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NON-CLINICAL RISK FACTORS OF HYSTERECTOMY

by

Chung-won Lee

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Sociology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

2001

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ABSTRACT

Non-Clinical Risk Factors of Hysterectomy

by

Chung-won Lee, Doctor of Philosophy

Utah State University, 2001

Major Professor: Dr. Michael B. Toney
Department: Sociology

In the United States, hysterectomy is one of the most commonly performed operations for women that is not related with pregnancy. However, not enough attention has been paid to how women's exposure to the surgery differs according to their social characteristics as well attitudinal/behavioral factors. Using cohort data from the National Longitudinal Surveys of Mature Women, this study investigated two aspects: (1) the association between socioeconomic status and hysterectomy and (2) the impact of women's attitudinal/behavioral characteristics on hysterectomy. With Cox proportional hazards analyses, this study found that women's exposure to hysterectomy significantly differs according to their social and attitudinal standings. Social characteristics that were found to be statistically significant risk factors of hysterectomy include women's education, employment status, and marital status. Among attitudinal and behavioral factors, women's locus of control and number of

children were identified as statistically significant risk factors. These findings may be used to enhance consumer awareness of hysterectomy and aid in policy reconstruction.

(171 pages)

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Chung-won Lee

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CHAPTER I

INTRODUCTION

Medical techniques are known to have both clinical and social antecedents and consequences. For many decades, researchers have conducted studies in attempts to identify the specific factors associated with medical techniques. Although medical knowledge has greatly improved the understanding of some treatment methods, not enough is known about the social and clinical factors. This dissertation research provides a detailed examination of the relationship between social factors and hysterectomy, one of the most common operational techniques for women.

Hysterectomy is the surgical removal of the uterus and is often accompanied by an oophorectomy (removal of one or both ovaries). The three major diagnostic symptoms associated with hysterectomy are uterine leiomyoma (benign tumors), endometriosis, and uterine prolapse. Hysterectomy was the most frequently performed surgery in the United States until 1981. As cesarean section became the most popular operation, hysterectomy became the second most frequently performed surgical procedure (Pokras and Hufnagel 1988). The most recent data available show that hysterectomy continues to be the second most frequently performed major operation for women (Popovic and Hall 2001). During 1999, about 616,000 hysterectomies were performed at a

cost of $5 billion (Popovic and Hall 2001).

Although numerous researchers have examined the clinical and non-clinical indicators of hysterectomy, few studies have been conducted focusing on the underlying association among some potentially important social characteristics and women's exposure to hysterectomy. In addition, few studies have been published concentrating on the long-term impacts of hysterectomy from either a clinical or a non-clinical perspective (Napoli 2000).

This study is concerned with the first of these two gaps, social factors affecting women's exposure to hysterectomy. In particular, this study examines the relationships between hysterectomy and the following variables: women's education, region of residence (South vs. Non-South), location of residence (Metropolitan vs. Non-Metropolitan), residence at age 15 (urban vs. rural), employment status, marital status, number of children, smoking status, race, nationality, locus of control, and occupation. Investigation of the sociological correlation of this surgical procedure is an essential step toward explaining why some groups of women are more likely to be exposed to hysterectomy.

Hysterectomies performed on women with life-threatening clinical symptoms are defined as non-elective. For these conditions, there is a consensus that the procedure should be performed. The impact of social, behavioral, and attitudinal factors on elective hysterectomies is examined in this study.

Approximately 37 percent of all U.S. women will have experienced a hysterectomy by the time they reach 60 years of age (Pokras and Hufnagel 1988). The possibility of undergoing a hysterectomy is open to women of all ages, races, and social backgrounds. Statistics show, however, that women 40 to 44 years of age are at the greatest risk of undergoing a hysterectomy (CDC 1997). In 1997, women at the peak of the baby boom generation turned 40. The pure magnitude of those exposed to hysterectomy makes it a very important public health issue.

Past studies have found a substantial variation in hysterectomy performance rates across nations as well as across areas within the United States. Women in the United States are three times more likely to have a hysterectomy than those living in England (Coulter, McPherson, and Vessey 1988). Within the United States, Dicker et al. (1982) discovered that interregional differences in hysterectomy rates persisted during the 1970 to 1978 period. They also found that during the 1980 to 1993 period, hysterectomy performance rates were the lowest in the Northeast (3.9 per 1000 women of reproductive age) and highest in the South (6.8 per 1000 women of reproductive age). This consistent interregional variation suggests that non-clinical conditions may influence the risk of hysterectomy.

In addition, several authors, including Kjerulff, Langenberg, and Guzinski (1993[b]) and Marks and Shinberg (1997), showed that other social aspects of patients such as age,

education, occupational status, and race have a statistically significant association with hysterectomy performance rate. Until now, these social variables have been examined in isolation rather than in a multivariate framework, causing a significant gap in this area of research.

Due to the limitations of available data, non-clinical indicators employed in hysterectomy studies have been mostly limited to a woman's race, education, income, and geographic region (Dicker et al. 1982; Kjerulff et al. 1993[a]; Kjerulff et al. 1993[b]; Marks and Shinberg 1997; Wilcox et al. 1994). Most studies have not taken into account the number of children women had when identifying risk factors of hysterectomy. Women's parental background information has not received substantial attention from hysterectomy researchers. Furthermore, very few studies have examined the behavioral or attitudinal aspects of women, such as smoking behavior and locus of control with regard to hysterectomy experience (Oprendek and Malcarne 1997).

Using the National Longitudinal Surveys of Mature Women's cohort (NLS-MW), 1967-1995 data, this study aims to

1. investigate the relationship between social factors and hysterectomy,
2. explore which social factors have more impact on hysterectomy risk than others, and
3. examine how behavioral and attitudinal factors, such as smoking behavior, the health locus of control, and

number of children are related with women's hysterectomy.

Significance of the Study

Although a key goal in the medical profession is to provide the most appropriate treatment for illnesses or conditions affecting patients, there is mounting evidence that many patients receive treatments that are not appropriate (Bernstein et al. 1993; Bickell, Earp, and Evans 1995; Doyle 1953). In some cases, there is disagreement among leading experts as to what constitutes the best or most appropriate treatments for a given disease or condition (Bickell et al. 1995). Some doctors may not know about problems associated with a given treatment or that alternative treatments have been identified as the preferred treatment. Patients may also influence the treatment they receive through a variety of means ranging from their own strong preferences to their ability to pay for alternative treatments. The studies cited above suggest that hysterectomy is strongly influenced by non-clinical conditions.

Concerns regarding the possible overuse of hysterectomy can be found in professional journals as early as the 1950s (Lembcke 1956; Bernhard 1986). In an article in *the Journal of the American Medical Association (JAMA)*, Bernstein et al. (1993) indicated that some 85 to 90 percent of all hysterectomies are now performed for reasons that do not clearly meet the clinical

conditions identified as warranting a hysterectomy. Researchers recognize that the professional uncertainty regarding appropriate use of hysterectomy stems from difficulties in diagnosis, lack of information on the outcomes and alternative treatments of hysterectomy, and differences between physician's judgments and patients' preferences for treatment (Carlson, Nichols, and Schiff 1993).

The fact that there is no firm professional or clinical certainty in identifying conditions that clearly warrant hysterectomy, along with the consistent national, regional, and subgroup hysterectomy rate variation, suggests that non-clinical indicators may account for such variations in hysterectomy performance patterns. Those non-clinical factors can include patient characteristics (demographic and social/socioeconomic background, attitudes and preferences, pattern in the use of health care resources; Finkel and Finkel 1990; Geller, Burns, and Brailer 1996; Kjerulff et al. 1993[a]; Kjerulff et al. 1993[b]; Marks and Shinberg 1997), physician characteristics (training background, practice setting, practice style, professional attitudes and behavior, and/or incentives; Bickell at el. 1994), and hospital characteristics (geographic location, ownership, and size; CDC 1997; Dicker et al. 1982; Geller et al. 1996; Pokras and Hufnagel 1988).

One of the underlying questions of this study is whether such non-clinical factors might have influenced the decision-

making process of women from less privileged classes more than those from higher social classes. In this study, patient-related characteristics such as education, occupation, race/ethnicity, and marital status will be intensively examined in relation to hysterectomy experience. Identifying the relative value of various measures of social, attitudinal, and behavioral status can help plot the impact of such measures on hysterectomy performance, lead the search for proximate mechanisms underlying the association of patient-related factors with hysterectomy, and help in the development of policies and practices regarding hysterectomies. Past studies on hysterectomy, mainly conducted by clinical researchers, had limited scope by focusing on the clinical indicators of the operation, the mere magnitude of the performance of the operation, or simple descriptive trends with regard to non-clinical predictors.

Theoretical Framework

The theoretical framework for this study is provided by the theory of social stratification derived from the work of Davis and Moore (1945). It aims to explore the applicability of social stratification to an understanding of hysterectomy performance trend.

Social stratification represents the vertical division of society into different social status levels. It concerns the unequal distribution of things that are desired by people and the

process of social mobility whereby some persons or groups come to receive more of these unplentiful by others. Persons of high social status are distinguished from people of low status in that the former have greater access to and control over unplentiful resources (Ellis 1993).

According to Davis and Moore (1945), it is necessary for a society to provide structural arrangement to motivate its individual members to fill certain positions and perform the attached duties. Since the opportunities to develop one's talents are not equally distributed, a society must provide rewards in order to encourage those with the most suitable abilities to fill the most important positions. Rewards in the form of wealth, prestige, and power lead those who hold them into a privileged class and generate social inequality (Cuff and Payne 1984).

Stratification theory suggests that when faced with the possibility of experiencing a hysterectomy, those from privileged classes are likely to be treated differently than those from the less privileged. For example, Gambone and Reiter (1997) found that the process of informed consent for hysterectomy is almost always inadequate and that the general perception of the process is that it is a non-negotiable requirement. Stratification theory suggests that those from privileged classes are more likely to be informed about alternative treatments. The theory also suggests that the medical profession is more likely to listen to what patients have to say regarding their concerns and fears about the

operation than to those from lower social classes. In addition, those with higher social standing have more knowledge in order to raise questions about their treatment and may have attitudes that lead them to seek information about alternative treatments. Individuals from lower classes may possess knowledge and attitudes that lead them to more blindly accept a treatment or to even seek a treatment because they view it as a cure-all.

As a result, when it is uncertain that a hysterectomy is needed because of identified clinical conditions such as benign tumors or non-critical uterine prolapse, the privileged may benefit more than the lower class from not taking the risk associated with hysterectomy because they have the resources to obtain (Kjerulff et al. 1993[b]; Marks and Shinberg 1997) alternative treatments which might be more costly. Furthermore, after the removal of the uterus, those who lack economic and social resources may not receive the post-hysterectomy care that is most appropriate, making it more likely that they will experience long-term negative consequences of the surgery (Kjerulff et al. 1993[a]).

Research Questions

Considering all the possible long-term positive and negative consequences, the high proportion of elective hysterectomies (i.e., hysterectomies that may be unnecessary), the high rate of hysterectomy and variations across personal

characteristics and geographic areas, and the high costs involved with the operation, it is obvious that more thorough investigation surrounding hysterectomy needs to be conducted by both clinical and non-clinical experts. Needless to say, it would be desirable to develop a knowledge base that insures that hysterectomies are only performed when they are the most appropriate treatment. Identifying the subgroup of women who are at greater risk of experiencing the operation than others would be a helpful step.

As presented earlier, the goals of this study are to analyze the relationships between social measures and hysterectomy and to test some of the possible effects of attitudes and behaviors on hysterectomy. Specifically, the purposes of this study are to investigate:

1. which social characteristics are more influential on hysterectomy risk than others;
2. how women's social characteristics influence women's exposure to hysterectomy;
3. how women's attitudinal/behavioral factors (e.g., smoking behavior, number of children, etc.) are related to hysterectomy risk.

The data used in this study are derived from the NLS-MW conducted between 1967 and 1995. The NLS-MW is a longitudinal survey developed by the Center for Human Resource Research at Ohio State University and sponsored by the Bureau of Labor

Statistics, U.S. Department of Labor. The NLS-MW is a nationally representative random sample of non-institutionalized, civilian female residents of the United States, 30 to 44 years of age, in 1967. A total of 5,083 respondents participated in an initial interview in 1967 and 2,711 of them were successfully followed until 1995. During 17 survey waves between 1967 and 1995, respondents were asked about their health, care of illness, labor force participation, education, family income, retirement status, attitudes, and so on. In 1995, survey questions were administered to women regarding their hysterectomy experience. Respondents of the 1995 survey wave were selected for the data analyses in this study. Details on the design and implementation of the survey are described in Chapter III.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter summarizes the review of literature, focusing on the issues that are of concern in this study. The literature is reviewed in the following areas: social factors and health, hysterectomy trends in the United States, clinical indicators of hysterectomy, appropriateness of hysterectomy, non-clinical indicators of hysterectomy, and decision-making process of hysterectomy. Since research on social factors and hysterectomy is limited, the review includes studies of the relationship between social factors and other health problems to depict the general role played by those factors. This may help to identify influential social factors that have not been investigated in previous studies on hysterectomy. In addition, methodological problems of the reviewed studies are discussed followed by suggestions for future research and policies.

Social Factors and Health

Numerous researchers have investigated the association between social characteristics and health. However, as Feinstein (1993) asserted, the scope of those studies has been limited to the existence and extent of health inequalities rather than in explaining why such inequalities persist.

Feinstein proposed that the possible explanations for

inequalities in health outcomes have two dimensions--materialistic and behavioral. The materialistic dimension involves both personal and public resources such as housing, sanitation, transit mode, and occupational hazards. The behavioral dimension involves psychological, genetic, and cultural aspects. According to Feinstein, while the materialistic explanation involves the ability to purchase health care and services, the behavioral dimension is related to how one "plays the system," including the ability to follow instructions, the ability to self-diagnose, and the awareness of recurrence. It is argued that both materialistic and behavioral factors contribute to inequalities in health care.

Lantz et al. (1998) analyzed the Americans' Changing Lives (ACL) longitudinal survey to investigate the impact of behavioral risk factors in explaining the relationsip between socioeconomic status and mortality. Based on some 3,600 adult men and women survey participants, the analysis results showed that among socioeconomic status variables, income had the strongest association with mortality. The impact of income on mortality did not change when health behaviors were controlled, indicating that health behaviors alone do not fully account for increased risk of dying in the low-income group.

Smith and Hart (1998) also studied the association between socioeconomic status and mortality based on a Scottish sample of 5,700 people. The study also found that mortality is influenced

by socioeconomic characteristics. It found that deaths due to coronary heart disease and respiratory disease are associated with socioeconomic status acting across the life course, while other deaths are primarily related with adult socioeconomic characteristics.

In a study examining the impact of socioeconomic and cultural factors on breast cancer, Lannin et al. (1998) conducted a case-control study with some 1,100 rural North Carolina women. Lannin et al. found that race, income, and marital status are statistically significant factors affecting the difference in stage of breast cancer at diagnosis. Lannin et al. asserted that, along with cultural beliefs and attitudes, socioeconomic factors play a substantial role in explaining racial difference in breast cancer stage at diagnosis.

As a study investigating association between socioeconomic status and health care, Marks and Shinberg (1998) studied the impact of socioeconomic status in hormone therapy pattern. Using the Wisconsin Longitudinal Study (1957-1993), the study found that the husband's occupation was the strongest socioeconomic predictor on hormone therapy. The higher the husband's occupational status was, the higher the hormone therapy rate was. It was also found that for women with hysterectomy experience, the rate of hormone therapy use was higher for those with less education. For those without hysterectomy experience, hormone therapy use was more prevalent among those with higher education.

Education and Health

In a study investigating the role of socioeconomic status in cardiovascular disease(CVD) risk, Winkleby et al. (1998) analyzed a subgroup of participants of the third National Health and Nutrition Examination Survey that was conducted between 1988 and 1994. In a comparison of three different racial/ethnic groups --white, black, and Mexican women aged 25 to 64 years of age-- Winkleby et al. found that socioeconomic status, represented by education and poverty status, are adversely related with CVD risk status. It was also found that ethnic minorities are at a higher risk of CVD than white women. However, no differential association between socioeconomic status (SES) and CVD risk was found among different racial groups.

Machenbach and Kunst (1999) investigated the socioeconomic inequalities in mortality among women and men using international data. They identified that the cause-specific mortality was lowest among women with a high level of education and highest among men with a low level of education. They also recognized that inequalities in mortality were larger among men.

In another study focusing on the impact of education on health, Ross and Wu (1995) found an influence of poverty and lack of education on economic strain. They found that lack of education and economic strain are synergistic while education provides people with access to subjectively rewarding work opportunities, which promote better health. They also discovered

that well educated people have a greater sense of control over their lives and higher levels of social support, both of which support good health.

Ross and Mirowsky (1999) also investigated the impact of education on health. They refined the association between education and health by focusing on the effects of quantity, credential, and selectivity of education. According to the authors, among theoretical models of education and health, the credential model sees no added benefit of having another year of education unless it awards a degree. Thus, they tested the impact of possessing a college degree (credential), net of the effect of years of education by including a credential variable in their study. College selectivity was measured based on grade point average and SAT/ACT scores of entering freshmen and the percentage of applicants accepted. The authors found that quantity of education (years of formal education completed) has the strongest and the most significant impact on health, the credential of college degree has no effect, and the selectivity of school attended has a small positive association with health measures.

Race and Health

Ferraro and Farmer (1996) examined the double jeopardy hypothesis in their study of African Americans. The double jeopardy hypothesis posits that racial discrimination throughout one's life and age discrimination in later life may interact to

produce steeper health declines for minority persons than their white counterparts as both groups age. Using the data from the National Health and Nutrition Examination Study I, the authors did not find any evidence for double jeopardy. Although they found positive impacts of education on health, black and white subjects did not differ with regard to chronic illness prevalence. The study found that health inequality exists throughout adulthood, but it does not amplify or diminish in later life (Ferraro and Farmer 1996).

Using data from the Health and Retirement Survey data on national middle-aged population aged 51-61, Kington and Smith (1997) examined the relationship between SES and racial/ethnic differences in the prevalence of four common chronic illnesses. They also examined the functional status among those with illnesses. A functional status score was developed based on responses to 17 questions asking about the respondent's ability to perform a series of functional activities. The authors discovered that although the incomes of African-American men comprise about two thirds of the income of white men, their wealth is only 28 percent of white men. They recognized that both income and wealth are significant predictors of the probability of having a chronic condition. They also found that African Americans and Hispanics have less functional ability than whites. Furthermore, they discovered that women have significantly less functional ability than men and that racial and ethnic

disparities are larger among women. The authors note that SES appears to explain almost all of the racial/ethnic differences in the ability to function but only moderate amounts of the differences in disease prevalence.

In their study of socioeconomic and racial differences in health, Williams and Collins (1995) claimed that although growing numbers of cohort studies suggest health-driven downward social mobility, it makes only a minor contribution to socioeconomic differences in health. They claimed that much of the widening inequality in health status reflects more rapid gains in the health status for high SES than for low SES groups. They also asserted that the differences between SES groups with regard to accessibility, utilization, and quality of care, along with the increasing economic inequality, are the main contributing factors to the widening inequality. They noted that social class position is a key determinant of variations in the distribution of disease, and it determines the social categories of people as well as their exposure to risk factors and resources.

Rogers and Hummer (1996) conducted a study on the impact of demographic, socioeconomic, and behavioral factors on cause specific mortality rates for different ethnic groups. They found that higher mortality rates exist among those who are older, male, previously married, less educated, poorer, and smoked. They also recognized that the high education level of Asian Americans; low smoking level of Mexican Americans and Asian Americans;

social pathologies of Mexicans, Native Americans, and African Americans; and the high smoking rate among Caucasian Americans played a significant role in explaining mortality differences. Noting that the social characteristics hypothesis is important in explaining ethnic mortality differences, the authors argued that improvements in further reducing socioeconomic gaps between ethnic groups may have an impact on reducing mortality discrepancies.

Massey (1990) examined the impact of racial residential segregation on infant mortality rates. He discovered a higher black infant mortality rate and a lower white infant mortality rate in highly segregated cities and the disparity in black-white infant mortality rates appeared to be greater in cities with high segregation levels.

Employment and Health

Lennon (1994) examined the association between women's work conditions and their psychological well being. Employed wives and full-time homemakers were compared on characteristics of their daily work activities and the consequences of work conditions for psychological well being. The study discovered that, on average, employed wives and homemakers experience similar levels of depressive symptoms. Full-time homemakers appeared to benefit from having less responsibility for things that are outside their control, and employed wives benefited from having less routinized work than homemakers.

Ross and Mirowsky (1995) investigated whether employment is a cause or consequence of health by testing a social causation hypothesis and a selection hypothesis. The social causation hypothesis posits that employment improves the health of men and women, while the selection hypothesis states that healthy people get and keep jobs more than unhealthy people do. With the use of the data from the National Survey of Personal Health Practices and Consequences (1979-1980), the authors discovered more support for the social causation hypothesis. Full-time employment status predicted a significantly slower decline in health rating with the impact being equal for men and women. Being unable to work and being a homemaker significantly decreased health over time when compared to the full-time employed. In support of the social selection hypothesis, it was found that initial health status of people significantly improves the likelihood of full-time employment. The authors noted that, generally, employment both protects and fosters health for both men and women. The reason for the effect, however, is less certain. The authors also argued that the social selection hypothesis cannot be ignored and that causation and selection are mutually reinforcing.

Other Social Factors and Health

Acknowledging that psychosocial factors and medical care are critical links between social structure and health status, Williams (1990) examined the impact of health behaviors, stress, social ties, and attitudinal orientations on the association

between socioeconomic status and health outcomes. Williams (1990) found that psychosocial factors such as environmental stressors, health practices, social ties, and attitudes are the central determinants of health status. Williams argued that it is important to recognize that attempts to change the behavior and lifestyle of the poor, while leaving social structures unmodified, are unlikely to be effective in eliminating inequalities in health.

In their study of the impact of residential location on health, Hayward and Pienta (1997) examined the mortality differences among rural and urban Americans accounting for their socioeconomic resources. Using the National Longitudinal Survey of Older Men (1966-1990), they investigated the influence of SES and lifestyle on health and found that rural elders have a significant health advantage controlling for other social and economic factors. As opposed to the finding that socioeconomic factors combine to influence mortality for men in urban areas, they found that rural men's mortality is less sensitive to both social origin and economic resources in later life. The authors noted that rural men's mortality advantages correspond with a less important role of social disparity as a determinant of mortality. The association between SES and mortality appeared to be the weakest among rural men and the strongest among urban elders.

Locus of Control and Health

Although some authors have found limitations on the convergent and discriminant validity of measurement of locus of control (Leone and Burns 2000; Shapiro et al. 1993), the psychological construct of control is still often considered to be an important variable in psychosomatic medicine (Bundek, Marks, and Richardson 1993; Myers and Myers 1999; Sugarek, Deyo, and Holmes 1988). As an attempt to investigate the impact of people's attitudes on their health behaviors, numerous past studies have examined the role of the locus of control on health behaviors. Studies found that viewing health as internally controlled rather than controlled by fate or destiny was associated with the practice of more health promotion behaviors (Brown et al. 1983; Duffy 1988; Pender et al. 1990; Weitzel 1989). In other words, findings from past studies on the locus of control and health behavior show that high internal locus of control is related to engaging in health promotion behaviors.

Past studies found that women who believe in personal control of their health (internal control) are more likely to practice health-promotion activities such as exercise, nutrition, health responsibility, stress management, and interpersonal support than others (Duffy 1997). It was also found that greater external locus of control is associated with better adherence to medical treatment (Myers and Myers 1999).

In their study, Oprendek and Malcarne (1997) assessed

cognitive-developmental reasoning level in dealing with illness and psychological concepts, experiences with physical illness and psychological difficulties, and locus of control orientation on 101 college students. Their findings include evidence that a less-mature understanding of illness prevention was associated with higher external locus of control. The authors argue that belief in an external locus of control may hamper the consideration of illness prevention behaviors since it is unlikely for one to think about prevention options when one considers illness unavoidable (Oprendek and Malcarne 1997).

Myers and Myers (1999) conducted a study on the locus of control and disease-specific health behaviors. They investigated the relationship between the locus of control and self-reported adherence to medical treatments in adults with cystic fibroids. Their study found that good adherence to medical treatments, doctor's instructions, and others was associated with external locus of control. This indicates that patients who believe that an uncontrollable force destined their disease are more likely to listen to doctors and others.

The above-presented studies provide a mixed indication of the possible role of the locus of control on women's hysterectomy risk. One possibility would be that women with higher internal locus of control might be at higher risk of hysterectomy if they define hysterectomy as a preventive behavior of potential cancer. On the other hand, a woman with greater external locus of control

may be at higher risk of hysterectomy if her doctor says that she "might" need to have a hysterectomy. With greater external locus of control, she may be more likely to listen to what the doctor says without seeking a second opinion. As an attempt to find out which of these is the case, the role of the locus of control on hysterectomy risk is investigated in this study.

Smoking and Health

As an indicatcr of people's behaviors and lifestyles, smoking status has been included in health research innumerable times. With regard to mortality, many researchers found greatly decreased longevity of smokers (Dorn 1959; Rogot and Murray 1980; Pearl 1938).

During the last half of the 19th and the first half of the 20th century, it was found that tobacco played a role in causing cancers of the lips, mouth, nasopharynx, larynx, trachea, bronchi, and lungs (Diehl 1969). Later, during the second half of the 20th century, it was also identified that tobacco plays a role in causing cancers of the pancreas, liver, spleen, kidneys, urinary bladder, cervix, prostate, and bone marrow (Doll and Hill 1954; Dorn 1959; Hammond 1964; Hammond and Horn 1958; Rogot and Murray 1980; US Dept of Health and Human Services 1989).

As stated earlier, Rogers and Hummer (1996) also found that a high smoking rate, in conjunction with other socioeconomic characteristics, was associated with high mortality in different racial groups.

In order to investigate if the hazardous impact of tobacco smoking plays a role in women's risk of hysterectomy as well, smoking status is included in this study as a potential hysterectomy risk indicator.

To sum up, studies reviewed in this chapter considerably support social stratification framework in explaining relationship between health and social factors. Many studies have found an inverse relationship between social factors and health. In other words, the higher one's social status is, the lower one's health status is likely to be.

Among social factors, researchers found that income (Kington and Smith 1997; Lannin et al. 1998; Lantz et al. 1998; Rogers and Hummer 1996; Winkleby et al. 1998), race (Kington and Smith 1997; Lannin et al. 1998; Winkleby et al. 1998), marital status (Lannin et al. 1998; Rogers and Hummer 1996), education (Ferraro and Farmer 1996; Machenbach and Kunst 1999; Marks and Shinberg 1998; Rogers and Hummer 1996; Ross and Mirowsky 1999; Ross and Wu 1995; Winkleby et al. 1998), husband's occupation (Marks and Shinberg 1998), racial residential segregation (Massey 1990), employment status (Lennon 1994; Ross and Mirowsky 1995), and urban/rural residence (Hayward and Pienta 1997) are associated with individuals' health or health behavior. Among attitudinal factors, researchers (Brown et al. 1983; Duffy 1997; Myers and Myers 1999; Oprendek and Malcarne 1997; Pender et al. 1990; Weitzel 1989) found association between locus of control

and health behaviors. As behavioral characteristics, smoking has been found to have association with health by many researchers (Diehl 1969; Doll and Hill 1954; Dorn 1959; Hammond 1964; Hammond and Horn 1958; Pearl 1938; Rogers and Hummer 1996; Rogot and Murray 1980; US Dept of Health and Human Services 1989).

Prevalence and Trend of Hysterectomy

Based on the most recently published Center for Disease Control report, the 1999 National Hospital Discharge survey shows some 616,000 hysterectomies performed in the U.S. during 1999 (Popovic and Hall 2001). Hysterectomy rates per 10,000 population in 1999 were 22.4 for all ages, 26.0 for women ages 15 to 44 years, 40.9 for women ages 45 to 64 years, and 17.1 for women 65 years and over.

In a study examining the prevalence of hysterectomy performance in Ireland, Ong et al. (2000) found among 17,735 women aged 50 to 65 years, 22.2 percent experience a hysterecomy. It was also found that hysterectomy prevalence was higher for younger women and those with private health insurance. The prevalence of hysterectomy performance was highest for women aged 45 to 49 years.

In a study on the prevalence of hysterectomy in England, Kennedy and Jones (2000) investigated 2,238 women from Teesside aged 20 to 69 and found 13.6 percent of 1,718 women had a

hysterectomy. This study asserts that the excess of hysterectomy performance among women with irritable bowel syndrome (IBS) may possibly be explained by the misdiagnosis of IBS resulting in hysterectomy or IBS symptoms occurring as a result of hysterectomy (Kennedy and Jones 2000).

According to the National Center for Health Statistics, approximately 12.5 million women in the U.S. underwent a hysterectomy between 1965 and 1984. The mean age at the time of hysterectomy during this period was 42.7 years and a median age of 40.9 years (Pokras and Hufnagel 1988). By 1984, about 6.9 hysterectomies were performed per 1,000 women older than 15 years of age. The highest rates were found for women between the ages of 40 and 44, with 16.2 hysterectomies per 1,000 women. The overall trend showed a gradual increase between 1965 and 1975 and then displayed a slight decline until the 1980s.

The three most common symptoms for hysterectomy were fibroids, prolapse, and endometriosis, which accounted for about 63 percent of all hysterectomies (Pokras and Hufnagel 1988). It was also found that the average lengths of stay for women hospitalized for hysterectomy decreased during this period from about 12 days in 1965 to about 7 days in 1984. This decline was due to fewer complications resulting from improved surgical techniques and earlier recovery after the surgery. Moreover, the study found that hysterectomy rates for endometriosis increased steadily during the study period. This increase was significantly

larger than for other diagnoses. In addition to other possible factors, this may reflect a change in physicians' preferences and they became more likely to perform a hysterectomy for endometriosis.

The proportion of women who experienced oophorectomy along with hysterectomy increased between 1965 and 1984. The combination of oophorectomy with hysterectomy accounted for 35 percent of all hysterectomy cases in 1965. This number increased to 66 percent by 1984. Findings from this study indicate that if current trend continues, 854,000 hysterectomies will be performed in the year 2005 as the baby boom generation enter the age range with greatest risk for hysterectomy.

In their hysterectomy trend study of 1970 to 1978, Dicker et al. (1982) examined the impact of age, race, and geographic regions on hysterectomy rates. Using the National Hospital Discharge Survey (NHDS) data for women aged 15 to 44 years, surgical procedures coded as hysterectomy (69.1, 69.2, and 69.4) in the International Classification of Diseases version eight were included in the study, while excluding radical hysterectomies (69.3, 69.5, and 69.7). They discovered that during this period, the hysterectomy rate averaged 8.5 per 1,000 women, aged 15 to 44 years, and the mean age of women undergoing hysterectomy was 35.1 years. The age-specific hysterectomy rates were higher for the older age group (35-44 years) than for the younger group (25-34 years). The rates were also higher for black

women than for whites. Across geographic regions, they identified that the hysterectomy rates were consistently highest in the South and lowest for women in the Northeast during the study period. They also found that the average age of Northeastern women undergoing hysterectomy was the highest, while young women in the South are more likely to experience hysterectomy than their counterparts in other regions of the U.S. In addition, significantly greater proportions of women in the Northeast region underwent abdominal hysterectomy as opposed to vaginal hysterectomy, and they also experienced more concurrent oophorectomy than women in the other regions. Dicker et al. (1982) also noted that throughout the study period, interregional differences in rates and in the mean ages of women undergoing hysterectomy have persisted. The authors emphasized that more patient-related factors and physician-related factors need to be explored to explain this phenomenon.

The scope of this study was limited to women between the ages of 15 and 44, thereby failing to examine whether the same kind of variations apply for the age groups older than 45 as well. According to the study by Pokras and Hufnagel (1988), hysterectomy rates are highest for women between the ages of 35 and 49. Women between the ages of 50 and 54 show hysterectomy rates as high as 7.8 per 1,000 women. By leaving out older age groups, the study by Dicker et al. (1982) limits its explanatory power.

Using the NHDS (National Hospital Discharge Survey) data, Wilcox et al. (1994) examined the patient characteristics represented by age, race, and diagnoses associated with hysterectomy in the U.S. between 1988 and 1990. Hysterectomy was defined in this study according to the ICD, 9th Revision (68.3, 68.4, 68.5, 68.6, and 68.8). Overall, the hysterectomy rates per 10,000 women aged 15 years or older were 58.0 in 1988, 53.9 in 1989, and 58.5 in 1990. Wilcox et al. (1994) noted that although the overall hysterectomy rates were similar for white and black women, uterine leiomyoma was responsible for 61 percent of hysterectomies for black women, while it accounted only for 29 percent for white women. It was also found that about half of the women who had hysterectomies also experienced bilateral oophorectomy during this period. Across age groups, hysterectomy rates were highest for women aged 30 to 54 years (100.5 per 10,000 women). For women aged 35 to 54, leiomyoma, endometriosis, and prolapse were the three most common diagnoses for hysterectomy. Prolapse and cancer were the most common causes for hysterectomy for women aged 54 and over. For non-cancerous conditions, uterine leiomyoma and endometriosis were the primary diagnoses for two-thirds of all women. White women were almost twice as likely as black women to undergo hysterectomy for cancer or hyperplasia.

It has been reported that black women are more likely than white women to develop cervical cancer but less likely to develop

uterine cancer (Seidman et al. 1985). The authors noted that, despite the well-known belief that uterine leiomyomas is more common among black women than white women, no population-based studies of this disorder have been reported. Also noting that the proportion of all hysterectomies using an abdominal method has changed little during the study period, Wilcox et al. (1994) emphasized the importance of the selection of surgical approach since abdominal hysterectomy may be associated with increased morbidity and a longer hospital stay. In addition, concurrent removal of ovaries along with hysterectomy has been noted for 37 percent of women under 45 years old. The authors noted that oophorectomy may increase the risk of osteoporosis and cardiovascular disease and lead to shorter life expectancy. Hysterectomy without oophorectomy has been associated with a decreased risk of ovarian cancer (Wilcox et al. 1994).

Acknowledging the importance of accurate reporting of hysterectomy rates, the Centers for Disease Control (CDC) set off an epidemiologic surveillance of sterilizing operations including hysterectomies in 1975 among women of reproductive age in the United States. As a result of the surveillance system, there is now a substantial amount of data regarding the hysterectomy-related hospitalization volume and charges as well as some hospital, physician, and patient related factors for some 22 years. However, the focus of this system has been mainly put on clinical factors of hysterectomy and little attention has been

paid to non-clinical predictors of hysterectomy.

The Center for Disease Control and Prevention summarized the hysterectomy trends in the United States from 1980 to 1993 using NHDS data (1997). Hysterectomy was defined using ICD-9-CM codes 68.3 (subtotal abdominal hysterectomy), 68.4 (total abdominal hysterectomy), or 68.5 (vaginal hysterectomy). Radical hysterectomy and pelvic evisceration performed on women with advanced pelvic cancer were excluded. It was discovered that about 8.6 million women aged 15 years or older had a hysterectomy between 1980 and 1993, and the hysterectomy rate decreased from 7.1 per 1,000 women in 1980 to 6.6 per 1,000 women by 1987.

Most likely due to the redesign of the NHDS in 1988, the hysterectomy rate declined slightly during the 1988 to 1993 period. Between 1988 and 1993, the average hysterectomy rate was about 5.5 per 1,000 women. Although no significant racial difference in hysterectomy rates was found, significant differences across age groups in hysterectomy rates were noted. During the 1988 to 1993 period, women aged 40 to 44 years (12.9/1,000) showed the highest hysterectomy rate, women between the ages of 35 and 39 or 45 and 54 age groups reported the second highest rate (9.9/1,000), and those aged 15 to 24 years reported the lowest rate (0.3/1,000).

With regard to geographic variations of hysterectomy performance, hysterectomy rates were reported the lowest in the Northeast (3.9/1,000) and highest in the South (6.8/1,000).

Between 1980 and 1993, the average age at the time of hysterectomy was 47.7 years in the Northeast and 41.6 years in the South.

The most frequently associated diagnoses were uterine leiomyoma, endometriosis, and uterine prolapse. For women 30 years of age and under, menstrual disturbances and cervical dysplasia were the most frequently associated diagnoses with hysterectomy; for women aged 30 to 34 years, endometriosis was the most frequently associated diagnosis; and for women 55 years of age and older, uterine prolapse and cancer were the most frequently associated diagnoses. Between 1988 and 1993, 51 percent of the hysterectomies were accompanied with bilateral oophorectomy. Oophorectomy was performed more than three times more frequently for abdominal hysterectomy than for vaginal hysterectomy (63% vs. 18%). The proportion of hysterectomies accompanied with concomitant oophorectomy increased with patients' ages until they reached 54 years of age and then showed a slight decline. Vaginal hysterectomy was performed more frequently for white women (28%) than for black women (15%).

The National Hospital Discharge Survey provides the only available national population-based estimates of hysterectomy rates; however, it has several limitations. First, with the redesign of the NHDS in 1988, the hysterectomy rates before and after 1988 are not directly comparable. Also, the NHDS does not provide patients' background information such as parity. In

addition, the non-response rate for some of the socioeconomic questions such as race is high (10-20%).

Clinical Indicators of Hysterectomy

Believing that professional uncertainty about the appropriate use of hysterectomy is the primary cause of the variation in hysterectomy rates across geographic, patient-related, and physician-related factors, Carlson et al. (1993) summarized primary diagnoses for hysterectomy. The authors argue that the professional uncertainty regarding appropriate use of hysterectomy stems from difficulties in diagnosis, lack of information on the outcomes of hysterectomy as well as alternative treatments, and differences between physicians' judgments and patients' preferences for treatment. According to their study, uterine leiomyomas account for about 30 percent of all hysterectomies, dysfunctional uterine bleeding for 20 percent, endometriosis for 20 percent, genital prolapse for 15 percent, and chronic pelvic pain for approximately 10 percent.

Mortality rates after hysterectomy have been reported to range between 6 and 11 per 10,000 women not related to pregnancy or cancer; between 29 and 38 per 10,000 women associated with pregnancy; and between 70 and 200 per 10,000 cancer-related cases. In addition, 24 percent of all after-hysterectomy deaths were related with vaginal hysterectomy while 43 percent were associated with abdominal hysterectomy. It is noted that,

although their long-term outcomes are not yet known, alternative treatments for diagnoses that have traditionally led to hysterectomy are becoming increasingly available. Carlson et al. (1993) asserted that patients' preferences for treatment should be considered carefully since the body of clinical evidence is inadequate to support consensus regarding treatment recommendations.

For their study of mortality risk associated with hysterectomy, Wingo et al. (1985) obtained data from the Commission on Professional and Hospital Activities (CPHA), which collected information from some 40 percent of patients discharged from short-stay hospitals in the United States between 1979 and 1980. Hysterectomy was defined using ICD-9-CM: 68.3, 68.4, and 68.5. The authors identified that there were about 12 after-hysterectomy deaths per 10,000 operations. The mortality risk was higher for both vaginal and abdominal hysterectomies that were related to pregnancy and cancer. They discovered that, in general, after-hysterectomy mortality rates were higher when performed by the abdominal approach than for hysterectomies performed by the vaginal approach. Mortality rates after hysterectomy increased with age, especially after age 54. In addition, the identified mortality rates for black women (21.3) were almost twice that for white women (11.0), regardless of associated conditions or surgical approach.

In their study, 92 percent of all hysterectomies were

related with conditions other than pregnancy or cancer. Mortality rates for conditions excluding pregnancy or cancer would have been more representative of the general risk of hysterectomy-related death. In addition, the deaths were defined when hospital discharge status on hospital records was coded as dead. Therefore, this study excludes those discharged from hospitals but subsequently developed hysterectomy-related complications resulting in death.

Past studies on hysterectomy also found that hysterectomy experience may bring several negative health consequences to women. Napoli (2000) asserted that women with hysterectomy experience are more likely to have damaged pelvic nerves or pelvic supportive structures and to develop urinary incontinence. Some of these negative consequences such as urinary incontinence may take years to occur (Napoli 2000).

Browder (2001) investigated the association between hysterectomy and cardiovascular disease. Claiming that only 10 percent of 600,000 hysterectomies are performed to remove cancerous tissue, Browder asserted that there are many new and less invasive alternative treatments for hysterectomy. After reviewing several past investigations on hysterectomy and heart disease, Browder found that women who experienced hysterectomy and oophorectomy have increased risk of coronary heart disease. It was also found that women who had a hysterectomy for fibroids have three times greater risk of cardiovascular disease. In

addition, Browder found that women who experience hysterectomies before menopause have three times greater risk of coronary artery disease than their counterparts. On the other hand, hormone replacement therapy was found to lower heart-disease risk for women who experienced a hysterectomy.

Appropriateness of Hysterectomy

In their study of the appropriate use of hysterectomy, Bernstein et al. (1993) compared seven managed care health plans using a list of indications developed by the authors. In order to assess the proportion of women who underwent a hysterectomy for inappropriate reasons among women in these managed care organizations, a convened panel of nine physicians nominated by the Health Maintenance Organization Quality of Care Consortium members rated the appropriateness of 652 hysterectomies conducted between 1989 and 1990.

A random sample of 100 hysterectomies per organization was selected and the development of the indications was assisted by discussions with clinicians. As an example of the indications, a hysterectomy was rated appropriate when symptomatic second-degree uterine prolapse without cystocele or rectocele was detected, the patient was aged older than 40 years with children and had no desire for more children, and the patient reported no prior conservative therapy. A hysterectomy was rated uncertain when mild abnormal ovulatory uterine bleeding was detected, the

patient was aged 40 years or older, was bleeding persistently, and had one course of hormonal therapy and one diagnostic evaluation of the endometrium. A hysterectomy was rated as inappropriate when leiomyomas were less than 12 week size with mild bleeding and without pain or discomfort and when the patient was aged 40 years of age or older.

Hysterectomy was identified by ICD-9-CM procedure codes (68.3-68.8) and Current Procedural Terminology (CPT-4: 51925, 58150-58285). The records of the selected patients were abstracted from health plans. The median age of the study patients was 44 years with 10 percent being older than 60 years of age. Seventy-five percent of them were married and 12 percent had no children. The authors discovered that 58 percent of the 652 cases reviewed underwent hysterectomies for appropriate reasons, 25 percent were for uncertain reasons, and 16 percent of them were for inappropriate reasons. Older women were more likely to have received an appropriate hysterectomy than younger women. For women aged 21 to 40 years, 56 percent of hysterectomies were conducted inappropriately, whereas 17 percent of the hysterectomies were inappropriate in patients 60 years of age and over. No significant differences were noted across racial groups. The authors also noted that there were considerable variations among health plans in terms of the appropriate use of hysterectomies.

A more recent national study investigated the awareness of

women of hysterectomy alternatives and physician's support to women's efforts to reach alternatives. Henderson (2000) studied 300 obstetricians/gynecologists and 500 women aged 35 to 50 for the above mentioned objective. The author found that 82 percent of women recommended for a hysterectomy accept the recommendation and experience a hysterectomy. The study also found that while 75 percent of physicians supported their patients' efforts to seek alternatives to hysterectomy, more than one-third of women who had a hysterectomy did not discuss potential alternatives with their doctor.

Saunders and Pennachio (2000) investigated inappropriate hysterectomy recommendations among nine medical groups operating in California. Based on two sets of criteria for appropriateness of recommendations for nonemergency, nononcologic hysterectomy, the study found that 70 percent to 76 percent of 497 hysterectomy cases had inappropriate indications. The main reasons for inappropriate recommendations were lack of sufficient diagnostic evaluation and not offering nonsurgical alternatives.

As an earlier study examining the frequencies of unnecessary hysterectomies, Doyle (1953) collected hospital records data from 35 privately administered hospitals in California. It was found that women aged 40 to 49 comprised the largest group, totalling 2,745. There were also more total hysterectomies than subtotal hysterectomies performed. Doyle discovered that out of 6,248 hysterectomy cases, 340 patients did

not have any complaints or symptoms requiring a hysterectomy. Among those 340 patients, 99 were aged 20 to 39 years. Irregular vaginal bleeding, which is not a sufficient reason for hysterectomy in itself, was the only reason cited for 8 percent of the hysterectomies. Of 4,459 women with complaints of irregular bleeding, 86 percent were not given the benefit of diagnostic curettage before hysterectomy. Furthermore, pain was the only complaint of 185 patients, and backache was the single symptom experienced by another 86 patients experiencing hysterectomy. It was also noted that 788 cases (12.5%) did not show any gross or microscopic evidence of disease, and 30 percent of the patients aged 20 to 29 had no disease at all. For those who had normal uteri with infection of the adnexae (ovaries), 60 percent (163 cases) were aged 20 to 39 years, for whom Doyle argued that a less radical procedure would seem the preferred choice. Overall, 21.5 percent of the 6,248 patients subjected to hysterectomy were cases where medical treatment and/or minor surgical procedures would have been preferable.

In order to examine the degree to which experts and community physicians' beliefs about the appropriateness of hysterectomy differ, Bickell et al. (1995) compared a national expert managed care panel with practicing community gynecologists in North Carolina. Two hundred thirty-one community gynecologists were randomly selected in North Carolina, and experts were composed of nine physicians nominated by the members of the HMO

Quality of Care Consortium. The survey questionnaire asked the two groups about their personal and practice characteristics as well as the appropriateness of performing hysterectomies for 32 clinical scenarios. After analyzing the answers of the respondents for the scenarios, little difference was discovered on appropriateness ratings between experts and community gynecologists.

For cervical dysplasia scenarios, community gynecologists were significantly more likely to rate hysterectomy as more appropriate than the experts. Regarding the within-group variation, the experts agreed among themselves on 19 of 32 indications (59%), whereas North Carolina community gynecologists agreed on 12 of 32 clinical scenarios (38%). The authors claimed that the different rating may be due to the fact that the experts were all clinicians with HMOs, whose goal is minimizing inappropriate procedures. In addition, they asserted that the difference may stem from the different practice styles by region considering that the experts were from all four major U.S. census regions.

This study limits its scope to clinical conditions by not assessing patient characteristics. Without including patient factors such as parity, desire for more children, age, and so on, the rating of appropriateness of hysterectomy cannot be completely assessed.

To summarize clinical findings, primary diagnoses of

hysterectomy are uterine leiomyomas, dysfunctional uterine bleeding, endometriosis, genital prolapse, and chronic pelvic pain (Carlson et al. 1993). After-hysterectomy mortality is known as 6 to 12 per 1,000 hysterectomies that are not related with cancer or pregnancy (Carlson et al. 1993; Wingo et al. 1985). Abdominal hysterectomy was associated with higher after-hysterectomy mortality than vaginal hysterectomy (Carlson et al. 1993; Wingo et al. 1985). Hysterectomy can cause negative consequences such as damaged pelvic supportive structures, urinary incontinence (Napoli 2000), or increased risk of coronary heart disease (Browder 2001). Past studies also found that 16 percent of 652 hysterectomies performed in seven health maintenance organizations were inappropriate (Bernstein et al. 1993), more than a third of women who had a hysterectomy did not discuss potential alternative treatments with their doctor (Henderson 2000), and 70 to 76 percent of hysterectomy cases among nine medical groups in California had inappropriate indications (Saunders and Pennachio 2000).

Non-Clinical Indicators of Hysterectomy

Social Characteristics and Hysterectomy

Earlier in this chapter, past studies examining the relationship between social factors and overall health were reviewed. It was identified that education, race, employment status, and place of residence are associated with variations in

people's health and mortality. In this section, previous studies that focused specifically on hysterectomy with regard to its relationship with women's social characteristics are reviewed.

Marshall, Hardy, and Kuh (2000) conducted a longitudinal study on a national cohort of women born in England, Scotland, or Wales to examine the inverse social grandients in hysterectomy risk. Two thousand five hudred and forty-seven women were followed from their birth in 1946 until they reached 52 years of age. This study found that women with less education are more likely to have a hysterectomy by age 52.

Using data from the 1988 Behavioral Risk Factor Surveillance System, Kjerulff et al. (1993[b]) examined the relationship between incidence of prior hysterectomy and age, race, education, and income in 15 states in the United States. Overall, 22.5 percent of the 12,465 women aged 18 and over experienced a hysterectomy. The 55 to 64 age group showed the highest percentage (40.5%) of women having a prior hysterectomy, those 65 years of age and older reported the second highest proportion (39.3%), and those 35 to 44 years of age showed the third highest proportion (37.0%) of women having had a hysterectomy.

Using logistic regression, the authors discovered that women without a high school diploma were twice as likely to have a prior hysterectomy (odds ratio: 2.1) than those with college

degrees. Furthermore, women in the lowest income category had a significantly higher likelihood (odds ratio: 1.6) of having had a prior hysterectomy than women in the highest household income category ($35,000 or more). The odds ratio increased as the education and income level decreased. Race did not appear to have a significant relationship with prior hysterectomy in this study.

As a possible explanation for the higher odds ratios of having a prior hysterectomy in low income/education levels, the authors suggested that women in lower socioeconomic status may not receive regular gynecological examinations to detect early cervical cancers. They also asserted that women in lower socioeconomic backgrounds may not present their gynecological problems until they become too severe to avoid a hysterectomy option.

To examine the relationship between women's socioeconomic status and hysterectomy, Marks and Shinberg (1997) used data from the Wisconsin Longitudinal Study -- a longitudinal study of a random sample of 10,317 men and women graduated from Wisconsin high schools in 1957. This study analyzed information for 3,326 females who responded to mail-back surveys in 1975 and 1993. The women in this study were almost all non-Hispanic whites; therefore, racial difference in hysterectomy could not be examined.

The questionnaire asked the respondents whether their menopause was induced or hastened by a hysterectomy and whether

they had ever had surgery to remove their uterus. Therefore, the definition of hysterectomy experience was dependent on respondents' correct recall. In addition, the type of hysterectomy, vaginal or abdominal, could not be identified. About 31 percent of the study's female respondents reported having experienced a hysterectomy.

Using maximum likelihood estimates from logistic regression models, the author contrasted respondents who had hysterectomy by age 53 or 54 with female respondents who had not. It was discovered that women with at least a bachelor's degree had significantly lower odds of having a hysterectomy than women with only a high school education. Also, women with higher occupational status appeared to have lower hysterectomy rates. Since the effects of education became non-significant when the women's occupational status was added to the model, the author asserts that education appears to influence the relative risk of hysterectomy through its effects on women's occupational status. Women's marital status did not show any significant associations with hysterectomy. Family net worth showed some association with hysterectomy, but the relationship did not appear to be linear.

The relatively lower importance of childhood SES and spousal SES for predicting hysterectomy, as evidenced from this study, emphasizes that the impact of women's own adult socioeconomic status on hysterectomy experience. Overall, women's occupational status was the most robust social predictor of

hysterectomy. The authors' argument is that more educated women have more opportunities for higher employment status and its health-related benefits. The authors asserted that possible factors associated with women's high social status and hysterectomy may be that women with high occupational status have positive psychosocial factors, better health insurance benefits, and may be given more respect by physicians.

Noting that information on hysterectomy in minority women is sparse, largely historical, and anecdotal, Kjerulff et al. (1993[a]) investigated black-white differentials in hysterectomy-related factors using the annual hospital discharge summary data from all nonmilitary hospitals in Maryland between 1986 and 1991. From the data, there were 53,159 hysterectomies defined by using the International Classification of Diseases (ICD-9-CM: 68.3-68.7). The data were composed of 70 percent white women, 26 percent black women, and about 3 percent other races. Only white and black women were included for the analyses. The annual hysterectomy rates were 49.5 per 10,000 black women and 41.2 per 10,000 white women during the study period. Using age-adjusted hysterectomy rates, the authors found a tendency for black women in Maryland to have hysterectomies at younger ages (average age: 42.0) than white women (average age: 46.1)

Kjerulff et al. (1993[a]) also discovered that hysterectomy rates were higher for black women under the age of 50, while they were higher for white women over the age of 50. Over 65 percent

of the hysterectomies in black women were for diagnosis of fibroids, whereas 28.5 percent were for the same diagnosis in white women only. White women were more likely to have a hysterectomy for diagnoses of uterine prolapse, endometriosis, cancer, or menstrual disorders. Black women were more likely to have abdominal hysterectomies and more likely to be Medicaid recipients or belong to health maintenance organizations. Although black women were less likely to have comorbidities (having secondary diagnoses that have been found to alter the risk of mortality) than white women, they were more likely to have complications of surgical or medical care than white women (odds ratio: 1.4).

All women having hysterectomies in teaching hospitals were twice as likely to have complications, especially those experiencing subtotal hysterectomies. Black women (47%) were more likely to have hysterectomies in teaching hospitals than white women (35%). The authors assert that controlling for other factors, women having a subtotal hysterectomy were substantially more likely to stay in the hospital more than 10 days, and they were more likely to have higher after-hysterectomy mortality. Subtotal hysterectomy occurred in 17.7 percent of black women and in 9.2 percent of white women who died after hysterectomy. In addition, the authors discovered that the average length of a hospital stay was longer for black women than for white women by one-half day and the mortality rate for black women having

hysterectomy was 24.6 per 10,000 procedures, but only 17.4 per 10,000 for white women.

Although this study provides noteworthy differences between black and white women with hysterectomy experiences, the data do not exclude non-elective hysterectomy cases. Therefore, it is difficult to distinguish whether it is black women's reproductive organ health or the patients' or physicians' preference of medical procedure that produces such differences.

Physicians and Hysterectomy

Using the Arizona State patient discharge database for 1989 to 1991, Geller et al. (1996) investigated the role of non-clinical factors represented by physician characteristics in explaining hysterectomy practice patterns. They hypothesized that women physicians would perform fewer hysterectomies than their male counterparts because female physicians may value the intact uterus more than male doctors. It was also hypothesized that more recent medical school graduates and board-certified physicians would have a higher probability of performing hysterectomies. Their hypotheses also suggested that the probability of a hysterectomy would be greater among patients with private insurance and for physicians who treat a high proportion of privately insured patients than for those who treat publicly insured and self-pay patients.

Based on 20,013 hysterectomy cases, the authors discovered that patient factors were more important than physician factors

with regard to hysterectomy practice. The average patient age for hysterectomy was a factor with 45.04 years, and the average length of hospital stay was 3.99 days. About 40 percent of women were insured through HMO/Blue Cross, 36.4 percent were with commercial insurance, 11.0 percent were with Medicare, 6.7 percent were other/self-pay, and 5.3 percent were with Medicaid. Ninety percent of the physicians were male and 83 percent were board-certified.

Although all three sets of factors (patient, physician, and hospital factors) contributed significantly to explaining variations in hysterectomy, Geller et al. (1996) found patient characteristics to be the major determinants of a hysterectomy (R^2=.440). Hospital and physician variables increased the explanatory power of the model (R^2) by .09 and .04, respectively.

Statistically significant patient-related predictors for a hysterectomy were clinical conditions, patient age, and means of payment. Women between the ages of 35 and 54 had a significantly higher likelihood of having a hysterectomy than women in other age groups. Women with any type of health care coverage were more likely to have a hysterectomy than self-pay women (Geller et al. 1996).

Among physician factors, the authors found a marginally significant difference based on the physician's gender. Female physicians were more likely to perform a hysterectomy than their male counterparts. Physicians with longer experience (15-19, 25-

29 years) performed significantly more hysterectomies than less experienced physicians (0-4 years). In addition, physicians who had a higher proportion of patients with private insurance were more likely to perform a hysterectomy than were physicians who were treating publicly insured patients. These findings cannot be generalized to overall U.S. trends because it only included one state, and previous studies have indicated substantial geographic variations regarding hysterectomy.

Geller et al. (1996) noted that, although non-clinical factors are confirmed to play a statistically significant role in the decision to perform hysterectomies, physician factors play a smaller and secondary role compared to clinical/patient factors in explaining practice variations in hysterectomies. Therefore, they emphasized that efforts to reduce unnecessary hysterectomies should be directed at identifying the appropriate clinical indications for hysterectomy as well as increased education for patients, physicians, and hospitals.

The study of Geller et al. (1996) fails to clearly present how hysterectomy was defined. Thus, it is impossible to distinguish whether the factors included in the study have impacts excessively on radical and elective hysterectomies. When one of the main goals of public health is to seek the most cost-effective quality care of hysterectomy patients, it is crucial to identify factors influencing elective hysterectomies separately from those affecting radical hysterectomies.

Acknowledging that most of the variations in hysterectomy rates have been attributed to physician uncertainty about the appropriate indications for hysterectomy, Bickell et al. (1994) examined the relationship between hysterectomy rates and physician's gender, ratings of hysterectomy's appropriateness, and beliefs about surgery and the uterus. Twenty-eight surgically active female gynecologists and 79 male gynecologists in North Carolina, a state with one of the highest hysterectomy rates, were included in their study. A mail survey was conducted with 106 questions about attitudes toward surgery and the uterus, practice characteristics, demographics, and clinical scenarios of a 45-year-old woman presenting major diagnoses usually leading to a hysterectomy.

Bickell et al. (1994) discovered that gynecologists who tended to perform hysterectomies at higher rates were male, had completed their training earlier, practiced in areas with a lower density of gynecologists, and had higher proportions of younger patients and patients with abdominal bleeding or cancer. Gynecologists who were trained more recently were shown to perform hysterectomies at lower rates than those who had been in practice longer. They were also more likely to believe that a woman's uterus contributes to sexual function. Recently trained gynecologists were also less likely to believe that hysterectomy was more effective than medical management. Physicians' beliefs about the appropriateness of hysterectomy and about the relative

efficacy of hysterectomy were not associated with hysterectomy rates. In addition, both male and female gynecologists were significantly influenced by a patient's expressed preference in avoiding hysterectomy.

The finding that physicians working in areas with fewer gynecologists perform hysterectomies at higher rates and share the belief that surgery is a better treatment than medicine, may point to the possibility that shared professional beliefs and community norms in certain geographic areas influence hysterectomy practice patterns. With more information available both to the public and professional communities, variations in hysterectomy may be reduced.

Other Non-Clinical Indicators of Hysterectomy

Van den Eeden et al. (1998) compared three most common types of hysterectomy--total abdominal hysterectomy, vaginal hysterectomy, and the more recent laparoscopically assisted vaginal hysterectomy--in terms of health-related quality of life, activity levels, health care utilization, and costs. Between November 1994 and November 1995, they selected women who were undergoing an elective hysterectomy (i.e., not performed on an emergency basis) in the Kaiser Permanante Medical Care Program in Northern California. Along with medical record reviews, they conducted telephone interviews with these women before and after they experienced a hysterectomy.

With 287 completed interviews, Van den Eeden et al. (1998) found that more abdominal hysterectomies were performed for fibroids/leiomyoma and more vaginal hysterectomies were performed for prolapse or bleeding. It was also discovered that a higher proportion of laparoscopically assisted vaginal hysterectomy (LAVH) patients (66.3%) and vaginal hysterectomy patients (71.5%) returned to normal activity levels at day 28 after the surgery compared to 48.1 percent for abdominal hysterectomy patients. Overall, the vaginal hysterectomy and LAVH groups reported significantly less health interference than the abdominal hysterectomy patients. At day 7, the LAVH and the abdominal hysterectomy groups reported significantly greater degradation of quality-of-life as measured by physical functioning, overall pain, abdominal pain, and energy/vitality than the vaginal hysterectomy group. The abdominal hysterectomy group had significantly more postoperative visits to obstetrician-gynecologists than other groups, and this group also reported significantly longer periods of hospital stay than the other two groups.

Van den Eeden et al. (1998) also found that overall hospitalization costs were highest for the abdominal hysterectomy group, followed by the LAVH and vaginal hysterectomy groups. The authors concluded their study by noting that vaginal hysterectomy is a less costly surgical approach and results in better postoperative quality-of-life outcomes. Although LAVH often

appeared to be as favorable on quality-of-life measures, when all clinical decisions were equal, they asserted that vaginal hysterectomy would yield the most satisfactory results from the patients' perspective.

This study has a limitation of small sample size (N=287), and it also failed to examine the long-term results of the three different surgical approaches. Some studies report long-term problems in 50 percent of hysterectomy patients (Bernstein et al. 1993). Therefore, findings within 28 days following hysterectomy may not reflect to the long-term effects of hysterectomy on patients.

In her study of the effect of crisis on female sexual identity, Savage (1981) argued that the loss of reproductive organs frequently provokes doubt about one's sexuality even when the organs removed may not be essential to the human sexual response. She also asserted that "the American woman may be destined to experience a profound sense of inadequacy and diminished self-concept because of the social cue that beauty is equated with youth and fertility" (p. 155). According to Savage, crises possibly influencing women's sexual identity include abortion, mastectomy, hysterectomy, and sexual dysfunction. Drellich and Bieber (1958) also claimed that the uterus is an important symbol of femininity and that its removal changes a woman's perception of her sexual identity.

To understand the hysterectomy experience from the women's

perspective, Kinnick and Leners (1995) conducted an ethnographic study examining the hysterectomy experience of six females. The informants were in their forties, lived in northeast Colorado, and experienced an elective hysterectomy three months prior to the study. The ethnographic interviews asked women questions regarding the quality of life before hysterectomy, the decision-making process, their knowledge base about hysterectomies, concerns and fears about hysterectomies, comparisons before and after the hysterectomy, and advice women gave each other about hysterectomies.

Overall, Kinnick and Leners (1995) found positive outcomes after hysterectomy, including physical and psychological relief as well as significant increase in quality of life. Before the hysterectomy, informants reported experiences of miserable feelings related with menstrual bleeding, bloating, chronic discomfort, and negative emotional and behavioral effects because of their physical problems. As they became aware of the hysterectomy option, they talked to others to seek their opinions. While some encouraged the informants to do it, others provided few negative comments involving complications of the surgery or postoperative estrogen therapy.

The study discovered that women did not know what to expect before hysterectomy. This indicates a lack of information available to women on this subject. Because informants were faced with limited access to sources of information and were not

prepared by their physicians, they reported a feeling of fright and surprise regarding routine procedures of hysterectomy and the degree of postoperative pain (Kinnick and Leners 1995). Out of six informants, five reported positive changes after hysterectomy including getting rid of numerous, difficult physical symptoms. All six of the women expressed that they did not feel any change in their feeling of womanhood after hysterectomy. While the informants reported receiving caring support from their family and friends, most reported feeling a lack of caring support from their physicians.

Although this study explores several important points about hysterectomy from women's perspectives, the fact that it was conducted only 3 months after the surgery limits its scope and fails to explore hysterectomy's long-term effects. It also failed to explore factors associated with a decision-making process of hysterectomy. Ethnographic studies provide a valuable opportunity to explore the decision-making process of hysterectomy for women by simply asking informants to explain how they reached the decision to have a hysterectomy instead of relying on telephone interviews or mail surveys.

Decision-Making Process of Hysterectomy

At least one study indicated that more than 85 percent of hysterectomies are elective (Wingo et al. 1985), implying that there is almost always at least one other alternative to

hysterectomy. A traditional view of patients being passive and compliant has been changed by the recognized need to encourage patients to actively participate in the medical decision-making process (Gambone and Reiter 1997). However, there have been few studies examining women's decision-making processes as related to the hysterectomy experience. The few existing studies fail to investigate the actual decision-making process from the women's perspective.

As one of few such studies, Finkel and Finkel (1990) examined the effect of a second opinion program on hysterectomy performance using data from a major insurance carrier in 1987. This company required all women to obtain a second surgical opinion for an elective hysterectomy. Among 1,698 women nationwide who were referred for a second opinion, 135 were subsequently not confirmed for the originally proposed hysterectomy. To match the number of cases for a control group, 135 cases were randomly selected among those who were confirmed for hysterectomy by the second opinion consultant. There was no significant difference across age groups and geographic regions with regard to the confirmation status for hysterectomy. Women under 29 years of age and women living in the Northeast region showed a greater proportion not confirmed for hysterectomy. Finkel and Finkel (1990) discovered that about 53 percent of women in the North Central regions and 56 percent of those in the South had hysterectomies despite the second opinion physician's

recommendation against surgery.

Among 59 individuals who were not confirmed for hysterectomy but chose to have the surgery anyway, 24 were from the South, 19 were from the North Central region, seven were from the Northeast, four were from the West, and five were from the Southwest. Of those whose hysterectomy recommendations were confirmed as being asymptomatic by the second physician, 71.4 percent did not have hysterectomy. Among 31 women to whom alternative procedures were recommended, 55 percent (17 women) chose to have the hysterectomy. More than a quarter (27.3%), who were found to have had no pathologic reason for hysterectomy, had the surgery anyway. Half of these women were told that they did not have any gynecologic problems. Forty percent of those recommended to wait and see if problems persisted did not have the hysterectomy.

Nearly two-thirds (64.4%) of those not confirmed for hysterectomy and decided not to have the surgery said their decision was a result of the second opinion exam, 16.4 percent stated that they followed the advice of the second opinion physician regarding medication, and 6.8 percent had an alternative procedure performed.

Although this study shows how a second opinion program might reduce the performance of unnecessary hysterectomies, the small sample size (135) limits the explanatory power of the study. Nonetheless, the results from this study reflect the fact

that physician and patient decision-making process varied markedly, leading to variations in hysterectomy rates.

Emphasizing the importance of patient participation in the decision-making process of elective hysterectomy, Gambone and Reiter (1997) presented ways to improve the patient's decision-making process associated with hysterectomy. Although informed consent for hysterectomy often includes a document following governmental guidelines for format and content, the authors assert that there is seldom any attempt to assess the patients' abilities to understand the information. Studies by Wu and Pearlman (1988) found that physicians communicated the rationale for a procedure during only 43 percent of 172 interactions between physicians and patients. They also found that even less physician-patient communications were made regarding benefits, risks, and alternative procedures (12-34%). Gambone and Reiter (1997) argued that the failure to share information with patients is a major barrier to informed consent. The authors presented four patient-centered models of informed consent.

The first way presented to improve informed consent is developed by Ballard-Reish and includes three phases: (1) diagnosis, (2) exploration of treatment alternatives, and (3) treatment decision, implementation, and evaluation. The second model, the "PREPARED" informed consent checklist, assists patients' abilities to ensure information about Procedure, the Reason for the procedure, the Expectation for benefits, patient-

centered Preferences, the Alternatives, the Risks, the Expense, and the Decision. The third was developed by the Foundation for Informed Decision-Making and is a video laser-disc Shared Decision Program (SDP) to help patients in the hysterectomy decision for benign indications. Finally, the American College of Obstetricians and Gynecologist's (ACOG's) computer-based interactions series published a program entitled "Decision-making and Hysterectomy."

Gambone and Reiter (1997) argued there are certain barriers to patient-centered decision-making. They include patients' low self-confidence for making medical and surgical decisions which is reinforced by the use of technical terms and jargon by physicians during the decision-making session and lack of time in the time-limited health care setting. The authors asserted that factors that can promote patient participation and collaboration can include accurate information presented in an unhurried and safe setting providing enough time for discussion, simplifying the information presented, and encouraging patient participation by avoiding use of jargon. They also emphasized the need to frame benefits and risks of hysterectomy within the proper perspective.

Gambone and Reiter (1997) argued that patient choice is particularly important since professional consensus regarding clear recommendation for hysterectomy is not present. In addition, they noted that the era of managed care has created an agency problem. Patients are concerned that necessary treatment

may be delayed due to the required cost. The authors asserted that health plans and medical groups should provide objective information about available choices including decision-making and hysterectomy.

To sum up the decision-making process findings, out of 172 interactions between physicians and hysterectomy patients, physicians communicated the benefits, risks, and alternative procedures with patients only 12 to 34 percent of the time (Wu and Pearlman 1988). Researchers claim that the failure to share information with patients is a major barrier to informed consent (Gambone and Reiter 1997). Barriers to patient-centered decision-making include patients' low self-confidence for making medical decisions, the use of technical terms and jargon by physicians during patient-doctor communication, and the lack of time in the health care setting (Gambone and Reiter 1997).

Methodological Problems of the Studies

In her study of methodology issues in studies of sexuality and hysterectomy, Bernhard (1986) pointed out that different emphases among researchers make findings from different studies difficult to compare even when the outcome may be considered the same. It was discovered that researchers do not usually state the surgical approach used in hysterectomy studies. Bernhard argued that without the type of hysterectomy identified, the effects of surgical approach on the study findings cannot be determined.

In addition to the lack of clearly stated surgical approaches, as Bernhard (1986) pointed out, the studies presented above pose several other methodological problems. One such problem is associated with the definition of hysterectomy. Different studies use different range of ICD-9-CM codes (International Classification of Disease: US Dept. of Health and Human Services 1980). Some include both critical and elective hysterectomies using ICD-9-CM codes, while others exclude critical and/or cancer-related hysterectomies in their study. Furthermore, others use ICD-9-CM along with Current Procedural Terminology (CPT) codes when identifying hysterectomies. Other studies simply ask respondents whether they have experienced a hysterectomy. When the definition of hysterectomy is not consistent across studies, comparison of hysterectomy rates and other findings cannot be made accurately.

Methodological problems related to the definition of hysterectomy continue as some studies include both radical and benign/elective hysterectomies, while others exclude radical hysterectomies. If a goal of public health care is to reduce hysterectomy rates that are performed unnecessarily, factors influencing elective hysterectomies must be identified. When the term hysterectomy is used interchangeably with radical *and* elective hysterectomy, indicators of unnecessary hysterectomies cannot be distinguished. Therefore, studies should clearly state whether they include both radical and elective hysterectomies or

exclude radical cases. When both types of surgeries are included, analyses should be separated for each type so that predictors and effects for the two types can be identified separately.

The third issue associated with methodological problems is that when analyzing differences across age groups, studies use different age groupings, making comparisons across studies difficult. Some studies use 5-year age groups while others use 10-year or 25-year age groupings. When presenting age group with highest hysterectomy rates, some present the 30 to 54 age group to have the highest rate, whereas other studies report the 40 to 44 age group to be the one with the highest hysterectomy rates. When the age range in a subgroup is as wide as 24 years, it is difficult to identify the target group for whom health policies should be addressed. In addition, studies employ different study populations. Some studies include women aged 15 and over, others use those aged 15 to 44 years, or those aged 18 years and older. These discrepancies in study population make comparisons across studies more difficult.

Finally, studies examining the effects of hysterectomy often include too short a period of time after the surgery. Examining how patients are recovering 1 to 3 months after a hysterectomy does not reflect long-term effects of hysterectomy. Although short-term effects are important, long-term consequences of the surgery also should be examined in depth.

Suggestions for Future Research and Policies

There is much disagreement between medical experts about the medical conditions that warrant the use of hysterectomy. Some researchers believe 85 percent of these operations are unnecessary, while others claim only 10 to 15 percent. More studies of clinical and non-clinical factors associated with hysterectomies are needed to resolve this disagreement. If more than 85 percent of hysterectomies are elective (Wingo et al. 1985) and can be avoided through the use of alternative treatments and/or medications, appropriate use of hysterectomy mandates that researchers identify those women most likely to have the surgery. Studies have found that women from low social status (low income, low education) have a higher likelihood of having a hysterectomy. It has also been shown that women in the South are the most likely to have hysterectomies, while those in the North are the least likely to have hysterectomies when compared to their counterparts in other regions. Because information on whether such differences are the results of different health statuses of women or different preferences of surgical procedures is lacking, the need to conduct improved studies on this topic is warranted.

Because of variations in defining hysterectomy and because redesigning studies may create fundamental changes in results, it is necessary to determine whether a true decline in hysterectomy rates occurred, or whether the decline is due to differences in

measurement. It is crucial to explore how women reach a decision to have a hysterectomy when they are faced with the option of having the surgery. Cross-sectional studies cannot fully explore respondents' clinical and/or behavioral histories, while retrospective studies have a limit of recall bias where respondents may not remember the past accurately. Therefore, a prospective longitudinal study would be an appropriate way to explore patients' decision-making processes as well as reasons for hysterectomy variations. Although prospective longitudinal studies with nationally representative samples may involve substantial cost burdens, it will no doubt be a cost-effective investment considering the future contribution of such studies.

Several studies found that lack of information in both the public and professional communities may lead to variations in hysterectomy. Health policymakers need to focus on making hysterectomy-related information easily available to everyone including potential hysterectomy patients and hysterectomy performers. Media campaigns and distribution of brochures may be two examples of disseminating information. Since the clear-cut criteria for appropriate hysterectomy has yet to be developed, letting people know the potential benefits and risks of hysterectomy as well as possible alternatives to hysterectomy would lead to more effective decision-making bypatients and physicians. A summary of previous studies on hysterectomy is presented in Table 1. As gathered from this review of previous

Table 1. Summary of Literature Review

Author(s),year	Period/data	Findings
Hysterectomy trends in the US		
Pokras & Hufnagell 1988	1965-1984(age 15&over) National Hospital Discharge data(NHDS)	mean age: 42.7 years rates: 6.9/1000 highest rate: 40-44 (16.2/1000)
Dicker et al. 1982	1970-1978(age 15-44) NHDS	mean age: 35.1 years rates: 8.5/1000 highest rate: 35-44, black, South (at younger age)
Wilcox et al. 1994	1988-1990(age 15&over) NHDS	per 1000: 5.8(1988), 5.39(1989), 5.85(1990) highest rate: 30-54 (10/1000) uterine leiomyoma responsible for more black women than for whites
CDC 1997	1980-1993(age 15&over) NHDS	8.6 million (age 15&over) had a hysterectomy during this period. rates: 7.1/1000(1980),6.6/1000(1987), 5.5/1000(1988-1993) highest rate: 40-44, South mean age: 47.7(North), 41.6(South)
Clinical indicators of hysterectomy		
Carlson et al. 1993	Primary diagnosis: uterine leiomyomas, dysfunctional uterine bleeding, endometriosis, genital prolapse Mortality rates: 6-10 per 10000 (not-pregnancy related), 29-38/10000 (pregnancy-related) higher mortality for abdominal hysterectomy than vaginal surgery	
Wingo et al. 1985	Mortality rates: 12 per 10000 - whites-11/10000, blacks-21.3/10000 Higher mortality for abdonominal surgery than vaginal hysterectomy	
Appropriateness of hysterectomy		
Bernstein et al. 1993	abstracted medical-records for 712 nation-wide managed health organization enrollees	58% of 652 hysterectomies with appropriate reasons, 25% uncertain, 16% inappropriate for age group 21-40 years, 56% inappropriate
Doyle 1953	hospital records, CA	340 out of 6,248 hysterectomies were inappropriate For 21% of them, other treatment or procedure would have been preferable
Bickell et al. 1995	comparison of national expert panel with NC physicians	little difference in ratings of hysterectomy between two groups larger within-group agreement for national experts than for community physicians
Non-clinical indicators of hysterectomy		
Kjerulff et al.(1993[b])	1988 behavioral risk factor surveillance system	education, income, race significant impact of women's education and income on hysterectomy risk lower income & education:higher hysterectomy rates

Table 1. Continued.

Non-clinical indicators of hysterectomy			
Marks and Shinberg 1997	Wisconsin longitudinal study	education, income, mental ability, marital status, home ownership, number of children, occupation, spouse's income &occupation, father's education& occupation, mother's education, parent's income, age at first birth	the most significant impact of women's occupation on hysterectomy significant impact of education through occupation on hysterectomy higher occupational status: lower hysterectomy rates
Kjerulff et al. 1993[a]	MD hospital discharge data 1986-1991	race, age, comorbidities, surgical route, ovary removal, hospital characteristics	Total 53,159 hysterectomies 4.95 per 1000 (blacks), mean age:42 4.12 per 1000 (whites), mean age:46.1 more abdominal hysterectomies and longer hospital stays for black women than for whites
Geller et al. 1996	AZ patient discharge database 1989-1991	age, length of stay, income, payment method, diagnosis of hysterectomy	among patient-, physician-, and hospital factors, patient factors the most significant (clinical conditions, age, and payment source)
Bickell et al. 1994	mail survey on 107 gyne-cologists of NC	age, gender, year of residency graduation, physician attitudes, practice characteristics, case mix	higher hysterectomy rates were associated with male gyn, earlier completion of training, practice in low-gyn-density area, and higher proportion of younger patients.
Van den Eeden et al. 1998	telephone interviews in CA, 1994-1995	quality of life, utilization and cost of hysterectomy	less health interference with vaginal & laparoscopically assisted hysterectomy longer hospital stays and more post-operative doctor visits after abdominal hysterectomy vaginal hysterectomy - less costly and better after-surgery quality of life
Kinnick & Leners 1995	ethnographic study:6 women,CO	not applicable	positive outcomes of elective hysterectomy, limited access to sources of information regarding hysterectomy
Finkel & Finkel 1990	nationwide insurance company data, 1987	not applicable	Out of 1698 women referred for a second opinion on hysterectomy, 64.4% decided not to have hysterectomy as a result of the second opinion exam.
Gambone & Reiter 1997	not applicable	not applicable	presented four patient-centered models of informed consent

research on factors associated with hysterectomy, there are many gaps in knowledge regarding the causes and consequences of this operation including the following:

1. A clear definition of appropriate hysterectomy needs to be made among medical experts.
2. Long term impacts of hysterectomy on women's lives are not yet fully examined.
3. Despite the consistent geographical variation in hysterectomy practice in the United States, not much attention has been paid to identify its possible causes.
4. There are only a few studies that focus on women's social characteristics as risk factors of hysterectomy (i.e., Kjerulff et al. 1993[b]; Marks and Shinberg 1997).

The fourth gap is most relevant to this study. As an attempt to narrow down the existing gaps in hysterectomy research, the goal of this study is to examine the impact of women's social characteristics on hysterectomy experience. In addition, the role of women's attitudes and behaviors with regard to hysterectomy is also investigated.

CHAPTER III

METHODOLOGY

In this chapter, an outline of the data and methods used in this study is presented. A description of the study instruments, the data collection procedures, and survey participant characteristics are also introduced. In addition, discussions on the operation of the concepts and variables as well as the analytical techniques used in this study are presented.

Data

The data used in this study come from the Mature Women's cohort of the National Longitudinal Survey (NLS-MW). The Mature Women's cohort age was 30 through 44 in 1967. Although the primary purpose of the NLS is to collect data on the labor force experiences of adults and young adults, it is one of the few data sets to provide information on women's hysterectomy experience along with their socio-economic background and attitudinal information. Other survey data sets focusing on women's health issues, such as a National Survey of Midlife Development in the United States (MIDUS) and National Health Interview Survey (NHIS), were examined for possible use. However, they either did not include a clear indicator of hysterectomy or the number of hysterectomy cases was too small for analysis.

Research Design

Sampling Technique

The NLS-MW is a national probability sample of 5,083 women who were between the ages of 30 and 44 in 1967. When interviewed in 1995, the last survey included in this study, these respondents were between the ages of 58 and 72. In 1967, the Census Bureau drew a multi-stage probability sample of these women as of April 1, 1967 who were civilian, non-institutionalized, and living in the United States. First, 1,900 primary sampling units (PSUs) composed of Standard Metropolitan Statistical Areas (SMSAs), counties, parts of counties, and independent cities were selected. Second, from those 1,900 PSUs, 235 sample areas were selected to represent every state and the District of Columbia. Third, from these 235 sample areas, comprising 485 counties and independent cities, 235 relatively homogeneous strata with regards to their socioeconomic status were created of one or more PSUs. For each stratum, one PSU was chosen to represent the stratum. Finally, a probability sample of housing units for each PSU was selected to represent the noninstitutionalized civilian population in the United States. The survey oversampled blacks so that they can be sufficiently represented in the data analyses. Eighteen interviews with the Mature Women's panel have been conducted periodically since 1967. The most recent resurvey of the surviving members occurred in 1999.

National Longitudinal Surveys

The NLS was developed by the Center for Human Resource Research (CHRR) at Ohio State University and is sponsored by the U.S. Department of Labor's Bureau of Labor Statistics (BLS). A set of surveys for six cohorts of men and women was designed to represent all adults in their respective cohorts who were born and living in the United States. Special attention has been given to ensure that the selected sample could render the labor market experiences of blacks, Hispanics, youth, women, and those economically disadvantaged.

The National Longitudinal Surveys began in the mid-1960s with four original cohorts including a national probability sample of Older Men (aged 45-59 in 1966), Young Men (aged 12-24 in 1968), Mature Women (aged 30-44 in 1967), and Young Women (aged 14-24 in 1968). Each cohort consists of about 5,000 participants. These groups of people were selected because the surveys were intended to put emphasis on labor market decisions. In 1979, two additional cohorts were drawn for young men and women aged 14 to 21 as of December 31, 1978. For all six cohorts, blacks, Hispanics, and economically disadvantaged non-blacks and non-Hispanics were overrepresented (OSU 2000).

The basic information collected through NLS-MW include women's work and non-work experiences, training, education, family income and assets, physical well-being, residence, background information on family and household, and marital and

fertility history. While the survey was conducted 18 times between 1967 and 1997, not all questions are repeated for each survey year.

Study Sample

The Mature Women's cohort is especially useful for addressing issues regarding hysterectomy experience because this cohort transits the ages during which hysterectomies rates are particularly high. In addition, the NLS-MW data provide information related with women's social, behavioral, and attitudinal backgrounds as well as their hysterectomy status. Cohort information offered by NLS-MW includes women's health, care of illness, labor force participation, educational attainment, family income, and retirement status. In the NLS-MW, questions about both individual and family background along with women's behaviors and attitudes were measured in many waves of the surveys.

With its wide range of variables, the NLS-MW enables the examination of the impact of women's SES, behaviors, and attitudes on hysterectomy experience, which almost none of the previous hysterectomy studies attempted to investigate altogether. The longitudinal data collection is particularly helpful in this study. Because the independent variables included in this study are measured at numerous points in time, the changes in women's various characteristics over time can be observed. The longitudinal aspects of the NLS-MW make it possible

to identify women's characteristics around the time of their hysterectomy experience. Measures of hysterectomy, whether women had experienced a removal of uterus, were collected only in 1995. Information on women's age at the time of their last menstrual period and reason for its stopping, also captured in the 1996 survey, can be used as a proximate variable for the year of hysterectomy. Since 1995 is the only survey wave when the question of hysterectomy was administered, the current study selects the participants who were successfully followed until 1995. Because it cannot be presumed that all of those who were not reinterviewed in 1995 did not experience a hysterectomy, it would be appropriate to prune the sample for those who were re-interviewed in 1995. This leaves the sample size to be 2,711 women aged 58 through 72 in 1995. These women represent about 53 percent of the original cohort and 61.3 percent of the surviving original cohort.

Table 2 provides an overview of the history of NLS-MW's data collection with number of completed surveys at each wave. The NLS-MW began interviewing 5,083 women in 1967 and 17 resurveys were conducted between the period of 1968 and 1995. In 1995, slightly over 53 percent of the original cohort re-participated in the survey. However, since many of the mature women in the original cohort died between 1967 and 1995, it would be more appropriate to measure the participation rate by looking at the percentage of women participating in resurveys among the

Table 2. National Longitudinal Surveys of Mature Women's Cohort: Number of Interviews per Survey Year

Survey year	Women's age	Sample size	Retention rate	Retention rate: living respondents only
1967	30-44	5083	100.0%	100.0%
1968	31-45	4910	96.6%	97.0%
1969	32-46	4712	92.7%	93.3%
1971	34-48	4575	90.0%	91.1%
1972	35-49	4471	88.0%	89.2%
1974	37-51	4322	85.0%	86.8%
1976	39-53	4172	82.1%	84.2%
1977	40-54	3964	78.0%	80.2%
1979	42-56	3812	75.0%	77.7%
1981	44-58	3677	72.3%	75.5%
1982	45-59	3542	69.7%	73.1%
1984	47-61	3422	67.3%	71.3%
1986	49-63	3335	65.6%	70.3%
1987	50-64	3241	63.7%	68.7%
1989	52-66	3094	60.9%	66.5%
1992	55-69	2953	58.1%	65.1%
1995	58-72	2711	53.3%	61.3%

Source: Ohio State University (2000).

live original cohort.

The NLS data include sampling weight variables for each survey wave which was created by the Census Bureau in order to take into account persons who were not interviewed and to over-represent blacks in the sample. In this study no weighting scheme is used because applying weights calculated for each survey wave would not be appropriate to use for a data set including multiple wave surveys. It is also known that for regression analysis, weighted data would not render accurate estimates (OSU 2000).

Interview Methods

In 1995, a computer-assisted personal interview (CAPI) was used as the survey protocol. Until 1992, paper-and-pencil interview (PAPI) instruments were used for personal interviews and CAPI replaced PAPI in 1995. The average length of an interview using CAPI lasted about 70 minutes. No incentives have

been paid to original cohorts for their interview participation. Between 1967 and 1995, ten surveys were conducted by personal interviews, six were conducted by telephone, and one survey was conducted by mail. Table 3 summarizes the survey methods and the reasons for non-interview for the NLS-MW surveys.

Respondents selected for interviewing in 1995 are those who had participated in the initial year (1967) interviews and who were alive, non-institutionalized, not in the Armed Forces, and residing within the United States as of the interview date in 1995. Those who are categorized as Congressional Refusal[1] in 1995 are also excluded from the survey.

Table 3. Sample Sizes, Survey Methods, and Reasons for Non-Interview: NLS-MW 1967-1995

				Reasons for non-interview			
Year	Method	Total interviewed	Total non-interviewed	Can't locate	Refused	Deceased	Other
1967	personal	5083	-	-	-	-	
1968	mail	4910	173	49(28%)	76(44%)	22(13%)	26(15%)
1969	personal	4712	371	50(13%)	210(57%)	35(9%)	76(20%)
1971	personal	4575	508	56(11%)	292(57%)	60(12%)	100(20%)
1972	personal	4471	612	39(6%)	389(64%)	72(12%)	112(18%)
1974	phone	4322	761	41(5%)	479(63%)	101(13%)	140(18%)
1976	phone	4172	911	34(4%)	580(64%)	131(14%)	166(18%)
1977	personal	3964	1119	22(2%)	761(68%)	140(13%)	196(18%)
1979	phone	3812	1271	21(2%)	867(68%)	176(14%)	207(16%)
1981	phone	3677	1406	18(1%)	963(68%)	216(15%)	209(15%)
1982	personal	3542	1541	15(1%)	1061(69%)	238(15%)	227(15%)
1984	phone	3422	1661	31(2%)	1113(67%)	285(17%)	232(14%)
1986	phone	3335	1748	38(2%)	1130(65%)	341(20%)	239(14%)
1987	personal	3241	1842	30(2%)	1195(65%)	364(20%)	253(14%)
1989	personal	3094	1989	29(1%)	1265(64%)	431(22%)	264(13%)
1992	personal	2953	2130	62(3%)	1286(60%)	546(26%)	236(11%)
1995	personal	2711	2372	69(3%)	1321(56%)	664(28%)	318(13%)

Source: Ohio State University (2000)

1 Congressional Refusal refers to a congressional representative requesting a respondent not be contacted again for an NLS survey after a respondent has completed one or more survey rounds (Ohio State University 2000).

Operation of the Data

The main goal of this study was to investigate the effects of women's various characteristics on their hysterectomy experience. During this period, women's characteristics were measured at numerous points. For example, women's employment status was measured 15 times and the total family income was measured 12 times between 1967 and 1995.

In this study, the NLS-MW data are transformed into person-years. Person-year transformation is the most popular choice for analyzing longitudinal data (Bijleveld et al. 1998). Employment of this unit allows the representation of the characteristics at a time just prior to measuring the risk of hysterectomy. The data for each time point are stacked vertically to form person-year observations. This way, the most pertinent relations among the variables can be identified. One individual in person-year observations of the NLS-MW may appear up to 29 times for years from 1967 to 1995.

For each observation-year, women who had a hysterectomy before the particular year would be excluded from the year's observation because those women are no longer "at risk" for hysterectomy.

By using person-year observations, it becomes possible to conduct a single common analysis for all time points simultaneously. Conceptually, person-year observations model changing subjects in a stable world (Bijleveld et al. 1998).

Out of 2,711 women who were successfully followed until 1995, 835 reported having had a hysterectomy. Among these 835 women, 250 either did not report the time of their last menstrual period or had a hysterectomy before 1967. Since the survey was not conducted before 1967, it is not practical for this study to estimate women's various characteristics before or at the time of hysterectomy for women who had a hysterectomy before 1967. Therefore, in this study, women who had a hysterectomy before 1967 are excluded. For the purpose of the analysis employed in this study, the time of hysterectomy is crucial information. Hysterectomy cases with missing time points were treated as missing. Thus, 2,461 women interviewed in 1995 are selected for transforming the data into person-years. Five hundred eighty-five of these women had a hysterectomy. To examine whether there was any selection bias by excluding those women who did not have the time of hysterectomy information or who had a hysterectomy before 1967, comparisons of excluded and included women in terms of their various characteristics are presented in the next chapter.

Although interviews were conducted only seventeen times during 29 years between 1967 and 1995, there were women experiencing hysterectomy in every year during this period. Therefore, women's characteristics are estimated for the person-years when interviews were not conducted. As a result, up to 29 observations are applied to each woman included in this study.

Using person-year observations there would be 2,461 x 29

observations (total: 71,369 person years) available for the analysis. However, person-year observations subsequent to experiencing a hysterectomy are excluded from the actual analysis. As stated earlier, women who had a hysterectomy are no longer "at risk" of hysterectomy after the time she had the surgery. The exclusion of person-years subsequent to experiencing a hysterectomy leaves a total of 60,063 person-year observations for this study. Person-year observations treat the time point at which the subjects were observed as independent replications or as added subjects (Bijleveld et al. 1998). Bijleveld et al. (1998) asserted that using person-year transformed data, "missing occasions do not constitute a problem: for each subject, all measurement occasions for which data are available can be entered, and those occasions for which no observations were collected are simply left out" (p. 86).

It should be also noted here that out of 60,063 person-years, 48,500 person-years are included in the actual analysis of this study because the need for valid responses for all independent and dependent variables. With regard to the original sample respondents of 1995, 2,039 out of 2,711 respondents who were eligible for this study, had valid responses for all independent and dependent variables. Among 2,039 women included in the person-year transformation and included in the analysis, 483 had experienced a hysterectomy between 1967 and 1995.

Measurement of the Variables

In this section, we give a brief description of how the variables included in the analysis were measured and conceptually defined.

Dependent Variables

Hysterectomy. In this study, the term "hysterectomy" is defined by the surgical removal of the uterus, the removal of the uterus and one ovary, and the removal of the uterus and both ovaries. Those who have experienced the removal of both ovaries only are excluded from the hysterectomy category because this study focuses on the removal of the uterus. Women's hysterectomy status was measured in 1995 by three questions. Question number one asked whether they "have ever had surgery to remove either uterus or ovaries." The next question asked, "Which one was removed: ovaries or uteri." Response categories to the second question included 1: uterus and ovaries, 2: uterus only, 3: uterus and one ovary, 4: both ovaries, and 5: one ovary.

Thirdly, NLS-MW asked women whether their menstrual period has stopped. For those who reported having experienced their last menstrual period, a question was asked for the reason why their menstrual period stopped. Among the response categories were pregnancy, breast feeding, chemotherapy or radiation, surgery, no obvious reason, or menopause. Women who responded "surgery" were cross-referenced with those who reported having had a hysterectomy.

In this study, those who answered "1", "2", or "3" to the question "which one was removed: ovaries or uterus" and who responded "surgery" to the question asking "why did your period stop" are defined as hysterectomy cases. For the analytic purpose, a code of "1" is assigned to represent those who had a hysterectomy and "0" for responses indicating no hysterectomy.

Year of hysterectomy. In the 1995 survey, women were also asked when they had their last menstrual period. Since all of the hysterectomy cases in this study identified "surgery" as the reason their menstrual period stopped, the time of last menstrual period was used as the variable of year of hysterectomy for women who had the procedure.

Independent Variables

The independent variables included in the multivariate analysis for hysterectomy are as follows:

- Educational status
- Geographic location of residence
- Metropolitan vs. non-Metropolitan residence
- Respondent's residence at age 15
- Race
- Occupation
- Employment status
- Marital status
- Nationality

- Number of children
- Smoking status
- Locus of control

Educational status of respondents (EDUC). Educational status of respondents represents the highest grade completed. Responses range from no education at all to six or more years of college. Women's highest grade completed was measured four times between 1967 and 1995 - in 1967, 1977, 1989, and 1995. The 1967 education measure was used for person-year observations for 1967 through 1976, the 1977 measure was used for person-year observations 1977 through 1988, and the 1989 measure was used for person-year observations for 1989 through 1994.

With the 48,500 person-year observations, the average education for the respondents was 11.6 years with a standard deviation of 2.8.

Geographical location of respondents' residences (REGION). Numerous past studies of hysterectomy found geographic variations in hysterectomy performance rates in the United States. In the NLS-MW data, women's residence was measured as a dichotomous variable--South versus non-South. South region includes the South Atlantic Division, the East South Central Division, and the West South Central Division as defined in the Census Divisions. This information was collected during all the survey waves between 1967 and 1995. For the years with no survey, the most recent information on REGION was repeated.

After the data were transformed to the person-year observations, 37.8 percent of the person-years resided in the South, while 62.2 percent lived in the non-South region.

Metropolitan versus non-metropolitan residence (SMSA). A Standard Metropolitan Statistical Area (SMSA) was created by using a series of variables for place of residence by researchers at Ohio State University. Response categories are (1) In Metropolitan and (2) Not In Metropolitan. This measure was collected in every survey wave between 1967 and 1989. For observations after 1989, the SMSA status of 1989 was used. With the person-year observations, 69 percent resided in SMSA, while 31 percent did not live in an SMSA.

Respondents residence at age 15 (ORIGIN). Respondent's residence at age 15 was measured in 1967. This measure identifies whether the respondent lived:

1. on a farm or ranch,
2. in the country,
3. in a town/small city,
4. in the suburb of a large city,
5. in a city of 25,000 - 100,000, or
6. in a large city (100,000 or more)

Information on the respondent's childhood background was included in the analysis. Since this was measured only once in 1967, it was repeatedly used in all other person-year observations.

Respondent's race (RACE). In the NLS-MW, the respondent's race is determined by the interviewer's observation at the time of household screening. Response categories are white, black, and other.

Instructions were given to interviewers to code Mexicans, Puerto Ricans, and other Latin Americans as "white" unless they were obviously of a non-white race. Respondents of Japanese, Chinese, American Indian, Korean, Hindu, or Eskimo heritage were to be coded in the "other" category. By combining all of the "other" categories into one, the NLS-MW data do not allow an in-depth investigation of racial variations.

Occupation of respondent (OCCU). A respondent's occupational status has been measured by asking: "What kind of work are/were you doing?" Based on the verbatim responses collected by interviewers, Census personnel coded the responses using the *Census Bureau Alphabetical Index of Occupation and Industries*. OCCU provides one-digit occupational codes for the current job reported by the respondent. The response categories are:

1. professional, technical, and kindred
2. managers, officials, and proprietors
3. clerical and kindred
4. sales workers
5. craftsmen, foremen, and kindred
6. operatives and kindred

7. private household workers
8. service workers, except private household
9. farmers and farm managers
10. farm laborers and foremen
11. laborers, except farm and mine
12. armed forces
13. never worked

This information was collected during all the survey waves between 1967 and 1992. The 1992 value was repeated for the following years.

Respondent employment status (EMPLOY). Respondent employment status was created by the Census Bureau based upon responses to various employment-related questions asking respondents' survey week labor force activities. In this study, response categories are working, keeping house, and other. This information is available for survey waves except for 1984 and 1986. For these years, the most recent information was repeated.

Respondent marital status (MARI). Questions asking respondent marital status were administered during all survey waves except in 1968. Response categories are (1) married, (2) widowed, divorced, or separated, and (3) never married.

Respondent nationality (NATION). A question asking respondent's nationality was administered once in 1967. If any of the respondents' parents or grandparents were born outside of the

United States and Canada, the nationality of the first person born outside of the United States and Canada was assigned for the respondent. Response categories are the United States or Canada and other countries.

Of the 48,500 person-year observations, 67.5 percent had parents or grandparents who were born in the United States or Canada, and 32.5 percent had parents or grandparents of other nationalities.

Number of children (NCHILD). Information on children ever born to a respondent was collected in 1977 and 1982. Based upon the number of children and their age(s), the total number of children for each year was calculated. After 1982, the information collected in 1982 was repeated because respondents were older than typical childbearing years. With person-year observations, the average number of children was 3.5 with the standard deviation of 2.5.

Respondent smoking status (SMOKE). Questions regarding respondents' cigarette use were administered in 1989 and 1995. Identification of current and past smokers was examined only in 1989 by asking respondents, "Do you smoke cigarettes now?" and "Did you ever smoke cigarettes?" Past studies on cigarette smoking found that most smokers become regular smokers by the age of 25. The initiation of smoking rapidly declines after age 25 (Escobedo et al. 1990; Pierce et al. 1991). Escobedo et al. (1990) found that the initiation of smoking increased rapidly

after 11 years of age, reaching a peak between 17 and 19 years, and rapidly declined through age 25 years with gradual decline thereafter. Based on these findings, this study assumes that those women identified as current or past smokers in 1989 started to smoke before 1967. Thus, the smoking status of 1989 is constantly used for constructing person-year observations.

Based on the above information, there are three response categories: (1) current or past smoker, (2)non-smoker, and (3) no answer.

The variable SMOKE shows the highest volume of missing cases among categorical variables. In order to reduce the volume of cases that are excluded from the multivariate analysis due to missing values, a "no answer" category was added to this variable. Of the study sample, 45 percent were current or past smokers, 50.3 percent never smoked, and 4.6 percent did not report their smoking status. In the United States, about 92 million (47%) are either current or former smokers (CDC 2001). The CDC data shows that in 1988, 41 percent of women aged 18 years and older were either current or former smokers. For total population, the percentage of people that were current or former smokers in 1988 was 49 percent. The 45 percent current or past smokers in NLS-MW is slightly lower than the general trend for total population in 1988 but slightly higher than the national trend for female population.

Locus of control (LOC). In the NLS-MW, Rotter's Internal-External Control Scale (1966) was measured at three points--in 1969, 1972, and 1977. Internal control represents the perception of events as being under personal control. External control refers to the perception of events as being controlled by other forces, such as luck or fate.

In the NLS-MW, the abbreviated scale including 11 items of the original 23-item Rotter scale was used. The 11 items of the abbreviated Rotter scale are presented in the Appendix. Respondents are first read two statements, one with an internal orientation and the other with an external orientation. Respondents are then asked to choose between the two statements. After making their choice, respondents are asked whether the statement they selected is *much closer* or *slightly closer* to their own opinion. People who chose the internal orientation statement and responded *much closer* received a score of "1", those who chose internal and responded *slightly closer* got a "2", those who responded external and *slightly closer* received a "3", and those who chose the external orientation statement and said *much closer* received a "4". Using the responses from all 11 items, LOC variables were constructed by adding up the responses. Responses were recoded to be consistent with each other.

Lower LOC value refers to greater internal locus of control, while higher LOC value represents greater external locus

of control. The 11 items of the Rotter scale are presented in the Appendix.

Smith and Dechter (1991) investigated the shift in the locus of control among NLS mature women and concluded that it did not change between 1969 and 1977. Assuming that women's perception on locus of control does not change significantly over time, 1969 information was used for 1967 and 1968. Following 1969, the most recently collected information was repeated for the years when no LOC observation was made.

With the 48,500 person-year observations, the mean LOC score was 23.7 with the standard deviation of 5.2.

Limitations of the Data

The NLS-MW provides immense information on a respondent's social characteristics as well as attitudinal and behavioral aspects. This enables an unprecedented sociological investigation of hysterectomy.

First, the NLW-MW data do not report the diagnostic symptoms that led women to experience hysterectomy. When such information is available, a closer look at the association between women's social status and hysterectomy would be possible by separating the analysis for different symptoms. By identifying specific symptoms of women, a further analysis of the appropriateness of a hysterectomy as well as its association with women's social characteristics would be possible. There is also

no information about the decision-making process of the doctors and patients.

Second, the NLW-MW data were not collected every year between 1967 and 1995. Years when interviews were conducted are 1967, 1968, 1969, 1971, 1972, 1974, 1976, 1977, 1979, 1981, 1982, 1984, 1986, 1987, 1989, 1992, and 1995. Even for the years that the interviews were conducted, the time interval between survey years is not regular. Person-year observations assumes that the longitudinal data are collected at regular intervals. Since the data in the NLS-MW were not collected every year or at regular intervals, data had to be estimated for the years with no interviews. The necessity to estimate data for years in which no interviews were conducted complicates the research design of the current study.

Analytical Methods

Descriptive Statistics

In order to examine whether women included in the analysis of this study are different from those excluded with regard to their various characteristics, comparisons of mean values for each characteristic are carried out using an independent sample t-test. A t-test indicates where there are statistically significant differences for a group's mean values. The results are presented in the next chapter.

Frequency distributions of the study sample, in terms of

its various characteristics, are also presented in the next chapter. Social, attitudinal, and behavioral characteristics of the sample are summarized. In addition, a summary of women's hysterectomy experience is also described in the next chapter.

Cox Proportional Hazards Model

In the NLS data used for this study, women's hysterectomy status after 1995 is not measured. Therefore, it is unknown how many women had a hysterectomy after 1995. Cases for which the event does not occur during the specified study period are referred to as "censored cases"(Courgeau and Lelievre 1992). When the events that occurred before the beginning of the study period are unknown, they are called "left-censored cases." When the events that occurred after the end of study period are unknown, they are called "right-censored cases." This study includes right-censored cases.

Proportional hazard models are similar to ordinary regression models in terms of predicting a dependent variable as a function of a set of independent variables (Norusis 1994). However, when the data include censored cases, proportional hazard models are more appropriate to use than the usual regression models. Ordinary multivariate models fail to take into account changes in predictor variables over time in longitudinal data. The Cox proportional hazards model allows retention of right-censored cases by assigning estimated values for such cases (Cox 1972; Cox and Oaks 1984). Furthermore, the Cox proportional

hazards model allows the use of continuous predictor and categorical variables.

In the Cox proportional hazards model, the proportion of cases "surviving" an event at a particular point in time is the dependent variable. It is also called the "cumulative survival function" since an event did not occur from the beginning of the study period until the specified time point. The hypothesis underlying proportional hazard models is that "the various individual characteristics have a multiplicative effect on a hazard function which is the same for the whole population, over time" (Courgeau and Lelievre 1992:136). That is, the hazard rates for all individuals are proportional among themselves, whatever the time passed.

When $h_0(t)$ stands for the hazard rate, the hazard rate of an individual with the z characteristics can be represented as $h_i(t;z) = h_0(t)exp(z\beta)$, with i = individuals and $z\beta = z_1\beta_1 + z_2\beta_2 + \ldots + z_n\beta_n$, where β represents the estimated effects of the various characteristics of an individual (Courgeau and Lelievre 1992). When all covariates are zero, it becomes the basic model, which is sometimes referred to as the baseline model. The basic model can be represented as $h(t;0) = h_0(t)$. In this model, only the impact of time is considered and the dimension of time dependence is indicated. The baseline survival function in the Cox proportional hazards model is similar to a constant term in multiple regression in that it is the reference value which will

increase or decrease depending on the values of predictor variables and their relationship with the dependent variable (Norusis 1994). However, the Cox proportional hazards model's baseline function differs from the multiple regression's constant term in that the values of the former change as time changes, while the value of the latter is fixed.

As predictor variables are entered into Cox proportional hazards model, the proportional hazard function depends on time, the values of covariates (predictor variables), and regression coefficients. The impact of predictor variables is represented as $\exp(z\beta)$. The coefficients β_{1-n} are similar to coefficients in logistic regression in that they indicate the effect of independent variables on a dependent variable.

As stated earlier, the Cox proportional hazards model permits the use of continuous and categorical independent variables. Categorical variables in the model are transformed into a new set of variables that correspond to the original values of each variable. The number of new variables is equal to one less than the number of categories in the original variable. That is, for example, if there were a categorical variable *occupation* with nine categories, eight new variables would be created for the analysis. One category is treated as a reference, and based on this separate coefficient, is estimated for each of the new variables.

For the interpretation of the analysis, the value of exp(β) becomes the hazard rate. For example, if the value of exp(β) for the variable *age* were 1.05, as one unit increases for *age*, the hazard is 5 percent greater. For categorical variables, the value of exp(β) is usually treated as relative risk. With each new set of variables created for the original categorical variable, for example, *occupation*, the relative risks are computed. Based upon the reference variable, other variables' relative risks are interpreted as being higher, equal to, or lower than the reference variable. If the coefficient is equal to 1, the variable has similar hazard (risk) as the reference variable. If the coefficient is greater than 1, the variable has greater risk than the reference variable (less likely to survive), and a coefficient of lower than one represents lower risk than the reference (more likely to survive).

There are three important assumptions to the Cox proportional hazards model. The first assumption is that for any two cases, the ratio of the estimated hazard across time is a constant. In other words, the hazard of an event occurring is similar for two individuals at any time point. This is why it is called the "proportional" hazards model. Stratifying predictor variables into different groups and estimating the hazard functions for each group can test the proportionality assumption. If the hazard functions are proportional in each group, the proportionality assumption is satisfied.

In order to test the proportionality assumption in this study, log-minus-log (LML) plots were drawn for each of the covariates. In LML plots, if the lines for different groups are parallel, the proportionality assumption is considered met. With the NLS-MW data, the lines for different sub-groups in LML plots were parallel with regards to hazard function of hysterectomy.

The second assumption suggests that predictor variables (covariates) are not highly related with each other. If two variables are highly correlated, one of the two needs to be excluded from the model. The results from the test of correlation among variables in the NLS-MW are presented in the next chapter.

The third assumption of the proportional hazards model is that model covariates fully explain the hazard. There can be unobserved heterogeneity if the investigator fails to include potentially important variables into the model. When this happens, effects of unobserved variables are underestimated in the study.

In this study, the Cox proportional hazards model was employed using a computer program, *SPSS for Windows*. The proportional hazard function for the hazards of having hysterectomy was used as a dependent variable. In order to identify variables that best explain the hazards of hysterectomy, the *forward* entry of variables was selected. In forward entry, variables are entered into the model one by one. After a variable is added to a model, all of the variables that are already in the

model are examined for removal. The procedure stops when no more variables can be added or removed to improve the explanatory power of the model.

Although the stepwise forward method only selects variables that are the most "statistically" significant, this procedure has a theoretical relevance to this study by enabling testing of the significance of the overall effects of social variables on hysterectomy compared with that of behavioral and attitudinal variables as a whole. This can be done by testing the significance of the difference between two R^2 values which results in identifying the best mixture of variables in explaining hysterectomy.

In this chapter, explanations on data, sample, variables, and analytical methods are presented. Data were drawn from the National Longitudinal Survey of Mature Women's cohort (NLS-MW). Women who did not have a hysterectomy and those who had a hysterectomy during or after 1967 are selected for this study. Among those selected, cases that have valid information for all independent and dependent variables are included in the analysis. Operation of variables is also provided in this chapter, along with a brief description of analytical methods employed in this study.

CHAPTER IV

FINDINGS/RESULTS

This chapter begins with a description of the study sample according to their social characteristics, hysterectomy experiences, behaviors, and attitudes in life. Following this, the bivariate relationships between various characteristics and hysterectomy are examined. Finally, the results of the Cox proportional hazards analysis are presented and discussed.

Descriptive Analysis

As mentioned in the previous chapter, this study includes women in the NLS-MW who were successfully followed until 1995. Among the 1995 respondents, women who did not have a hysterectomy and those who had a hysterectomy between 1967 and 1995 are included in this study. Women who reported having experienced a hysterectomy but did not report the time of their last menstrual period and those who had a hysterectomy before 1967 are excluded from the analysis.

First, an investigation is carried out in order to examine the differences in women's characteristics for those who were successfully followed up until 1995 and those who were not. Table 4 displays the comparisons of distribution for study variables. The independent variables that are considered as potential

Table 4. Distribution of Study Variables for Women Who Were Successfully Followed until 1995 and Those Who Were Not

Characteristics	1995 respondents (N=2711)	1967 respondents lost to follow-up (N=2372)
Continuous variables	Mean	
Education(1967)	11.2	10.7
Number of children (1977)	3.5	3.4
Locus of control(1969)	23.4	23.8
Categorical variables	Percentage	
Employment (1967)		
Working	49.1	50.3
Keeping house	42.8	39.2
Other	8.2	10.4
Marital (1967)		
Married	82.7	78.8
Widowed/divorced/separated	11.9	15.2
Never married	5.5	6.0
Occupation (1967)		
Professional/technical	11.7	8.1
Managers/officials/proprietors	3.0	2.7
Clerical/kindred	31.6	28.6
Sales workers	6.0	6.0
Craftsmen/foremen/kindred	1.0	0.9
Operatives/kindred	15.1	20.4
Private household workers	8.2	8.4
Service workers excpt privt household	15.5	16.8
Farmers/farm managers	0.3	0.1
Farm laborers/foremen	3.2	2.8
Laborers except farm and mine	0.2	0.5
Armed forces	0.1	0.0
Never worked	4.0	4.6
Race (1967)		
White	72.8	68.8
Black	25.8	29.1
Other	1.4	2.0
Residence at 15 (1967)		
Farm/ranch	27.6	23.0
Country	6.0	7.5
Town/small city	30.8	27.7
Suburb of large city	4.0	4.3
City:2,5000-10,000	13.1	14.1
Large city:10,000+	18.5	23.3
SMSA (1967)		
In metropolitan	69.6	75.2
Not in metropolitan	30.4	24.8
South (1967)		
Non-south	61.2	62.9
South	38.8	37.1
Nationality of parents/ grandparents (1967)		
US/Canada	68.0	69.0
Other countries	32.0	31.0
Smoking (1989)		
Ever/current smoker	48.0	52.7
Never smoker	52.0	47.3

hysterectomy predictors and included in the multivariate analysis are respondents' education, race, employment status, marital status, occupation, number of children, residence at age 15, region, metropolitan/non-metropolitan residence, nationality, smoking status, and locus of control. Table 4 also compares the distribution of categorical and nominal characteristics of 1967 for those two groups of women.

Overall, women who were successfully followed up until 1995 were more likely to be white, be married, live in a farm or small city at age 15, have slightly less education, were slightly less likely to be working, were more likely to keep house, in professional or clerical occupations, and showed slightly greater external locus of control than those lost to follow-up since 1967. The 1995 respondents are also more likely to live in non-metropolitan areas, reside in non-South regions, smoke cigarettes, and have parents or grandparents born in countries other than the United States or Canada.

Of those 2,711 respondents of the 1995 NLS-MW, 2,039 are actually converted into person-years and included in the analysis of the current study. Cox hazards analysis includes observations that have valid information for all study variables. Among 2,711 women, 672 were excluded from the study because they did not report the time of hysterectomy (N=20), had a hysterectomy before 1967 (N=230), and/or did not have valid responses for all study variables (N=422). Using the data from the remaining 2,039 women,

48,500 person-year observations are constructed and used for the multivariate analysis of this study.

In order to see if selection bias played a role by excluding person-years that did not have valid response values for all independent and dependent variables, another set of investigation is conducted. Table 5 presents the distribution of missing values for each variable included in the analysis. The number of missing values is substantially higher for the locus of control and smoking variables than for other variables. The high volume of missing values for these two variables mainly explains why a total of 48,500 person-years out of 60,063 are eligible for the multivariate analysis. As stated earlier, the missing values for smoking status are treated as another category in the multivariate analysis of this study. A category of "no answer" was added to the variable SMOKE. With this treatment, it

Table 5. Number of Missing Values (Person-Years) for Each Independent Variable

Variables	Number of missing values (N=60,063)	Percentage of missing values
EDUC	1,097	1.8
REGION	1,117	1.9
SMSA	1,270	2.1
ORIGIN	153	0.3
RACE	0	0.0
OCCU	2,664	4.4
EMPLOY	1,044	1.7
MARI	1,115	1.9
NATION	2,657	4.4
NCHILD	273	0.5
SMOKE	3,587	6.0
LOC	6,458	10.8

can be identified whether the hysterectomy risk of those who did not report smoking status is different from others.

Table 6 presents the distribution of study variables for the total sample as well as for the study sample. The variable distributions are provided for both person years and respondents. The total sample includes all respondents and person years that are successfully followed up in the 1995 NLS-MW. The study sample represents person years and respondents that are included for the multivariate analysis. Mean values are presented for continuous variables, and percent distributions are provided for categorical or nominal variables. With respondent samples, characteristics of 1967 are presented.

The purpose of presenting Table 6 is to examine if the characteristics of the study sample are different from the total sample. Overall, the degree of difference in percent distributions and the mean scores do not appear worrisome. The study sample included in the analysis appears to have slightly higher education than the total sample. A slightly higher percentage of married women and those in clerical occupations are included in the analysis than for the total sample; however, the degree of difference in mean values and percentage distributions between the two samples is minimal. Therefore, it would be appropriate to assume that the characteristics of the study sample are consistent with those of the total sample. In other words, the characteristics of those excluded from the

Table 6. Distribution of Study Variables for the Total Sample and Study Sample

Characteristics	Total sample Respondents (N=2,711)	Total sample Person years (N=60,063)	Study sample Respondents (N=2,039)	Study sample Person years (N=48,500)
		Mean		
Continuous variables				
Education	11.2(N=2704)	11.5(N=58966)	11.3(N=2039)	11.6(N=48500)
Locus of control	23.4(N=2353)	23.7(N=53605)	23.3(N=2039)	23.7(N=48500)
# children	3.3(N=2711)	3.5(N=59790)	3.3(N=2039)	3.5(N=48500)
		Percentage		
Categorical variables				
Employment	(N=2711)	(N=59019)	(N=2039)	(N=48500)
Working	49.1	52.9	48.6	54.7
Keeping house	42.8	36.4	43.9	35.7
Other	8.2	10.7	7.6	9.6
Marital	(N=2711)	(N=58948)	(N=2039)	(N=48500)
Married	82.7	72.8	83.5	73.4
Widowed/divorced/separated	11.9	22.5	10.8	21.9
Never married	5.5	4.8	5.7	4.7
Occupation	(N=2709)	(N=57399)	(N=2039)	(N=48500)
Professional/technical	11.7	13.6	11.6	13.7
Managers/officials	3.0	5.7	2.7	5.6
Clerical/kindred	31.6	28.9	33.1	29.6
Sales workers	6.0	5.8	6.7	6.3
Craftsmen/foremen/kindred	1.0	1.3	1.0	1.4
Operatives/kindred	15.1	13.6	14.2	13.5
Private household workers	8.2	8.0	8.1	7.6
Other Service workers	15.5	17.8	15.3	17.8
Farmers/farm managers	0.3	0.5	0.4	0.5
Farm laborers/foremen	3.2	3.1	3.0	2.7
Laborers except farm&mine	0.2	0.6	0.1	0.5
Armed Forces	0.1	0.0	0.1	0.0
Never worked	4.0	0.9	3.6	0.8
Race	(N=2711)	(N=60063)	(N=2039)	(N=48500)
White	72.8	71.6	72.6	72.0
Black	25.8	27.0	25.9	26.6
Other	1.4	1.4	1.5	1.4
Residence at 15	(N=2704)	(N=59910)	(N=2039)	(N=48500)
Farm/ranch	27.6	27.5	27.9	26.7
Country	6.0	5.8	6.1	5.9
Town/small city	30.8	30.6	30.0	30.7
Suburb of large city	4.0	4.2	4.2	4.3
City:2,5000-10,000	13.1	13.2	13.3	13.6
Large city:10,000+	18.5	18.6	18.2	18.8
SMSA	(N=2711)	(N=58793)	(N=2039)	(N=48500)
In Metropolitan	69.6	67.8	69.0	68.7
Not in Metropolitan	30.4	32.2	31.0	31.3
South	(N=2711)	(N=58946)	(N=2039)	(N=48500)
South	38.8	38.5	38.2	37.8
Non-South	61.2	61.5	61.8	62.2
Nationality of parents/ grandparents	(N=2588)	(N=57406)	(N=2039)	(N=48500)
US/Canada	68.0	67.6	67.7	67.5
Other countries	32.0	32.4	32.3	32.5
Smoking status	(N=2711)	(N=60063)	(N=2039)	(N=48500)
Current/ever smoker	45.0	43.9	44.4	45.1
Never smoker	48.9	50.2	49.2	50.3
No answer	6.1	6.0	5.9	4.6

analysis are not systematically different from those included in a way that may distort the study results.

Based on 48,500 person-years, the average grades completed by respondents were 11.6 years, and the average number of children was 3.5. The average score for the locus of control was 23.7. This is slightly higher but relatively consistent with what Smith and Dechter found (1991).

About 55 percent were working, while 36 percent were keeping house. About 14 percent were in professional or technical occupations, while 30 percent were in clerical and some 25 percent were working as a private household worker or other service worker. Seventy-three point four percent were married; 22 percent were separated, divorced, or widowed; and 5 percent were never married.

About 27 percent lived on farms or ranches when they were 15. About 31 percent lived in a town or small city and 19 percent lived in a large city with greater than 100,000-population size at age 15. Some 69 percent reported as living in Standard Metropolitan Statistical Area (SMSA), while 31 percent lived outside of SMSA. Thirty-eight percent lived in the South and 62 percent reported living in non-South region. Seventy-two percents of the study sample were white, 27 percent were black, and 1.4 percent were from other races. The proportion of black respondents is substantially higher among the current study

sample than in the general population. This is, as stated earlier, to adequately represent blacks in the analysis.

Another 67.5 percent had parents and grandparents with United States or Canadian nationality, while 32.5 percent reported having parents or grandparents whose nationality was from other countries. The NLS-MW asked respondents if they have a parent or grandparent who was not born in the United States or Canada and then recorded the nationality of the first person among parents and grandparents who was born in a country other than the United States or Canada.

Women who never smoked comprised 50.3 percent of the study sample, 45.1 percent were current or past smokers, and 4.6 percent did not report their smoking status.

Table 7 displays a summary of hysterectomy experience for all 1995 NLS-MW respondents as well as for those included in the multivariate analysis. Among 2,711 women who participated in the 1995 interview, 30.8 percent had a hysterectomy. Of those who were 60 years of age and older in 1995, 30.9 percent had a hysterectomy. Considering that about 37 percent of all women in the United States are estimated to have experienced a hysterectomy by the time they reach 60 years of age (Pokras and Hufnagel 1988), the sample in NLW-MW shows a slightly lower hysterectomy rate. However, using the 1999 National Hospital Discharge data, Popovic and Hall (2001) reported that hysterectomy rates were 22.4 per 10,000 for women in all ages.

Table 7. Distributions of Hysterectomy Experience for Overall 1995 NLS-MW Participants and for Those Included in the Analysis

Measure	Number	Percent	Number	Percent
Hysterectomy	(N=2,711)		(N=2,039)	
Yes	835	30.8	483	23.7
No	1,876	69.2	1,556	76.3
Age of hysterectomy	(N=815)		(N=483)	
< 25	13	1.6	0	0
25-29	50	6.1	0	0
30-34	88	10.8	21	4.3
35-39	164	20.1	66	13.7
40-44	202	24.8	149	30.8
45-49	172	21.1	143	29.6
50-54	87	10.7	73	15.1
55-59	34	4.2	26	5.4
60 and over	5	0.6	5	1.0
	(mean:41.3)		(mean:44.7)	
Year of hysterectomy				
before 1967	(N=815)		(N=483)	
1967-1971	230	28.2%	0	0%
1972-1976	167	20.5%	139	28.8%
1977-1981	194	23.8%	160	33.1%
1982-1986	119	14.6%	93	19.3%
1987-1991	74	9.1%	64	13.3%
1992-1995	25	3.1%	21	4.3%
	6	0.7%	6	1.2%

The hysterectomy rate reported by Pokras and Hufnagel (1988) was 6.9 per 1,000 women in 1984. The performance rate of hysterectomy may have decreased between the mid 1980s and 1995. Therefore, the estimate of 37 percent of women having had a hysterectomy by age 60 may not hold true with more recent data. To verify this, studies on hysterectomy trends using consistent measures are warranted. Of those 2,039 women included in the analysis, 23.7 percent had a hysterectomy.

The proportion of hysterectomy cases is smaller in the study sample due to the elimination of hysterectomies that occurred before 1967. Among 835 women who reported having had a

hysterectomy, 352 did not report the time of their last menstrual period (N=20), had a hysterectomy before 1967 (N=230), or did not have valid information for all independent variables (N=102). The remaining 483 hysterectomy cases are included in the analysis of this study.

The largest group of women experienced a hysterectomy when they were 40 to 49 years old. A CDC report published in 1997 reports that women aged 40 to 44 are at the greatest risk of experiencing hysterectomy (CDC 1997). The National Center for Health Statistics reported the mean age of women at hysterectomy was 42.7 years (Pokras and Hufnagel 1988). In this study, women's mean age at hysterectomy was 41.3, which does not appear substantially different from the national statistics. From these regards, the study population for this study is not different in characteristics from women included in the National Hospital Discharge Survey.

Overall, about 77 percent of women had the surgery when they were between 35 and 54 years of age. The overall average age at hysterectomy was 41 years. For those included in the multivariate analysis of this study, the average age at hysterectomy was 44.7 years. These results are consistent with the trends discovered from other studies (see pages 26, 27, and 28).

In terms of the years when women had a hysterectomy, 24 percent had a hysterectomy between 1972 and 1976, 21 percent had

the surgery between 1967 and 1971, and 15 percent experienced hysterectomy between 1977 and 1981. For those included in the analysis, about 62 percent had a hysterectomy between 1967 and 1976. Another 33 percent experienced a hysterectomy between 1977 and 1986. Since 1987, when women reached the age range of 50 to 64, the hysterectomy performance rate has significantly decreased.

Table 8 presents hysterectomy rates per 1,000 women for subgroups of the study variables. The variations in hysterectomy rates across subgroups are examined in order to identify possible impacts of the variables. Table 8 also displays the results of the chi-square test between independent variables and the dependent variable (hysterectomy risk). With the chi-square test, it can be identified whether the relationship between dependent variable and independent variables is statistically significant or not. The numbers in parenthesis represent the number of valid cases for each variable and each category. When the number of cases for each category (denominator) is less than 30, the hysterectomy rates are not calculated because the numbers are too small to have any statistical meaning.

The first column in Table 8 presents a list of study sample characteristics. The second column shows hysterectomy rates per 1,000 women aged 58 through 72 in 1995. In the third column, hysterectomy rates per 1,000 person years are presented. Person-

Table 8. Hysterectomy Rates per 1,000 Women and Chi-Square Test with Hysterectomy for Subgroups of the Study Variables for the Total Sample and Study Sample

Characteristics	Total sample: Respondents (N=2,711)	Total sample: Person years (N=60,063)	Study sample: Respondents (N=2,039)	Study sample: Person years (N=48,500)
		Rate per 1,000		
Overall hysterectomy rate	308(2711)	10(60063)	237(2039)	10(48500)
Employment	(N=2711)*	(N=59019)**		(N=48500)**
Working	333(1331)	11(31216)	288(1042)	11(26507)
Keeping house	279(1159)	8(21492)	172(844)	8(17321)
Other	312(221)	8(6311)	248(153)	8(4672)
Marital	(N=2711)*	(N=58948)***	(N=2039)*	(N=48500)**
Married	317(2241)	11(42897)	232(1666)	11(35596)
Widowed/divorced/separated	289(322)	8(13248)	319(263)	8(10626)
Never married	209(148)	5(2803)	109(110)	5(2278)
Occupation	(N=2709)	(N=57399)	(N=2039)**	(N=48500)
Professional/technical	265(317)	10(7828)	262(256)	10(6636)
Managers/officials/proprietors	346(81)	9(3300)	389(69)	10(2728)
Clerical/kindred	319(857)	10(16575)	232(650)	11(14369)
Sales workers	377(162)	10(3340)	224(120)	9(3067)
Craftsmen/foremen/kindred	NA(27)	13(772)	NA(22)	15(667)
Operatives/kindred	311(409)	11(7811)	246(301)	11(6534)
Private household workers	265(223)	9(4586)	191(167)	9(3674)
Other Service workers	310(420)	9(10226)	242(326)	9(8657)
Farmers/farm managers	NA(9)	10(304)	NA(8)	13(235)
Farm laborers/foremen	244(86)	4(1795)	135(59)	6(1297)
Laborers except farm and mine	NA(6)	13(316)	NA(3)	12(252)
Armed Forces	NA(3)	0(7)	NA(1)	NA(6)
Never worked	294(109)	4(539)	360(55)	5(378)
Race	(N=2711)**	(N=60063)*	(N=2039)*	(N=48500)*
White	324(1973)	10(43014)	252(1480)	11(34909)
Black	262(699)	8(16213)	198(530)	8(12903)
Other	308(39)	10(836)	175(29)	7(688)
Residence at 15	(N=2704)	(N=59910)	(N=2039)	(N=48500)
Farm/ranch	319(747)	11(16466)	261(563)	11(12950)
Country	309(162)	8(3500)	201(124)	9(2855)
Town/small city	316(833)	10(18353)	232(616)	10(14899)
Suburb of large city	250(108)	9(2521)	222(86)	9(2064)
City:2,5000-10,000	295(353)	9(7905)	213(277)	9(6605)
Large city:10,000+	301(501)	9(11165)	241(373)	10(9127)
SMSA	(N=2711)	(N=58793)	(N=2039)	(N=48500)
In metropolitan	309(1886)	10(39891)	233(1407)	10(33325)
Not in metropolitan	305(825)	10(18902)	245(632)	10(15175)
South	(N=2711)	(N=58946)	(N=2039)	(N=48500)
South	317(1051)	10(22707)	240(775)	10(18356)
Non-south	302(1660)	10(36239)	235(1264)	10(30144)
Nationality of parents/ grandparents	(N=2588)	(N=57406)	(N=2039)	(N=48500)
US/Canada	312(1761)	10(38799)	236(1376)	10(32735)
Other countries	295(827)	10(18607)	238(663)	10(15765)
Smoking status	(N=2711)	(N=60063)	(N=2039)	(N=48500)
Current/ever smoker	324(1221)	10(26348)	251(910)	10(21892)
Never smoker	291(1325)	9(30128)	229(1009)	9(24382)
No answer	321(165)	10(3587)	194(118)	10(2226)

* <.05 ** <.01 *** <.001 NA: not applicable when n<30.

years converted from 2,711 respondents of 1995 are used. The fourth column contains hysterectomy rates per 1,000 women for whom valid responses for all study variables are available. The final column shows hysterectomy rates per 1,000 person years that are converted from 2,039 sample (study sample). Two hundred and thirty-seven of every 1,000 women between the ages of 58 and 72 in 1995 had had a hysterectomy. This compares to a person-year rate of 10 per 1,000. That is, there were 10 hysterectomies per 1,000 women each person year.

In terms of answering the first two research questions of this study--which and how women's SES status has an impact on their risk of hysterectomy--employment, marital status, occupation, race, residence at 15, and SMSA are examined. According to the hysterectomy rates displayed in Table 8, women who are working, married, craftsmen, farmers, and laborers show higher hysterectomy rates than their counterparts. Women who were never married and farm laborers show lower hysterectomy rates than their counterparts. The high hysterectomy rates for craftsmen, farmers, and laborers may be due to the small sample size of these categories. However, variations in hysterectomy rates are observed in overall occupational categories. Differential hysterectomy rates across employment status, marital status, and occupaticnal categories indicate potential role of SES characteristics on hysterectomy risk.

Whites have a higher hysterectomy rate than blacks or other races. Metro versus non-metropolitan residents do not have different hysterectomy rates. The relationships between hysterectomy risk and employment, marital status, and race are statistically significant. Statistically, significant association between these independent social groups and chi-square indicates that the variation in hysterectomy rates in some subgroups is not by chance. The dependence of hysterectomy risk on marital status and race appears to be statistically significant for all four samples. Surprisingly, the variation in hysterectomy rates between smokers and non-smokers is not statistically significant. Also, the association between residence at age 15 and hysterectomy experience is not statistically significant.

Some past studies on hysterectomy found variations in hysterectomy rates across different social subgroups. Specifically, Dicker et al. (1982) found that blacks are more likely to experience a hysterectomy than whites and women in the South are at higher hysterectomy risk than those in other regions. There were studies that have observed non-differential hysterectomy rates across racial groups in the past. Wilcox et al. (1994) found similar hysterectomy rates for whites and blacks. Kjerulff et al. (1993[a]) and CDC (1997) also observed no significant racial difference in hysterectomy rates. Based on the bivariate analysis presented in Table 8, the hysterectomy risk is higher for whites than for blacks. In addition, the differential

hysterectomy rates for geographic regions are not statistically significant.

Later in this chapter, I will investigate whether the impact of race on hysterectomy risk is statistically significant in a multivariate analysis.

Dicker et al. (1982) and CDC (1997) found substantial variation in hysterectomy rates across geographical regions in the United States. According to these studies, women in the South are at higher hysterectomy risk than those in other regions. Based on Table 8, although the hysterectomy rates appear to be slightly higher for the South in respondent samples, the association between region and hysterectomy risk does not show statistical significance.

Based upon the Wisconsin Longitudinal Study (1957-1993), Marks and Shinberg (1997) found that higher occupational status is associated with lower hysterectomy rates. They also found that marital status has no statistically significant impact on hysterectomy risk. The impact of occupational status shows somewhat statistically significant in Table 8. However, the association is not linear. Furthermore, from Table 8, the impact of marital status on hysterectomy risk appears to be statistically significant in all four samples, which contradicts the finding of Marks and Shinberg (1997). Married women show higher hysterectomy rates than those who are not currently married or never married.

With regard to the impact of attitudinal and behavioral characteristics on hysterectomy, this study examined smoking status, metro vs. non-metro residence, locus of control, and the nationality of women's parents and grandparents. Current or past smokers show a slightly higher hysterectomy rate than never smokers but it is not statistically significant. Those who did not report their smoking status show a similar hysterectomy rate to current or past smokers. Neither nationality nor geographical location of residence shows a difference in hysterectomy rates.

Relationships among the Study Variables

In order to examine the relationships between the dependent and independent variables, Pearson's correlation coefficient scores were computed. The Pearson correlation coefficient identifies the strength and significance of linear relationship between two variables (Norusis 1994). The bivariate relationships among characteristics included in this study are presented in Table 9.

The table shows the correlation coefficient scores, significance of the relationships, and the direction of the statistically significant relationships. While Pearson correlation value determines whether two variables are linearly related, this applies for continuous and ordinal variables only. For categorical variables, the Pearson correlation determines whether two variables have a statistically significant

Table 9. Bivariate Relationships among Study Sample's Characteristics (N=48,500)

Variables	EDUC	EMPLOY	HYST	LOC	MARI	NCHILD	OCCU	ORIGIN	RACE	REGION	SMOKE	SMSA	NATION
EDUC	1.000												
EMPLOY	-.1139 (***)	1.000											
HYST	-.0041 (NS)	**-.0139 (***)**	1.000										
LOC	-.1782 (***)	.0437 (***)	-.0088 (NS)	1.000									
MARI	-.0304 (**)	-.0664 (***)	**-.0161 (***)**	.0411 (***)	1.000								
NCHILD	-.2786 (***)	.0989 (***)	-.0075 (NS)	.0780 (***)	-.1179 (***)	1.000							
OCCU	-.5320 (***)	.1742 (***)	-.0058 (NS)	.1313 (***)	.0483 (***)	.2700 (***)	1.000						
ORIGIN	.2148 (***)	.0032 (NS)	-.0057 (NS)	-.0768 (***)	.0075 (NS)	-.1223 (***)	-.2003 (***)	1.000					
RACE	-.2712 (***)	-.0172 (***)	**-.0116 (**)**	.1058 (***)	.2151 (***)	.2345 (***)	.2861 (***)	-.0873 (***)	1.000				
REGION	-.2704 (***)	-.0037 (NS)	.0014 (NS)	.0381 (***)	.0745 (***)	.1416 (***)	.1913 (***)	-.2273 (***)	.3388 (***)	1.000			
SMOKE	.0537 (***)	-.0120 (***)	-.0037 (NS)	.0895 (***)	-.0352 (***)	.0719 (***)	.0574 (***)	-.1244 (***)	.0686 (***)	.0179 (***)	1.000		
SMSA	-.1344 (***)	.0054 (NS)	.0017 (NS)	.0346 (***)	-.0412 (***)	.0953 (***)	.1354 (***)	-.3816 (***)	.0003 (NS)	.1950 (***)	.0530 (***)	1.000	
NATION	.1450 (***)	-.0127 (***)	.0004 (NS)	-.0276 (***)	-.0679 (***)	-.1422 (***)	-.1630 (***)	.2885 (***)	-.2932 (***)	-.3706 (***)	-.0405 (***)	-.1814 (***)	1.000

Two-tailed significance test: NS - not significant
** - significant at .05 level
***- significant at .01 level

relationship. In other words, Pearson correlation tests the independence between two categorical variables.

The correlation of all study variables is presented so that any problematic co-linearity can be detected. Among the associations between two variables, only one showed a statistically significant relationship with the coefficient value greater than 0.5. It was between occupation and education with the coefficient value of -0.5320. This indicates that higher

educational attainment is correlated with more professional occupations. Marks and Shinberg (1997) found that education influences hysterectomy risk through its effects on women's occupational status. It will be examined whether similar association with hysterectomy can be identified in this study. The correlation coefficient between occupation and education is -0.5398, indicating that the higher one's education is, the more likely one is to have a professional occupation.

With regard to the association between characteristics and hysterectomy, three showed statistically significant relationships with hysterectomy. Variables that show a statistically significant relationship with hysterectomy are EMPLOY, MARI, and RACE. These are three of the four variables shown to be related to hysterectomy in the chi-square analysis. Of the four, occupation is not statistically significant in the examination of the Pearson correlation coefficient. For the statistically significant bivariate associations, the value of coefficients did not appear notable. Respondent's employment status (EMPLOY) showed a correlation coefficient value of -.0139, indicating that higher hysterectomy risk is associated with working women and/or those keeping house. Marital status (MARI) showed a correlation coefficient of -.0161 with hysterectomy, indicating that married women are slightly more likely to have a hysterectomy. A correlation coefficient of -.0116 identified between hysterectomy and race (RACE) indicates that whites are

more likely to have a hysterectomy. Women's employment status, marital status, and race may have a statistically significant impact on the hysterectomy risk. However, looking at bivariate association is not adequate to answer the research questions proposed in this study: 1. Which social characteristics of women have statistically significant influence on their hysterectomy risk? 2. How do those social characteristics influence women's risk of hysterectomy? and 3. Did their attitudinal and/or behavioral characteristics also influence hysterectomy experience? Since correlation does not necessarily mean causation, a further detailed investigation is necessary to analyze the above three research questions in depth. In the next section, results from a multivariate analysis are presented and discussed.

Multivariate Analyses

Cox Proportional Hazards Model

In order to identify the statistically significant predictors of hysterectomy risk both from SES and attitudinal/behavioral aspects, the Cox proportional hazards model is used. As stated in the previous chapter, the Cox proportional hazards model better handles data with censored cases. It identifies a set of variables among the ones entered into the program that best explain the dependent variable--in this study, the risk of hysterectomy.

First, in order to answer the first two research questions of this study: (1) Which social characteristics of women have statistically significant influence on their hysterectomy risk? and (2) How do those social characteristics influence women's risk of hysterectomy?, the Cox hazards model is assessed including only women's SES variables as independent variables. Variables included are education, employment, marital status, occupation, residence at age 15, race, and metro vs. non-metro residence.

Table 10 summarizes the results of the first model. In this model, predictor variables representing women's social status are included to test their influence on hysterectomy. Using the FORWARD method, the hazards model processed three steps to identify the most statistically significant SES predictors of hysterectomy.

In Table 10, the values of exp(β) for each characteristic are displayed along with their statistical significance. In each model, a new variable that is considered a statistically significant predictor of hysterectomy risk is added to the existing variables from the previous model. The three rows at the bottom of Table 10 displays model -2 Log-Likelihood (-2LL) values, changes from the previous model, and the significance of the difference. In Cox hazards model, the changes in the values of -2LL (-2 times the log likelihood) for difference models are used to verify the improvement in a model.

Table 10. Cox Proportional Hazard Models of the Social Indicators of Hysterectomy, NLS-MW (N=48,500)

Independent variables	Model 1 Exp(β)	Model 2 Exp(β)	Model 3 Exp(β)
Marital status (married)			
Widowed/separated/divorced	.8857	.8894	.8584
Never married	.7482	.7236	.7478
Employment status (working)			
Keeping house		.9355	.9192
Other		.7767*	.7707*
Education			.9516**
Occupation (profess/technic)			
Managers/officials			
Clerical/kindred			
Sales workers			
Craftsmen/foremen			
Operatives/kindred			
Private household workers			
Other service workers			
Farmers/farm managers			
Farm laborers/foremen			
Other laborers			
Armed forces			
Never worked			
Origin (farm/ranch)			
Country			
Town/small city			
Suburb of large city			
City(25k-100k)			
Large city (100k+)			
Race (white)			
Black			
Other			
SMSA (Metro)			
Constant term -2LL	9955.671		
-2*Log-Likelihood	9929.049	9906.850	9897.803
Change from the previous model and its significance	26.622 **	22.199 **	9.047 **

* = p<.05, ** = p<.01
Reference categories are in parenthesis.

In the first model, marital status among seven SES variables was identified as a statistically significant predictor of hysterectomy risk. The relative risk of having a hysterectomy for married women was 12 percent greater than those previously married and 25 percent greater than those never married women. The -2LL value in the baseline model was 9955.671 and was

decreased to 9929.049 by adding MARI into the model. The difference in the -2LL value was statistically significant at .01 level, indicating that the impact of women's marital status on their hysterectomy risk is statistically significant. Based on the exp(β) value of marital status, the risk of hysterectomy is higher for married women than for those widowed, separated, or divorced. The hysterectomy risk for never married women is the lowest.

The second step added women's employment status to the model. In addition to marital status, women's employment status was identified as another social characteristic of women that has a statistically significant impact on women's hysterectomy risk. The -2LL value decreased to 9906.850 with a statistically significant difference from the previous model at .01 level. Working women show higher hysterectomy risk than those keeping house, going to school, or are unemployed.

The final step in this model identified women's educational attainment as another statistically significant indicator of hysterectomy risk. Higher educational attainment appears to have an association with lower risk of hysterectomy. In other words, women with higher education have lower risk of having a hysterectomy.

With this hazards model, I attempted to answer the first and second research questions of this study: which social characteristics have a statistically significant impact on

hysterectomy risk and what are their impacts? The results presented in Table 10 indicate that among seven social variables entered into this model, education, employment, and marital status were identified as having statistically significant impacts on women's risk of having a hysterectomy. The next hazards model attempts to answer the third research question of this study: Did women's attitudinal and/or behavioral characteristics and influence hysterectomy experience? As attitudinal/behavioral characteristics, smoking status, number of children, nationality of parents or grandparents, geographical location of residence, and the locus of control are included in the model.

Results of the second hazards model are presented in Table 11. Among five attitudinal/behavioral variables, the hazards model identified the locus of control as the only variable that has a statistically significant impact on women's hysterectomy risk.

Smoking status, number of children, nationality of parents or grandparents, and geographical region of residence did not appear to be a statistically significant indicator of hysterectomy risk. A lower value in the locus of control appears to be associated with higher risk of hysterectomy. In other words, greater internal locus of control, believing in self rather than fate or destiny, is associated with higher risk of hysterectomy.

Table 11. Cox Proportional Hazard Models of the Attitudinal/Behavioral Indicators of Hysterectomy, NLS-MW (N=48,500)

Independent variables	Model 1 Exp(β)
Locus of control	.9803*
Smoking(current/past smoker)	
Never smoker	
No answer	
Nationality of parents/ grandparents (US/Canada)	
Other countries	
Region (non-South)	
Number of children	
Constant term -2LL	9955.671
-2*Log-Likelihood	9950.521
Change from the previous model and its significance	5.150 *

* = p<.05, ** = p<.01
Reference categories are in parenthesis.

One possible explanation would be that women with greater internal locus of control may find hysterectomy to be a preventive health behavior.

With the second hazards model, the third research question of this study has been assessed. Among women's behavioral/ attitudinal characteristics, the locus of control appears to have a statistically significant impact on the hysterectomy risk. Greater internal locus of control seems to be associated with higher risk of hysterectomy.

In the next hazards model, an investigation is carried out to examine how the impact of women's social characteristics on hysterectomy risk changes when other variables are also considered. In addition, it is also investigated whether the

impact of attitudinal/behavioral characteristics on hysterectomy risk shows different patterning when SES variables are entered in the model. The purpose of this model is to identify the possible interplay of variables and their impacts on women's hysterectomy risk. By including both social and attitudinal/behavioral variables into the model, it can be identified which of these variables are more statistically significant in predicting women's hysterectomy risk. Therefore, it is possible to pinpoint which of these social, attitudinal, and behavioral characteristics are the best indicators of women's hysterectomy risk. Whether the previously shown impact of SES variables such as education, employment, and marital status (Table 10) will remain statistically significant is also examined.

Table 12 summarizes the results of the final hazards model. In this model, all of the 12 social, attitudinal, and behavioral independent variables are included. The hazards model identified five statistically significant indicators of hysterectomy through five steps. Five variables identified as being statistically significant indicators of hysterectomy are education, employment, marital status, locus of control, and number of children. Detailed explanations of each step in this hazards model are presented below.

First of all, the Cox model identified marital status as a statistically significant indicator of hysterectomy risk. The

Table 12. Cox Proportional Hazard Models of the Indicators of Hysterectomy, NLS-MW (N=48,500)

Independent variables	Model 1 Exp(β)	Model 2 Exp(β)	Model 3 Exp(β)
Marital status (married)			
Widowed/separated/divorced	.8857	.8894	.8584
Never married	.7482	.7236	.7478
Employment status (working)			
Keeping house		.9355	.9192
Other		.7767*	.7707*
Education			.9516**
Occupation (profess/technic)			
Managers/officials			
Clerical/kindred			
Sales workers			
Craftsmen/foremen			
Operatives/kindred			
Private household workers			
Other service workers			
Farmers/farm managers			
Farm laborers/foremen			
Other laborers			
Armed forces			
Never worked			
Origin (farm/ranch)			
Country			
Town/small city			
Suburb of large city			
City(25k-100k)			
Large city (100k+)			
Race (white)			
Black			
Other			
SMSA (Metro)			
Locus of control			
Smoking(current/past smoker)			
Never smoker			
No answer			
Nationality of parents/ grandparents (US/Canada)			
Other countries			
Region (non-South)			
Number of children			
Constant term -2LL	9955.671		
-2*Log-Likelihood	9929.049	9906.850	9897.803
Change from the previous model and its significance	26.622 **	22.199 **	9.047 **

* = p<.05, ** = p<.01

Reference categories are in parentheses.

Table 12. Continued.

Independent variables	Model 4 Exp(β)	Model 5 Exp(β)
Marital status (married)		
Widowed/separated/divorced	.8973	.9043
Never married	.6852	.6815
Employment status (working)		
Keeping house	.9250	.9252
Other	.7705*	.7734*
Education	.9401**	.9348**
Occupation (profess/technic)		
Managers/officials		
Clerical/kindred		
Sales workers		
Craftsmen/foremen		
Operatives/kindred		
Private household workers		
Other service workers		
Farmers/farm managers		
Farm laborers/foremen		
Other laborers		
Armed forces		
Never worked		
Origin (farm/ranch)		
Country		
Town/small city		
Suburb of large city		
City(25k-100k)		
Large city (100k+)		
Race (white)		
Black		
Other		
SMSA (Metro)		
Number of children	.9437**	.9445**(.0046)
Smoking(current/past smoker)		
Never smoker		
No answer		
Nationality of parents/ grandparents (US/Canada)		
Other countries		
Region (non-South)		
Locus of control		.9801*(.0242)
Constant term -2LL	9955.671	
-2*Log-Likelihood	9889.083	9883.981
Change from the previous model and its significance	8.720 **	5.102 *

* = p<.05, ** = p<.01
Reference categories are in parentheses.

decrease in -2LL value from the constant term was statistically significant at the .01 level. Currently married women appear to go through more hysterectomies than those separated, widowed, divorced, or never married. The hysterectomy risk seems to be the lowest for those never married.

The second step identified employment status in addition to marital status as having a statistically significant impact on women's hysterectomy risk. The difference in -2LL value from the previous model was statistically significant at the 0.01 level. Therefore, the null hypothesis, the coefficients of employment status and marital status are both 0, can be rejected. That is, both employment and marital status of women are associated with their risk of hysterectomy.

The third step of the Cox proportional hazards model added education as another statistically significant indicator of hysterectomy risk. The -2LL score decreased from the previous model by 9.047, and the change was statistically significant at the .01 level. Thus, the null hypothesis, coefficients of MARI, EMPLOY, and EDUC are 0, can be rejected. All three variables appear as statistically significant indicators of hysterectomy risk. By far, the impact of SES variables in this hazards model appears identical as shown in the first hazards model, which included SES characteristics only as independent variables. It demonstrates that the addition of behavioral/attitudinal variables does not alter the impact of SES variables on women's

hysterectomy risk. Therefore, the answers to the research question one and two of this study can be provided with the results so far. Statistically significant SES variables in predicting women's hysterectomy risk are education, employment, and marital status. The higher the level of education a woman has, the lower hysterectomy risk she is likely to have. Working women have higher hysterectomy risk than their counterparts. Married women have higher hysterectomy risk than those divorced, separated, widowed, or never married.

Step 4 added the number of children (NCHILD) to three SES variables: EDUC, EMPLOY, and MARITAL. By including NCHILD, -2LL became 9889.083 with a difference of 8.720 from the previous model. The change was statistically significant at the .01 level. This indicates that EDUC, EMPLOY, MARITAL, and NCHILD are all statistically significant predictors of hysterectomy. According to this model, greater number of children is associated with lower risk of hysterectomy. That is, women with more children have lower risk of having a hysterectomy. This finding is somewhat surprising since it has been hypothesized that women with fewer children might want additional children, and a hysterectomy would prevent having children in the future.

One possible explanation of this finding would be that women with more children may have greater reproductive health, thus reducing the need for hysterectomy. Women with fewer children may have poor reproductive health, possibly being the

reason for having fewer children and putting them at higher risk of hysterectomy than others. The impact of NCHILD has not been detected in the previous hazards model focusing on attitudinal/behavioral characteristics only. In the previous model, the impact of NCHILD did not appear statistically significant. However, with SES variables included in the model, the statistical significance of NCHILD increased and this may be a product of variable-interplay.

The final step (Model 5) added the respondent's locus of control (LOC) into the model. With the inclusion of LOC, the -2LL score showed 5.102 changes from the previous model, and the difference was statistically significant at the .05 level. With a value increase in LOC, the relative risk of hysterectomy appears to decrease by 2 percent. Although the decrease in relative risk is small with one value increase in LOC, considering that the LOC value ranges from 11 to 44 and that a woman's risk of hysterectomy is 20 percent lower than others if her value of LOC is greater by 10, the impact of LOC does not seem marginal. Thus, based on this Cox model, greater internal locus of control appears to be associated with higher hysterectomy risk. The impact of LOC was identified in the previous hazards model in the investigation of attitudinal/behavioral characteristics in relation to hysterectomy risk. With social variables added to the model, the impact of LOC did not change.

Since the Cox proportional hazards model could not add other variables into the model or remove any variables from the model, it can be concluded that model 5 includes the best statistical set of predictors of hysterectomy risk. Based on model 5, women's hysterectomy experience is associated with their education, employment status, marital status, number of children, and locus of control. Married women appear to have greater odds of having a hysterectomy than those widowed, separated, divorced, or never married. Those working have greater odds of having a hysterectomy than women who keep house or are in other employment status. Women with lower educational attainment appear to have greater odds of having a hysterectomy. The final model also shows that women with greater number of children and those with greater external locus of control have lower odds of having a hysterectomy than their counterparts.

It may be worthwhile to note here that this does not mean that other variables do not have any association with women's hysterectomy risk. Rather, when all things are considered, the impacts of those five variables are more statistically significant than others.

The results from Cox proportional hazards analysis displayed in Table 11 provide answers to the first and second research questions of this study. That is, among women's social status, employment, education, and marital status best explain their risk of hysterectomy. Women with higher educational

attainment, who are working and married show higher hysterectomy risk than their counterparts. Consistent with this study, the association between low education and high hysterectomy risk has been found in several past studies. If women with lower educational attainment are disproportionately exposed to higher risk of hysterectomy, the route through which education influences hysterectomy risk needs to be identified. In addition, mechanisms for the relationship between employment status and hysterectomy as well as between marital status and hysterectomy should be identified.

With regard to attitudinal/behavioral characteristics, number of children and locus of control are identified as statistically significant indicators of hysterectomy. Smoking status, nationality of parents or grandparents, and geographical region of residence did not appear as statistically significant indicators of hysterectomy. This provides an answer to the third research question of this study. This is a unique finding that none of the previous hysterectomy studies investigated and/or found.

Major Findings and Discussion

This study was guided by a social stratification framework and examined the extent of differentiation in women's exposure to hysterectomy based on their social status. The social stratification framework was chosen because past studies of

hysterectomy consistently found differential risk of hysterectomy for women in different social status (Kjerulff et al. 1993[a]; Kjerulff et al. 1993[b]; Marks and Shinberg 1997; Marshall et al. 2000).

Both bivariate and multivariate analyses were employed in order to test this hypothesis. Results from bivariate analysis showed that women's employment status, marital status, and race have statistically significant association with hysterectomy. After a series of multivariate analyses were conducted, however, the results indicated that women's marital status, employment status, education, number of children, and locus of control have statistically significant association with hysterectomy. In other words, when other things are considered together, the statistically significant bivariate relationship between hysterectomy and race disappeared and the impact of other variables such as education, number of children, and locus of control became statistically significant.

It was hypothesized that women with low social status would be more likely to experience hysterectomy than their counterparts due to limited informational and material resources. Based on the results of multivariate analysis, the study hypothesis was only partially supported by this study. Among social characteristics, women's educational attainment is the only variable that showed a statistically significant impact on hysterectomy that supports

social stratification framework. Women with less education were more likely to have a hysterectomy than their counterparts.

Education influences one's ability to effectively use the health care system. Individuals with limited education are less likely to use health-screening procedures or to seek help early in the course of a disease (Paita 1998). Thus, to the extent that women with low education would seek fewer second opinions and alternative treatments, low education was expected to be associated with higher hysterectomy rates. This study's finding of higher hysterectomy rates for less-educated women suggests that theories regarding the association between education and health may be applicable to the area of health care utilization.

Education differentials in utilization of hysterectomy may be due to the more active participation in the decision-making process by those with higher education. Individuals with higher education may also have more informational and material resources to seek alternative treatments.

It was also hypothesized in this study that there would be differential hysterectomy rates for women with different employment, marital, and occupational status as well as their race and urban/rural residence.

Among women's social characteristics stated above, findings from this study showed no statistically significant differentials in hysterectomy risk as hypothesized. Even though this study observed that the association between hysterectomy and women's

employment and marital status was statistically significant, the directions of their association with hysterectomy were not as expected. Women currently married or working were more likely to have a hysterectomy than those who were not currently married or not working. In other words, contrary to what was expected, women currently married have higher utilization of hysterectomy when alternative methods may be possible. This suggests that currently married women may have poorer reproductive health, possibly due to different sexual behavior patterns than those not currently married or may be due to their childbearing frequencies.

Currently working women were expected to show lower hysterectomy rates than those not working because they were expected to have more informational and material resources to seek less invasive alternative treatments. However, the results from this study showed that working women are more likely to have hysterectomy than those that are not working. This suggests that working women may have less endurance for potential hysterectomy symptoms, even when the symptoms are not critical, because they have to work on a daily basis. It may also be that working women find it more troublesome to seek a second opinion and/or alternative treatments due to their work schedule. From the same token, those staying at home may have more time to gather information on alternative treatments or to visit doctors for second opinion.

In addition to testing the applicability of social stratification framework in explaining women's hysterectomy utilization, this study also investigated the impact of women's attitudinal and behavioral characteristics on their risk of hysterectomy. As representing women's behavior, smoking, parents' or grandparents' nation of origin, geographic region of residence (South vs. non-South), and number of children were included in the study. Women's locus of control was employed as the only attitudinal variable of this study. It was hypothesized that women who are smoking, with U.S. nationality, living in the South, and with more children would have a higher likelihood of having a hysterectomy. It was also hypothesized that women with greater external locus of control would have more hysterectomies than their counterparts.

Although many previous studies on hysterectomy found substantial variation in hysterectomy performance across geographical regions in the United States, this study did not find any impact by region or nationality. This may be because both variables were dummies, a rather crude measurement scheme. Smoking was not identified as a statistically significant predictor of hysterectomy. This study did observe a statistically significant impact of women's locus of control and number of children. However, the directions of association were not as expected.

This study observed that women with greater internal locus of control had more hysterectomies than those with greater external locus of control. This suggests that women with greater internal locus of control may have a more positive perception of hysterectomy than those with external locus of control. They may perceive hysterectomy as a preventive health measure. Thus, when faced with the possibility of having a hysterectomy, rather than seeking alternative treatment options, they may feel that the removal of the uterus may prevent them from having a recurrence of any negative health problems caused by the organ. On the other hand, those with greater external locus of control may feel that having a hysterectomy may not necessarily prevent what was meant to happen to them.

It was hypothesized that women with more children may have more hysterectomies because they may feel less need to keep the intact uterus. However, findings from this study indicate that it may not be a matter of wanting the intact uterus, but the status of women's reproductive health that enables them to have an intact uterus or not. Women with fewer number of children showed a higher likelihood of having a hysterectomy than their counterparts. This suggests that women with more children may have better reproductive health, which may have enabled them to have more children than their counterparts. By the same token, those with fewer children may have had to give up having more children because of their poorer reproductive health. Overall,

the above-mentioned findings suggest that the social stratification framework does not fully explain women's hysterectomy utilization patterns. Based on social stratification framework, it was hypothesized that women with higher social status would be less likely to have hysterectomy than their counterparts, mainly because they would have more informational and material resources to seek alternative treatments that are less invasive than removal of uterus. However, findings from this study suggest that this may not be the case. Although women with higher education are less likely to have a hysterectomy than those with lower education, other findings indicate that the social status of women may not be the only factor in determining their risk of hysterectomy in the direction that social stratification framework suggests. Factors other than social status of women, such as patterns in women's sexual and childbearing behavior, daily environment, and available time, might also influence women's hysterectomy risk. With the findings from this study alone, it is impossible to identify specific factors. Because it is hard to understand what reasons make working or currently married women experience more hysterectomies, studies on women's pre-hysterectomy conditions, both in terms of health and feelings, will help answer those questions. Findings from this study also suggest that a different theoretical model than social stratification framework may better explain factors associated with women's risk of hysterectomy.

In summary, findings of this study support the hypothesis that women's exposure to hysterectomy would be determined by the interplay of a multitude of factors including their social characteristics. It has been hypothesized in this study that women with low social status would be more likely to experience hysterectomy. The results from the Cox proportional hazards analyses only partially support this hypothesis. Women with higher education show lower risk of hysterectomy than their counterparts. However, findings of this study also suggest that other factors including attitudinal and behavioral characteristics of women--locus of control and number of children--may also play a substantial role in explaining women's hysterectomy experience. The results described above indicate that a consistent differentiation exists among women with respect to their exposure to hysterectomy depending upon their social locations as well as their attitudes and behaviors. The most important finding of this study is that women with diverse educational, employment, and marital status are exposed to a differential risk of having a hysterectomy. This is important because a woman's risk of hysterectomy should depend on her clinical symptoms, not on her social characteristics. This study provides another piece of evidence on hysterectomy variations related with women's social factors.

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter will briefly summarize the purpose of this study, research questions proposed, methods applied, and the major findings. Additionally, the implications of the data results will be discussed along with the limitations of this study and implications for future research within the context of the findings.

The focus of this study has been on identifying the predictors of hysterectomies, a common surgical operation performed on women today. Using a social stratification framework, the purposes of this study were first, to investigate whether women's hysterectomy experience was influenced by their social status and second, to examine whether behavioral and attitudinal characteristics of women have an impact on their exposure to hysterectomy.

Numerous past studies on hysterectomy found variations in hysterectomy performance rates depending on women's socioeconomic characteristics (Kjerulff et al. 1993[b]; Marks and Shinberg 1997). However, much of that research had limitations. One such limitation was presenting merely descriptive statistics. For example, when variations in simple and absolute rates are presented across geographic regions, it is difficult to know

whether the regional variations in hysterectomy rates are real or a statistical artifact of other variables.

In order to overcome some of the limitations of past hysterectomy studies and extend the scope of hysterectomy study to attitudinal and behavioral aspects from non-clinical and sociological perspectives, three research questions were asked in this study:

1. How do women's social characteristics influence their risk of hysterectomy?

2. Which subgroup of women at various social standings is more likely to be exposed to hysterectomy experience than others?

3. How are women's attitudinal and behavioral characteristics correlated with hysterectomy?

To address the above questions, data from the National Longitudinal Survey data for Mature Women's cohort (NLS-MW), collected from a national probability sample of women who were 30 to 44 years of age in 1967, were analyzed. These women were between the ages of 58 and 72 when interviewed for the 17th time in 1995, the last date point employed in this study. For the analysis in this study, only those women who were successfully followed up until the 1995 survey wave, when the questions identifying hysterectomy experience were asked, who did not have a hysterectomy prior to 1967, and those who reported valid information for all of the study variables were selected (N=2,039). In order to fully represent the changing

characteristics of women over time during the study period, the data were converted into person-year observations. Thus, each individual was observed and their person-years were entered until they had a hysterectomy or up to 29 times. In the multivariate analysis, women who had a hysterectomy before the observation year were excluded for subsequent years because they were no longer at risk of hysterectomy. Person-years that had all the valid dependent and independent variable values are included in the multivariate analysis. The total number of person-years meeting these criteria was 48,500.

For the multivariate Cox proportional hazards analyses, the hysterectomy experience indicator was used as the dependent variable. Respondent's education, employment status, locus of control, marital status, nationality, number of children, occupation, residence at age 15, race, geographic region, smoking status, and urban/rural residence were selected as the independent variables. Among these, social stratification variables are education, employment status, marital status, occupation, residence at age 15, race, and urban/rural residence. In addition, locus of control, nationality, number of children, geographic region, and smoking status, are employed as attitudinal and behavioral measures. After running the Cox proportional hazards model that includes all of the above predictor variables, 5 variables were identified as statistically significant indicators of women's hysterectomy risk.

Summary

In sum, the final multivariate Cox proportional hazards model identified three social characteristics, one attitudinal characteristic, and one behavioral characteristic as statistically significant predictors of hysterectomy risk. Regarding social status, the hazards model identified education, employment status, and marital status as statistically significant hysterectomy predictors. Regarding behavioral characteristics, number of children was identified as a statistically significant hysterectomy indicator. Locus of control was identified as an attitudinal predictor of hysterectomy.

Several past studies of hysterectomy found that the risk of hysterectomy is associated with women's social status (Kjerulff et al. 1993[b]; Marks and Shinberg 1997). Previous findings include that lower educational attainment is associated with higher risk of hysterectomy. The findings in this study are consistent with this. A study by Marks and Shinberg (1997) found that women with at least a bachelor's degree had significantly lower odds of having a hysterectomy than those with a high school education. Their study also found higher occupational status was associated with lower risk of hysterectomy. Specifically, an important finding of this study is that women with lower levels of education are more likely than women with higher levels of

education to have a hysterectomy. This is the study's strongest support for the social stratification perspective.

The impact of behavioral and attitudinal characteristics of women on hysterectomy risk is also an important finding since none of the previous studies investigated these factors. The documentation of an empirical association between these types of variables and hysterectomy is an important step toward a more complete understanding of the determinants of hysterectomies. Admittedly, the finding does not explain why the relationship exists, but knowing that women with particular attitudes and behaviors are more likely to have hysterectomies may make doctors who perform hysterectomies more likely to assess whether these non-clinical factors are influencing their tendency to perform this surgery. Perhaps more importantly, evidence that those factors are strongly associated with hysterectomy risks may lead to future research that will determine if these social, behavioral, and attitudinal factors actually contribute to the development of clinical symptoms that warrant hysterectomies or if they are influencing the decision-making process in some other way. This finding provides a new direction for future hysterectomy studies.

The impacts of women's occupation, place of residence at age 15, race, region, metro/non-metro residence, or nationality were not statistically significant. In the study by Marks and Shinberg (1997), the impact of education disappeared as

occupation was entered into the analysis. The opposite was found in the current study. Education is identified as a statistically significant indicator of hysterectomy risk, while occupation was not. Since bivariate analysis identified the correlation between education and occupation earlier in this chapter, it could be argued that the impact of occupation is overpowered by the influence of education. In other words, the impact of occupation on hysterectomy risk is partially represented by the impact of education. Viewing education as the primary determinant seems reasonable because of its importance as a determinant of occupation.

Past studies found geographical variations in hysterectomy rates in the U.S. (Dicker et al. 1982; CDC 1997). In this study, however, the impact of region was not identified as a predictor of hysterectomy risk. In the NLS-MW, geographical region has only two categories: South versus non-South. This coding difference might account for this difference. Other variables not identified as having statistically significant impacts on women's hysterectomy risk during this study include residence at age 15, race, nationality, and metro/non-metro residence.

There were three research questions proposed in this study. First, which social characteristics of women are more influential on hysterectomy risk than others? Findings from multivariate analysis of this study show that education, employment status, and marital status are statistically significant social

predictors of hysterectomy risk. Although the application of social stratification framework was not fully successful in explaining women's risk to hysterectomy, findings of this study suggest that women with similar diagnostic symptoms have different odds of experiencing hysterectomy depending on her social standing, attitudes, and behaviors. The second question was, How do women's social characteristics influence their exposure to hysterectomy? The current study found that women who are married, less educated, working, or keeping house are at higher risk of hysterectomy than their counterparts. Further investigations are warranted to identify ways these characteristics of women impact their hysterectomy experience.

The third question was, How are women's attitudinal or behavioral characteristics related with hysterectomy risk? The findings from this study suggest that women's attitudes have an influence on hysterectomy risks. As an attitudinal variable, the locus of control showed statistical significance as a predictor of hysterectomy. Women with greater internal locus of control had a higher risk of hysterectomy than those with external locus of control. Among behavicral characteristics, the number of children is identified as a statistically significant indicator of hysterectomy. Women with fewer children are at higher risk of hysterectomy.

This study showed that women with higher educational attainment have a lower risk of experiencing a hysterectomy. From

a social stratification perspective, this may be explained in patterns of relationship between doctors and patients. Women with low educational background may feel less comfortable asking their doctors about possible alternative treatments or seeking second opinions than those with higher education. Doctors may be more willing to share more information with patients who ask more questions. Thus, those with higher education might have more information and access to alternative treatments.

On the other hand, the inverse relationship between education and hysterectomy risk may also be explained by women's health-related behaviors. Those with less education may have less access to preventive health care or may delay their visit to doctors even when symptoms of illness are noticed. These women may be less likely to realize the importance of preventive health care or an immediate doctor visit once symptoms are detected than those who obtained more education.

For both possibilities, slight modifications in health care policies would be able to help eliminate the differential hysterectomy risk by obtained level of education. One example would be placing mandatory policies at hospitals that require all women recommended for a hysterectomy to get information and guidance regarding less invasive treatment alternatives. Another example would be increasing public education on hysterectomy by placing television advertisements or distributing consumer pamphlets that explain the advantages and disadvantages of

hysterectomy and access to possible alternative treatments.

If it is the differential exposure to knowledge and access to alternative treatments that cause the differential risk of hysterectomy, consumer education and modifications in health care policy should be able to help eliminate the differential hysterectomy risk of women by employment status as well. Likewise, public education about lifestyle behaviors that lead to the development of benign tumors, endometriosis, and uterine prolapse may help eliminate the need for more hysterectomies among women of lower status if they are indeed more likely to develop critical clinical symptoms.

More research is needed to investigate why married and working women have more hysterectomies than their counterparts. A behavioral model of health-services utilization developed by Andersen (1968) may better explain the directions of the above-mentioned associations than the social stratification framework used in this study.

Andersen's behavioral model asserts that the use of health services by the family depends on (1) the predisposition of the family to use services, (2) their ability to secure services, and (3) their need for such services (Andersen 1968). The predisposition component can be measured by demographic (e.g., age, sex, marital status) and social structure (e.g., education and occupation of family head) characteristics of the family, and health beliefs and attitudes about medical care, physicians, and

disease. The ability to secure services can be measured through family resources (e.g., family income, savings, health insurance) and community resources (e.g., availability of health services and health personnel, travel time). Information on family's need for health services can be gathered through their perception of illness as well as their manner of response to illness. Perceived need of health services requires measurements on subjective perceptions of illness along with clinical evaluation of illness. Manner of response to illness can be measured by a pattern of doctor visits and receipt of regular physical examinations. Andersen's model could not be used for this study since the NLS-MW data lacked the required components, especially the family's need for health services--perception and manner of response.

Representing women's attitudes, the locus of control showed an inverse relationship with hysterectomy risk. That is, women with greater external locus of control have lower odds of having a hysterectomy. This indicates that women with greater self-confidence are more likely to experience hysterectomy. A possible explanation for this may be that women with greater external locus of control (believing in fate, etc.) may be more likely to accept an illness which does not require a hysterectomy and are not as motivated to have elective surgery to try to fix the problem. A woman with greater external locus of control may also feel that having elective surgery might be a deed against her

destiny. Women with greater internal locus of control (believing in self) may feel that a hysterectomy will cure an illness and bring her a better quality of life. A differential exposure to hysterectomy based on attitudes in life can also be altered by better doctor-patient communication and better consumer education.

As a variable representing women's behaviors, the number of children showed an inverse association with women's hysterectomy risk. That is, women with more children appear to have lower odds of experiencing a hysterectomy. One possible explanation is that women with more children may have better reproductive health and may need hysterectomy less than those with fewer children.

The present study yielded several useful findings that have implications for future study. This research is important because it provides information about how women's social characteristics influence their exposure to hysterectomy as well as how women's attitudes and behaviors can influence their hysterectomy risk. At a basic level, the findings from this study are useful in helping individuals understand that some characteristics of women have a significant impact on their exposure to hysterectomy. It is important to know which characteristics are associated with hysterectomy risks. Identifying important relationships is an essential step in developing a more complete explanation. Women with higher education may be more likely to seek second opinions. Employed women may be too busy to seek second opinions or

alternative treatments. Women with less self-confidence may feel more afraid of the surgery than others. Although some possible explanations can be suggested, there is a need to more fully determine why such relationships exist between hysterectomy and women's social, attitudinal, and behavioral standings.

Limitations of the Study

There are two main constraints associated with this study: (1) the lack of information on women's diagnosis for hysterectomy and (2) the necessity to estimate data for years in which no interviews were conducted.

First, the NLS-MW did not include the physician's diagnosis on the respondent's reasons for hysterectomy. Not all women experience a hysterectomy because of the same symptoms. The three most common symptoms for hysterectomy are known to be uterine leiomyoma (benign tumors), endometriosis, and uterine prolapse. Different clinical symptoms may be related with different associations between women's non-clinical characteristics and hysterectomy. If information on women's diagnostic symptoms had been available, separate analyses for different diagnosis would have been possible. It would also have been possible to further identify whether the performed hysterectomy was appropriate or could have been altered by other treatments. A more detailed investigation on the impact of smoking on hysterectomy would have been possible. This information would have also enabled a

substantialy closer insight over how women's social characteristics influence their hysterectomy experience for different symptoms.

Second, since the NLS-MW did not conduct interviews every year or at constant intervals, data had to be estimated for the years when interviews were not conducted. When converting the original data into person-year observations, estimations were done for the years with no interviews based upon the most recent survey data. Since estimated data cannot be as accurate as observed information, this limits the explanatory power of current study.

Need for Future Research

One suggestion for future research is to conduct a qualitative study using interview techniques to follow women from the stage when they are diagnosed with symptoms that may warrant a hysterectomy until years after the hysterectomy. This type of research will make it possible:

1. to explore the factors playing major roles during the decision-making process for hysterectomy,
2. to identify how such factors influence women's decisions on hysterectomy,
3. to investigate the positive and negative aspects of the hysterectomy operation experience, and
4. to identify the short- (1-2 years) and mid-term (up to 5

years) consequences of hysterectomy.

This type of research will enable an investigation on how women's decision-making processes differ according to their social status, and how such decision-making processes render an impact on women's feelings and moods after the hysterectomy. It is also important and necessary to identify whether the short- and long-term impacts of hysterectomy are indeed negative or positive.

There is also a need for more social-medical research to identify the determinants of conditions that warrant hysterectomies. If low-status women have higher exposure to conditions or a lifestyle (diet, medical neglect, etc.) that create a greater need for hysterectomy, it is important to identify these factors in order to develop preventive strategies. Likewise, it is important to determine if some behaviors and attitudes lead to more serious clinical conditions that warrant hysterectomies. If clinical conditions do not account for higher rates of hysterectomies for some groups of women than for others, it is important to fully assess the causes and consequences of the differences. The type of evidence provided in this study is needed to eventually determine if programs aimed at targeted groups are needed.

This study is only a small slice of possible studies that can be pursued as an active research agenda involving hysterectomy issues from a non-clinical perspective. This study opens up an avenue for further investigations into hysterectomy

research. Despite the previously mentioned limitations, this study makes a unique contribution to the existing body of knowledge regarding factors surrounding hysterectomy.

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APPENDIX

Rotter's Internal-External Locus of Control Scale
Abbreviated Scale (11 items)

Question: How closely each of the 11 statements represent your own view of the issue?

a) 1. misfortune result of mistake (much closer)
   2. misfortune result of mistake (slightly closer)
   3. unhappy things due to bad luck (slightly closer)
   4. unhappy things due to bad luck (much closer)

b) 1. people get respect they deserve (much closer)
   2. people get respect they deserve (slightly closer)
   3. individuals worth often unrecognized (slightly closer)
   4. individuals worth often unrecognized (much closer)

c) 1. people who fall did not take advantage of opportunities (much closer)
   2. people who fall did not take advantage of opportunities (slightly closer)
   3. without breaks cannot be effective leader (slightly closer)
   4. without breaks cannot be effective leader (much closer)

d) 1. success a matter of hard work (much closer)
   2. success a matter of hard work (slightly closer)
   3. good job depends on right place, right time (slightly closer)
   4. good job depends on right place, right time (much closer)

e) 1. happens to me is own doing (much closer)
   2. happens to me is own doing (slightly closer)
   3. don't have control over direction of my life (slightly closer)
   4. don't have control over direction of my life (much closer)

f) 1. can make plans work (much closer)
   2. can make plans work (slightly closer)
   3. plans matter of good or bad fortune (slightly closer)
   4. plans matter of good or bad fortune (much closer)

g) 1. what I want has nothing to do with luck (much closer)
   2. what I want has nothing to do with luck (slightly closer)
   3. decide what to do by flipping coin (slightly closer)
   4. decide what to do by flipping coin (much closer)

h) 1. getting people to do right things depends on ability (much closer)
   2. getting people to do right things depends on ability (slightly closer)
   3. who is boss depends on luck (slightly closer)
   4. who is boss depends on luck (much closer)

i) 1. no such thing as luck (much closer)
   2. no such thing as luck (slightly closer)
   3. people don't realize lives controlled (slightly closer)
   4. people don't realize lives controlled (much closer)

j) 1. misfortune result of lack of ability (much closer)
   2. misfortune result of lack of ability (slightly closer)
   3. bad things balanced by good things (slightly closer)
   4. bad things balanced by good things (much closer)

k) 1. impossible to believe luck plays role (much closer)
   2. impossible to believe luck plays role (slightly closer)
   3. little influence over things that happen (slightly closer)
   4. little influence over things that happen (much closer)

(1=most internal, 2=internal, 3=external, 4=most external)

VITA

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SUMMARY OF QUALIFICATIONS

Over 8 years of quantitative and qualitative research experience in the areas of demography, public health, and public opinion

PROFESSIONAL EXPERIENCE

November 2000 - Present
Research Consultant II
Office of Health Care Statistics
Utah Department of Health, Salt Lake City, UT

- Designed, implemented, and managed satisfaction surveys of managed care consumers
- Coordinated HEDIS (Health plan Employer Data and Information Set) collection from Utah managed care organizations
- Analyzed and summarized findings from surveys and HEDIS to produce reports and brochures for policy-makers, the public, and health care providers
- Responded to ad-hoc data requests
- Specific responsibilities include:
  design of survey questionnaire and protocols, preparation of sample frame, release of request for proposal (RFP), vendor selection, continuous contact with selected vendor during survey period including sample frame provision and receipt of survey results, continuous communication with managed care organizations' personnel, analysis of survey data using SAS and SPSS, interpretation of results, report production, Utah Hospital Discharge data analyses, and participation in grant writing

September 1999 - October 2000
Information Analyst II
Office of Health Care Statistics
Utah Department of Health, Salt Lake City, UT

- Provided analytical support and statistical consultation to Medicaid and other office staff with regard to managed care related issues
- Specific responsibilities include:

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May 1999 - September 1999
Intern
Emergency Medical Services
Utah Department of Health

- Analyzed and summarized hospital Emergency Department data using SAS and SPSS
- Produced Utah Emergency Department Annual Reports for public release

March 1996 - August 1998
Researcher
Korea Research Center
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- Applied knowledge in qualitative and quantitative research to conduct and analyze market research, political poll, and public opinion research
- Developed survey instruments, analyzed survey results, and produced reports for clients

September 1992 - December 1996
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Teaching and Research Assistant
Department of Sociology
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- Assisted in the teaching of numerous courses in sociology and demography
- Provided statistical analysis for numerous research projects
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EDUCATION

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Areas of specialty: Demography, Public Health
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MS Sociology 1995
Thesis: Estimates of net migration for Utah and its counties by age, sex, and race/ethnic groups: 1980-1990

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BA Cultural Anthropology 1992
Yeungnam University
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SKILLS

Computer: Expert level with Microsoft Office (Access, Excel, PowerPoint, Word), SAS (PC and Unix), SPSS (PC and Unix), GIS Arcview, Visio, Lotus 1-2-3, Word Perfect, Netscape, Internet Explorer, and PageMaker

Other: Familiarity with multiple data sources - Utah Hospital Discharge Data, Utah Emergency Department Data, Utah HMO Enrollee Satisfaction Survey Data, and HEDIS
Familiarity with issues in Utah managed care system and Utah Medicaid program
Familiarity with CAHPS (Consumer Assessment of Health Plans), HEDIS, and NCQA (National Committee for Quality Assurance) guidelines
Knowledge in population statistics (births, deaths, and migration)
Familiarity in developing RFP and contract writing
Experienced in planning and implementation of projects
Exceptional ability for learning, independent work performance, and being a part of team
Strong organizational and communication skills