related factors may exist with regard to sexual orientation and PCOS status. Although not significant, lesbians had higher rates of reported PCO, hirsutism, and obesity than heterosexuals in our sample. In addition, higher (non-significant) median androstenedione and testosterone concentrations were found in lesbians compared to heterosexuals. Rates of reported infertility were higher among heterosexuals compared to lesbians, which was also true among women with PCOS; however in both cases no significant differences were found. This result was expected because heterosexuals generally attempt and/or have children more frequently than lesbians. Compared to non-PCOS women, those with PCOS had higher androstenedione and testosterone and lower SHBG concentrations, which concur with

results reported from prior research studies. As expected, women with PCOS had significantly higher rates of oligomenorrhea, hirsutism, PCO history, and family history of PCOS than non-PCOS women. Although not significant, women with PCOS were heavier than non-PCOS women. Women who did not have PCOS were significantly more likely to have given birth to children. No significant differences were found between heterosexual and lesbian women who had PCOS; however, lesbians reported higher rates of being previously diagnosed with PCO and being overweight while heterosexuals had higher rates of having given birth and being obese.

Although this study did not have the statistical power to detect a significant difference in PCOS prevalence among lesbian and heterosexual women, meaningful trends were observed. If the trends observed are reflective of the larger population, lesbians may (1) may exhibit differences in PCOS features, (2) have higher rates of PCOS, and (3) perhaps even be more likely to be diagnosed with PCOS compared to heterosexuals. Future research should aim to investigate this potential difference in a larger sample of women, and explore the potential of diagnostic bias for PCOS among lesbian women.

5.6   LIMITATIONS

To date the two research papers examining the prevalence of PCOS among lesbian and heterosexual women, as well as our study, have different research definitions of lesbian sexual orientation. This makes it difficult to compare results across studies. Agrawal and colleagues' definition of lesbian was based on "historical and current information obtained during the assent".[86] This definition does not inform readers if a lesbian sexual orientation was determined by same-sex attraction, previous sexual history, and/or self-identification as a lesbian. De Sutter

and colleagues defined a lesbian sexual orientation according to the gender of each participant's current partner, and therefore all single women were excluded from their study. This limits their study because single heterosexual women and lesbians may attend fertility clinics more for the same reasons (lack of a male partner) compared to heterosexual women in relationships. It could be hypothesized that single women and lesbians who attend fertility clinics may have lower rates of fertility problems, like PCO and PCOS, than women in heterosexual relationships. Also, both studies did not clarify if bisexual women were grouped with the lesbians, or if they were disqualified from their study. Bisexual women could possibly skew results, making lesbian women appear to have similar characteristics and risk factors as heterosexual women. Our analysis was based on the ESTHER research definition of lesbian sexual orientation which included sexual attraction, previous sexual history, and self-identification as a lesbian. Women who were identified as having a bisexual sexual orientation did not qualify. It would be beneficial if future studies would explore if PCOS prevalence rates are consistent across different definitions of lesbian sexual orientation. A limitation to our definition is that we only were able to report on women who were "out" as being a lesbian to a certain degree. Results do not represent lesbian women who have a "closeted" sexual orientation. It is possible that some women did not feel comfortable reporting same sex attraction, behavior, or identity and therefore would have been mistakenly placed in the heterosexual group.

This study has several limitations. First, our PCOS definition was based primarily on self-reported data. Unfortunately funding was not available to perform ultrasounds; to conduct blood assays of all biochemical measures associated with PCOS; and to have a physician physically diagnose PCOS, clinical hyperandrogenism, and oligomenorrhea. We did however have a reproductive endocrinologist on our team to review menstrual history, biochemical

measures of hyperandrogenism (testosterone and androstenedione), and make probable PCOS diagnoses.

As mentioned, we were unable to confirm whether participants in our study had PCO through ultrasound technology, which is the gold standard of diagnosing PCO. PCO is defined as having at least 8-10 follicles measuring 2-9 mm in diameter on one or both ovaries, increased stroma, and an ovarian volume > 6 ml in nulliparous and 8 ml in parous women.[93] It is possible that some participants who reported having a history of PCO did not have PCO. They may have confused PCO with having a cyst(s) on their ovary; having a cyst(s) on one's ovary is not the same diagnosis as PCO.[89] Conversely, some women may have been unaware that they had PCO which could have underestimated the prevalence of PCO, and PCOS, in our sample.

Another limitation is that results represent primarily white women of a stringent age range. This occurred for two reasons (1) the ESTHER Project only included women who were age 35 or older, and (2) the age limit for our study was 45 to eliminate menopausal women from underestimating our PCOS rate. Research has suggested that hyperandrogenism may decrease around the age of menopause in women with PCOS, which may explain why some women with PCOS begin to menstruate more regularly as they age.[94] If women over 45 were included, it would have been difficult to identify women with PCOS because (1) decreased menstrual periods per year could be the result of menopause, (2) more women would have been disqualified for exhibiting menopausal symptoms, and (3) hormonal assays of androstenedione and testosterone may have been unable to detect potential PCOS cases. Lastly, findings reported in this paper represent women with PCOS who did not have a previous history of coronary heart disease. Prior studies have shown that PCOS is associated with an increased risk for heart

disease[95]; therefore, our PCOS prevalence rate may underestimate the true PCOS prevalence rate found in general populations of women.

5.7   CONCLUSION

Despite these limitations our findings make a valuable contribution to the literature examining the relationship between PCOS and sexual orientation. As mentioned previously, only two published studies investigating this relationship exist; both conducted in fertility clinics. Ours was the first to examine PCOS and PCOS-related factors among a general population of heterosexual and lesbian women.   Although we did not have adequate power to detect significant differences, we did find that rates of having a research PCOS diagnosis and of being previously diagnosed with PCOS by a medical professional were higher among lesbians compared to heterosexual women. Results indicate that PCOS-related factors may also vary by sexual orientation. Although not significant, lesbians had higher rates of being previously diagnosed with PCO and hirsutism compared to heterosexuals. Among women who had PCOS, lesbians had non-significantly higher rates of reported PCO and being obese compared to heterosexual.

Our pilot data leads us to three questions for future research: (1) Do lesbians truly have higher rates of PCOS in both general and clinic populations?; (2) Do PCOS-related factors vary by sexual orientation?; and (3) Regardless of true PCOS status, are medical professionals more likely to diagnosis lesbians than heterosexuals with PCOS? If medical professionals are more likely to diagnose lesbians with PCOS, this could explain higher PCOS rates found among lesbians compared to heterosexuals. Future research could explore whether lesbians who have

androgynous/butch gender identities are more likely to be diagnosed with PCOS than lesbians with feminine appearances or heterosexual women. Future studies could also investigate if disclosure of a lesbian sexual identity to a primary care physician increases the likelihood of being diagnosed with PCOS.

5.8 PAPER 3 TABLES

Table 10. Comparison of Demographic and PCOS-Related Factors Between Lesbian and Heterosexual Women, Polycystic Ovary Syndrome Study, Pittsburgh, PA, 2008

Variable	Total (N=215)	Heterosexual (N=100)	Lesbian (N=117)	*P*
Age*	41.0	41.0	41.0	0.663
Race (%)				**<0.0001**
African American	27 (12.6)	22 (22.0)	5 (4.4)	
Caucasian	183 (85.1)	75 (75.0)	108 (93.9)	
Other	5 (2.3)	3 (3.0)	2 (1.7)	
Sexual Orientation (%)				
Heterosexual	100 (46.5)	---------	---------	---------
Lesbian	117 (53.5)			
Education (%)				0.325
HS or Less	16 (7.4)	10 (10.0)	6 (5.2)	
Some College	66 (30.7)	34 (34.0)	32 (27.8)	
Bachelors	57 (26.5)	23 (23.0)	34 (29.6)	
Graduate	76 (35.4)	33 (33.0)	43 (37.4)	
Income (%)				0.067
<$25K	29 (13.6)	16 (16.3)	13 (11.3)	
$25K-$39K	45 (21.1)	19 (19.4)	26 (22.6)	
$40K-$59K	47 (22.1)	17 (17.4)	30 (26.1)	
$60K-$74K	28 (13.2)	9 (9.2)	19 (16.5)	
$75K	64 (30.1)	37 (37.8)	27 (23.5)	
In a Committed Relationship (%)	164 (76.6)	75 (75.8)	89 (77.4)	0.778
Given Birth (%)	93 (43.3)	76 (76.0)	17 (14.8)	**<0.0001**
Research PCOS Diagnosis (%)	15 (7.0)	4 (4.0)	11 (9.6)	0.110
History of PCOS Diagnosis (%)	11 (5.1)	2 (2.0)	9 (7.8)	0.053

Table 10. Continued

Variable	Total (N=215)	Heterosexual (N=100)	Lesbian (N=117)	*P*
PCO History (%)	19 (8.8)	6 (6.0)	13 (11.3)	0.172
Oligomenorrhea (%)	28 (13.02)	19 (19.0)	9 (7.8)	**0.015**
Hirsutism (%)	44 (20.5)	15 (15.0)	29 (25.2)	0.064
Adult Acne (%)	49 (22.8)	25 (25.0)	24 (20.9)	0.471
Family History of PCOS (%)	3 (1.4)	2 (2.0)	1 (0.87)	0.599
Previous Infertility Diagnosis (%)	8 (3.7)	6 (6.0)	2 (1.74)	0.149
BMI				0.629
<25	83 (38.6)	42 (42.0)	41 (35.7)	
25-29.9	56 (26.1)	25 (25.0)	31 (27.0)	
>30.0	76 (35.4)	33 (33.0)	43 (37.4)	
Testosterone Concentration > 3.4 l (%) (ng/ml)	16 (7.4)	6 (6.0)	10 (8.7)	0.453
Androstenedione Concentration > 2.4 (%) (ng/ml)	17 (7.9)	6 (6.0)	11 (9.6)	0.334
BMI *	27.0	26.0	27.2	0.245
Testosterone*	1.56	1.54	1.70	0.112
Androstenedione*	1.57	1.52	1.63	0.126
SHBG*	43.7	44.3	43.0	0.816

* Mean (SD)

Table 11. Comparison of Demographic and PCOS-Related Factors by Research PCOS Diagnosis, Polycystic Ovary Syndrome Study, Pittsburgh, PA, 2008

Variable	No PCOS (N=200)	PCOS (N=15)	P
Age*	41.0	41.0	0.798
Race (%)			0.120
African American	27 (13.5)	0 (0.0)	
Caucasian	169 (84.5)	14 (93.3)	
Other	4 (2.0)	1 (6.67)	
Sexual Orientation (%)			0.110
Heterosexual	96 (48.0)	4 (26.7)	
Lesbian	104 (52.0)	11 (73.3)	
Education (%)			0.728
HS or Less	16 (8.0)	0 (0.0)	
Some College	60 (30.0)	6 (40.0)	
Bachelors	54 (27.0)	3 (20.0)	
Graduate	70 (35.0)	6 (40.0)	
Income (%)			0.601
<$25K	26 (13.1)	3 (20.0)	
$25K-$39K	40 (20.2)	5 (33.3)	
$40K-$59K	45 (22.7)	2 (13.3)	
$60K-$74K	26 (13.1)	2 (13.3)	
$75K	61 (30.8)	3 (20.0)	
In a Committed Relationship (%)	154 (77.4)	10 (66.7)	0.350
Given Birth (%)	91 (45.5)	2 (13.3)	0.015
History of PCOS Diagnosis (%)	3 (1.5)	8 (53.3)	**<0.0001**
PCO History (%)	9 (4.5)	10 (66.7)	**<0.0001**
Oligomenorrhea (%)	22 (11.0)	6 (40.0)	**0.006**
Hirsutism (%)	30 (15.0)	14 (93.3)	**<0.0001**
Adult Acne (%)	45 (22.5)	4 (26.7)	0.751
Family History of PCOS (%)	1 (0.50)	2 (13.3)	**0.013**
Previous Infertility Diagnosis (%)	7 (3.5)	1 (6.7)	0.445

Table 11. Continued

Variable	No PCOS (N=200)	PCOS (N=15)	P
BMI			0.080
<25	81 (40.5)	1 (13.3)	
25-29.9	50 (25.0)	6 (40.0)	
≥30.0	69 (34.5)	7 (46.7)	
Testosterone Concentration ≥ 3.4 l (%) (ng/m)	14 (7.0)	2 (13.3)	0.309
Androstenedione Concentration > 2.4 (%) (ng/ml)	13 (6.5)	4 (26.7)	**0.021**
BMI*	26.5	29.0	**<0.0001**
Testosterone*	1.54	2.37	**<0.0001**
Androstenedione*	1.54	1.79	**<0.0001**
SHBG*	44.3	26.4	**<0.0001**

Table 12. Comparison of Demographic and PCOS-Related Factors by Research PCOS Status and Sexual Orientation, Polycystic Ovary Syndrome Study, Pittsburgh, PA, 2008

Variable	No PCOS (N=202)			PCOS (N=15)		
	Hetero. (N=96)	Lesbian (N=104)	P	Hetero. (N=4)	Lesbian (N=11)	P
Age*	41.0	41.0	0.787	39.0	41.0	0.419
Previous PCOS Diagnosis	0 (0.0)	3 (2.9)	0.247	2 (50.0)	6 (54.6)	0.99
Previous PCO Diagnosis	4 (4.2)	5 (4.8)	0.99	2 (50.0)	8 (72.7)	0.560
Oligomenorrhea	16 (16.7)	6 (5.8)	**0.014**	3 (75.0)	3 (27.3)	0.235
Hirsutism	11 (11.5)	19 (18.3)	0.178	4 (100.0)	10 (90.9)	0.99
Adult Acne	23 (24.0)	22 (21.2)	0.635	2 (50.0)	2 (18.2)	0.517
Testosterone Concentration > 3.3 (%)	6 (6.3)	8 (7.7)	0.690	0 (0.0)	2 (18.2)	0.99
Androstenedione Concentration > 2.4 (%)	5 (5.2)	8 (7.7)	0.477	1 (25.0)	3 (27.3)	0.99
BMI			0.593			0.585
<25	42 (43.8)	39 (37.5)		0 (0.0)	2 (18.2)	
25-29.9	24 (25.0)	26 (25.0)		1 (25.0)	5 (45.5)	
≥30.0	30 (31.3)	39 (37.5)		3 (75.0)	4 (36.4)	
Family History of PCOS	1 (1.0)	0 (0.0)	0.480	1 (25.0)	1 (9.1)	0.476
Previous Infertility Diagnosis	5 (5.2)	2 (1.9)	0.264	1 (25.0)	0 (0.0)	0.267
Given Birth	74 (77.1)	18 (16.4)	**<0.0001**	2 (50.0)	0 (0.0)	0.057

Table 12. Continued

BMI*	26.0	27.1	0.210	38.8	28.5	0.131
Testosterone*	1.53	1.63	0.190	2.16	2.45	0.489
Androstenedione*	1.52	1.62	0.127	2.10	1.66	0.507
SHBG*	44.6	43.5	0.810	24.5	30.2	0.753

* Mean (SD)

6.0   OVERALL DISCUSSION

6.1   SUMMARY OF FINDINGS

This dissertation covered three separate research questions; each investigated a different aspect of lesbian health. The first manuscript explored the prevalence and potential differences of CAM use among lesbian and heterosexual women. Analyses revealed a high prevalence rate of CAM use ever and within the past 12 months among women who participated in the ESTHER Project, with lesbians reporting higher rates of CAM use than heterosexuals. These findings, representing the second known manuscript discussing CAM use among a general population of healthy lesbian and heterosexual women, indicate that sexual orientation should be viewed as a demographic factor associated with CAM use. Other significant factors associated with ever CAM use and CAM use within the past 12 months were comparable to other published studies: being Caucasian, having a higher education level, reporting perceived discrimination in a medical establishment, living in a large city, reporting being very spiritual, and having a history of a diagnosed mental health disorder. Among the women who had used CAM in the previous 12 months, types of CAM used did not significantly vary based on sexual orientation, except that heterosexual women were significantly more likely to have participated in yoga compared to lesbian women. The second manuscript investigated the relationship of sexual orientation, sexual abuse history, and current adulthood obesity, and found that lesbians and women who

reported CSA by a family member were significantly more likely to be obese than heterosexuals and women who reported no CSA by a family member. Other independent predictors of current adulthood obesity were: having less education than a bachelors' degree, a lower household income (<$75K), African American race, and history of a mental health disorder. The third manuscript examined the prevalence of PCOS and related factors among heterosexual and lesbian women. To investigate this research topic, qualified participants of the ESTHER Project were invited to take part in our PCOS study. Information collected by the ESTHER Project, a mailed questionnaire, and additional blood assays were used for the analysis. Although this study lacked the power to detect statistically significant differences, meaningful trends were observed. Lesbians had a higher rate of having a research diagnosis of PCOS compared to heterosexual women (9.6% and 4.0%, respectively); and also had a higher rate of being previously diagnosed with PCOS by a medical professional compared to heterosexuals (7.8% and 2.0%, respectively). Among PCOS cases, PCOS-related factors did not statistically differ by sexual orientation; however, this may be due to our small number of research PCOS cases (N=15).

6.2   PUBLIC HEALTH SIGNIFICANCE

Analyses in the first manuscript revealed that that sexual orientation was an important factor in understanding CAM use. Additionally, we discussed that due to the high prevalence of CAM use found in our population, medical professionals should be encouraged to ask about the CAM practices of their female patients, particularly lesbians. The second manuscript explored the association of sexual orientation, sexual abuse history, and obesity. Results suggested that a

lesbian sexual orientation and CSA by a family member were both significant predictors of adulthood obesity. This indicates that there is a need for future studies and weight programs to consider how lesbian sexual orientation and CSA may influence weight gain, motivation to lose/maintain weight, and weight loss. The third paper examined PCOS prevalence and PCOS-related factors among heterosexual and lesbian women. Findings indicate that if trends found in rates are true, lesbian populations may: (1) have a higher prevalence of PCOS, (2) differ with regard to PCOS-related factors, and (3) be more likely to be diagnosed with PCOS by medical professionals, than heterosexual women. These findings demonstrate the need for future PCOS studies to consider sexual orientation as a potential demographic factor when describing health outcomes related to PCOS and designing PCOS interventions or maintenance programs.

6.3   STRENGTHS AND WEAKNESSES

The three manuscripts presented have a number of notable strengths in common. First, all statistical analyses were based on data collected by the ESTHER Project. Unlike many lesbian studies, the ESTHER Project represents a large sample of both lesbian and heterosexual women. Although non-probability recruitment methods were used, multiple strategies were administered to maximize participation and all data were collected by trained research staff. Another overall strength was that each manuscript filled a needed research gap in lesbian health research.

Despite these strengths, the manuscripts have common limitations that must be considered when interpreting results. First, conclusions were limited to the inclusion criteria and study protocol of the ESTHER Project. Only women who were identified as lesbian or heterosexual, age 35 or older, had no previous history of heart disease, and lived in the

Pittsburgh, PA area were represented. Sexual orientation was based on same-sex attraction, behavior, and self-identification; this specific definition has not been used consistently across lesbian health studies. When comparing results it will be important to acknowledge not only how sexual orientation is defined, but also other variables such as CAM and sexual abuse. In addition, the ESTHER Project mainly represented Caucasian, highly educated, women who had household incomes above the national poverty index. Many of the factors used for analyses were based on self-report; therefore, reporting bias may have influenced results in all three manuscripts. Lastly, the ESTHER Project was a cross-sectional study, so results represent information collected at one point in time. To help build a case for potential causality, longitudinal studies need to be conducted.

6.4   FUTURE RESEARCH

As previously mentioned, large-scale longitudinal studies are necessary to fill major research gaps in lesbian health; inclusive of the three research questions presented in this dissertation. Furthermore, more efforts are needed to explore different lesbian subgroups based on geographic location, race, age, socio-economic status, varying sexual orientations (bisexual and questioning women), and gender identities. This will involve new innovative strategies to capture different female sexual minority populations. A greater understanding of how sexual orientation may change over time in relationship to certain health behaviors, practices, and disease outcomes is essential. Standard definitions of how lesbian and other sexual orientations are required to make comparisons across studies and to make more meaningful statements/conclusions about the state of lesbian health. The three manuscripts presented in this dissertation make it clear that lesbian-

specific health education, health programs, and interventions are needed to reach this population of women. Findings of this dissertation express the necessity for medical professionals and public health programs to acknowledge potential health disparities among lesbians and address the needs of sexual minority populations of women.

6.5   CONCLUSIONS

Understanding lesbian health and how it changes across the lifespan is a relatively new area of research. This dissertation filled some essential research gaps in lesbian health through three epidemiological studies that explored CAM use, determinants of obesity, and PCOS prevalence. Despite this, more work is needed to further explain how each of these public health matters may vary between lesbian and heterosexual women, and how the medical health establishment, researchers, and community-health organizations can better serve the lesbian population.

A.1   ESTHER SCREENING FORM

Phone Screen Interview

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: <u>Read all</u> responses and <u>check all</u> 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)	☐ Bisexual (Ask question #9 only) ☐ Lesbian or Gay (Ask question #9 only) ☐ Other (Specify) _____ (Ask question #9)
8. Since age 18, have your sexual partners been… ☐ **Only men** ☐ Both men and women ☐ Only women	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)**

B.1   QUESTIONNARES

B.1.1 ESTHER Questionnaire 1

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.)

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

7. Which of the following categories represents your total <u>household</u> income from <u>all</u> sources?

1 ❑   Less than $15,000
2 ❑ $15,000 - $24,999
3 ❑ $25,000 - $39,999
4 ❑ $40,000 - $59,999
5 ❑ $60,000 - $74,999
6 ❑ $75,000 or more

10.   What is the highest grade or year of school you have completed?
1 ❑   Less than 12 years
2 ❑   High school diploma or GED
3 ❑   Some college, 2-year degree or diploma, technical school
4 ❑   Bachelor's degree
5 ❑   Graduate or professional degree

Please read the following list of the ways you may have felt or behaved recently. For each statement, place an "X" over the box indicating how often you have felt this way during the PAST WEEK.

	Rarely or none of the time (less than 1 day)	**Some of the time (1-2 days)**	**Occasionally (3-4 days)**	**Most of the time (5-7 days)**
18. I was bothered by things that don't usually bother me.	1 ❑	2 ❑	3 ❑	4 ❑
19. I had trouble keeping my mind on what I was doing.	1 ❑	2 ❑	3 ❑	4 ❑
20. I felt depressed.	1 ❑	2 ❑	3 ❑	4 ❑
21. I felt everything I did was an effort.	1 ❑	2 ❑	3 ❑	4 ❑
22. I felt hopeful about the future.	1 ❑	2 ❑	3 ❑	4 ❑
23. I felt fearful.	1 ❑	2 ❑	3 ❑	4 ❑
24. My sleep was restless.	1 ❑	2 ❑	3 ❑	4 ❑
25. I was happy.	1 ❑	2 ❑	3 ❑	4 ❑
26. I felt lonely.	1 ❑	2 ❑	3 ❑	4 ❑
27. I could not "get going."	1 ❑	2 ❑	3 ❑	4 ❑

B.1.2 ESTHER Questionnaire 2

1. In general, how would you characterize your health?

1 ❑   Excellent
2 ❑   Very good
3 ❑   Good
4 ❑   Fair
5 ❑   Poor
6 ❑   Very poor

6. Do you have a clinic, doctor, nurse, or physician's assistant who provides your usual health care?

1 ❑   Yes
0 ❑   No

8.   About how long has it been since you last visited a doctor for a routine checkup?

1 ❑   Within the past year (anytime less than 12 months ago)
2 ❑   More than 1 year but less than 2 years ago
3 ❑   More than 2 years but less than 3 years ago
4 ❑   More than 3 years but less than 5 years ago
5 ❑   5 or more years ago
-8 ❑   Don't know/Not sure

9.   Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?

1 ❑   Yes   *0* ❑   No [*Go to Question 10*]

A. Is your health insurance under the coverage of a partner or spouse?

1 ❑ Yes   *0* ❑   No [*Go to Question 10*]

B. If needed, could you obtain health insurance yourself?

1 ❑ Yes   *0* ❑   No

34. Have you <u>ever</u> sought help from any type of alternative health services, such as traditional healing, acupuncture, massage, or herbal therapies? EXCLUDE CLERGY AND CHIROPRACTORS.

      1 ❏ Yes   *0* ❏ No

35. Have you sought help from any type of alternative health services in the <u>last 12 months</u>?

      1 ❏ Yes   *0* ❏ No

A. Which of the following have you used in the <u>last 12 months</u>? (Check all that apply.)

     1 ❏ Acupuncture
     2 ❏ Aromatherapy
     3 ❏ Biofeedback
     4 ❏ Herbal medicine
     5 ❏ Homoeopathy
     6 ❏ Hypnosis
     7 ❏ Massage
     8 ❏ Meditation
     9 ❏ Reiki
     10 ❏ Relaxation techniques
     11 ❏ Therapeutic touch
     12 ❏ Yoga
     13 ❏ Others (specify):_____

               _____

               _____

B.1.3 ESTHER Questionnaire 3

10. Has a doctor or other health care provider ever diagnosed you as having any of the following? If yes, are you currently being treated with medication or some other therapy?

	Ever diagnosed?		Currently being treated?	Specify treatment		
	No		**Yes**	**No**	**Yes**	
a. High blood pressure	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
b. High cholesterol	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
c. High triglycerides	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
d. Diabetes	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
e. Angina	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
f. Heart attack	❑ *0*		❑ → *1*	❑ *0*	❑→ *1*	_____
g. Other heart disease	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
h. Stroke	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
i. Ulcers (stomach)	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
j. Obesity	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
k. Eating disorder (anorexia, bulimia)	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
l. Depression	❑ *0*		❑ → *1*	❑ *0*	❑→ *1*	_____
m. Anxiety	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
n. Arthritis	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
o. Breast cancer	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____
p. Lung cancer	❑ *0*		❑→ *1*	❑ *0*	❑→ *1*	_____

	0	1	0	1	
q. Ovarian cancer	❏	❏→	❏	❏→	_____
r. Cervical cancer	❏	❏→	❏	❏→	_____
s. Other cancer (specify): _____	❏	❏→	❏	❏→	_____
t. Asthma	❏	❏→	❏	❏→	_____
u. Emphysema or chronic bronchitis	❏	❏→	❏	❏→	_____
v. Over- or underactive thyroid	❏	❏→	❏	❏→	_____
w. Osteoporosis/Osteopenia	❏	❏→	❏	❏→	_____
x. Autoimmune disease (e.g., Lupus, Rheumatoid arthritis)	❏	❏→	❏	❏→	_____

15. Has a doctor or other health care provider ever diagnosed you as having any of the following? If yes, are you currently being treated with medication or some other therapy?

	Ever diagnosed?		Age at first diagnosis
	No	**Yes**	
o. HIV/AIDS	0 ❏	1 ❏ →	_____ years

B.1.4 ESTHER Take-home Questionnaire (T11)

We are interested in learning about the importance of both spirituality and religion for participants in this study. For some people, spirituality and religion may be very important. For other people, spirituality and religion may not be important at all. Please do not skip any item even if spirituality and religion are not important to you. Choose the answer that best describes what is true for you.

35. To what extent do you consider yourself to be a spiritual person? Check the most appropriate number.

Not religious at all   **Very religious**

1 ❏   2 ❏   3 ❏   4 ❏   5 ❏

APPENDIX C. PAPER TWO APPENDICES

C.1   QUESTIONNARES

C.1.1 ESTHER Questionnaire 1

7.   Which of the following categories represents your total <u>household</u> income from <u>all</u> sources?

1 ❑   Less than $15,000
2 ❑ $15,000 - $24,999
3 ❑ $25,000 - $39,999
4 ❑ $40,000 - $59,999
5 ❑ $60,000 - $74,999
6 ❑ $75,000 or more

10.   What is the highest grade or year of school you have completed?
1 ❑   Less than 12 years
2 ❑   High school diploma or GED
3 ❑   Some college, 2-year degree or diploma, technical school
4 ❑   Bachelor's degree
5 ❑   Graduate or professional degree

14. What is your current relationship status?

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

Please read the following list of the ways you may have felt or behaved recently. For each statement, place an "X" over the box indicating how often you have felt this way during the PAST WEEK.

	Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)
18. I was bothered by things that don't usually bother me.	1 ❑	2 ❑	3 ❑	4 ❑
19. I had trouble keeping my mind on what I was doing.	1 ❑	2 ❑	3 ❑	4 ❑
20. I felt depressed.	1 ❑	2 ❑	3 ❑	4 ❑
21. I felt everything I did was an effort.	1 ❑	2 ❑	3 ❑	4 ❑
22. I felt hopeful about the future.	1 ❑	2 ❑	3 ❑	4 ❑
23. I felt fearful.	1 ❑	2 ❑	3 ❑	4 ❑
24. My sleep was restless.	1 ❑	2 ❑	3 ❑	4 ❑
25. I was happy.	1 ❑	2 ❑	3 ❑	4 ❑
26. I felt lonely.	1 ❑	2 ❑	3 ❑	4 ❑
27. I could not "get going."	1 ❑	2 ❑	3 ❑	4 ❑

C.1.2 ESTHER Questionnaire 3

**11. Has a doctor or other health care provider ever diagnosed you as having any of the following?
If yes, are you currently being treated with medication or some other therapy?**

	Ever diagnosed?		**Currently being treated?**	**Specify treatment**	
	No	**Yes**	**No**	**Yes**	
K. Eating disorder (anorexia, bulimia)	*0*	*1* →	*0*	*1* →	_____
l. Depression	*0*	*1* →	*0*	*1* →	_____
m. Anxiety	*0*	*1* →	*0*	*1* →	_____

C.1.3   Take-Home Questionnaire 11

50. Do you feel that you were sexually abused by a family member when you were growing up (<u>before age 18</u>)?

　　　1 ❑ Yes　　　　　　*0* ❑ No

51. Do you feel that you were sexually abused by someone other than a family member when you were growing up (<u>before age 18</u>)?

　　　1 ❑ Yes　　　　　　*0* ❑ No

52. Since age 18, was there a time when someone forced you to have sexual activity that you <u>really did not want</u>? This might have been intercourse or other forms of sexual activity, and might have happened with a partner, spouse, lover, friend, as well as with more distant persons or strangers.

　　　1 ❑ Yes　　　　　　*0* ❑ No

D.1 QUESTIONNARES

D.1.1 ESTHER Questionnaire 1

7. Which of the following categories represents your total <u>household</u> income from <u>all</u> sources?

1 ❑ Less than $15,000
2 ❑ $15,000 - $24,999
3 ❑ $25,000 - $39,999
4 ❑ $40,000 - $59,999
5 ❑ $60,000 - $74,999
6 ❑ $75,000 or more

10. What is the highest grade or year of school you have completed?
1 ❑ Less than 12 years
2 ❑ High school diploma or GED
3 ❑ Some college, 2-year degree or diploma, technical school
4 ❑ Bachelor's degree
5 ❑ Graduate or professional degree

14. What is your current relationship status?

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

D.1.2 ESTHER Questionnaire 3

1. At what age did you have your first menstrual period?

1 ❑ < 10 years of age
2 ❑ 10
3 ❑ 11
4 ❑ 12
5 ❑ 13
6 ❑ 14
7 ❑ 15
8 ❑ > 15 years of age

2. Have you had at least one period in the last 12 months?

1 ❑ Yes   *0* ❑ No

A. At what age did you stop having your menstrual period?

_____ years of age

B. Did your periods stop naturally or because you had an operation, radiation treatment, or some drug therapy?

1 ❑ Natural menopause
2 ❑ Surgical menopause (uterus and/or ovaries removed)
3 ❑ Radiation therapy
4 ❑ Drug therapy
5 ❑ Other   (specify): _____

C. During menopause (in the last 12 months while you were still having menstrual periods) did you have any of the following?

	<u>Yes</u>	<u>No</u>
Hot flashes	*1* ❑	*0* ❑
Vaginal dryness	*1* ❑	*0* ❑
Dizziness	*1* ❑	*0* ❑
Feeling nervous or depressed	*1* ❑	*0* ❑

Continue with Question 3

A. What was the first day of your last menstrual period?

____ ____ month ____ ____ day ____ ____ ____ ____ year

B. Thinking back over the <u>last 12 months</u>, in how many of those months did you have a period?

_____ number of months

C. What would you estimate was the length of your menstrual cycle during the <u>last 12 months</u>? The length of your cycle is the number of days between the first day of two consecutive periods.

1 ❑ < 21 days
2 ❑ 21-26 days
3 ❑ 27-32 days
4 ❑ 33-40 days
5 ❑ > 40 days

D. In the <u>last 12 months</u> have your periods…

1 ❑ become somewhat further apart?
2 ❑ become somewhat closer together?
3 ❑ become quite variable?
4 ❑ remained quite regular?

---

7. Have you had a hysterectomy or have you had one or both of your ovaries removed?

1 ❑ Yes   *0* ❑ No [***Go to Question 8***]

A. Please check the type of surgery and write your age when the surgery was performed.

1 ❑ A hysterectomy with both ovaries removed→   _____ years of age
2 ❑ A hysterectomy alone or with one ovary removed → _____ years of age
3 ❑ Both ovaries removed (no hysterectomy)   →   _____ years of age
-8 ❑ Not sure/Don't know type of surgery performed →   _____ years of age

8. Have you ever had a wedge resection of one or both of your ovaries or "ovarian drilling"?

1 ❑ Yes   → _____ years of age
0 ❑ No

11. Have you had any other gynecological surgery or procedure?

1 ❏ Yes   *0* ❏ No [*Go to Question 12*]

> **A. Please specify:**
>
> _____   → _____ years of age
>
> _____   → _____ years of age

12. Have you ever taken oral contraceptives (birth control pills) <u>for any reason</u>?

1 ❏ Yes   *0* ❏ No [*Go to Question 13*]

> **A. At what age did you begin taking oral contraceptives?**
>
> _____ years
>
> **B. Are you <u>currently</u> on oral contraceptives?**
>
> *1* ❏ Yes   *0* ❏ No
>
> **C. How long have you been on or did you take oral contraceptives? List <u>total time</u> if you have used them more than once.**
>
> _____ years _____ months

13. Other than oral contraceptives, have you ever used female hormones (estrogen or progesterone) that were prescribed by a doctor or healthcare provider? These could have been in the form of a pill, skin patch, shot, or vaginal cream or suppository.

1 ❏ Yes   *0* ❏   No [*Go to Question 14*]

A. At what age did you begin hormone therapy?

_____ years of age

B. Are you <u>currently</u> on hormone therapy?

1 ❏ Yes   *0* ❏ No

C. How long have you been on or were you on hormone therapy? List <u>total time</u> if you have been on HRT (Hormone Replacement Therapy) more than once.

_____ years _____ months

14. Have you ever been pregnant?

1 ❏ Yes   *0* ❏   No [*Go to Question 15*]

A. How many times have you been pregnant?
1 ❏ Once
2 ❏ Twice
3 ❏ Three times
4 ❏ Four or more times

B. How many pregnancies resulted in births (live born or stillborn children)?
0 ❏ None
1 ❏ One
2 ❏ Two
3 ❏ Three
4 ❏ Four or more

D. At what age did you give birth (live born or stillborn) for the first time?
__ years of age

15. Have you ever been diagnosed with any of the following conditions? If yes, please indicate how old you were when you were first diagnosed.

		Ever diagnosed?		**Age at first diagnosis**
		NNo	**Yes**	
a.	Endometriosis (fibroids in the uterus)	❏	*1* ❏→	_____ years
b.	Fibrocystic Breast Disease	❏	*1* ❏→	_____ years
c.	Chlamydia	❏	*1* ❏→	_____ years
d.	Inflammation or blockage of Fallopian tubes	❏	*1* ❏→	_____ years
e.	Pelvic Inflammatory Disease	❏	*1* ❏→	_____ years
f.	Ectopic pregnancy	❏	*1* ❏→	_____ years
g.	Polycystic ovaries	❏	*1* ❏→	_____ years
h.	Infertility	❏	*1* ❏→	_____ years
i.	Bacterial Vaginosis (yeast infection)	❏	*1* ❏→	_____ years
j.	Human Papilloma Virus	❏	*1* ❏→	_____ years
k.	Abnormal Pap tests (more than 2 in a row)	❏	*1* ❏→	_____ years
l.	Gonorrhea	❏	*1* ❏→	_____ years
m.	Genital herpes	❏	*1* ❏→	_____ years
n.	Genital warts	❏	*1* ❏→	_____ years
o.	HIV/AIDS	❏	*1* ❏→	_____ years

20. <u>Compared to most women,</u> have you ever had an excessive amount of hair on any part of your body?

            1 ❏ Yes   *0* ❏   No   [*Go to Question 21*]

A. **Where was the excessive hair growth? (check all that apply)**

        1 ❏ Upper lip
        2 ❏ Chin
        3 ❏ Neck
        4 ❏ Chest
        5 ❏ Lower stomach
        6 ❏ Inner upper thighs
        7 ❏ Sideburns

21. **Did you have acne <u>after your teen years</u>?**

          1 ❏ Yes   *0* ❏   No   [*Go to Question 22*]

A. **For how many years?**

      _____ years

B. **Where was (is) the acne located?**

        1 ❏ Face and head
        2 ❏ Shoulder, back or chest
        3 ❏ Face/head AND shoulder, back or chest

C. **Do you currently have acne?**

        1 ❏ Yes   *0* ❏ No

22. For each of the areas of the body shown in the diagram below, mark the number (0-4) of the figure that best depicts the amount of hair you have in each area. If you do not have any noticeable hair in a particular area, mark zero (0).

1	2	3	4

0 1 2 3 4
Upper Lip:
❏ ❏ ❏ ❏ ❏

0 1 2 3 4
Chin:
❏ ❏ ❏ ❏ ❏

0 1 2 3 4
Chest:
❏ ❏ ❏ ❏ ❏

0 1 2 3 4
Upper Abdomen:
❏ ❏ ❏ ❏ ❏

0 1 2 3 4
Upper Arm:
❏ ❏ ❏ ❏ ❏

0 1 2 3 4
Thigh:
❏ ❏ ❏ ❏ ❏

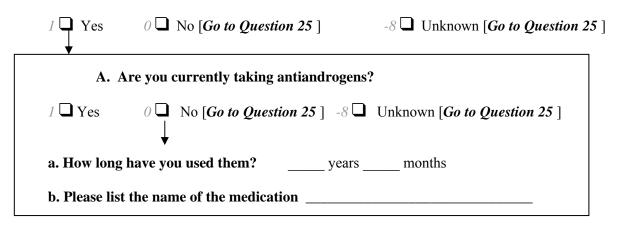*0 1 2 3 4*
Upper Back:
❏ ❏ ❏ ❏ ❏

23. Do you have any family members with Polycystic Ovary Syndrome (PCOS)? This is a condition marked by menstrual irregularity and/or infertility, abdominal body weight gain ("apple shape") and sometimes increased body hair and severe acne.

1 ❑ Yes   *2* ❑ Possible   *0* ❑ No [*Go to Question 24*]   *-8* ❑ Unknown [*Go to Question 24*]

| | | | Which of the following blood relatives have been diagnosed with PCOS or it is suspected that they might have PCOS based on the symptoms described above. If you do not have a sister or daughter, please mark "Not Applicable." | | | | |

		Not Applicable	D on't know	Diagnosed			Suspected		
				No	**Yes**	**How many?**	**No**	**Yes**	**How many?**
a.	Maternal Grandmother		*-8* ❑	*0* ❑	❑		❑	❑	
b.	Paternal Grandmother		*-8* ❑	*0* ❑	❑		❑	❑	
c.	Mother		*-8* ❑	*0* ❑	❑		❑	❑	
d.	Sister(s)	*-7* ❑	*-8* ❑	*0* ❑	❑→	⎯⎯	❑	❑→	⎯⎯
e.	Daughter(s)	*-7* ❑	*-8* ❑	*0* ❑	❑→	⎯⎯	❑	❑→	⎯⎯

24. Have you ever taken antiandrogens (for example, Flutamide or Spironolactone)?

     1 ❏ Yes   *0* ❏ No [*Go to Question 25*]   *-8* ❏ Unknown [*Go to Question 25*]

> **A. Are you currently taking antiandrogens?**
>
> *1* ❏ Yes   *0* ❏ No [*Go to Question 25*] *-8* ❏ Unknown [*Go to Question 25*]
>
> **a. How long have you used them?**   _____ years _____ months
>
> **b. Please list the name of the medication** _____

25. Have you ever taken any medications to induce ovulation (for example, fertility drugs such as Clomid, Serophene, Pergonal, Metrodin, hcG)?

     1 ❏ Yes   *0* ❏ No   *-8* ❏ Unknown

> **A. Please list the medications, age when taken and number of cycles taken.**
>
> | Name of Fertility Drug | Approximate age when taken | Number of cycles taken |
> |---|---|---|
> | _____ | _____ | _____ |
> | _____ | _____ | _____ |
> | _____ | _____ | _____ |
> | _____ | _____ | _____ |

D.1.3 Consent Form for Polycystic Ovary Syndrome (PCOS) Study

University of Pittsburgh

Graduate School of Public Health
Department of Epidemiology

CONSENT TO ACT AS A PARTICIPANT IN A RESEARCH STUDY

TITLE: Polycystic Ovarian Syndrome (PCOS)

PRINCIPAL INVESTIGATOR: Helen A. Smith, PhD Candidate (Epidemiology)
CO-INVESTIGATORS: Michelle Danielson, PhD and Nina Markovic, PhD
ESTHER Study
134 Trees Hall
University of Pittsburgh
Telephone: 412.648.8447 (Nina Markovic, PhD)

Why is this research being done?
Polycystic Ovarian Syndrome (PCOS) is found in 4-10% of women in the general population and is associated with increased risk of infertility, cardiovascular disease (CVD), endometrial cancer (EC), and Type II diabetes. The purpose of this study is to examine if the symptoms of PCOS differ in women based on demographic, health, and lifestyle characteristics. Findings of this study could help health care providers make available additional screenings for associated co-morbidities, information regarding symptomology of PCOS, and improved assessment tools for diagnosis of PCOS.   Intervention strategies could also be created to help manage the symptoms and risk factors of PCOS, specific to certain groups of women.

What would I be agreeing to if I decide to be in this research study?
If you choose to participate in this study by signing your name on page 2, you are agreeing to:
- **sign this form and complete the attached questionnaire.** Return them in the attached postage-paid envelope. (If we do not receive these forms from you within 2 months, we will call you to see if you would prefer to complete the questionnaire by phone).
- allow us to correlate the information you provide in the attached questionnaire with some of the information about yourself that you provided as a participant in the ESTHER Project.
- allow an additional analysis of the blood that you provided as a participant in the ESTHER Project. (You will *not* need to come into our offices for another blood draw). The additional analysis will primarily examine testosterone levels. Low levels of testosterone are typically present in women's blood.

What are the possible benefits from taking part in this study?
You will not receive any direct benefit from participating in this research study. We will provide you with a copy of the test findings. We are hopeful though that the information we receive will

provide additional knowledge about Polycystic Ovarian Syndrome, which could potentially help other women.

Will I be paid if I take part in this research study?

You will not be paid to complete this questionnaire and for allowing additional blood analysis to be performed on your stored blood samples. Your participation is completely voluntary. If you decide not to participate, this decision will not affect your relationship with the ESTHER Project or with the University of Pittsburgh.

If I agree to take part in this research study, will I be told of any new risks that may be found during the course of the study?

Investigators will identify individuals who may have PCOS. Once those suspected of having PCOS are identified, investigators will promptly contact each woman suspected of having PCOS by telephone. Investigators will discuss what PCOS is and suggest that each woman suspected of having PCOS follow-up with her primary healthcare provider.

Will the information I provide be kept confidential?

Yes, the completed questionnaire will only be labeled by an assigned research code number and will not be associated with your name. In the same way, the analysis of your blood will also be labeled with this assigned code number. We will do this to protect your privacy and confidentiality. All records related to your involvement in this research study will be stored in a locked file cabinet with your ESTHER Project data. While there is the possibility of an accidental breach of confidentiality, we are using these methods to minimize the possibility of this risk.

****

If you have any questions or would like to discuss my study, contact Nina Markovic, PhD at 412.648.8447.

If <u>you want</u> to participate, please sign below and print your name.

VOLUNTARY CONSENT:

I understand the purpose and procedures in the Polycystic Ovarian Syndrome study, and agree to participate. I understand that if I have questions these can be answered by Dr. Nina Markovic or PhD Candidate Helen Smith. In addition, if I have questions or concerns about my rights as a research participant these can be addressed by the University's Human Subject Protection Advocate 1-866-212-2668.

_____   _____
Participant's signature   Date

_____
Participant's printed name

- -

If you <u>do not want</u> to participate in this study, do not sign the consent, check the box below, and return this form in the enclosed envelope.

[   ] I do not wish to participate in this study.

Date: _____/____/_____   Participant ID Number: _____
       Mo.   Day   Year

MENSTRUAL, HORMONE USE & MEDICAL HISTORY QUESTIONNAIRE
If you have any questions answering the following questions please call Nina Markovic, PhD at 412.648.8447.

1. **What is your date of birth?**   _____/_____/_____ (Month/Day/Year)

2. **How old were you when you had your first menstrual period?** _____ years
   If you do not remember the exact age, please give your best estimate.

In the following two sections "Hormone Use and Duration" and "Menstrual History When Not On Hormones or Pregnant" we are interested in knowing more about your use of hormones and menstrual cycles throughout several stages of your life, i.e. during your teen years, during your twenties, during your thirties, and so on.

Hormone Use and Duration (Years/Months)

      The following questions refer to common hormones women use. Please indicate if you have used or are using any of the following hormones and the length of time you used or have been using each item. If you do not remember the exact number of years or months you used each item, please give your best estimate.

      EXAMPLE: *This is an example of how you should answer the questions on the next page.*

A. Have you used <u>oral contraceptives</u> (i.e. birth control pills) or birth control patches during the following times in your life?

	Teens or Younger	20s	30s	40s ☐ Check here if under 40	50s ☑ Check here if under 50
Oral Contraceptives (OC) or Birth Control Patches	☒ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	☐ Yes ☒ No	☐ Yes ☐ No
How long (in years/months) did you use this?	1 Years 6 Months	10 Years 0 Months	2 Years 3 Months	___ Years ___ Months	___ Years ___ Months

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A. Have you used <u>oral contraceptives</u> (i.e. birth control pills) or <u>birth control patches</u> during the following times in your life?

	Teens or Younger	20s	30s	40s □ Check here if under 40	50s □ Check here if under 50
Oral Contraceptives (OC) or Birth Control Patches	□ Yes □ No	□ Yes □ No	□ Yes □ No	□ Yes □ No	□ Yes □ No
How long (in years/months) did you use this?	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months

B. Have you taken <u>progesterone</u> (i.e. Provera) during the following times in your life?

	Teens or Younger	20s	30s	40s □ Check here if under 40	50s □ Check here if under 50
Progesterone	□ Yes □ No	□ Yes □ No	□ Yes □ No	□ Yes □ No	□ Yes □ No
How long (in years/months) did you use this?	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months

C. Have you used <u>hormone replacement therapy</u> (HRT) in the form of pills, patches, creams, gels, vaginal rings or suppository tablets during the following times in your life?

	Teens or Younger	20s	30s	40s □ Check here if under 40	50s □ Check here if under 50
Hormone Replacement Therapy (HRT)	□ Yes □ No	□ Yes □ No	□ Yes □ No	□ Yes □ No	□ Yes □ No
How long (in years/months) did you use this?	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months	↓ ____Years ____Months

D. To the best of my knowledge I have <u>never</u> used oral contraceptives, birth control patches, progesterone, hormone replacement therapy or <u>any other</u> form of hormones.

☐ True   ☐ False

Menstrual History When <u>NOT</u> on Hormones or Pregnant

Complete the following questions for the times when you were <u>NOT</u> using any type of hormone or pregnant. The purpose of this section is to collect detailed information about the frequency of your menstrual cycle and the average number of days between your the first day of your periods. We are looking for potential menstrual irregularities. Since hormones are often used to help regulate menstrual cycles, it is important you complete the following for the times when you were not using any hormones (e.g. oral contraceptives or birth control patches, progesterone, or hormone replacement therapy).

A. **IN YOUR TEENS or younger, what was your average number of periods a year when NOT on hormones or pregnant? _____ Periods a Year**
   ☐ Does not apply. I used hormones every year from age at first period to age 19.
   ☐ Does not apply. (I was 20 or older when I got my first menstrual period.)
   ☐ Does not apply. Specify:_____

B. **IN YOUR TEENS or younger, what was your average cycle length (the average number of days between the first day of your periods) when NOT on hormones or pregnant.**
   ☐ <21 Days
   ☐ 22 - 26 Days
   ☐ 27 - 31 Days
   ☐ 32 - 40 Days
   ☐ >40 Days
   ☐ Does not apply. (I took hormones during this whole time period.)
   ☐ Does not apply. (I was 20 or older when I got my first menstrual period.)
   ☐ Does not apply. Specify:_____

C. **IN YOUR 20s, what was your average number of periods a year when NOT on hormones or pregnant?**
   _____ Periods a Year
   ☐ Does not apply. I used hormones every year from 20-29
   ☐ Does not apply. Specify:_____

D. IN YOUR 20s, what was your average cycle length (the average number of days between the first day of your periods) when NOT on hormones or pregnant.

☐ <21 Days

☐ 22 - 26 Days

☐ 27 - 31 Days

☐ 32 - 40 Days

☐ >40 Days

☐ Does not apply, I used hormones every year from 20-29

☐ Does not apply. Specify:_____

E. IN YOUR 30s, what was your average number of periods a year when NOT on hormones or pregnant?
_____ **Periods a Year**

☐ Does not apply. I used hormones every year from 30-39

☐ Does not apply. Specify:_____

F. IN YOUR 30s, what was your average cycle length (the average number of days between the first day of your periods) when NOT on hormones or pregnant.

☐ <21 Days

☐ 22 - 26 Days

☐ 27 - 31 Days

☐ 32 - 40 Days

☐ >40 Days

☐ Does not apply. I used hormones every year from 30-39.

☐ Does not apply. Specify:_____

G. IN YOUR 40s, what was your average number of periods a year when NOT on hormones or pregnant?
_____ **Periods a Year**

☐ Does not apply. I used hormones every year from 40-49.

☐ Does not apply. (I am not yet in my 40s.)

☐ Does not apply. Specify:_____

H. IN YOUR 40s, what was your average cycle length (the average number of days between the first day of your periods) when NOT on hormones or pregnant.

☐ <21 Days

☐ 22 - 26 Days

☐ 27 - 31 Days

☐ 32 - 40 Days

☐ >40 Days

☐ Does not apply. I used hormones every year from 40-49

☐ Does not apply. (I am not yet in my 40s.)

☐ Does not apply. Specify:_____

I. **IN YOUR 50s, what was your average number of periods a year when NOT on hormones or pregnant?**

_____ **Periods a Year**

☐ Does not apply. I used hormones every year from 50-59.

☐ Does not apply. Specify:_____

J. **IN YOUR 50s, what was your average cycle length (the average number of days between the first day of your periods) when NOT on hormones or pregnant.**

☐ <21 Days

☐ 22 - 26 Days

☐ 27 - 31 Days

☐ 32 - 40 Days

☐ >40 Days

☐ Does not apply. I used hormones every year from 50-59.

☐ Does not apply. (I am not yet in my 50s.)

☐ Does not apply. Specify:_____

Medical History

Have you ever been told by a doctor or other healthcare professional that you have or had any of the following health conditions:

1. **Polycystic Ovarian <u>Syndrome</u> (PCOS)?**
Note: PCOS is a syndrome and is different from only having polycystic ovaries.

☐ Yes   ☐ No   ☐ Not Sure

2. **Congenital adrenal hyperplasias?**

☐ Yes   ☐ No   ☐ Not Sure

3. **Congenital androgen-secreting tumors?**

☐ Yes   ☐ No   ☐ Not Sure

4. **Cushing's syndrome?**

☐ Yes   ☐ No   ☐ Not Sure

D.1.5   Graduate School of Public Health - Nutrition Laboratory (Blood Assay Procedures)

Facilities: The Nutrition Laboratory is located in five rooms which occupy 2,000 square feet in the Department of Epidemiology at the University of Pittsburgh's Graduate School of Public Health. The laboratory is equipped with two Sterilgard Biological Safety cabinets; an Abbott VP Supersystem Bichromatic Analyzer; a Clinical Diagnostics Atac 8000 Chemistry Analyzer; an Olympus AU400 Chemistry Analyzer; a Perkin-Elmer 8410 capillary gas chromatograph with FID detector and Shimadzu C-R3A integrator; a Perkin Elmer Clarus 500 gas chromatograph with an FID detector, an auto sampler, a HP Pentium 4 with a data handling system and a HP Laserjet 1300; a Waters HPLC System, (two 6000A pumps, WISP 712 automatic injector, 2996 Photodiode array detector, 490 Programmable detector, a Pentium 2 Gateway computer, Millennia software, a HP Laserjet 2100); a Packard Cobra II Gamma Counter; a LS-S fluorescence spectrophotometer; a Carey 50 uv/visible spectrophotometer; 2 Centra GP8R refrigerated centrifuges; an Optima TLX ultracentrifuge; three -20ºC freezers; twenty -70ºC freezers; a Mettler H542 analytical balance; an APX-100 analytical balance; a Buchler Vortex-Evaporator; a Hewlett-Packard 85 computer and a Northgate Slimline 333 computer system with a Panasonic VGR screen and Hewlett-Packard Laserjet III printer.

Quality Control: Outlines of the analytical procedures employed in the laboratory are given below.   Initially the accuracy and precision of each technique is verified.   Briefly, blanks, controls, samples and standards are ran on multiple occasions.   Accuracy is estimated by comparing values obtained for the reference controls with their stated values.   Precision is evaluated as the coefficient of variation both intra-assay and inter-assay (reported with procedure outline).

Ongoing quality control is monitored by plotting the mean values and the difference between the duplicates for the control samples versus time.   The 95% and 99% confidence limits are indicated on the graphs.   The laboratory has maintained the required levels of proficiency to be included in the CDC-NHLBI Lipid Standardization Program since 1982.

At quarterly intervals, the CDC sends 36 samples to be analyzed for total cholesterol (high:100 to 400 mg/dl), total cholesterol (low:<100 mg/dl), HDL cholesterol and triglyceride.   Nine samples are analyzed weekly for four weeks. The results are returned to CDC and the mean and standard deviation compared to the accepted mean and standard deviation.

In February 2004, the laboratory obtained CLIA certification. The laboratory was found to be in complete compliance with both the state's clinical laboratory regulation and those of the Centers for Medicare and Medicaid Services.   Accordingly, the laboratory became enrolled in a proficiency testing program organized by the College of American Pathologists (CAP).   Three times a year CAP sends samples for analysis of glucose, insulin, total cholesterol, HDLc and LDLc (both calculated and direct) and triglycerides.   Results are evaluated for accuracy and precision.

Sample Collection.   Blood is collected at the antecubitial vein from subjects in a reclined position into red-top tubes (serum) and lavender tubes (EDTA, plasma) (Vacutainer, Becton-

Dickinson). The samples are kept on ice and centrifuged (1500g for 15 min at 4ºC) within 90 min of collection. The samples are then aliquoted (1 ml) and stored at -70ºC until analysis.

Sample Shipment. Samples are shipped to Pittsburgh (533 Parran Hall, GSPH, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, PA 15261, Attention: Ms. B. Hauth) in accordance with Department of Transport regulations for biological hazards, overnight and on dry ice. Delivery on weekends should be avoided.

Procedures: (Volumes refer to plasma/serum)

Testosterone (50 µl of sample). Total testosterone is measured in duplicate using a commercial EIA kit (DSL-10-4000) purchased from Diagnostic Systems Laboratories (Webster, Texas). In brief, samples (50 µl serum or plasma) are mixed with enzyme conjugate solution and testosterone antiserum and incubated for one hour at room temperature with rapid shaking. The plate is then washed x5, TMB chromogen solution added and the plate incubated at room temperature for 30 minutes with rapid shaking. Stop solution (0.2 M H_2SO_4) is added and the absorbance read at 450 nm with background correction at 600 or 620 nm. Standards (0.1 to 25 ng/ml), blanks, controls and a pooled laboratory control are run with each assay.

Sex Hormone Binding Globulin (SHBG) (50µL of sample). SHBG is measured using an ELISA procedure developed by ALPCO (#11-SHB HU-E01; Salem, NH). Briefly, 100 µL samples (10µL serum diluted to 100 µL with buffer) are placed in microtitration wells coated with a monoclonal antibody specific for SHBG. The plates are incubated for 30 minutes at room temperature with shaking (200 rpm). The plates are washed with 300 µL buffer three times and 150µL of conjugate solution (a monoclonal antibody to SHBG conjugated with horseradish peroxidase) and incubated for 15 minutes at room temperature with shaking. The plates are washed three times and 150 µL of TMB substrate added and the plates incubated at room temperature for 10 to 15 minutes with shaking. Stop solution, 50 µL, is added to each well and the optical density measured at 450 nm within 20 minutes. Standards (0.3 nM to 295 nM), blanks, calibrators and control pools are run simultaneously with all samples.

Androstenedione (100 µL of sample). Androstenedione is measured using an ELISA procedure developed by ALPCO (#11-ANRHU-E01; Salem, NH). In brief, samples (25 µL) are placed in microtitration wells coated with rabbit anti-androstenedione antibody. To each well 100 µL of androstenedione-horseradish peroxidase conjugate is added and the plates incubated at room temperature for one hour with shaking (200 rpm). The plates are washed with 300 µL of buffer three times and 150 µL of TMB substrate then added. The plates are incubated at room temperature for 10-15 minutes with shaking. Stop solution, 50 µL is added to each well and the optical density measured within 20 minutes at 450 nm. Standards (0.1 to 10 ng/mL), blanks, calibrators and control pools are run simultaneously with all samples.

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