HEALTH POLICY AND MANAGEMENT

Racial Difference in Hysterectomy Route

NIS 2009-2010

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Abstract

This study explored racial differences in the selection of hysterectomy route between abdominal hysterectomy and two minimally invasive nonabdominal approaches, vaginal and laparoscopic hysterectomy. A logistic regression examined the existence of racial difference and a linear probability fixed effect model explored if these racial differences persisted after controlling for unobservable differences between hospitals. A weighted sample of 570,627 patients who had received a hysterectomy for benign disease was analyzed from the 2009-2010 Nationwide Inpatient Sample (NIS) of the Healthcare Cost and Utilization Project (HCUP). We found that minority women had an increased likelihood of receiving an abdominal hysterectomy over White women, particularly Black and Asian or Pacific Islander women at an increase of 18% and 16%, respectively. Though the magnitude of the probability decreased after within hospital analysis, all minority women had an increased likelihood of abdominal hysterectomy receipt when compared to white women.

Introduction

Hysterectomy is the most commonly performed surgical procedure in the United States for the treatment of gynecological disorders; an estimated one in three women will receive a hysterectomy before the age of 60 (Farquhar & Steiner, 2002). Most hysterectomy procedures for benign uterine disorders remove the uterus and, if necessary, accompanying structures in surgery through one of three hysterectomy routes: abdominal, vaginal, or laparoscopic. Selection of each of these routes has differences in outcomes and complications for the patient with consensus in the literature of abdominal hysterectomy as inferior to the other two options in terms of outcomes and complications (Nieboer et al., 2009). Consequently, the American Congress of Obstetricians and Gynecologists (ACOG) and the American Association of Gynecologic Laparoscopists (AAGL) have recently published recommendations encouraging physicians, in the absence of contraindications, to seek alternative hysterectomy routes to abdominal hysterectomy.

The Institute of Medicine's (IOM) report, "Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare," found that minorities typically receive lower quality healthcare than whites, even when there is no difference in health insurance or access to health care; this finding appears to hold true for hysterectomy as well, with minority women appear more likely to receive abdominal hysterectomies. A 2009 publication by Jacoby et al explores the racial differences in the selection of laparoscopic hysterectomy (Jacoby et al., 2009). However, this study uses only one form of minimally invasive hysterectomy, laparoscopic hysterectomy, as an outcome measure.

Study Significance

This study seeks to improve upon the Jacoby's 2009 study by using data after the 2006 creation of a new ICD-9-CM for total laparoscopic hysterectomy. This is an important measure

to have because it will allow for a more precise estimate of abdominal and minimally invasive hysterectomy rates. With the new ICD-9-CM coding in place, it will be easier to examine if laparoscopic hysterectomy's role in the existence of racial differences in hysterectomy route selection.

Research Questions

This study seeks to determine if minority women have the same likelihood of receiving minimally invasive hysterectomies as white women, and whether these differences persist when analyzed within hospitals using a fixed effect approach. The following questions will be answered in this study:

Research Question 1: Will the probability of receiving an abdominal hysterectomy versus a minimally invasive hysterectomy differ between minority women and white women when adjusting for patient, clinical, and health system factors?

Hypothesis 1: The probability of receiving an abdominal hysterectomy versus a minimally invasive hysterectomy will not differ significantly between minority and white women.

Research Question 2: If there is a significant difference between minority and white women, will the probability of receiving an abdominal hysterectomy versus a minimally invasive hysterectomy differ between minority women and white women after within hospital analysis when adjusting for patient, clinical, and health system factors?

Hypothesis 2: The probability of receiving an abdominal hysterectomy versus a minimally invasive hysterectomy will not differ significantly between minority and white women after within hospital analysis.

The answers to these questions will inform policymakers of the need for improving physician knowledge about selecting minimally invasive hysterectomy.

Conceptual Framework

The differences in the health outcomes from hysterectomy are due primarily because of the route selected for hysterectomy. The decision-making regarding route is done by the physician in most circumstances, with little input from the patient (Askew, 2009). Therefore, it is important to explore the factors which influence a physician's hysterectomy route decision-making. There are three important factors which are believed to influence a physician's decision-making: demographic characteristics of the patient, clinical characteristics of the patient, and hospital characteristics of the facility in which the procedure will be performed.

There are several patient level demographic characteristics that could influence a physician's decision-making. The most important for this study is race. Race could influence a physician's decision-making in one of three ways. First, racial differences in the conditions indicating hysterectomy could influence a physician's decision to select one route over the other (Moore et al., 2008). Second, minority women could be differentially seeking care in facilities or from providers who are more likely to perform a certain type of hysterectomy. Lastly, there could be some underlying issues of discrimination that are causing a health difference or disparity.

Other patient level factors include patient demographics such as age, insurance status of the patient, socioeconomics of the patient, and patient's attitude for the procedure. Younger women are more likely to receive abdominal hysterectomy(Jacoby et al., 2009). Also, women with Medicaid for insurance types are more likely to receive abdominal hysterectomy (Abenhaim, Azziz, Hu, Bartolucci, & Tulandi, 2008). Patients with higher education would be

more likely to engage with physicians in the decision-making for route selection(Smith, Dixon, Trevena, Nutbeam, & McCaffery, 2009). Patient education level may influence their attitudes towards engaging with physicians on deciding hysterectomy route. This study is limited in that it cannot assess the influence of patient education and patient attitude on physician decision making regarding route selection.

Clinical and biological characteristics could also influence decision making. Women with uterine fibroids are more likely to undergo abdominal hysterectomy (Bower, Schreiner, Sternfeld, & Lewis, 2009). Additionally, uterine fibroids are more commonly found in women with higher BMIs. These fibroids make cause enlargement of the uterus which may require abdominal hysterectomy (Dandolu, Singh, Lidicker, & Harmanli, 2010). Also, physicians are more likely to perform abdominal hysterectomy for obese patients (Holub, Jabor, Kliment, Fischlová, & Wágnerová, 2001).

Finally, hospital characteristics may influence physician route selection. Minimally invasive hysterectomies are more likely to be performed in teaching hospitals (Tu & Senapati, 2009). Additionally, hospital size may increase the likelihood of receiving a minimally invasive hysterectomy because high volume surgeons are more likely to perform via this route (Boyd, Novetsky, & Curtin, 2010). Furthermore, regional, urban versus rural, and ownership differences are associated with differences in hysterectomy route selection (Jacoby et al., 2009).

Literature Review

Background

Hysterectomies are the most commonly performed gynecological surgery in the United States (Farquhar & Steiner, 2002). Although hysterectomies can be performed to remove

gynecologic cancers, the vast majority of hysterectomy procedures are performed for benign uterine disorders (Becker, 2007). Currently, the major routes for hysterectomy are abdominal hysterectomy and two minimally invasive approaches, vaginal hysterectomy and laparoscopic hysterectomy. Although the abdominal route has long been the most commonly performed route for hysterectomy, trends show a movement away from this procedure. With reduced length of stay, lower rates of infection, shorter interval for resuming normal activities, and smaller incisions, both vaginal and laparoscopic hysterectomy can be a much more desirable alternative when compared with abdominal hysterectomy (Kovac, 2000). However, despite changing trends in route for hysterectomy route, minority women continue to have abdominal hysterectomies at high rates (Bower, Schreiner, Sternfeld, & Lewis, 2009; Jacoby, Fujimoto, Giudice, Kuppermann, & Washington, 2010) .

Current literature shows that minority women are both more likely to receive a hysterectomy and less likely to receive laparoscopic hysterectomy than white women (Jacoby et al., 2010). However, because of the differences in socioeconomic status between these two groups, some of the difference being seen at a macro level between the two groups could be due to the cumulative effect of micro level socioeconomic status in individuals within a racial group. Research on socioeconomic status and race done shows how intimately race is linked to socioeconomic status (Abenhaim et al., 2008).

Becker et al. (2005) conducted research from 1998 to 2002 and concluded that socioeconomic and institutional factors affected hysterectomy rates. However, Becker makes the recommendation that further research should be done to include socioeconomic status (SES) and hysterectomy rates because of the dearth of information on the influence of SES on hysterectomy (Becker, Spalding, DuChane, & Horowitz, 2005). Becker also conducted research that found

laparoscopic hysterectomy to be associated with higher out-of-pocket costs, in spite of reduced length of hospital stay(Becker, 2007). This higher cost may be prohibitive to laparoscopy for people of lower incomes with out-of-pocket costs associated with the procedure.

Abenhaim et al. (2008b) conducted analyses on NIS data from 1998 and 2002 and concluded socioeconomic factors of race, income, and insurance were determinants of access to laparoscopic hysterectomy when compared to abdominal hysterectomy. People of minority race, lower income, and public insurance were less likely to receive laparoscopic hysterectomy. However, because this research does not include vaginal hysterectomy, it could be only illuminating part of the picture with regard to racial difference. If minority women, lower income women, and those with public insurance are receiving vaginal hysterectomy as the lower-cost substitute for laparoscopy, this would show more equality in access to procedures, as vaginal hysterectomy is more similar to laparoscopy in health outcomes than is abdominal hysterectomy.

Clinical Factors/Influence

Clinical factors could potentially also create a racial difference in hysterectomy route selection. Research has shown that rates of overweight and obesity are higher in black women than they are in white women (Must, Dallal, & Dietz, 1991). As such, there are concerns that high BMI could be a contraindication for laparoscopic hysterectomy. Research conducted in the earlier years of laparoscopic hysterectomy adoption concluded that higher BMI, particularly obesity, lead to conversion from laparoscopy to laparotomy hysterectomy route. However, research by Malzoni et al. (2004) has shown the steep learning curve in performing laparoscopic procedures is what causes the reduction in health outcomes for patients. In light of this study it is

not surprising to find that later research has found the laparoscopic method to be an appropriate hysterectomy route for women of higher BMI.

Route Selection Decision Making

The only study examining patient choice processes for hysterectomy was a small, qualitative study by Askew (2009), which found that hysterectomy route choice was primarily made by the provider, with little input from the patients . Askew noted 1) patients had limited information about their conditions, prescribed procedures, and alternative treatments, and 2) the unquestioning level of trust that hysterectomy patients had for their providers. The hysterectomy patients were overwhelming trusting of their usual providers to decide which procedure that they were to receive, though patients were often unsure why they were receiving it.

Summary of the Literature

Current literature on hysterectomy route selection remains largely descriptive, with a primary focus on the types of hysterectomies being selected (Boyd et al., 2010) costs associated with procedures (Dorsey, Holtz, Griffiths, McGrath, & Steinberg, 1996), and outcome differences (Anderson, Chang, Parsons, & Talamini, 2012a). While some studies explore factors including race which are associated with hysterectomy selection, these studies are few and reflect trends in the earlier stages of the adoption of laparoscopic hysterectomy(Jacoby et al., 2009).

A study performed by Jacoby et al. (2009) examines the demographic, clinical, and health system factors that influence the decision for a patient to receive a laparoscopic hysterectomy. While this study did employ nationally-representative data, it included only women receiving hysterectomy and was not able to examine total laparoscopic hysterectomies in the sample, as the

ICD-9-CM code for laparoscopic total abdominal hysterectomies did not exist when this sample was collected (the new code became effective for on October 1, 2006)(Jacoby et al., 2010).

The absence of this ICD-9-CM is important because Jacoby may have overestimated the racial differences between laparoscopic and abdominal hysterectomies. This is because total laparoscopic abdominal hysterectomies is the most commonly performed laparoscopic hysterectomy (Anderson, Chang, Parsons, & Talamini, 2012b). Additionally, the study findings may have been different if these hysterectomies were being coded as total abdominal hysterectomies. This is particularly important as the researchers found that minority women were much more likely to receive abdominal hysterectomies.

This study has the opportunity to contribute to the literature on racial differences in hysterectomy route by improving on the methodology done by the Jacoby study by including the updated ICD-9-CM code. Additionally, this study will compare both vaginal and laparoscopic hysterectomies together under the categorization of minimally invasive hysterectomy against abdominal hysterectomy. Doing so will fit better with the medical communities opinion on those methods being comparable when compared to abdominal hysterectomy. Lastly, this study will contribute to the literature by conducting within hospital analysis. This level of analysis adds another level of control that has not been seen in previous studies by controlling for differences in where women of different races select to seek care.

Methods

Data

The study analyzed racial differences in abdominal and minimally invasive hysterectomy receipt using discharge data from the Nationwide Inpatient Sample (NIS), Healthcare Cost and

Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality. The NIS is a national survey of all of the inpatient hospital stays in a single year. The NIS is a 20 percent sample of community based hospitals in the United States. The community based hospitals included long-term acute facilities, public hospitals, academic medical centers, general, specialty, non-Federal, and short-term hospitals. Each year the sample is comprised of 5 to 8 million inpatient stays from over 1,000 hospitals in more than 40 states. The states sampled in the 2010 NIS data contained 96 percent of the population in the United States. Because of this, the information gathered from analysis of NIS data can show national trends in admissions and procedures in the United States.

The NIS data are publicly available. The study was deemed exempt by the Institutional Review Board at Emory University, Atlanta, Georgia.

Sample

The subjects used in this sample were collected from NIS data from 2009 and 2010. The subjects included in this study were women 18 years of age or older at the time of their admission. These women had an ICD-9-CM procedure code indicating hysterectomy through one of one of the three major routes: abdominal, vaginal, or laparoscopic. Women with a diagnosis code for the following benign uterine conditions will be included in the sample: uterine prolapse, uterine fibroids, abnormal bleeding, pelvic pain, pelvic infection, and endometriosis. These conditions were included because they can be resolved through selection of any of the three hysterectomy routes. However, women who have ICD-9-CM or Clinical Classification Software (CCS) codes for the following malignant conditions will be excluded: lymphoma, non-specified site malignant neoplasm, or gynecologic, gastrointestinal or genitourinary tract cancers. Those with malignant conditions were excluded because there is not a way to control for the

extent of their pathology, which may require no other route but abdominal hysterectomy. Furthermore, any woman with an ICD-9-CM code indicating a hysterectomy after a cesarean delivery will be excluded because the abdomen is already open for cesarean delivery, negating the need for the use of another route for hysterectomy. Finally, only patients from the 27 states (see Appendix A) with less than 10 percent missing race data for both years of the analysis will be included.

Design

Dependent Variables-Hysterectomy Type & Abdominal Hysterectomy

Abdominal Hysterectomy [binary]: A variable for abdominal hysterectomy type was created using the aforementioned hysterectomy type variable. Abdominal hysterectomy was coded if a subject was coded "abdominal" for the hysterectomy type variable (ICD-9-CM 68.39 or 68.49). Minimally invasive hysterectomy was coded if a subject had received a minimally invasive hysterectomy, either laparoscopic hysterectomy (ICD-9-CM of 68.31, 68.41, or 68.51), or vaginal hysterectomy (ICD-9-CM of 68.59).

Key Independent Variable - Race

Race [categorical]: The primary independent variable of interest will be race. A race variable for this analysis was created using the NIS race of patient variable. Patient race was uniformly coded in the NIS sample using the source reported patient race. In this study race was grouped into the following six categories: White, Black, Hispanic, Asian or Pacific Islander, Other, or Unknown. "White" served as the reference group and was coded using all patients who were classified as such in the NIS dataset. Black, Hispanic, and Asian or Pacific Islander were coded using the same classification used by NIS. Other was coded using those with either "Other" or "Native American" as a response in the NIS. Those patients with missing race data were categorized as "Unknown."

Covariates—Patient, Clinical, Health System, and Year

Demographic

Age [categorical]: Six age categories were created using the numeric value for the age variable in the NIS dataset. In the NIS dataset patient age is coded as the age at the time of admission. These categories were as follow: 18 to 34 years, 35 to 39 years, 40 to 44 years, 45 to 49 years, 50 to 54 years, and 55 years or older. Ages 18 to 34 years served as the reference group.

Income [categorical]: A variable for the patient's income was created by using the NIS variable for the household median income in the patient's ZIP code. This variable is classified into quartile categories with the first quartile containing the poorest individuals. Patients in the fourth quartile (the wealthiest) served as the reference group. The following chart shows the dollar amounts, which are updated annually, for each quartile for both years included in the study:

	2009	**2010**
1st Quartile	1 - 39,999	1 - 40,999
2nd Quartile	40,000 - 49,999	41,000 - 50,999
3rd Quartile	50,000 - 65,999	51,000 - 66,999
4th Quartile	66,000+	67,000+

Source: HCUPnet. Healthcare Cost and Utilization Project (HCUP). 2009-2010. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/db/vars/zipinc_qrtl/nisnote.jsp. Accessed March 26, 2013.

Insurance [categorical]: The six insurance categories included in the NIS dataset were used for the primary expected payer for each patient. The payer type was uniformly coded into the following categories: Medicaid, Medicare, Private insurance, No insurance, No charge, or Other. Those categorized as Other included patients with the Worker's Compensation, CHAMPUS, CHAMPVA, Title V, and other government programs for insurance. Those who were privately insured served as the reference group.

Clinical

Surgical Diagnosis [categorical]: A surgical diagnosis variable was created using the ICD-9-CM and CCS diagnosis codes for the patient. Seven categories were created for surgical diagnosis using the following codes: endometriosis 617; prolapse 618.0 – 618.05, 618.09,618.1–618.4, 618.6–618.8, 618.81–618.83, 618.89, or618.9; pelvic infection614.0 – 614.9,615.0, 615.1, 615.9, 616.10, 616.11, or 616.2– 616.5, abnormal bleeding 626.0–626.6, 626.8–627.1, or 626.7; pelvic pain: 625.0 or 625.2–625.5; fibroids: 218.0, 218.1, 218.2, or 218.9; and no surgical diagnosis code indicated. Those without an indicated surgical diagnosis for hysterectomy served as the reference group.

Concomitant Adnexal Surgery [categorical]: A binary variable indicating concomitant adnexal surgery was created using the ICD-9-CM procedure codes for the patient. Adnexal surgery was classified as having an unilateral or bilateral oophorectomy or salpingo-oophorectomy at the time of hysterectomy using the following codes: 656.1, 656.3, 655.1, 655.3, 656.2, 656.4, 655.2, 655.4, 654.9, 654.1,6531, and 6539. Those without adnexal surgery served as the reference group.

Health System

Hospital Region [categorical]: The hospital region variable indicates the region of the country in which the patient received hysterectomy. The data are uniformly coded into the following four regions using data from the 2000 Census-derived classifications from the AHA Annual Survey of Hospitals: Northeast, West, South, and Midwest. Northeast hospitals served as the reference group.

Hospital Urbanicity [binary]: This variable indicates whether the hospital that performed the hysterectomy was located in an urban or rural area of the country. The data are uniformly

coded using information from the 2000 Census Core Based Statistical Area (CBSA) codes. Hospitals located in urban areas served as the reference group.

Bed size [categorical]: The bed size variable indicates the size of the hospital using the number of beds. The three categories for bed size are small, medium, and large. This variable is uniformly coded using the hospital's region, urbanicity, and teaching status. Large hospitals served as the reference group. The table below shows how bed size was coded.

BEDSIZE CATEGORIES

Location and Teaching Status	Hospital Bedsize		
	Small	Medium	Large
NORTHEAST REGION			
Rural	1-49	50-99	100+
Urban, nonteaching	1-124	125-199	200+
Urban, teaching	1-249	250-424	425+
MIDWEST REGION			
Rural	1-29	30-49	50+
Urban, nonteaching	1-74	75-174	175+
Urban, teaching	1-249	250-374	375+
SOUTHERN REGION			
Rural	1-39	40-74	75+
Urban, nonteaching	1-99	100-199	200+
Urban, teaching	1-249	250-449	450+
WESTERN REGION			
Rural	1-24	25-44	45+
Urban, nonteaching	1-99	100-174	175+
Urban, teaching	1-199	200-324	325+

Source: HCUPnet. Healthcare Cost and Utilization Project (HCUP). 2009-2010. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/db/vars/hosp_bedsize/nisnote.jsp. Accessed March 26, 2013.

Hospital Ownership [categorical]: The hospital ownership variable is comprised of three categories: public, private, and for profit. Hospitals categorized as public are nonfederal, government hospital. These categories are uniformly coded in the NIS dataset using data from the American Hospital Association (AHA) Annual Survey of Hospitals. Public hospitals served as the reference group.

Hospital Teaching Status [binary]: The hospital teaching status variable was uniformly coded using data from the AHA Annual Survey of Hospitals. Hospitals are categorized as "teaching hospitals" if the meet one of the three following criteria: 1) it operates an AMA-approved residency program, 2) the hospital belongs to the Council of Teaching Hospitals (COTH), or 3) has at least a 1:4 ratio of full-time equivalent interns residents to beds. Non-teaching hospitals served as the reference group.

Year [binary]: This variable indicates the calendar year in which the patient received the hysterectomy procedure. The data are uniformly coded from the reporting source as either "2009" or "2010." The year 2010 served as the reference group.

Research Questions

The research questions in this study will examine if minority women are 1) receiving the minimally invasive hysterectomies at the same rate as white women when controlling for patient, clinical, and health system factors and 2) if these differences persist when analyzed within hospitals using a fixed effect approach.

Research Question 1: Will the probability of receiving an abdominal hysterectomy versus a minimally invasive hysterectomy differ between minority women and white women when adjusting for patient, clinical, and health system factors?

Hypothesis 1: The probability of receiving an abdominal hysterectomy versus a minimally invasive hysterectomy will not differ significantly between minority and white women.

Research Question 2: If there is a significant difference between minority and white women, will the probability of receiving an abdominal hysterectomy versus a minimally

invasive hysterectomy differ between minority women and white women after within hospital analysis when adjusting for patient, clinical, and health system factors?

Hypothesis 2: The probability of receiving an abdominal hysterectomy versus a minimally invasive hysterectomy will not differ significantly between minority and white women after within hospital analysis.

Statistical Analysis

I examined patients who received a hysterectomy during the study period. I compared the groups of women by race using X^2 test. I conducted X^2 test to determine if there was a statistically significant difference between women of different races for hysterectomy route as well as the patient-level, clinical, and hospital factors variables used in this study.

To answer the first research question of whether there is a difference in the probability in receiving abdominal hysterectomy versus minimally invasive hysterectomy for minority women when compared to white women, I obtained coefficients through logistic regression on an unbalanced panel. Afterwards, I found the average marginal effects and the standard errors for the marginal effects. These marginal effects were interpreted as the probabilities of receiving abdominal hysterectomy.

To answer the second research question which examines if these differences exist after within hospital analysis, I used the linear probability model with hospital-level fixed effects. The linear probability analysis was performed to determine the probability of receiving an abdominal hysterectomy versus a minimally invasive hysterectomy while adjusting for patient, clinical, and health system characteristics. Linear probability was appropriate for this analysis because of the large sample size, which allowed the binary outcome, abdominal hysterectomy, to be treated as a continuous variable in a way that allowed for easily interpretable results.

All analyses were performed using Stata 12 software (StataCorp 2011). Because of the complex survey design of the NIS dataset, survey commands were used in Stata using the variable for discharge weight to create nationally representative estimates. Additionally, the variable for hospital identification number was used to cluster the standard errors in the regressions.

Results

Descriptive Statistics

From the sample representing 570,627 hysterectomies in the United States in 2009 and 2010, abdominal approach was selected for 56 percent of hysterectomies, laparoscopic approach was selected for 26 percent of hysterectomies, and vaginal approach was selected 19 percent of the hysterectomies. As illustrated in Figure 1, vaginal hysterectomy rates remained relatively stable during the period of analysis as approximately 19 percent of all hysterectomy procedures. However, abdominal hysterectomies rates dropped from 58 percent in 2009 to 53 percent in 2010, while laparoscopic hysterectomy procedures increased from 24 percent to 28 percent during this time period.

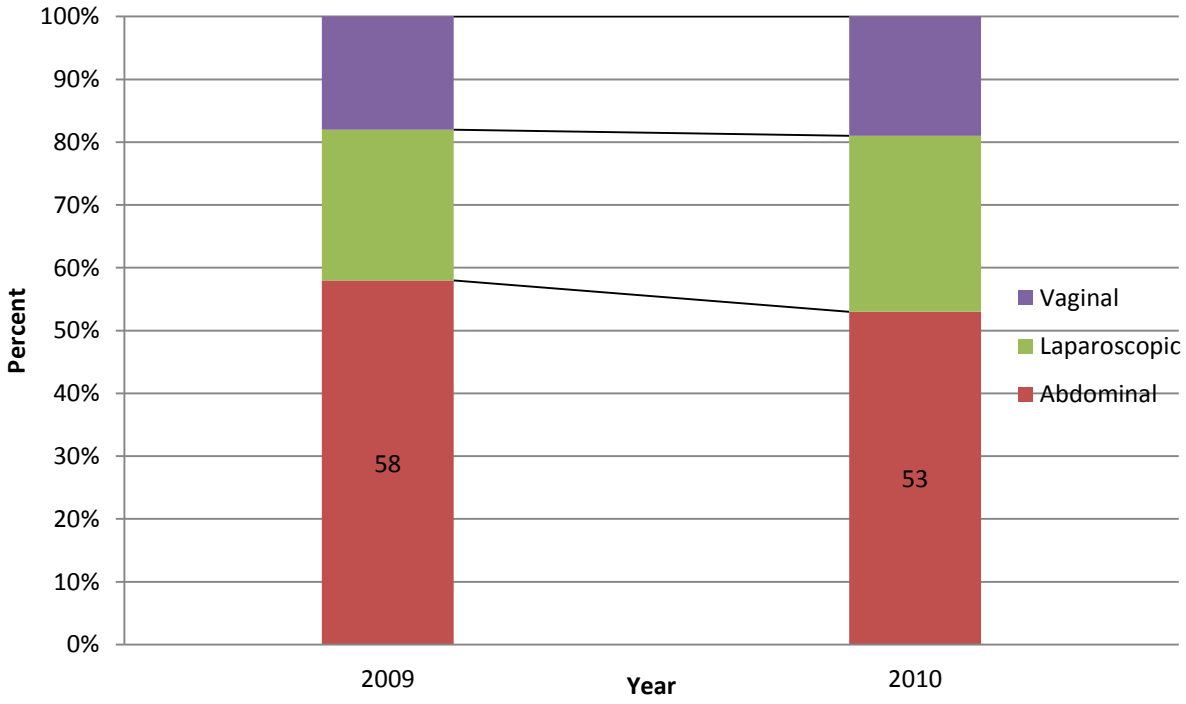

Figure 1.Hysterectomy Surgical Route Trends, 2009-2010

Table 1 summarizes the characteristics of the sample population by race and ethnicity. There were significant differences in abdominal hysterectomy rates, with the lowest rates in white women and the highest rates in minority women, particularly black women. In the study sample, almost half of white women received an abdominal hysterectomy. In contrast, almost three-quarters of black women, over two thirds of Asian or Pacific Islander women, and more than 55 percent of Hispanic and Other race women received abdominal hysterectomies.

Figure 2 shows the racial differences in abdominal hysterectomy rates over time. White women had the lowest rates of abdominal hysterectomy in both years. Conversely, black women had the highest rates of abdominal hysterectomy. Despite higher rates of abdominal hysterectomy in minority women, abdominal hysterectomy declined for all women during the period of analysis, mirroring the trend in the study population. Figure 2 illustrates the decline in

abdominal hysterectomy rates by race during the study period. The largest decline in abdominal hysterectomy was in Other race women. Asian and Pacific Islander women experienced the smallest decline and the second highest rates in abdominal hysterectomy. Similarly, those women for whom race was unknown experienced a marginal decline in abdominal hysterectomy rates.

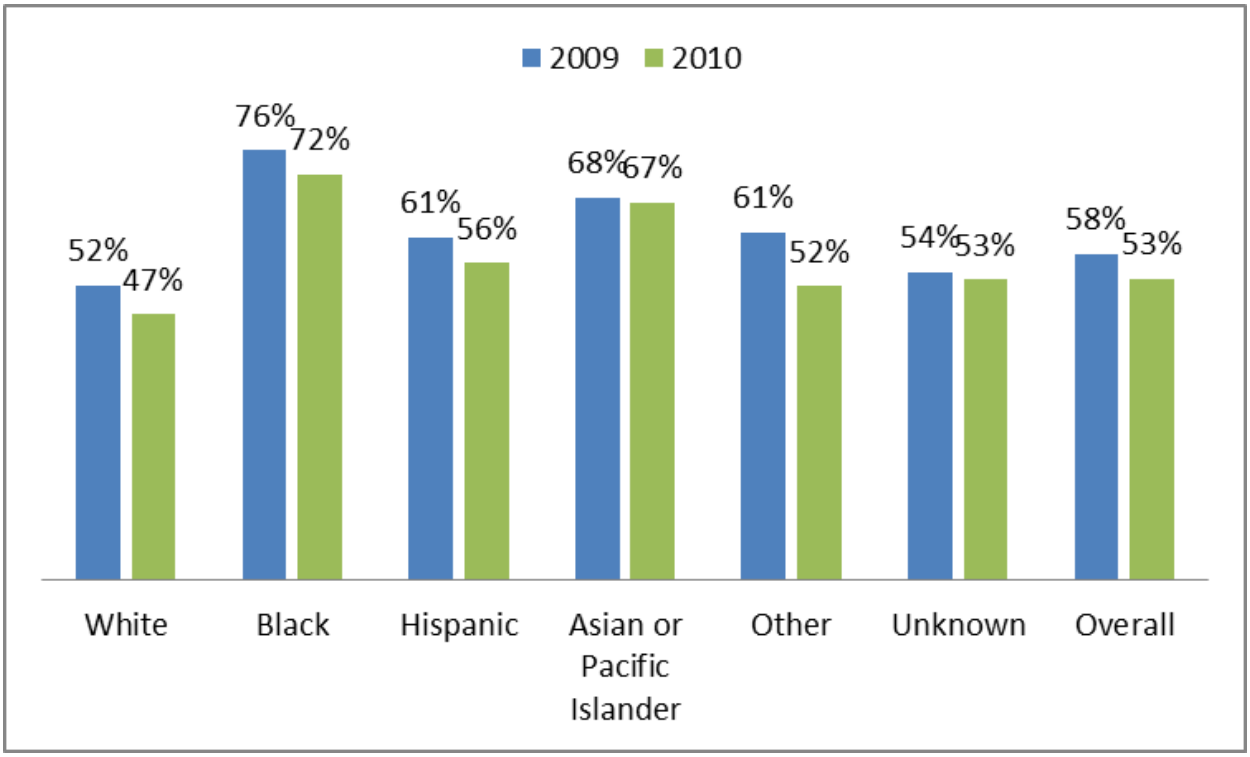

Figure 2. Abdominal Hysterectomy Rates By Race, 2009-2010

Age differed by race in the sample population (Table 1). Black women had the lowest mean age at time of hysterectomy at 44.5 years old. Similarly, Black women had the lowest percentage of women over the age of 55 years old at 9 percent compared to white women at nearly 21 percent. Hispanic women had mean ages below the mean age of white women (45.6 versus 47.2 years). Asian or Pacific Islander women had the highest mean age at 48.2 years old, a full year higher than white women.

Some interesting patient-level trends in the sample occurred with respect to race. White and Asian or Pacific Islander women had the highest rates of private insurance in the sample, while Black and Hispanic women had the highest rates of being uninsured or Medicaid beneficiaries. Black and Asian or Pacific Islander women had the highest rates of fibroids. Asian or Pacific Islander women and White women had the highest rates of uterine prolapse. These two groups also had the highest rates of adnexal surgery.

Table 1. Patient Characteristics by Race/Ethnicity

	Race/Ethnicity							
	White (n=358,712)	**Black** (n=92,772)	**Hispanic** (n=73,703)	**Asian or Pacific Islander** (n=15,465)	**Other** (n=21,084)	**Unknown** (n=8,890)	**Total** (N=570,627)	**P-value**
Hysterectomy								
Abdominal	178,067 (49.6)	68,204 (73.5)	43,009 (58.4)	10,406 (67.3)	11,932 (56.6)	4,790 (53.9)	316,409 (55.4)	<.001
Laparoscopic	104,420 (29.1)	16,475 (17.8)	15,466 (21.0)	2,961 (19.1)	5,560 (26.4)	2,519 (28.3)	147,401 (25.8)	
Vaginal	76,225 (21.2)	8,093 (8.7)	15,228 (20.7)	2,098 (13.6)	3,592 (17.0)	1,581 (17.8)	106,817 (18.7)	
Age (years)								
Mean (SE)	47.2 (0.04)	44.5 (0.06)	45.6 (0.08)	48.2 (0.17)	46.6 (0.16)	47.3 (0.22)	47.2 (0.04)	<.001
18-34	38,388 (10.7)	7,896 (8.5)	7,188 (9.8)	568 (3.7)	1,887 (9.0)	589 (6.6)	56,517 (9.9)	
35-39	45,567 (12.7)	15,228 (16.4)	11,142 (15.1)	1,523 (9.8)	2,930 (13.9)	901 (10.1)	77,291 (13.5)	
40-44	70,904 (19.8)	25,840 (27.9)	18,465 (25.1)	3,476 (22.5)	4,674 (22.2)	1,790 (20.1)	125,150 (21.9)	<.001
45-49	82,282 (22.9)	25,061 (27.0)	18,717 (25.4)	4,795 (31.0)	5,305 (25.2)	3,075 (34.6)	139,235 (24.4)	
50-54	47,665 (13.3)	10,608 (11.4)	8,020 (10.9)	2,484 (16.1)	2,782 (13.2)	1,234 (13.9)	72,793 (12.8)	
55+	73,905 (20.6)	8,138 (8.8)	10,171 (13.8)	2,620 (16.9)	3,505 (16.6)	1,301 (14.6)	99,640 (17.5)	
Median household ZIP Code Income								
1st Quartile	66,842 (18.6)	35,723 (38.5)	25,284 (34.3)	1,359 (8.8)	5,126 (24.3)	1,199 (13.5)	135,534 (23.8)	<.001
2nd Quartile	90,009 (25.1)	20,070 (21.6)	16,721 (22.7)	2,268 (14.7)	5,002 (23.7)	1,510 (17.0)	135,580 (23.8)	
3rd Quartile	94,716 (26.4)	20,503 (22.1)	18,209 (24.7)	4,146 (26.8)	5,386 (25.5)	2,256 (25.4)	145,215 (25.4)	
4th Quartile	107,145 (29.9)	16,476 (17.8)	13,489 (18.3)	7,694 (49.7)	5,570 (26.4)	3,925 (44.2)	154,298 (27.0)	
Insurance								
Medicare	40,347 (11.2)	6,837 (7.4)	5,511 (7.5)	982 (6.3)	1,814 (8.6)	688 (7.7)	56,178 (9.8)	<.001
Medicaid	31,304 (8.7)	14,363 (15.5)	14,077 (19.1)	1,721 (11.1)	2,692 (12.8)	987 (11.1)	65,144 (11.4)	
Private	265,261 (73.9)	60,938 (65.7)	44,040 (59.8)	11,353 (73.4)	14,257 (67.6)	6,485 (72.9)	402,335 (70.5)	
No Insurance	8,059 (2.2)	5,851 (6.3)	4,911 (6.7)	636 (4.1)	1,154 (5.5)	160 (1.8)	20,770 (3.6)	
No charge	1,360 (0.4)	881 (0.9)	1,314 (1.8)	46 (0.3)	92 (0.4)	16 (0.2)	3,708 (0.6)	
Other	12,381 (3.5)	3,903 (4.2)	3,850 (5.2)	728 (4.7)	1,075 (5.1)	555 (6.2)	22,492 (3.9)	

Table 1. Patient Characteristics by Race/Ethnicity

	Race/Ethnicity							
	White (n=358,712)	**Black** (n=92,772)	**Hispanic** (n=73,703)	**Asian or Pacific Islander** (n=15,465)	**Other** (n=21,084)	**Unknown** (n=8,890)	**Total** (N=570,627)	**P-value**
Surgical Diagnosis*								
Abnormal Bleeding	88,466 (24.7)	31,240 (33.7)	20,428 (27.7)	4,032 (26.1)	5,684 (27.0)	2,261 (25.4)	152,112 (26.7)	
Endometriosis	42,474 (11.8)	6,810 (7.3)	6,748 (9.2)	1,764 (11.4)	2,074 (9.8)	690 (7.8)	60,560 (10.6)	
Fibroids	62,824 (17.5)	25,578 (27.6)	15,509 (21.0)	3,938 (25.5)	4,418 (21.0)	2,719 (30.6)	114,986 (20.2)	
No Surgical Diagnosis	29,591 (8.2)	3,051 (3.3)	5,575 (7.6)	1,225 (7.9)	1,482 (7.0)	817 (9.2)	41,741 (7.3)	<.001
Pelvic Infection	42,630 (11.9)	15,227 (16.4)	9,642 (13.1)	2,264 (14.6)	2,697 (12.8)	783 (8.8)	73,244 (12.8)	
Pelvic Pain	34,336 (9.6)	7,254 (7.8)	5,433 (7.4)	763 (4.9)	1,787 (8.5)	570 (6.4)	50,142 (8.8)	
Prolapse	58,389 (16.3)	3,612 (3.9)	10,367 (14.1)	1,480 (9.6)	2,942 (14.0)	1,051 (11.8)	77,842 (13.6)	
Adnexal Surgery								
No Adnexal Surgery	164,971 (46.0)	51,528 (55.5)	43,059 (58.4)	7,526 (48.7)	10,738 (50.9)	5,154 (58.0)	282,975 (49.6)	<.001
Adnexal Surgery	193,741 (54.0)	41,244 (44.5)	30,644 (41.6)	7,940 (51.3)	10,347 (49.1)	3,736 (42.0)	287,651 (50.4)	
Year								
2009	193,623 (54.0)	47,667 (51.4)	37,723 (51.2)	7,803 (50.5)	11,246 (53.3)	5,155 (58.0)	303,217 (53.1)	<.001
2010	165,089 (46.0)	45,104 (48.6)	35,980 (48.8)	7,663 (49.5)	9,838 (46.7)	3,735 (42.0)	267,410 (46.9)	

Column percentages are reported in parentheses.
*Individuals could have more than one surgical diagnosis reported.

There were differences in the hospital characteristics which varied by race (Table 2). Though most hysterectomies were performed in hospitals in urban areas (90 percent), an even greater percentage of minority women had their procedure performed in those hospitals. Approximately 95 percent of Black, Hispanic, and Asian or Pacific Islander women had hysterectomies in urban areas. Conversely, 87 percent of white women had hysterectomies performed in urban areas. Additionally, Black, Hispanic, and Asian or Pacific Islander women had hysterectomies in public hospitals at almost twice the rate of white women. Finally, Black and Asian or Pacific Islander women had the majority of their hysterectomies performed in teaching hospitals, which differed from the trend of non-teaching hospitals found in other racial groups.

Table 2. Hospital Characteristics by Race/Ethnicity

	Race/Ethnicity							
	White	Black	Hispanic	Asian or Pacific Islander	Other	Unknown	Total	P value
Hospital								
Northeast	82,004 (22.9)	17,488 (18.9)	12,530 (17.0)	2,041 (13.2)	3,813 (18.1)	1,682 (18.9)	119,558 (21.0)	<.001
Midwest	62,320 (17.4)	10,469 (11.3)	4,049 (5.5)	1,073 (6.9)	5,757 (27.3)	226 (2.5)	83,893 (14.7)	
South	144,491 (40.3)	56,605 (61.0)	32,394 (44.0)	3,205 (20.7)	7,555 (35.8)	2,064 (23.2)	246,313 (43.2)	
West	69,896 (19.5)	8,210 (8.8)	24,731 (33.6)	9,148 (59.1)	3,959 (18.8)	4,919 (55.3)	120,863 (21.2)	
Urbanicity								
Rural	47,165 (13.1)	5,453 (5.9)	3,674 (5.0)	581 (3.8)	2,429 (11.5)	562 (6.3)	59,862 (10.5)	<.001
Urban	311,547 (86.9)	87,319 (94.1)	70,029 (95.0)	14,886 (96.2)	18,656 (88.5)	8,328 (93.7)	510,765 (89.5)	
Hospital Bed Size								
Small Hospital	47,159 (13.1)	8,175 (8.8)	6,288 (8.5)	906 (5.9)	1,973 (9.4)	1,276 (14.4)	65,776 (11.5)	<.001
Medium Hospital	95,375 (26.6)	26,776 (28.9)	17,788 (24.1)	4,668 (30.2)	6,233 (29.6)	2,183 (24.6)	153,023 (26.8)	
Large Hospital	216,178 (60.3)	57,821 (62.3)	49,627 (67.3)	9,893 (64.0)	12,879 (61.1)	5,431 (61.1)	351,829 (61.7)	
Hospital Ownership								
Public	31,827 (8.9)	14,395 (15.5)	12,782 (17.3)	2,501 (16.2)	2,459 (11.7)	1,046 (11.8)	65,011 (11.4)	<.001
Non-profit	275,701 (76.9)	63,717 (68.7)	42,992 (58.3)	10,729 (69.4)	12,654 (60.0)	6,638 (74.7)	412,431 (72.3)	
For-profit	51,184 (14.3)	14,659 (15.8)	17,929 (24.3)	2,236 (14.5)	5,971 (28.3)	1,206 (13.6)	93,185 (16.3)	
Hospital Teaching Status								
Non-teaching	212,123 (59.1)	42,381 (45.7)	41,793 (56.7)	7,694 (49.7)	12,205 (57.9)	5,204 (58.5)	321,400 (56.3)	<.001
Teaching	146,589 (40.9)	50,390 (54.3)	31,911 (43.3)	7,772 (50.3)	8,879 (42.1)	3,686 (41.5)	249,227 (43.7)	

Column percentages are reported in parentheses.

Research Question 1

The question of whether racial difference exists in hysterectomy surgical route was addressed through the results of the logistic regression. Race was a significant predictor of abdominal hysterectomy in the study sample (Table 3). All minority women had statistically significant higher probabilities of receiving abdominal hysterectomy than white women. The probability of receiving abdominal hysterectomy was 18 percent higher for Black women than white women ($p<0.001$). Similarly significant increased probabilities of abdominal hysterectomy were found in both Asian or Pacific Islander women and Hispanic women when compared to white women at 0.16 and 0.092, respectively.

There were several other factors that were associated with a significant increase in the probability of experiencing abdominal hysterectomy compared to minimally invasive hysterectomy (Table 3). With respect to age, those who were 40 to 44 years old and those 45 to 49 years old had the greatest increased probabilities of abdominal hysterectomy at 0.030 and 0.022, respectively, when compared to the 18 to 34 years old reference group ($p<0.001$). Other factors which increased the probability of having an abdominal hysterectomy were having the hysterectomy performed in a hospital in the Midwest, having adnexal surgery, being uninsured or on Medicaid, or having surgery performed in 2009 ($p<0.001$). Having hysterectomy performed in a medium hospital also increased the probability of abdominal hysterectomy when compared to having surgery in a large hospital ($p<0.01$).

Several factors were associated with a significant reduction in the probability of receiving an abdominal hysterectomy when compared to minimally invasive

hysterectomy. Women 55 years or older, women in the third income quartile, women residing in the West and South had a lower likelihood of having abdominal hysterectomy. All surgical diagnoses except pelvic infection were associated with decreased likelihood of receiving abdominal hysterectomy. Furthermore surgery in a small hospital, hysterectomy in a teaching hospital, and both nonprofit and for-profit ownership were associated with a reduction in the likelihood of receiving abdominal hysterectomy.

Table 3. Factors Associated with the Probability of Selection of Abdominal Hysterectomy Compared with Minimally invasive Hysterectomy (Laparoscopic Hysterectomy or Vaginal Hysterectomy)

	Logistic Regression Model		Fixed Effect Model	
	AH	SE	AH	SE
Race/Ethnicity				
White	*Reference*		*Reference*	
Black	0.178*	0.00340	0.153*	0.00590
Hispanic	0.0915*	0.0038	0.0483*	0.0064
Asian or Pacific Islander	0.155*	0.007	0.0918*	0.0093
Other	0.0486*	0.0066	0.0492*	0.0084
Unknown	0.062*	0.01	0.0285#	0.012
Age (years)				
18-34	*Reference*		*Reference*	
35-39	0.0153+	0.0052	0.0166+	0.0057
40-44	0.0302*	0.0049	0.0285*	0.0056
45-49	0.0223*	0.005	0.022*	0.006
50-54	-0.0088	0.0058	-0.0065	0.0071
55 or older	-0.0805*	0.0061	-0.0751*	0.0077
Median ZIP Code Income				
4th Quartile	*Reference*		*Reference*	
3rd Quartile	-0.0094+	0.0036	0.0147*	0.0044
2nd Quartile	-0.0057	0.0038	0.0255*	0.005
1st Quartile	0.0025	0.004	0.0306*	0.0055
Region				
Northeast	*Reference*			
Midwest	0.0353*	0.0044		
South	-0.0159*	0.0038		
West	-0.0773*	0.0043		
Hospital Setting				
Urban	*Reference*			
Rural	0.0056	0.0044		

Table 3. Factors Associated with the Probability of Selection of Abdominal Hysterectomy Compared with Minimally invasive Hysterectomy (Laparoscopic Hysterectomy or Vaginal Hysterectomy)

	Logistic Regression Model		Fixed Effect Model	
	AH	SE	AH	SE
Surgical Diagnosis				
No Surgical Diagnosis	*Reference*		*Reference*	
Abnormal Bleeding	-0.0720*	0.00560	-0.0755*	0.00820
Endometriosis	-0.0771*	0.0063	-0.0723*	0.0086
Fibroids	-0.0127#	0.0057	-0.0136	0.0086
Pelvic Infection	0.009	0.0061	0.008	0.0087
Pelvic Pain	-0.151*	0.0066	-0.141*	0.0096
Prolapse	-0.414*	0.005	-0.402*	0.017
Adnexal Surgery				
No Adnexal Surgery	*Reference*		*Reference*	
Adnexal Surgery	0.203*	0.0027	0.182*	0.0047
Insurance				
Private Insurance	*Reference*		*Reference*	
Medicare	-0.0092	0.0052	-0.005	0.0059
Medicaid	0.0268*	0.0042	0.0333*	0.0065
Uninsured	0.0603*	0.007	0.0807*	0.0093
No charge	0.0081	0.017	0.06+	0.022
Other	-0.0043	0.0068	0.0005	0.01
Hospital Size				
Large Hospital	*Reference*		*Reference*	
Medium Hospital	0.0089+	0.003	0.0917*	0.0076
Small Hospital	-0.0424*	0.0041	0.039+	0.015
Hospital Teaching Status				
Nonteaching	*Reference*		*Reference*	
Teaching	-0.0123*	0.0029	0.0051	0.0093
Hospital Ownership				
Public	*Reference*		*Reference*	
Non-profit	-0.0437*	0.0045	-0.315*	0.016
For-profit	-0.0242*	0.0053	--	--
Year				
2010	*Reference*		*Reference*	
2009	0.0355*	0.0026	0.019	0.01

# $p < 0.05$, + $p < 0.01$, * $p < 0.001$

AH, abdominal hysterectomy; SE, standard error

Marginal effects calculated at the means.

Research Question 2

The question of whether the racial differences in hysterectomy route, if seen in the logistic regression, would persist after within hospital analysis can be

answered by the results of the fixed effects linear probability model regression comparing selected surgical routes to alternatives (Table 3). Within hospital analysis shows significant increased probability of abdominal hysterectomy compared to minimally invasive hysterectomy for all minority women when compared to White women. However, for most minority women, the magnitude of the increased probability of abdominal hysterectomy decreased. The increased probability for Black women of abdominal hysterectomy compared to white women was 0.15 ($p<0.001$). Similarly, Asian or Pacific Islander and Hispanic women had a higher probability of abdominal hysterectomy than white women with probabilities of 0.092 and 0.048, respectively ($p<0.001$). Other race was the only group for whom the size of the probability of abdominal hysterectomy did not decrease at the hospital-level analysis; for this group the increased probability of abdominal hysterectomy when compared to white women was 0.049 at both levels of analysis.

Summary of Findings

Research Question 1

This study found that all minority women had a significant increased likelihood of receiving abdominal hysterectomy. This increased likelihood was greatest among Black and Asian or Pacific Islander women. These groups had hysterectomies at rates almost 20 percentage points higher than sampled White women. After adjusting for patient, clinical, and hospital characteristics there were significant racial differences in the probability of receiving abdominal hysterectomy.

Research Question 2

The racial differences in abdominal hysterectomy receipt found in the first level of analysis were not negated when we considered within hospital analysis.

Though the magnitude of increased probability decreased, the probabilities of abdominal hysterectomy in minority women remained significantly greater than that of white women. These findings support the existing literature on this topic even with the examination of more recent data. However, these findings do not support the hypothesis that there would not be a significant racial difference at the hospital level of analysis.

Discussion

One notable difference in this updated study is that we find that trends in abdominal hysterectomy rates are decreasing for all women irrespective of race. Therefore, this study contributes to the literature on this topic in two ways: using 1) updated data and 2) updated coding to provide clarification. Currently the most significant study that examines hysterectomy route and race is that by Jacoby et al., who used 2005 Nationwide Inpatient Sample data to examine racial and other factors contributions to hysterectomy route selection. In addition to older data, this study was conducted before the creation of an ICD-9-CM code for total laparoscopic *abdominal* hysterectomy. This is an important distinction, as the new coding distinguished between more invasive abdominal hysterectomies and less invasive laparoscopic abdominal hysterectomies. As such, their findings may have overstated the racial difference in hysterectomy route as their abdominal category may have included laparoscopic abdominal hysterectomies or excluded from analysis those procedures. This study incorporates this coding, allowing for a clearer understanding of the difference in hysterectomy route selection. Additionally, as our analysis

looked at two years of the most currently available data, it provides a clearer, broader view of the current and changing trends in procedure.

Limitations

There were four limitations to this study: 1) missing data on patient race, 2) missing socioeconomic data, 3) no patient biometric information, and 4) no patient medical history, particularly information about previous cesarean section.

Race data was missing for some records in the NIS dataset. Only those states with less than 10 percent missing race data were included in the analysis. As such, the following states with sizable minority populations were excluded from the analysis: Louisiana, Michigan, Colorado, North Carolina, Tennessee, and Washington. Because Washington has a large Asian or Pacific Islander population, the results of this analysis may overestimate the racial difference in abdominal hysterectomy for this group because having a hysterectomy in a western state was associated with a significant decreased probability of abdominal hysterectomy.

Missing socioeconomic data, particularly about patient education, is a limitation of this study. Patient education can influence their sharing of decision making. Because there is not information about patient education level, there is no way to ascertain whether education level differences between minorities and white women are what are driving the differences in hysterectomy route selection.

Another limitation of my study is the absence of patient biometric data in the NIS, particularly data on BMI and uterine size of the patients. BMI is strongly correlated with an increase in uterine size in women with and without fibroids. A

large uterus (greater than 180 grams) is commonly believed to be a contraindication to vaginal and laparoscopic hysterectomy, which lends itself to selection of abdominal hysterectomy for women. Not taking into account uterine size may, therefore, overestimate racial difference, especially with respect Black women. When compared to White women, Black women had over twice the odds of reporting fibroids as the primary reason for having a hysterectomy (Samadi, Lee, Flanders, Boring, & Parris, 1996). However, this lack of data may not be a big issue in my results as studies have shown both vaginal and laparoscopic hysterectomy to be highly successful hysterectomy route (Kovac, 1995).

Lastly, the study was limited by the absence of data on whether a woman had previously delivered by cesarean section. Another commonly believed contraindication to minimally invasive hysterectomy is prior cesarean delivery. According to the Centers for Disease Control and Prevention, Black women have slightly higher rates of cesarean delivery than white women. As such, there may be an overestimation of the racial difference in abdominal hysterectomy probability. However, as studies have shown cesarean delivery to rarely contraindicate minimally invasive hysterectomy; this issue does not undermine the results of this study.

Policy Implications

The most important findings from this study with regards to policy are that racial differences in hysterectomy type continue to exist despite overall decreasing trends in abdominal hysterectomy. However, the reduction of the magnitude of the probability of abdominal hysterectomy after within hospital analysis indicates that a

portion of the difference is due to unobservable differences in where minority women seek care. As such, policymakers should seek to improve knowledge about alternatives to abdominal hysterectomies in minority-serving hospitals. Moreover, improvements in the dissemination of physician guidelines regarding hysterectomy selection will decrease racial differences.

Policymakers also need to address what appears to be a possible racial disparity in hysterectomy selection. The Institute of Medicine's 2002 report on racial disparities in health care defines a racial disparity as "racial or ethnic differences in the quality of healthcare that are not due to access related factors or clinical needs, preferences, and appropriateness of intervention" (Brian D. Smedley, Adrienne Y. Stith, Alan R. Nelson, Editors, Racial, & Care, 2003). The findings from this study coupled with information in the literature indicate a racial disparity in women's health that warrants further attention from policymakers.

The within hospital analysis of this study controls for access related factors which may have contributed to the racial difference. When it comes to clinical needs, it has been shown through research on benign disorders that higher BMI does not contraindicate laparoscopy (Brezina, Beste, & Nelson, 2009). Additionally, as hysterectomy route seems to be a decision typically made by the provider alone, patient preference for selecting abdominal hysterectomies seem unlikely as a cause for the difference. Furthermore, conditions such as fibroids, which cause an enlarged uterus and with which there is an interaction with race, is rarely an indication for abdominal hysterectomy. Minimally invasive hysterectomy is still possible in these circumstances through morcellation of the uterus (Doucette, Sharp,

& Alder, 2001). Therefore, the persistence of a racial difference after controls for other clinical and health system factors indicates the possible existence of a racial disparity.

Future Research

Prior to the American Congress of Obstetricians and Gynecologists (ACOG) publication in late 2009 and the American Association of Gynecologic Laparoscopists (AAGL) publication in 2010 of recommendations for hysterectomy route selection, there were no formal guidelines for hysterectomy route selection.(AAGL Advancing Minimally Invasive Gynecology Worldwide, 2011; "ACOG Committee Opinion No. 444: Choosing the Route of Hysterectomy for Benign Disease," 2009). Because the latest data available for this study came from 2010, only a short time after the publication of the clinical guidelines promoting minimally invasive hysterectomies, widespread adoption of these newly supported procedures may not have occurred in the time frame of our study. Future research should consider the impact of ACOG's and AAGL's published guidelines on the selection of minimally invasive hysterectomies in future years, when the guidelines have become more pervasive in gynecologic practice. This research should look at the probability of receiving an abdominal hysterectomy prior to and after the ACOG and AAGL publications. This multiyear study would be better able to determine if these guidelines, of which ACOG's reach over 90% of U.S. board-certified

obstetricians and gynecologist and AAGL's reach over 6,000 physicians globally, has an impact on reducing racial difference in hysterectomy route selection.[1]

Additionally, future research should examine if there are racial differences in the type of minimally invasive hysterectomy. There is not a clear consensus of whether vaginal hysterectomy is better than laparoscopic hysterectomy. However, laparoscopic method is often indicated for morcellation when the vaginal hysterectomy is not feasible. As a woman's race is associated with larger uterus size, a cause for morcellation with laparoscopy, an analysis which compares these minimally invasive approaches may control for the physiological differences between races.

Looking Forward

Our findings show that racial differences in hysterectomy route are still a problem, but that the magnitude of the problem is diminishing when we compare our results to the Jacoby et al study. This is promising, if not sufficient for improving hysterectomy treatment for minority women. While additional research is needed to better understand the impact of the published guidelines on these trends, there are also other avenues that may be able to simultaneously improve these outcomes.

Patient Education

One way to decrease the racial difference in hysterectomy route selection would be to educate patients not only on the benefits of minimally invasive hysterectomy over abdominal hysterectomy, but to also inform patients of the

[1] http://www.acog.org/~/media/About%20ACOG/ACOGFactSheet.pdf

physicians in their area who are high volume hysterectomy performers. As study from New York State found surgeons who performed at least 10 hysterectomies a year were less likely to opt for the abdominal route for hysterectomy (67% vs. 81%) (Boyd et al., 2010). If patients were informed of those providers who were more experienced in hysterectomy procedures, they could improve the likelihood of receiving the better standard of care.

Value-based Reimbursements

Due to the Affordable Care Acts dictating a change from volume based reimbursements to value-based reimbursements, there is an opportunity to decrease the racial difference through reimbursements. One such way is to require indication that guidelines, similar to those put forth by Kovac, were used to determine the optimal hysterectomy route (Robert Kovac, 2004). These guidelines, which favor minimally invasive approaches to hysterectomy, improve the likelihood that a provider will consider and use a minimally invasive approach. This approach may remove some of the differential procedure selection that currently exists.

The trend of increasing minimally invasive hysterectomy selection for all women has resulted in a decrease in the racial differences in the selection of abdominal hysterectomy. However, despite this change, racial differences still exist. Future research is necessary to explore ways in which to close the racial gap.

Conclusion

Legislation creating the National Center for Minority Health and Health Disparities within the National Institute for Health signifies national commitment towards addressing racial and ethnic differences and disparities in healthcare. This

study improves the measurement and methodology of the extant literature on racial differences in hysterectomy type and allows a better determination of who is getting "better" (minimally invasive) versus "worse" (abdominal) care, finding that minority women have an increased probability of receiving abdominal hysterectomy.

While the magnitude of the racial differences in hysterectomy procedures has improved, this remains a real problem. Future studies should continue to examine the impact of the ACOG and AAGL recommendations and stakeholders should consider developing additional interventions, either provider training or additional guidelines or some combination thereof to continue to improve hysterectomy care for minority women.

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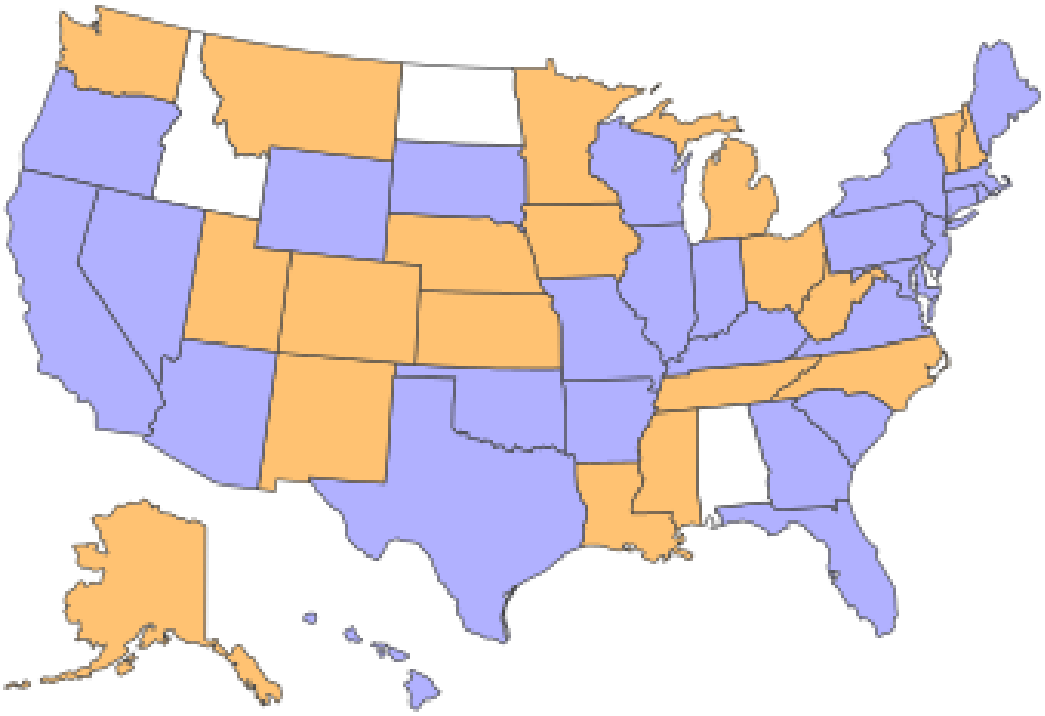
Appendix

Appendix A. Included and Excluded States from Study Sample

Included States	Excluded States
Arkansas	Alaska
Arizona	Colorado
California	Iowa
Connecticut	Kansas
Florida	Louisiana
Georgia	Michigan
Hawaii	Minnesota
Illinois	Mississippi
Indiana	Montana
Kentucky	Nebraska
Massachusetts	New Hampshire
Maryland	New Mexico
Maine	North Carolina
Missouri	Ohio
New Jersey	Tennessee
Nevada	Utah
New York	Vermont
Oklahoma	Washington
Oregon	West Virginia
Pennsylvania	
Rhode Island	
South Carolina	
South Dakota	
Texas	
Virginia	
Wisconsin	
Wyoming	

Appendix B. Map of Included and Excluded States from Study Sample



- Blue: states included in study
- Amber: states excluded in study
- White: states not included in NIS sample, 2009-2010