2022

Uterine Fibroid Prevalence and Health Care Disparities by County. Florida, 2010-2019

Saarah K. Sherifi
University of Central Florida

UTERINE FIBROID PREVALENCE AND HEALTH CARE DISPARITIES BY COUNTY. FLORIDA, 2010-2019.

by

SAARAH K. SHERIFI

A thesis submitted in fulfillment of the requirements

for the Honors Undergraduate Thesis Program in Health Sciences

in the College of Health Professions and Sciences

and in The Burnett Honors College

at the University of Central Florida

Orlando, Florida

Spring Term, 2022

Thesis Chair: Humberto López Castillo, M.D., Ph.D.

ABSTRACT

Also known as uterine fibroids, leiomyomas occur in 70% of women. A uterine leiomyoma is a benign growth in the muscular wall of the uterus which, if left untreated, can grow, and affect surrounding organs, leading to complications, including hemorrhage and death. Symptomatic women often experience pain and debilitating menstrual cycles which, in turn, result in poor health, poor quality of life, and loss of income. Preventative and treatment services in Florida could benefit from the characteristics of women affected the most by this disease in the state. Thus, we describe the demographic characteristics and estimate the prevalence rate of uterine leiomyomas among women 18 years and older in Florida between 2010 to 2019. Data was obtained from Florida's Agency for Healthcare Administration and analyses included descriptive statistics with prevalence rate estimation and geolocation. Over the decade studied, we identified 232,475 cases, almost half (49.2%) of which were reported among white women, with women in their forties having the highest frequency. Florida counties with the highest prevalence rates (e.g., Miami-Dade, Broward, and Palm Beach) are the seat to densely populated cities. Over the decade analyzed, the prevalence rate (95% CI) was estimated at 284.8 (284.21, 285.39) cases of uterine leiomyomas per 100,000 women 18 years and older. Compared to non-Hispanic white women, black, Hispanic, and other women of color presented with higher prevalence rate ratios (4.84, 1.87, and 1.58, respectively). While most women diagnosed with uterine fibroids in Florida were non-Hispanic white in their forties, results evidence noticeable disparities by race, ethnicity, age, and county of residence. Counties with the highest prevalence rates were urban and densely populated with more access to

healthcare, unlike counties with the lowest prevalence rates. Overall, results point at important unmet needs in leiomyoma prevention and treatment services for women in Florida.

DEDICATIONS

I would like to dedicate this page to my loving parents, Enkeleda and Kujtim Sherifi. As a child, you two have been my heroes. Throughout my entire life, your stories have inspired me to dedicate putting forth my best in everything that I do. Seeing how you both worked hard every single day as immigrants from an impoverished country taught me the importance of diligence, teamwork, and never giving up on my dreams. Dad, you came to this country as a political refugee with nothing else but the shirt on your back. Without you, I would not have the life I currently have now in the United States. I thank my darling mother, who inspired me to research uterine leiomyomas after her life-saving surgery. You have always pushed me to step outside of my comfort zone, and this thesis was certainly outside of it. However, I am so thankful you pushed me because now I have contributed to the field in a much bigger way than I could have imagined. Mom and dad, thank you for providing me with everything I needed in my life to succeed, for your endless support, love, and encouragement. I love you both and I would not be the woman I am today without you.

In addition, I would like to dedicate this to my wonderful grandparents. I am beyond blessed to have you all with me today. You have all seen me grow up into the woman I am now, and I am so glad I could make you all proud. You all have given me endless love, support, and encouragement ever since I was a child. Thank you Myrsete and Agim Sherifi and thank you Zoica and Thoma Todo. You are all the best grandparents I could have been blessed with and I love you all dearly.

Finally, I would like to dedicate this to all my amazing friends, family, and family friends, especially Aida Xhufi. Although you are no longer with us, your support and love will always be in my heart. Thank you.

ACKNOWLEDGEMENTS

To Dr. Humberto López Castillo, my thesis chair, thank you for your countless hours spent helping with this thesis and for your immeasurable hard work. Without your endless support, initiative, and encouragement this thesis would have not been possible. You are the best mentor I could have ever asked for and I am so glad to have you on my team. I truly appreciate your patience on this long and winding journey. In addition, thank you for pushing me to present my research and pushing towards publication. Your mentorship has shaped me into a far better researcher than I could have imagined, and for that I thank you.

To my thesis committee member, Dr. Cassie Lewis Odahowski, thank you for your guidance, expertise, and support. Without you, this thesis would have not been possible. Thank you for encouraging me to never give up and for helping me. Also, thank you for pushing me to present and publish my work. I am beyond grateful to have had you on my team.

To Amanda Ammirati, thank you for your unconditional support, encouragement, and cheer. I am so glad to have had you on my team. You and all at the Office of Honors Research are some of the most encouraging and supportive faculty and staff I have ever seen.

Thank you, Burnett Honors College for your support, patience, and encouragement. I appreciate all the amazing opportunities you have given me.

Thank you, Florida Agency for Health Care Administration for providing the dataset free of cost. Agencies such as yourself are the champions for undergraduate research, and without you, this thesis would have not been possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
Introduction

Women of reproductive age are at risk of developing uterine leiomyomas, which are benign tumors of the uterus. Uterine leiomyomas occur in more than 70% of women.[1] When they develop, leiomyomas pose health issues, such as damage to the uterus, ovaries, urinary bladder, and other surrounding pelvic organs.[5] As a result, women may need partial or total hysterectomies, which may result in the loss of hormone-producing ovaries. Additionally, women with leiomyomas may experience irregular and heavy menstrual cycles, pelvic pain, and hemorrhage, which can lead to death.[5] However, only between one-quarter and half of women report clinical symptoms and the rest live symptom-free lives.[1] As a result, women who present with symptoms are more likely to seek treatment, given that they have access to healthcare.

The pathophysiology behind leiomyoma formation is like that of any benign tumor. The myometrium of the uterus contains myometrial stem cells. Under certain conditions, myometrial stem cells can transform into leiomyoma progenitor cells.[1] These cells are clonal: each is a clone derived from one stem cell. Once cells undergo reproduction, the leiomyoma will grow and pose risks to surrounding tissues and organs.[1] Formation and growth of leiomyomas are dependent upon a variety of factors, most of which are related to the complex interaction among menstrual cycle regulating hormones,[1] especially estrogen and progesterone. Whether produced internally by the ovaries or consumed externally from estrogen-positive foods, estrogen increases the likelihood of leiomyoma formation.

Women diagnosed with uterine leiomyomas are at risk of developing severe symptoms due to the uncontrolled cell growth. Nonspecific discomfort, along with infertility, pain, and infections, put not only a financial but also social burden on women with leiomyomas.[6] Additionally, women with leiomyomas often present with other associated conditions, such as

polycystic ovarian syndrome (PCOS), cervical cancer, obesity, and type 2 diabetes.[7] Women with PCOS have a 65% higher incidence of uterine leiomyoma than women without PCOS.[3] In addition, women with a family history of uterine leiomyoma have an increased risk of developing leiomyoma.[2]

In the United States (US), women of lower socioeconomic status (SES) are at increased risk of complications and death from leiomyomas compared to women of higher SES.[8] Race also seems to play a role, as black women are disproportionately affected by both leiomyomas and poverty, with limited access to healthcare.[8] Black women have a two- to three-fold greater risk of developing uterine leiomyomas than white women.[2] Due to the elevated cost and limited access to health care, preventative screenings and early interventions may not be available to women from low socio-economic status, resulting in increased morbidity and mortality among women from lower SES backgrounds compared to their more economically advantaged peers.[8]

Although the risk factors, complications, treatment, and pathophysiology of leiomyomas are well known, there are still several unanswered questions. As noted, black women are more likely to develop the disease than white, Asian, and Latina women.[1] However, it remains unclear as to which demographic is greatly impacted by uterine leiomyomas in Florida. Such demographics of women diagnosed with uterine leiomyoma as age, ethnicity, and race remain a mystery. The prevalence among ethnicity and race, along with frequency between age, race, ethnicity, and type of uterine leiomyoma are yet to be examined. In addition, the geographic distribution of uterine leiomyomas throughout the state has not yet been studied, along with prevalence of the disease in each county. Understanding which demographic has the highest prevalence rate, which has the highest frequency, and which counties contain the highest or

lowest prevalence will allow for a clearer understanding of who and where uterine leiomyomas are affecting.

This study aims to describe demographic characteristics and estimate prevalence rates of uterine leiomyomas in the state of Florida between the years of 2010 to 2019. The objective of this study, then, is to estimate the prevalence of leiomyomas in Florida in the past decade by race, ethnicity, and county of residence since there are expected health disparities between counties.

CHAPTER 2
Literature Review

Pathophysiology

Uterine fibroids, or uterine leiomyomas, are benign tumor cells of the uterus composed of smooth muscle cells and fibroblasts rich in extracellular matrix.[1] Uterine leiomyomas consist of four components: smooth muscle cells, vascular smooth muscle cells and two types of fibroblasts.[1] As a myometrial stem cell, it can transform into leiomyoma progenitor cells which give rise to rapid, uncontrolled growth.[1] As a result, the cells found in leiomyoma tissue all rise from one cell- the parent cell. A factor that gives rise to leiomyoma growth are the growth factors sequestered in the extracellular matrix (ECM).[1] These growth factors are fibroblast growth factor 2 (FGF2), vascular endothelial growth factor (VEGF), heparin binding epidermal growth factor (HB-EGF), and platelet-derived growth factor (PDGF).[1] These growth factors in the ECM are vital in understanding how and why myometrial stem cells evolve into uterine leiomyomas. Lastly, uterine leiomyomas are named after the location in the uterus and include submucosal, intramural, and subserosal.

Epidemiology and Natural History

Since leiomyomas are estrogen dependent, women who are premenopausal are significantly more likely to develop leiomyomas within their lifetime, with incidence estimated at 77% in premenopausal women of reproductive age.[2] However, not all women have the same likelihood of developing uterine leiomyomas. The incidence of leiomyomas among black women in the US is approximately three times higher compared to women of other racial groups.[2] Besides this higher incidence, black women with PCOS are at a 65% increased risk of developing uterine leiomyomas.[3] Additionally, black women with uterine leiomyoma have larger uteruses and larger

uterine leiomyomas than white women and were seven times more likely to undergo a myomectomy than white women.[1]

In addition to PCOS, multiple comorbidities such as diabetes poses a possible risk factor for developing uterine leiomyomas. A 2001 study found hyperinsulinemia to be a natural candidate who provides a biologically plausible link.[8] In addition, insulin has been shown to promote vascular smooth muscle proliferation in rats.[9] Since uterine tissue is classified as smooth muscle, the finding of notes women with diabetes may also have a higher prevalence of uterine leiomyoma than those without, as insulin is a growth factor.

Age of menarche is another factor which increases the likelihood of leiomyoma development. The earlier a woman experienced age of menarche, the more likely the development of leiomyomas will be since there is longer exposure to estrogen.[1] This is due to estrogen and progesterone being key regulators of the life of leiomyomas.[1] However, women who have higher rates of testosterone have higher rates of leiomyomas.[1] With estrogen, there is increased ribonucleic acid (RNA) and protein, along with increased estrogen receptor alpha (ERα) and estrogen receptor beta (ERβ), both of which are expressed in leiomyoma following the differentiation of leiomyoma progenitor cells.[1] As a result, these upregulate epidermal growth factor (EGF), transforming growth factor beta 3 (TGFβ3), progesterone receptor (PR), and insulin-like growth factor 1 (IGF1), maintains PR, and activates signaling pathways—all of which are interconnected in the growth stimulation of leiomyomas.[1] However, for postmenopausal women the risk of developing leiomyomas decreased, due to the cease of menses and hormonal production.[2] In addition to age of menarche, women with a family history of leiomyomas were over three times more likely than women without a positive family history

due to genetic predisposition.[2] This does not necessarily means the woman is certain to develop the disease, but she is at increased risk due to a positive family history.

On the other hand, oral contraceptives offer a protective effect against uterine leiomyomas. Women who regularly use oral contraceptives have a 20% lower risk of developing leiomyomas. Among women who have used oral contraceptives for 4 to 5 years, the risk of developing leiomyomas decreases by 53%.[2] The decreased risk is associated with the regulation of the menstrual cycle with manipulating progesterone and estrogen production.

Significance

Due to the increased likelihood of women developing leiomyomas within their lifetime, there is a noticeable impact on quality and other aspects of life, such as financial burden and medical expenses. Uterine leiomyomas can cause heavy menstrual bleeding, pelvic pain, and can enlarge the uterus leading to uterine pain. Additionally, because some women are asymptomatic, emergency surgery may be required if there is a hemorrhage or tear in the uterine wall. As a result of such risk, the lifetime risk of a hysterectomy in the US is 45%, and globally uterine leiomyomas contribute to almost half of all hysterectomies performed.[1] Such a major surgery has a profound effect on the woman's life, where she may have to orally ingest hormones (if total-hysterectomy was performed), eliminates the chance of offspring if the woman wanted to have children, along with healing time and time taken off from work. Additionally, cost of medications, hormone replacement, and sanitary products add up to the overall expense of leiomyomas along with the health care expenses. Women with little to no health insurance are left in medical debt. Loss of monetary income and disability accounts for a substantial proportion of the total costs of this disease.[1]

Leiomyomas in Florida

Within the studies surrounding leiomyomas, there is a substantial gap concerning leiomyoma cases within the state of Florida. Florida is the third largest state in the US, with a population of just over 21 million residents in 2020, with women comprising 10.98 million.[4] In addition, 73% of female patients in Florida and California received a hysterectomy as an intervention for the disease.[10] As noted before, the development and outcomes of leiomyomas are influenced by race, age, existing comorbidities, and access to healthcare. Additionally, affordable, and equitable access to healthcare plays a key role in preventative measures, knowledge, and treatment for leiomyomas which can prevent nonreversible procedures, such as hysterectomies.[1]

Prevention and Management Strategies

Unfortunately, leiomyomas cannot be fully prevented, but they can be managed. A nutritious and varied diet, rich in vegetables and fruit has been shown to lower the risk of leiomyoma development, whereas a diet heavy in red meat is associated with a 70% increased risk of uterine leiomyoma.[1] Additionally, regularly consuming dairy has been shown to have a 33% decrease in uterine leiomyoma development when compared to women who consume less than one serving per day.[1] Avoiding alcoholic beverages, especially beer which has been shown to increase the risk, is another diet alteration which can help lower the risk of disease.[1] In conjunction with a nutritious diet low on red meat and alcohol, yearly physical examinations are important in the early detection and treatment of uterine leiomyoma. The primary aim of prevention efforts would be to limit the number and size of uterine leiomyoma, minimizing the risk of surgery and discomfort.[1]

CHAPTER 3
Methodology

Study Design

This longitudinal study analyzed yearly hospitalization data routinely collected by Florida's Agency for Healthcare Administration (AHCA). The database contains all hospital inpatient, ambulatory, and emergency department visits reported to and certified by AHCA between January 01, 2010, and December 31, 2019.

Ethical Oversight

The study was reviewed by the University of Central Florida's Institutional Review Board (STUDY00003180) and deemed as not research with human subjects. The University of Central Florida and AHCA signed data use agreement DUA00000092 regulating confidentiality and appropriate use of the data and AHCA disclaims responsibility for any analyses, interpretations, or conclusions originated from the limited data set in this study.

Participants

The dataset was subset to include all women 18 years and older diagnosed with ICD-10 code of D25 (leiomyoma of uterus) and its subcategories (submucosal, intramural, and subserosa) and their demographic characteristics, namely: age, diagnosis, county of residence, race, and ethnicity. The frequency of and personal history of ICD-10 codes E11 (type 2 diabetes mellitus) and its subcategories and E28.2 (polycystic ovarian syndrome) and its subcategories was also determined. Prevalence rates of women with uterine leiomyoma and either PCOS or diabetes was determined and compared to the prevalence rates of women without uterine leiomyoma but with diabetes or PCOS.

Analyses

Descriptive analyses were conducted to extract the frequency distribution of cases over time by county and the proportions of cases by age, race, ethnicity, county of residence, and diagnosis. Analyses were conducted using the Statistical Package for the Social Sciences (SPSS v. 28; The IBM Corporation; Armonk, NY). To estimate the yearly prevalence rates by county, we used the US Census Bureau publicly available mid-year population estimates for Florida counties between 2010 and 2019 (www.census.gov) as the denominator. Prevalence rate estimates over time were analyzed using Pearson product-moment correlation coefficient (r) and the coefficient of determination (R^2) as an effect size of time over the prevalence rates. Choropleth maps were generated using ArcGIS Pro software, illustrating quintiles of the county-level prevalence rate of uterine leiomyomas per 100,000 population of women 18 years and older in Florida for 2010-2019.

CHAPTER 4
Results

There was a total of 232,475 cases of leiomyomas in women aged 18 and older between 2010 to 2019 in the state of Florida. Table 1 shows each county, case count by year, and total cases at the end of the decade.

Table 1: *Frequency of uterine leiomyomas reported by county. Florida, 2010-2019.*

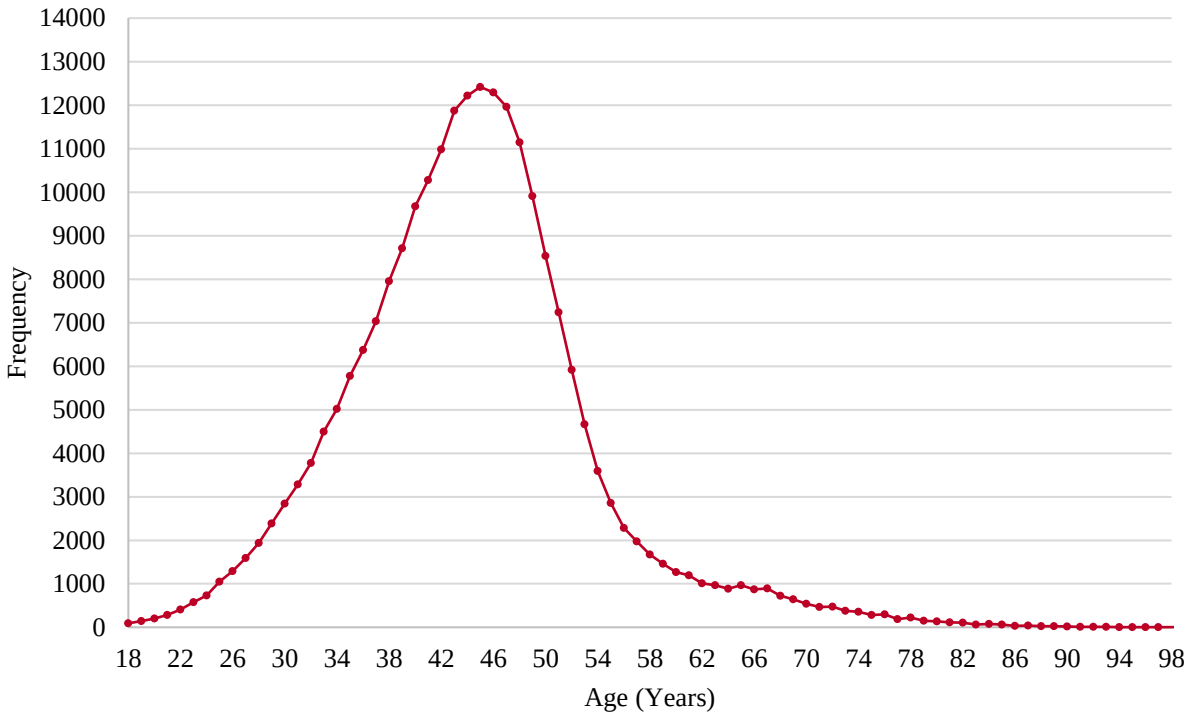
County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Alachua	347	371	264	379	436	352	477	531	493	539	4189
Baker	1	0	0	1	1	0	1	1	1	1	7
Bay	182	185	122	134	205	113	200	276	226	287	1930
Bradford	2	3	1	1	0	7	8	6	3	5	36
Brevard	370	351	250	364	510	317	424	486	528	506	4106
Broward	3481	3493	2701	3795	3997	3035	4082	4482	4660	4622	38348
Calhoun	0	0	3	0	0	2	0	1	1	0	7
Charlotte	145	108	57	110	132	71	83	99	101	93	999
Citrus	63	53	45	57	53	32	34	45	52	66	500
Clay	275	227	112	154	208	133	266	286	276	318	2255
Collier	324	277	193	214	276	149	287	334	373	395	2822
Columbia	22	42	28	19	21	23	36	42	47	34	314
Miami-Dade	3495	3682	2958	3866	3968	3223	4199	4638	4838	4979	39846
DeSoto	10	4	4	4	1	1	2	2	2	2	32
Dixie	0	0	0	0	0	0	0	0	0	0	0
Duval	1619	1586	1092	1620	1790	1119	1544	1825	1737	1711	15643
Escambia	363	363	314	372	412	236	357	423	487	473	3800
Flagler	55	41	42	46	38	33	34	48	45	34	416
Franklin	2	0	0	0	0	0	1	0	1	1	5
Gadsden	3	11	6	9	12	7	12	10	9	20	99
Gilchrist	0	0	0	0	0	0	0	0	0	0	0
Glades	0	0	0	0	0	0	0	0	0	0	0
Gulf	2	1	1	0	2	2	5	2	2	3	20
Hamilton	0	0	0	0	0	0	0	0	0	0	0
Hardee	2	2	2	4	1	0	5	2	6	3	27
Hendry	1	5	5	7	4	6	8	8	10	5	59
Hernando	104	99	66	71	92	94	115	160	151	131	1083
Highlands	67	69	47	69	63	69	64	69	61	74	652
Hillsborough	1450	1375	1134	1445	1544	1189	1663	1873	2112	2100	15885
Homes	5	1	1	1	3	1	0	0	0	1	13
Indian River	89	103	55	76	82	63	103	130	112	132	945
Jackson	26	15	18	13	8	8	12	7	13	9	129
Jefferson	0	0	0	0	0	0	0	0	0	0	0
Lafayette	0	0	0	0	0	0	0	0	0	0	0
Lake	225	235	176	218	300	224	240	235	262	295	2410
Lee	495	474	417	533	606	446	547	652	665	675	5510
Leon	595	571	406	622	660	463	664	730	719	797	6227
Levy	0	0	0	0	1	0	0	1	0	0	2
Liberty	0	0	0	0	0	0	0	0	0	0	0
Madison	0	0	0	1	0	0	0	1	1	1	4
Manatee	155	107	86	131	140	121	220	234	218	268	1680
Marion	255	260	212	269	340	286	401	330	336	288	2977
Martin	161	135	138	187	163	97	124	163	133	117	1418

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Monroe	41	43	35	39	37	19	26	24	34	22	320
Nassau	44	37	26	41	38	40	32	40	37	31	366
Okaloosa	115	135	93	121	116	71	92	135	164	180	1222
Okeechobee	24	19	14	26	34	14	26	31	42	33	263
Orange	1599	1734	1335	1961	2025	1412	2217	2202	2247	2146	18878
Osceola	597	567	435	564	555	423	610	726	698	685	5860
Palm Beach	1610	1672	1205	1813	2112	1569	1950	2303	2408	2556	19198
Pasco	142	120	82	167	172	163	224	264	302	397	2033
Pinellas	942	918	585	804	866	611	925	981	1041	952	8625
Polk	464	492	351	476	539	457	523	590	564	576	5032
Putnam	30	35	28	28	31	9	38	33	33	40	305
St. Johns	44	57	45	79	98	48	92	79	61	62	665
St. Lucie	176	195	170	229	295	316	419	372	318	341	2831
Santa Rosa	25	44	27	48	47	33	45	53	44	74	440
Sarasota	368	374	247	422	387	191	384	431	416	423	3643
Seminole	370	355	305	373	419	317	458	480	598	527	4202
Sumter	16	27	23	33	27	22	32	17	15	14	226
Suwannee	3	3	5	3	3	6	2	3	6	8	42
Taylor	3	1	1	3	2	0	3	1	2	1	17
Union	0	0	0	0	0	0	1	1	0	0	2
Volusia	419	371	214	320	380	291	346	361	375	354	3431
Wakulla	0	0	0	0	0	0	0	0	0	0	0
Walton	28	37	25	58	38	23	52	37	74	90	462
Washington	0	1	1	3	0	1	1	2	3	5	17
Unknown	0	0	0	0	0	0	0	0	0	0	0
Total	**21451**	**21486**	**16208**	**22403**	**24290**	**17958**	**24716**	**27298**	**28163**	**28502**	**232475**

Demographics

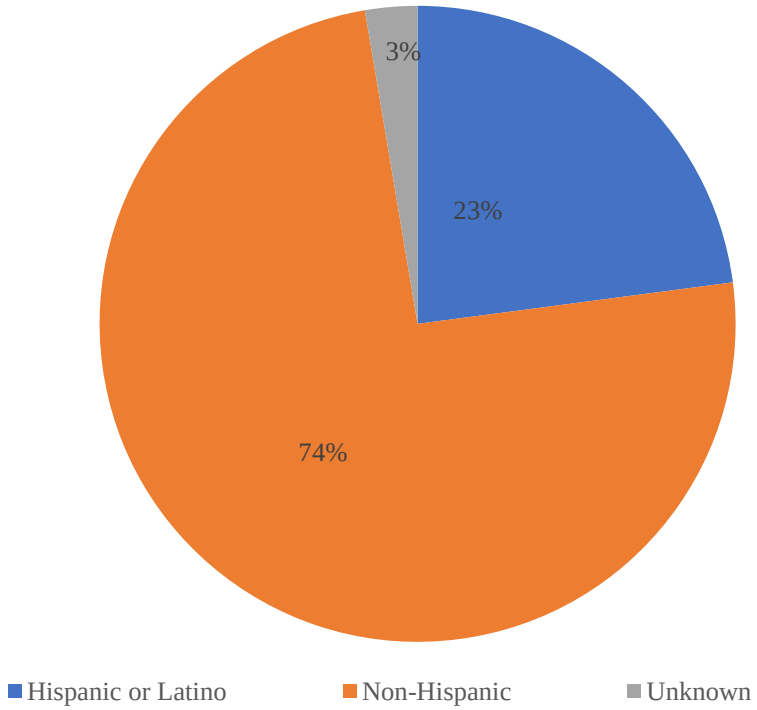
Distribution by age. The average age (standard deviation) was 44.3 years old (9.32), with a per-protocol minimum of 18 and a maximum of 97 years. An unlikely case was reported at 137 years of age and was flagged as an outlier. However, given the sample size, the effect of this case on the mean age calculation was negligible. Figure 1 presents the frequency of uterine leiomyoma diagnoses among all races and ethnicities of Floridian women, with age in intervals of four. Each dot represents an age. Women in their forties had the highest frequency of uterine leiomyoma.

Figure 1: *Frequency of uterine leiomyomas reported by age. Florida, 2010-2019.*



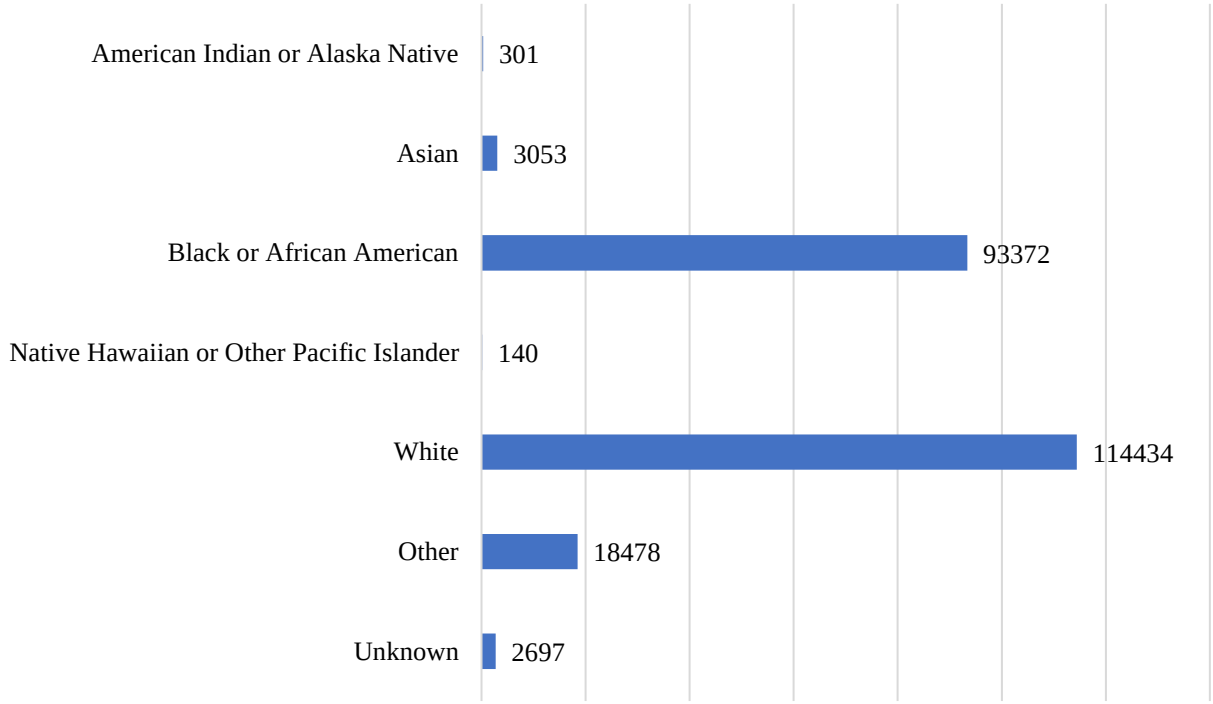
Distribution by ethnicity. Non-Hispanic women comprised 74% of uterine leiomyomas reported, followed by 23% Hispanic women, and 3% of unknown ethnicity (Figure 2).

Figure 2: *Frequency of uterine leiomyomas reported by ethnicity. Florida, 2010-2019.*



Distribution by race. White women slightly outnumbered black or African American women in frequency, with over 100,000 cases followed by over 90,000 cases. The lowest frequency of reported cases was seen in Asian, Unknown, American Indian, or Alaska Native, and Native Hawaiian or Pacific Islander (Figure 3).

Figure 3: *Frequency of uterine leiomyomas reported by race. Florida, 2010-2019.*



Geographic distribution. 22.28% of cases reported were from out of state and most frequently, out-of-state cases were from the Bahamas, Canada, and Jamaica (Table 2). Among Florida residents, most cases came from Broward, Miami-Dade, and Palm beach counties, as observed in Table 2.

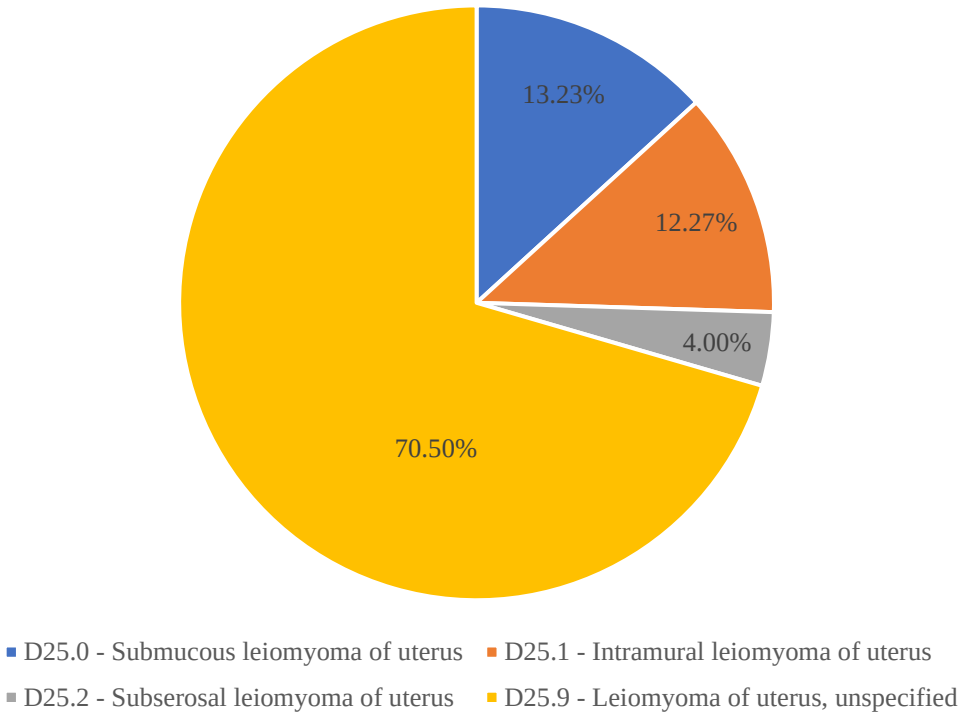
Table 2: *Geographic distribution of uterine leiomyomas reported. Florida, 2010-2019.*

Country of Residence	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Afghanistan	1	0	0	0	0	0	0	0	0	0	1
Antigua and Barbuda	0	0	0	0	2	0	0	0	0	0	2
Argentina	1	0	1	1	1	1	0	0	3	1	9
Bosnia & Herzegovina	1	0	1	0	0	0	1	0	0	3	6
Barbados	0	0	0	0	0	1	0	0	0	0	1
Bahrain	0	0	0	1	0	0	0	0	0	0	1
Bermuda	1	0	0	0	0	0	0	0	0	0	1
Bolivia	0	1	0	0	1	0	0	0	0	0	2
Brazil	1	0	0	2	2	1	0	4	2	1	13
Bahamas	18	11	11	27	24	10	13	23	35	17	189
Canada	4	1	2	2	4	4	2	5	2	3	29
Switzerland	0	0	0	0	1	0	0	0	0	0	1
Cote d'Ivoire	0	0	0	0	1	0	0	0	0	0	1
China	0	0	0	0	0	0	1	0	0	0	1
Colombia	0	0	1	0	1	2	1	0	2	0	7
Costa Rica	0	0	0	0	0	0	0	0	1	0	1
Cuba	1	0	0	1	1	0	1	0	0	0	4
Germany	0	1	1	1	1	0	1	0	0	0	5
Dominica	0	1	0	0	1	0	1	0	0	0	3
Dominican Republic	2	1	1	2	3	1	1	3	3	6	23
Algeria	0	0	0	0	0	0	0	1	0	0	1
Ecuador	1	0	0	0	0	1	1	2	4	5	14
Spain	0	0	0	1	1	0	0	1	1	1	5
Federated States of Micronesia	0	0	0	0	0	1	0	0	0	0	1
France	0	0	0	0	0	0	0	1	0	0	1
United Kingdom	0	3	2	2	1	1	1	2	1	0	13
Greece	0	0	0	0	0	0	0	0	1	0	1
Guatemala	1	0	1	0	0	0	1	2	1	0	6
Guyana	0	0	0	1	0	0	0	0	0	1	2
Honduras	1	0	3	0	0	2	1	0	1	2	10
Haiti	1	1	0	3	1	0	3	2	0	2	13
India	0	0	0	0	0	0	0	0	1	0	1
Italy	0	0	0	0	0	1	0	0	0	0	1
Jamaica	1	1	1	2	2	2	6	4	6	3	28
Japan	0	1	0	0	0	0	0	0	0	0	1
Saint Kitts and Nevis	0	0	0	1	0	1	1	1	3	0	7
Kuwait	0	0	0	0	0	0	0	0	1	0	1
Cayman Islands	2	1	2	1	4	0	1	2	10	1	24
Morocco	0	0	0	0	0	0	0	0	1	0	1
Monaco	0	0	0	0	0	0	3	0	0	0	3
Mexico	2	1	0	0	0	2	0	1	0	0	6
Nigeria	0	0	1	1	1	3	0	0	0	1	7
Nicaragua	0	0	0	0	1	1	0	1	0	0	3
Netherlands	0	1	0	0	0	0	0	0	0	1	2
Panama	0	0	0	0	0	0	1	1	3	2	7
Peru	0	0	0	0	0	1	0	0	0	0	1
Philippines	0	0	0	0	0	0	0	0	0	1	1
PK	0	1	0	0	0	0	0	0	0	0	1

Country of Residence	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Puerto Rico	0	0	1	0	1	0	0	0	0	0	2
Romania	0	0	1	0	0	0	0	0	0	0	1
Russian Federation	0	0	0	0	0	0	1	0	1	0	2
Saudi Arabia	0	1	0	0	0	0	0	0	0	0	1
Sweden	0	0	0	0	0	1	0	0	0	0	1
Suriname	0	0	0	0	0	0	0	1	0	0	1
El Salvador	0	0	0	1	0	0	0	0	0	1	2
Turks and Caicos Islands	2	0	2	6	4	0	4	2	1	3	24
Trinidad and Tobago	0	1	0	2	2	1	0	1	1	0	8
United States of America	15764	15760	13118	16021	17785	16333	19631	21628	22442	22187	180669
Uruguay	0	0	1	0	0	0	0	0	0	0	1
Saint Vincent and the Grenadines	0	0	0	0	0	1	0	0	0	0	1
Venezuela	0	0	0	1	0	1	0	1	0	3	6
British Virgin Islands	0	1	2	1	0	1	1	0	2	1	9
US Virgin Islands	1	1	0	0	0	2	0	0	2	1	7
South Africa	0	0	0	0	0	0	1	0	0	0	1
Unknown	5645	5696	3055	6322	6444	1582	5037	5609	5632	6255	51277

Distribution by anatomic site. As broken down by Figure 4, 70.5% of uterine leiomyoma cases were unspecified, while 13.23% of cases were submucosal, followed by 12.27% intramural and 4.0% subserosal.

Figure 4: *Frequency of uterine leiomyomas reported by anatomic categories. Florida, 2010-2019.*



Prevalence estimates

State of Florida. The 10-year prevalence (95% confidence interval) of uterine leiomyomas in the state of Florida was estimated at 284.8 (284.21, 285.39) cases per 100,000 population of women 18 years and older. The trend-over-time analysis showed a significant trend towards an increase of cases (Pearson's $R = 0.557$) with a small effect size ($R^2 = 0.3105$) that was not statistically significant ($P = 0.094$).

Prevalence by county. Table 3 presents 10-year prevalence (95% confidence interval) of uterine leiomyomas in the state of Florida by county. For the decade analyzed, the highest mean prevalence per 100,000 were observed in the counties of Broward, Palm, and Miami-Dade and the lowest rates were observed in the counties of Glades, Homes, and Sumter.

Table 3: *Prevalence rates and 95% confidence intervals (per 100,000 women 18 years of age and older) of uterine leiomyomas reported by county. Florida, 2010-2019.*

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean	*R*	R^2	*P*
Alachua	177.67 (165.09, 190.24)	188.61 (175.62, 201.61)	139.05 (127.91, 150.19)	205.39 (191.97, 218.8)	231.47 (217.42, 245.52)	171.46 (159.53, 183.38)	220.79 (207.38, 234.21)	254.69 (240.36, 269.01)	242.78 (229.01, 256.55)	254.89 (240.94, 268.84)	209.45 (208.13, 210.78)	0.771	59.43%	0.009
Baker	240.03 (78.73, 401.33)	210.37 (58.13, 362.61)	93.9 (0, 194.9)	177.18 (38.7, 315.66)	123.9 (9.11, 238.69)	92.52 (0, 191.3)	237.24 (78.74, 395.73)	216.87 (65.12, 368.63)	193.09 (52.15, 334.03)	257.48 (98.98, 415.97)	184.54 (170.56, 198.52)	0.241	5.81%	0.502
Bay	221.03 (198.88, 243.18)	222.18 (200, 244.35)	155.12 (136.75, 173.5)	160.56 (141.93, 179.2)	248.96 (225.91, 272.01)	137.13 (120.25, 154.01)	222.35 (201.14, 243.56)	306.33 (281.81, 330.84)	271.83 (249.14, 294.52)	309.14 (284.74, 333.55)	226.48 (224.32, 228.65)	0.595	35.38%	0.070
Bradford	153.89 (26.82, 280.97)	227.51 (71.88, 383.13)	43.34 (0, 114.63)	122.86 (9.51, 236.21)	174.02 (39.22, 308.82)	213.83 (65.25, 362.4)	272.62 (106.36, 438.87)	238.95 (85.41, 392.48)	207.59 (65.46, 349.72)	179.23 (46.16, 312.29)	184.48 (170.67, 198.3)	0.435	18.92%	0.209
Brevard	168.71 (162.95, 174.46)	163.88 (158.22, 169.54)	116.54 (111.8, 121.29)	164.14 (158.57, 169.71)	232.25 (225.71, 238.78)	138.63 (133.68, 143.59)	184.08 (178.45, 189.7)	208.26 (202.36, 214.17)	220.92 (214.91, 226.93)	213.17 (207.36, 218.99)	181.85 (181.28, 182.42)	0.598	35.80%	0.068
Broward	427.1 (424.21, 429.99)	431.42 (428.53, 434.32)	335.19 (332.66, 337.72)	459.29 (456.36, 462.22)	482.78 (479.81, 485.74)	359.25 (356.72, 361.77)	472.32 (469.47, 475.17)	509.78 (506.87, 512.7)	515.98 (513.07, 518.89)	504.99 (502.15, 507.83)	451.1 (450.82, 451.39)	0.613	37.62%	0.059
Calhoun	97.73 (0, 290.78)	58.64 (0, 208.23)	137.42 (0, 367.22)	97.81 (0, 291.08)	77.81 (0, 249.25)	136.56 (0, 364.22)	135.58 (0, 360.8)	326.17 (0, 671.55)	147.11 (0, 369.83)	225.86 (0, 508.09)	144.7 (121.53, 167.88)	0.672	45.14%	0.033
Charlotte	160.28 (142.51, 178.05)	135.28 (119.08, 151.48)	88.8 (75.94, 101.66)	154.44 (137.48, 171.4)	138.02 (122.15, 153.9)	99.46 (86.25, 112.68)	119.15 (105.03, 133.27)	169.54 (152.97, 186.11)	167.26 (151.03, 183.5)	132.79 (118.9, 146.68)	136.68 (135.14, 138.22)	0.156	2.44%	0.666
Citrus	121.27 (103.48, 139.05)	124.83 (106.74, 142.92)	93.7 (78.08, 109.33)	114.59 (97.33, 131.84)	117.5 (100.07, 134.92)	84.58 (69.92, 99.25)	94.47 (79.18, 109.76)	132.08 (114.24, 149.91)	131.06 (113.22, 148.89)	137.94 (119.96, 155.92)	115.35 (113.64, 117.05)	0.293	8.58%	0.412
Clay	368.28 (342.1, 394.46)	326.94 (302.29, 351.59)	166.51 (149.07, 183.95)	243.01 (222.25, 263.77)	324.22 (300.94, 347.49)	164.84 (148.58, 181.09)	262.2 (242.22, 282.17)	310.41 (289.19, 331.62)	299.1 (278.55, 319.65)	298.19 (278.06, 318.33)	276.54 (274.43, 278.66)	-0.056	0.32%	0.877
Collier	232.8 (221.37, 244.23)	200.03 (189.5, 210.57)	134.99 (126.52, 143.45)	162.3 (153.16, 171.43)	195.91 (186.03, 205.79)	104.26 (97.21, 111.3)	179.65 (170.62, 188.69)	215.43 (205.78, 225.08)	223.81 (214.21, 233.41)	234 (224.45, 243.55)	189.09 (188.14, 190.04)	0.228	5.22%	0.525
Columbia	170.23 (118.67, 221.79)	229.67 (169.8, 289.54)	133.64 (88.26, 179.02)	162 (111.79, 212.22)	215.18 (157.91, 272.45)	144.44 (97.59, 191.28)	255.97 (194.08, 317.86)	284.43 (219.79, 349.07)	306.97 (240.77, 373.16)	296.24 (231.89, 360.58)	220.76 (215, 226.52)	0.746	55.67%	0.013
Miami-Dade	372.48 (370.6, 374.37)	387.65 (385.75, 389.56)	300.25 (298.6, 301.9)	395.48 (393.62, 397.34)	398.39 (396.55, 400.22)	317.84 (316.23, 319.45)	407.22 (405.44, 409.01)	439.08 (437.26, 440.91)	450.2 (448.39, 452.02)	462.74 (460.92, 464.57)	394.74 (394.56, 394.92)	0.659	43.37%	0.038
DeSoto	174.16 (59.44, 288.87)	166.7 (53.61, 279.78)	61.76 (0, 131.04)	147.98 (42.25, 253.71)	181.21 (65.26, 297.15)	118.67 (26.44, 210.91)	192.39 (76.59, 308.19)	90.99 (12.16, 169.83)	120.92 (32.38, 209.46)	154.6 (53.58, 255.61)	140.88 (130.82, 150.94)	-0.122	1.49%	0.737
Dixie	99.37 (0, 264.3)	16.64 (0, 84.54)	50.07 (0, 168.09)	133.2 (0, 325.11)	99.17 (0, 263.62)	99.01 (0, 263.04)	229.81 (0, 478.08)	212.35 (0, 449.87)	215.45 (0, 458.18)	201.78 (0, 440.16)	135.88 (116.59, 155.17)	0.833	69.31%	0.003

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean	*R*	R^2	*P*
Duval	386.82 (381.14, 392.51)	382.32 (376.67, 387.97)	264.29 (259.65, 268.94)	385.95 (380.4, 391.49)	408 (402.41, 413.59)	265.92 (261.49, 270.36)	362.62 (357.55, 367.68)	395.42 (390.23, 400.61)	371.88 (366.9, 376.85)	360.9 (356.06, 365.73)	358.6 (358.08, 359.12)	0.049	0.24%	0.893
Escambia	187.79 (176.27, 199.31)	201.01 (189.16, 212.86)	171.07 (160.18, 181.97)	215.91 (203.73, 228.08)	258.46 (245.22, 271.7)	148.96 (139.04, 158.88)	222.09 (210.12, 234.05)	260.31 (247.46, 273.16)	270.69 (257.82, 283.56)	268.04 (255.43, 280.66)	221.2 (219.99, 222.4)	0.664	44.09%	0.036
Flagler	232.56 (194.92, 270.21)	174.73 (142.26, 207.21)	169.69 (138.17, 201.22)	203.57 (169.47, 237.68)	246.59 (209.8, 283.38)	139.46 (112.5, 166.42)	158.82 (130.67, 186.96)	200.26 (169.52, 231)	196.07 (166.29, 225.85)	191.1 (162.75, 219.45)	191.02 (187.86, 194.18)	-0.176	3.11%	0.626
Franklin	201.06 (0, 556.7)	101.29 (0, 355.89)	125.53 (0, 406.48)	74.57 (0, 289.06)	145.28 (0, 436.7)	49.26 (0, 222.05)	168.03 (0, 478.65)	188.24 (0, 510.45)	135.62 (0, 398.51)	296.94 (0, 689.37)	149.97 (120.39, 179.55)	0.415	17.26%	0.232
Gadsden	599.42 (466.81, 732.04)	496.81 (384.37, 609.24)	395.03 (293.47, 496.6)	529.77 (413.15, 646.4)	539.18 (422.8, 655.56)	428.84 (326.02, 531.66)	559.6 (443.11, 676.09)	603.99 (483.05, 724.93)	600.42 (478.55, 722.29)	677.68 (547.89, 807.47)	543.07 (531.32, 554.81)	0.526	27.70%	0.118
Gilchrist	78.99 (0, 219.28)	174.13 (0, 382.67)	79.25 (0, 220.25)	126.42 (0, 303.88)	236.07 (0, 477.31)	156.08 (0, 350.77)	185.47 (0, 395.57)	226.11 (0, 452.26)	117.75 (0, 277.28)	146.43 (0, 323.38)	152.84 (133.79, 171.9)	0.352	12.38%	0.319
Glades	46.51 (0, 205.04)	117.23 (0, 370.8)	23.15 (0, 134.49)	68.82 (0, 259.01)	111.93 (0, 348.51)	66.4 (0, 246.64)	108.06 (0, 332.48)	21.07 (0, 117.77)	208.12 (0, 507.73)	105.06 (0, 320.22)	88.56 (67.74, 109.38)	0.405	16.36%	0.246
Gulf	312.44 (0, 656.53)	391.54 (5.68, 777.41)	116.66 (0, 326.43)	172.35 (0, 423.31)	281.27 (0, 594.86)	114.55 (0, 318.64)	313.02 (0, 637.76)	377.97 (29.37, 726.57)	219.5 (0, 489.9)	232.72 (0, 505.19)	253.74 (223.87, 283.6)	-0.067	0.44%	0.855
Hamilton	234.49 (0, 560.16)	191.33 (0, 484.81)	105.29 (0, 321.12)	194.55 (0, 495.48)	231.19 (0, 550.02)	224.17 (0, 528.61)	145.08 (0, 394.35)	248.24 (0, 573.37)	287 (0, 633.3)	266.45 (0, 600.12)	213.16 (182.72, 243.61)	0.503	25.33%	0.138
Hardee	173.72 (30.86, 316.59)	142.03 (12.01, 272.05)	118.68 (1.29, 236.07)	204.59 (50.89, 358.29)	74.83 (0, 167.25)	117.6 (1.8, 233.39)	137.62 (13.6, 261.65)	190.03 (44.77, 335.29)	220.84 (64.91, 376.78)	201.66 (51.24, 352.07)	158.33 (144.89, 171.77)	0.389	15.16%	0.266
Hendry	179.03 (75.07, 282.99)	230.63 (110.13, 351.13)	256.18 (128.37, 383.99)	188.98 (80.94, 297.01)	238.19 (119.89, 356.49)	181.68 (79.83, 283.53)	248.06 (129.96, 366.17)	245.66 (129.27, 362.06)	248.05 (133.43, 362.66)	231.38 (121.65, 341.11)	225 (213.59, 236.42)	0.407	16.57%	0.243
Hernando	166.34 (148.78, 183.89)	137.68 (121.7, 153.65)	88.26 (75.51, 101.01)	111.88 (97.64, 126.12)	133.7 (118.26, 149.13)	93.58 (80.84, 106.32)	159.6 (143.23, 175.97)	199.31 (181.31, 217.31)	200.28 (182.49, 218.08)	181.31 (164.73, 197.89)	148.09 (146.5, 149.69)	0.552	30.45%	0.098
Highlands	169.46 (138.44, 200.48)	162.82 (132.32, 193.32)	119.13 (93.16, 145.11)	168.27 (137.58, 198.96)	183.05 (151.36, 214.74)	150.92 (122.44, 179.4)	152.11 (123.73, 180.49)	201 (168.68, 233.32)	154.03 (125.96, 182.1)	188.16 (157.12, 219.19)	165.06 (162.07, 168.05)	0.347	12.02%	0.326
Hillsborough	260.48 (257.19, 263.77)	251.28 (248.06, 254.49)	199.54 (196.72, 202.35)	247.22 (244.15, 250.29)	262.14 (259.04, 265.23)	204.2 (201.52, 206.88)	278.8 (275.74, 281.85)	300.88 (297.77, 303.98)	334.75 (331.54, 337.95)	322.48 (319.38, 325.58)	267.96 (267.65, 268.27)	0.689	47.45%	0.028
Homes	95.26 (0, 227.97)	54.53 (0, 155.13)	40.7 (0, 127.22)	67.48 (0, 178.26)	80.96 (0, 202.27)	0 (0, 0)	107.51 (0, 246.71)	93.85 (0, 223.6)	39.42 (0, 121.89)	79.43 (0, 197.31)	65.96 (55.03, 76.88)	0.032	0.10%	0.930
Indian River	144.68 (124.24, 165.13)	176.13 (153.69, 198.56)	100.66 (83.85, 117.48)	135.03 (115.68, 154.37)	144.28 (124.62, 163.95)	110.51 (93.69, 127.33)	166.71 (146.62, 186.79)	198.05 (176.65, 219.44)	162.6 (143.61, 181.6)	188.9 (168.97, 208.84)	153.71 (151.74, 155.69)	0.490	24.02%	0.150

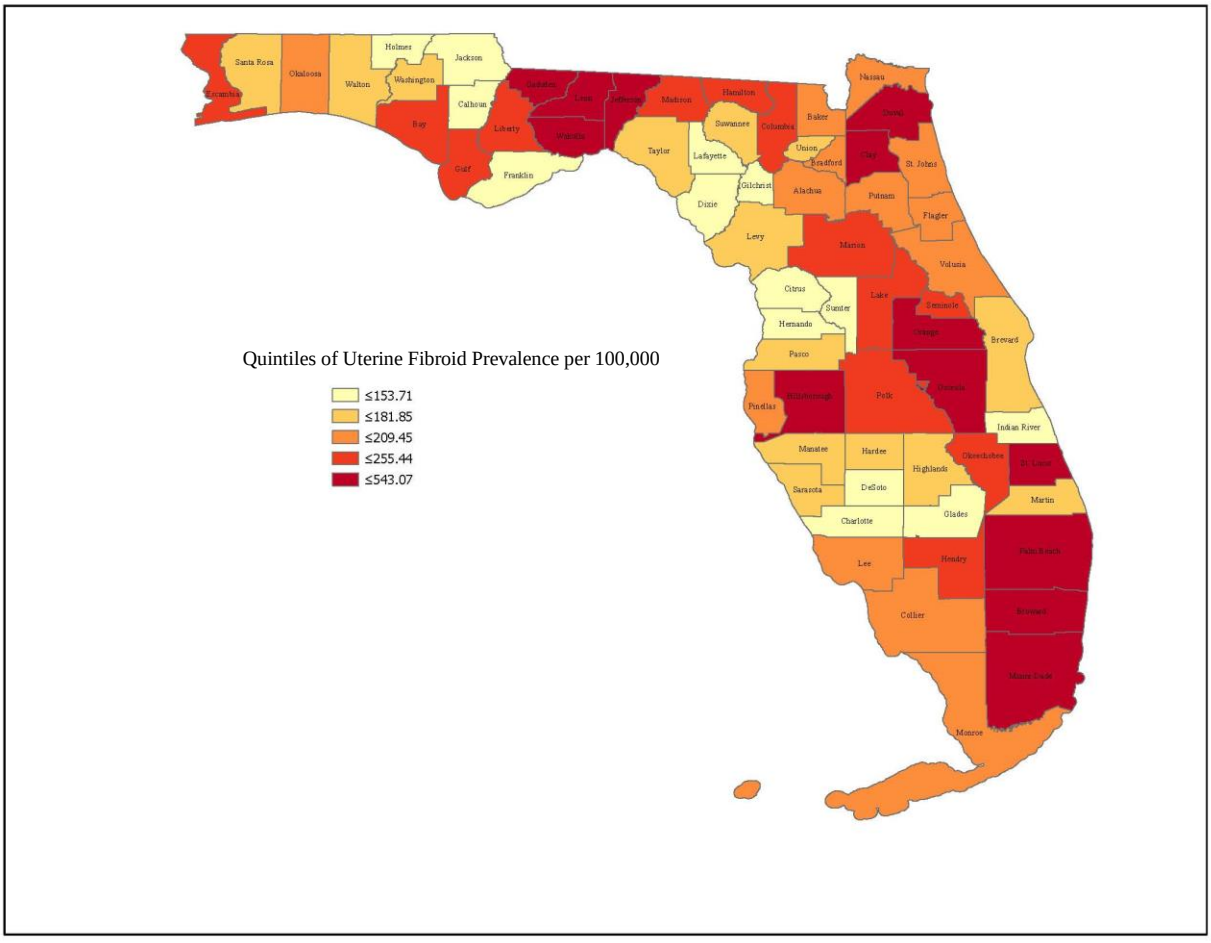
County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean	*R*	R^2	*P*
Jackson	163.55 (91.54, 235.55)	106.72 (48.76, 164.68)	89.2 (36.59, 141.8)	123.17 (61.11, 185.23)	94.07 (40.45, 147.7)	82.85 (32.62, 133.08)	116 (56.58, 175.43)	99.26 (44.37, 154.14)	135.33 (72.44, 198.21)	143.65 (77.53, 209.78)	115.35 (109.4, 121.3)	0.027	0.07%	0.940
Jefferson	209.94 (0, 462.89)	405.93 (51.78, 760.08)	176.62 (0, 410.92)	415.44 (64.09, 766.79)	417.9 (63.43, 772.37)	227.55 (0, 490.99)	351.06 (23.33, 678.79)	451.23 (84.24, 818.23)	344.83 (25.77, 663.89)	563.91 (160.41, 967.41)	357.22 (324.4, 390.03)	0.567	32.17%	0.087
Lafayette	117.46 (0, 541.32)	159.81 (0, 664.06)	79.05 (0, 430.2)	155.88 (0, 641.7)	77.13 (0, 415.57)	193.57 (0, 731.17)	76.05 (0, 407.37)	151.4 (0, 616.42)	113.25 (0, 514.53)	249.82 (0, 812.5)	138.19 (93.13, 183.24)	0.359	12.91%	0.308
Lake	227.73 (215.53, 239.94)	222.36 (210.33, 234.39)	176.97 (166.33, 187.6)	206.83 (195.55, 218.12)	287.23 (274.25, 300.2)	182.65 (172.55, 192.75)	262.42 (250.61, 274.23)	239.38 (228.38, 250.38)	238.25 (227.58, 248.91)	251.08 (240.58, 261.58)	230.34 (229.2, 231.47)	0.372	13.86%	0.289
Lee	188.09 (182.76, 193.42)	173.93 (168.86, 178.99)	151.4 (146.78, 156.03)	189.63 (184.52, 194.74)	210.57 (205.3, 215.85)	150.07 (145.71, 154.43)	190.07 (185.29, 194.86)	217.86 (212.88, 222.84)	219.6 (214.75, 224.45)	213.44 (208.76, 218.11)	191.43 (190.94, 191.92)	0.585	34.21%	0.076
Leon	339.3 (323.72, 354.87)	316.21 (301.23, 331.2)	232.61 (219.84, 245.39)	358.71 (343, 374.42)	379.87 (363.9, 395.83)	250.85 (238.02, 263.67)	364.29 (349.06, 379.51)	380.98 (365.64, 396.32)	386.47 (370.93, 402.01)	420.92 (404.54, 437.3)	343.77 (342.26, 345.28)	0.564	31.75%	0.090
Levy	138.6 (67.75, 209.44)	127.34 (59, 195.68)	103.31 (41.61, 165.01)	103.2 (41.59, 164.8)	197.65 (113.61, 281.69)	131.88 (63.13, 200.63)	167.12 (90.09, 244.16)	159.78 (85.1, 234.47)	236.75 (148.11, 325.39)	187.41 (109.81, 265.02)	155.98 (148.56, 163.4)	0.688	47.40%	0.028
Liberty	280.79 (0, 951.05)	403.39 (0, 1210.31)	119.43 (0, 553.95)	121.26 (0, 565.82)	394.63 (0, 1175.49)	158.35 (0, 655.74)	233.19 (0, 825.3)	190.04 (0, 713.01)	300.64 (0, 950.27)	182.42 (0, 674.26)	238.06 (177.99, 298.13)	-0.204	4.14%	0.573
Madison	154.19 (0, 327.98)	251.75 (30.4, 473.1)	111.79 (0, 259.38)	233.29 (24.18, 442.41)	220.93 (16.14, 425.72)	152.25 (0, 322.77)	342.79 (89.8, 595.79)	245.03 (32.47, 457.6)	231.39 (24.82, 437.95)	228.4 (25.82, 430.99)	217.56 (197.3, 237.83)	0.412	16.96%	0.237
Manatee	169.81 (160.16, 179.45)	138.92 (130.26, 147.57)	108.38 (100.86, 115.89)	164.59 (155.46, 173.71)	156.59 (147.89, 165.28)	105.8 (98.88, 112.73)	190.71 (181.64, 199.77)	201.5 (192.4, 210.59)	176.74 (168.57, 184.92)	209.7 (200.99, 218.41)	163.74 (162.87, 164.6)	0.572	32.77%	0.084
Marion	215.93 (205.55, 226.31)	212.93 (202.63, 223.23)	178.16 (168.82, 187.51)	222.49 (212.11, 232.87)	254.98 (243.97, 265.99)	216.23 (206.22, 226.24)	301.14 (289.51, 312.77)	253.75 (243.22, 264.28)	244.01 (233.79, 254.23)	220.96 (211.38, 230.54)	232.48 (231.44, 233.51)	0.463	21.48%	0.177
Martin	159.52 (138.99, 180.04)	128.55 (110.13, 146.98)	142.2 (122.96, 161.44)	166.75 (146.08, 187.42)	165.91 (145.4, 186.43)	127.52 (109.76, 145.27)	167.14 (146.98, 187.3)	205.41 (183.32, 227.5)	181.51 (161.17, 201.85)	172.41 (152.92, 191.89)	162.07 (160.07, 164.07)	0.588	34.53%	0.074
Monroe	201.78 (152.46, 251.1)	254.69 (199.15, 310.23)	218.65 (167.44, 269.86)	229 (177.39, 280.6)	216.68 (166.95, 266.41)	113.86 (78.17, 149.56)	160.8 (119.26, 202.35)	151.97 (112.17, 191.77)	232.17 (183.15, 281.19)	168.21 (124.65, 211.77)	194.27 (189.59, 198.95)	-0.458	20.98%	0.183
Nassau	258.86 (204.2, 313.51)	248.11 (194.7, 301.51)	154.8 (112.99, 196.6)	204.88 (157.68, 252.09)	224.97 (176.18, 273.76)	130.81 (94.37, 167.26)	187.52 (144.8, 230.23)	235.45 (188.64, 282.26)	216.83 (173.78, 259.88)	222.8 (180.26, 265.34)	208.51 (203.93, 213.09)	-0.130	1.69%	0.721
Okaloosa	166.22 (147.93, 184.5)	220.69 (199.86, 241.53)	160.12 (142.83, 177.41)	212.33 (192.28, 232.38)	202.92 (183.56, 222.28)	117.46 (102.85, 132.08)	165.15 (147.92, 182.38)	207.66 (188.52, 226.81)	282.72 (260.78, 304.67)	298.32 (276.08, 320.56)	204.19 (202.25, 206.12)	0.539	29.09%	0.108
Okeechobee	263.03 (148.04, 378.02)	214.5 (110.01, 318.99)	128.63 (47.69, 209.57)	212.13 (109.36, 314.91)	296.05 (175.12, 416.97)	146.45 (62.18, 230.73)	284.65 (170.63, 398.67)	229.61 (127.51, 331.7)	292.42 (179.1, 405.73)	266.28 (157.94, 374.61)	234.16 (223.58, 244.73)	0.357	12.73%	0.312

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean	*R*	R^2	*P*
Orange	328.5 (324.49, 332.51)	343.83 (339.77, 347.9)	266.46 (262.96, 269.96)	362.7 (358.72, 366.67)	348.88 (345.06, 352.69)	248.85 (245.7, 252)	360.89 (357.2, 364.58)	365.84 (362.21, 369.47)	357.78 (354.34, 361.22)	326.98 (323.74, 330.22)	331.71 (331.35, 332.08)	0.212	4.49%	0.557
Osceola	314.31 (297.22, 331.4)	332.56 (315.29, 349.83)	259.58 (244.74, 274.43)	336.1 (319.68, 352.52)	349.68 (333.43, 365.93)	266.08 (252.55, 279.6)	372.08 (356.83, 387.32)	414.97 (399.53, 430.42)	355.84 (342.38, 369.29)	369.02 (355.65, 382.4)	339.91 (338.39, 341.44)	0.561	31.50%	0.091
Palm Beach	277.08 (274.06, 280.09)	279.26 (276.25, 282.28)	195.14 (192.65, 197.64)	290.43 (287.42, 293.44)	336.24 (333.05, 339.44)	244.6 (241.91, 247.29)	295.88 (292.95, 298.8)	357.89 (354.72, 361.06)	361.99 (358.86, 365.11)	382.36 (379.19, 385.53)	303.59 (303.29, 303.89)	0.715	51.18%	0.020
Pasco	173.47 (166.6, 180.34)	153.22 (146.78, 159.66)	107.82 (102.47, 113.17)	164.16 (157.64, 170.68)	155.2 (148.95, 161.44)	121.86 (116.42, 127.29)	156.53 (150.48, 162.58)	185.5 (179.04, 191.97)	200.9 (194.32, 207.47)	232.34 (225.38, 239.29)	166.19 (165.56, 166.83)	0.607	36.87%	0.063
Pinellas	212.48 (208.82, 216.14)	207.87 (204.25, 211.48)	136.71 (133.79, 139.63)	184.58 (181.22, 187.94)	198.29 (194.85, 201.74)	135.28 (132.48, 138.09)	203.17 (199.77, 206.57)	221.59 (218.07, 225.11)	229.95 (226.4, 233.5)	212.07 (208.71, 215.43)	194.54 (194.2, 194.87)	0.315	9.94%	0.375
Polk	240.47 (233.98, 246.96)	252.27 (245.64, 258.89)	175.18 (169.71, 180.65)	249.79 (243.36, 256.21)	269.44 (262.88, 276)	230.17 (224.21, 236.12)	265.02 (258.78, 271.25)	294.33 (287.91, 300.75)	283.51 (277.38, 289.64)	282.47 (276.43, 288.52)	255.44 (254.82, 256.07)	0.639	40.90%	0.046
Putnam	194.59 (147.06, 242.11)	202.46 (153.73, 251.18)	169.51 (124.55, 214.47)	197.16 (148.69, 245.64)	251.63 (197.09, 306.17)	136.9 (96.91, 176.89)	293.19 (234.98, 351.39)	203.94 (155.5, 252.39)	206.81 (158.16, 255.47)	224.73 (173.8, 275.67)	208.15 (203.22, 213.08)	0.279	7.78%	0.435
St. Johns	221.87 (202.47, 241.27)	207.1 (188.63, 225.58)	119.45 (105.72, 133.18)	193.44 (176.55, 210.32)	224.28 (206.64, 241.92)	121.34 (108.74, 133.93)	154.14 (140.39, 167.89)	233.7 (217.35, 250.05)	190.86 (176.79, 204.93)	197.11 (183.3, 210.92)	186.55 (184.99, 188.12)	0.006	0.00%	0.986
St. Lucie	256.8 (242.55, 271.06)	272.71 (258.08, 287.34)	230.24 (216.94, 243.55)	333.28 (317.4, 349.15)	352.73 (336.63, 368.83)	308.1 (293.37, 322.83)	433.42 (416.34, 450.51)	413.39 (397.07, 429.7)	376.44 (361.12, 391.76)	365.84 (351.03, 380.64)	336.55 (335.01, 338.08)	0.787	62.01%	0.007
Santa Rosa	212.02 (186.77, 237.27)	212.64 (187.69, 237.6)	147.12 (126.4, 167.84)	179.88 (157.37, 202.39)	171.66 (150.07, 193.25)	91.88 (76.44, 107.32)	127.4 (109.67, 145.13)	151.59 (132.76, 170.41)	197.98 (177.08, 218.88)	230.48 (208.52, 252.43)	172.49 (170.38, 174.6)	-0.064	0.41%	0.860
Sarasota	192.9 (184.72, 201.08)	185.51 (177.53, 193.49)	106.64 (100.62, 112.65)	192.84 (184.82, 200.87)	190.78 (182.86, 198.7)	87.57 (82.29, 92.85)	173.57 (166.3, 180.83)	175.34 (168.16, 182.51)	163.39 (156.62, 170.16)	165.56 (158.93, 172.18)	163.35 (162.63, 164.06)	-0.109	1.19%	0.765
Seminole	240.48 (231.41, 249.55)	226.94 (218.17, 235.71)	171.11 (163.61, 178.61)	245.31 (236.45, 254.16)	266.38 (257.33, 275.43)	179.2 (171.9, 186.51)	277.57 (268.65, 286.49)	250.37 (242.03, 258.71)	303.94 (294.86, 313.02)	268.51 (260.15, 276.86)	243.95 (243.09, 244.8)	0.526	27.72%	0.118
Sumter	92.43 (69.07, 115.79)	124.69 (98.45, 150.93)	75.95 (56.5, 95.4)	113.04 (90.81, 135.27)	115.93 (94.8, 137.06)	97.58 (79.06, 116.1)	107.03 (88.29, 125.78)	69.4 (54.96, 83.84)	109.3 (91.46, 127.13)	98.39 (82.14, 114.64)	100.07 (98.12, 102.02)	-0.129	1.67%	0.722
Suwannee	172.23 (91.65, 252.82)	187.14 (104.71, 269.57)	170.64 (91.17, 250.11)	140.65 (68.23, 213.07)	115.13 (50.19, 180.07)	163.52 (86.2, 240.83)	205.21 (118.93, 291.5)	196.41 (113.16, 279.65)	169.12 (93.41, 244.82)	207.03 (124.45, 289.6)	172.97 (165.08, 180.85)	0.356	12.66%	0.313
Taylor	204.58 (22.07, 387.08)	204.5 (22.1, 386.9)	137.67 (0, 284.32)	166.2 (1.66, 330.74)	191.77 (15.07, 368.47)	115.12 (0, 252.2)	206.72 (21.34, 392.09)	271.21 (59.1, 483.33)	139.21 (0, 288.31)	136.05 (0, 280.13)	176.92 (160.02, 193.82)	-0.140	1.97%	0.699
Union	98.4 (0, 342.19)	199.1 (0, 549.59)	74.53 (0, 288.87)	126.07 (0, 408.83)	149.29 (0, 452.85)	147.89 (0, 447.21)	325.57 (0, 775.98)	352.38 (0, 823.2)	174 (0, 501.32)	168.19 (0, 479.26)	181.14 (147.8, 214.47)	0.493	24.33%	0.147

County	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean	*R*	R^2	*P*
Volusia	241 (233.53, 248.46)	208.43 (201.5, 215.37)	128.42 (123.02, 133.82)	174.43 (168.2, 180.66)	224.55 (217.57, 231.53)	155.42 (149.69, 161.14)	199.14 (192.75, 205.53)	201.26 (194.93, 207.59)	219.61 (213.09, 226.14)	209.63 (203.33, 215.92)	196.39 (195.74, 197.03)	0.089	0.79%	0.807
Wakulla	246.1 (97.98, 394.22)	293.56 (131.79, 455.33)	151.09 (35.19, 266.98)	268.72 (117.23, 420.21)	303.39 (143.74, 463.04)	220.69 (84.39, 356.99)	271.17 (122.73, 419.62)	346.17 (181.6, 510.75)	259.11 (120.44, 397.78)	450.26 (270.8, 629.72)	282.89 (267.63, 298.15)	0.581	33.71%	0.078
Walton	196.39 (130.99, 261.79)	152.08 (95.33, 208.83)	98.58 (54.13, 143.03)	197.92 (136.16, 259.67)	118.58 (72.52, 164.64)	79.18 (42.13, 116.24)	167.7 (116.08, 219.32)	161.84 (112.9, 210.79)	216.96 (161.98, 271.94)	186.98 (137.9, 236.05)	158.73 (153.52, 163.95)	0.223	4.97%	0.536
Washington	182.94 (28.58, 337.31)	149.05 (9.28, 288.81)	112.37 (0, 231.36)	114.05 (0, 235.71)	146.68 (10.23, 283.12)	56.5 (0, 141.4)	158.07 (16.34, 299.79)	157.06 (16.69, 297.43)	132.57 (5.54, 259.59)	325.49 (130.38, 520.59)	154.13 (140.18, 168.07)	0.378	14.26%	0.282
Total	279.71 (277.8, 281.61)	278.68 (276.78, 280.58)	207.5 (205.87, 209.13)	283.07 (281.18, 284.96)	302.13 (300.19, 304.06)	219.29 (217.66, 220.93)	296.27 (294.38, 298.15)	321.45 (319.51, 323.39)	325.1 (323.17, 327.04)	324.05 (322.13, 325.97)	284.8 (284.21, 285.39)	0.557	31.05%	0.094

Figure 5 depicts a choropleth map of the prevalence rate quintiles distribution by county for each year and Figure 5 summarized the decade-long prevalence distribution. Light yellow represents low prevalence and dark red represents high prevalence. Prevalence rates are highest among counties which contain metropolitan cities such as Miami, Orlando, and Jacksonville and lower in counties that do not contain such.

Figure 5: *Prevalence rate (per 100,000 females ≥18 years old) of uterine fibroids in quintiles by county. Florida, 2010-2019.*



Prevalence Rate Ratios by Race and Ethnicity. Prevalence rate ratios by race and ethnicity were compared to non-Hispanic white women as the reference group. Throughout the decade, non-Hispanic black women had a prevalence rate 4.84 times that of non-Hispanic white women. Hispanic women followed with a 1.87-time prevalence rate, and non-Hispanic other with 1.58.

Table 4: *Prevalence rate ratios of uterine leiomyomas reported by race and ethnicity, with non-Hispanic (NH) White women as the reference group. Florida, 2010-2019.*

Race/Ethnicity	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Decade
NH White	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hispanic	1.51	1.73	1.86	1.79	1.74	2.15	1.96	1.93	1.90	2.03	1.87
NH Black	4.26	4.58	5.03	4.77	4.63	6.01	5.07	4.79	4.80	4.85	4.84
NH Other	1.26	1.44	1.54	1.51	1.64	1.85	1.67	1.58	1.60	1.67	1.58

Proportion of Cases with Comorbidities of Interest. As displayed in Table 5, the prevalence rate per 100 women with uterine leiomyoma and diabetes was 4.98%, followed by 0.31% for polycystic ovarian syndrome (PCOS). The prevalence rate for diabetes and PCOS in the general population of Floridian women was 11.00% and 1.59%. From the data presented below, there is a lower prevalence of women with uterine leiomyoma and with diabetes or PCOS.

Table 5: *Prevalence of diabetes and polycystic ovary syndrome (PCOS) per 100 women among women with uterine leiomyoma and in the general population.*

		Prevalence Estimate (per 100 women)	
Comorbidity	**Cases**	**Among women with leiomyomas**	**Among women in the general population**
Diabetes	11575	4.979	11.00[a]
PCOS	728	0.313	1.59[b]

[a]Data from Reference 11.
[b]Data from Reference 12.

CHAPTER 5
Discussion

This study identified the demographic characteristics, such as age, race, ethnicity, county, and diagnosis of uterine leiomyoma in Florida from 2010 to 2019 and calculated the prevalence of such disease county by county and total throughout the decade. The demographic characteristics and prevalence rates of uterine leiomyoma within Florida had not been previously studied.

This study found the average age of cases to be women 44.3 years old, and women in their forties to have the highest frequency than other ages. Similar studies suggest premenopausal women in their forties were more likely to develop uterine leiomyoma than those younger.[2] The group with the lowest frequency of uterine leiomyoma were postmenopausal women, in accordance with findings from similar studies.

In terms of race and ethnicity, white women had over 100,000 cases whereas black women had over 90,000. However, comparing prevalence rate ratios, the prevalence rate among non-Hispanic black women was almost 5 times higher compared to non-Hispanic white women. Hispanic and non-Hispanic other women also presented with higher prevalence rate ratios, at 1.87 and 1.58, respectively. Findings from Stewart et al and Eltoukhi et al., which found the incidence of uterine leiomyoma in black women to be three times greater than white women, agree with the results of this study in that black women are disproportionately affected by uterine leiomyoma than white and Hispanic women.

Results indicate the most common diagnosis was leiomyoma of uterus, unspecified. It remains unclear as to why this is, however, hospital billing procedures may hold the answer. A study by Wise et al. found women with leiomyomas often present with other associated

conditions, such as PCOS and type two diabetes.[7] In addition, Wise's study found that women with PCOS have a 65% higher incidence of uterine leiomyoma than women without PCOS.[3]

Although results from this study showed some women with leiomyomas also have PCOS or diabetes, findings were not consistent with that of Wise's study. The prevalence rates of diabetes or PCOS among women with uterine leiomyomas were not higher than the prevalence rates reported for the general female population. We could hypothesize this unusual finding could be due to lack of data capture by physicians and coders in addition to ER datasets only focusing on the chief complaint and not on comorbidities.

Throughout the entire decade for all the counties in Florida, there is a positive, direct trend of uterine leiomyoma prevalence rates over time. The passage of time explains 31.05% of the variance in the prevalence rate and this trend was not statistically significant.

In terms of geographic distribution, clusters of dark red in the choropleth occurred predominantly for counties with metropolitan cities—such as Miami, Orlando, Tallahassee, and Jacksonville. This could be due to improved availability of healthcare resources, providing improved detection and diagnosis of uterine leiomyoma. Future research should closely examine the relationship of healthcare providers and diagnoses of uterine leiomyoma to better understand this relationship.

Limitations and Strengths

This study has limitations worth mentioning. The lack of a unique identifier did not allow to identify repeated cases. As in, the same woman has returned to the hospital for the same complaint. This mean there was a possible prevalence overestimation. On the other hand, the results of this study could be underreported, since the database used only included cases reported by healthcare facilities to the Florida AHCA.

Limitations aside, this study has noteworthy strengths. This study had over a quarter-of-a-million cases throughout the last decade. The large sample size increased precision and power, therefore decreasing the probability of a type I error. In addition, the database was from a credible, trustworthy agency and cases in the database were certified.

Future Directions

The findings of this study provide a better understanding of the distribution of uterine leiomyomas in Florida. Such results provide vital information for developing future strategies to improve detection and diagnosis of the disease. Future research is also needed to examine the impact of geographic access to obstetrics/gynecology services and how it may be resulting in current missed diagnoses of uterine leiomyomas in rural populations in Florida.

CHAPTER 6
Conclusion

Non-Hispanic, white, and women in their forties had the highest frequency of uterine leiomyomas. Women of color had higher prevalence rate ratios than non-Hispanic, white women. Black women had the highest prevalence ratio followed by Hispanic and non-Hispanic other women. Urban counties had significantly higher prevalence of uterine leiomyomas than rural counties**.** There are important disparities by age, race, ethnicity, and geographic location that points to unmet needs of leiomyoma care among these groups.

REFERENCES

1. Stewart EA, Laughlin-Tommaso SK, Catherino WH, Lalitkumar S, Gupta D, Vollenhoven B. Uterine fibroids. *Nat Rev Dis Primers*. 2016;2:16043. Published 2016 Jun 23. doi:10.1038/nrdp.2016.43
2. Stewart EA, Cookson CL, Gandolfo RA, Schulze-Rath R. Epidemiology of uterine fibroids: a systematic review. *BJOG*. 2017;124(10):1501-1512. doi:10.1111/1471-0528.14640
3. Wise LA, Palmer JR, Stewart EA, Rosenberg L. Polycystic ovary syndrome and risk of uterine leiomyomata. *Fertil Steril*. 2007;87(5):1108-1115. doi:10.1016/j.fertnstert.2006.11.012
4. United States Census Bureau. American Community Survey 1-Year Data (2005-2020). 2021. http://www.census.gov/data/developers/data-sets/acs-1year.html. Accessed January 15, 2022
5. Al-Hendy A, Myers ER, Stewart E. Uterine Fibroids: Burden and Unmet Medical Need. *Semin Reprod Med*. 2017;35(6):473-480. doi:10.1055/s-0037-1607264
6. Cardozo ER, Clark AD, Banks NK, Henne MB, Stegmann BJ, Segars JH. The estimated annual cost of uterine leiomyomata in the United States. *Am J Obstet Gynecol*. 2012;206(3):211.e1-211.e2119. doi:10.1016/j.ajog.2011.12.002
7. Choi EJ, Cho SB, Lee SR, et al. Comorbidity of gynecological and non-gynecological diseases with adenomyosis and endometriosis. *Obstet Gynecol Sci*. 2017;60(6):579-586. doi:10.5468/ogs.2017.60.6.579
8. Eduardo Faerstein, Moyses Szklo, Neil B. Rosenshein, Risk Factors for Uterine Leiomyoma: A Practice-based Case-Control Study. II. Atherogenic Risk Factors and Potential Sources of Uterine Irritation, *American Journal of Epidemiology*, Volume 153, Issue 1, 1 January 2001, Pages 11–19, https://doi.org/10.1093/aje/153.1.11

9. Bornfeldt KE, Arnqvist HJ, Capron L. In vivo proliferation of rat vascular smooth muscle in relation to diabetes mellitus, insulin-like growth factor I and insulin. *Diabetologia* 1992;35:104–8.
10. Eltoukhi HM, Modi MN, Weston M, Armstrong AY, Stewart EA. The health disparities of uterine fibroid tumors for African American women: a public health issue. *Am J Obstet Gynecol*. 2014;210(3):194-199. doi:10.1016/j.ajog.2013.08.008
11. Segars JH, Akopians AL. The two health disparities of uterine fibroids. *Fertil Steril*. 2013;99(7):1851-1852. doi:10.1016/j.fertnstert.2013.03.002
12. Wang C, Kuban JD, Lee SR, et al. Utilization of Endovascular and Surgical Treatments for Symptomatic Uterine Leiomyomas: A Population Health Perspective. *J Vasc Interv Radiol*. 2020;31(10):1552-1559.e1. doi:10.1016/j.jvir.2020.04.039
13. Florida Diabetes Advisory Council. 2019 Florida Diabetes Report. January 10, 2019. https://www.floridahealth.gov/diseases-and-conditions/diabetes/Diabetes-Resources/_documents/2019-dac-report.pdf. Accessed January 15, 2022
14. Okoroh EM, Hooper WC, Atrash HK, Yusuf HR, Boulet SL. Prevalence of polycystic ovary syndrome among the privately insured, United States, 2003-2008. *Am J Obstet Gynecol*. 2012;207(4):299.e1-299.e2997. doi:10.1016/j.ajog.2012.07.023