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The Estimated Annual Cost of Uterine Leiomyomata in the United States

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Abstract

Objective—To estimate the total annual societal cost of uterine fibroids in the United States, based on direct and indirect costs, including associated obstetric complications.

Study Design—A systematic review of the literature was conducted to estimate the number of women seeking treatment for symptomatic fibroids annually, the costs of medical and surgical treatment, work lost and obstetric complications attributable to fibroids. Total annual costs were converted to 2010 U.S. dollars. A sensitivity analysis was performed.

Results—The estimated annual direct costs (surgery, hospital admissions, outpatient visits, medications) were $4.1 to $9.4 billion. Estimated lost work costs ranged from $1.55 to $17.2 billion annually. Obstetric outcomes attributed to fibroids resulted in a cost of $238 million to $7.76 billion annually. Uterine fibroids were estimated to cost the US $5.9 to $34.4 billion annually.

Conclusions—Obstetric complications associated with fibroids contributed significantly to their economic burden. Lost work costs may account for the largest proportion of societal costs due to fibroids.

Keywords

Cost of fibroids; Fibroids; Obstetric costs of fibroids; Uterine leiomyomata

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Introduction

Uterine fibroids are a prevalent condition in the United States, with a cumulative incidence by age 50 of nearly 70% in white women and greater than 80% in black women.[1] As approximately 200,000 hysterectomies and 30,000 myomectomies are performed annually for leiomyomata,[2, 3] surgical costs alone contribute significantly to the total annual costs of this disease. Patients who do not undergo surgery often require medical management, hospitalization and additional outpatient physician visits, which further increase the annual costs.[4–7] Recent studies have explored the societal costs of uterine fibroids, including both direct costs (costs of surgery, hospital admissions, outpatient visits, medications) and indirect costs (costs of lost work due to absenteeism and short term disability).

Mauskopf et al.[7] estimated the economic impact of uterine fibroids; however this report was limited to costs of medical and surgical management of fibroids and did not include indirect costs. Flynn et al.[4] used national databases to estimate the annual direct cost of uterine fibroids (including office visits, hospital and outpatient procedures) in the United States to be $2,151,484,847 in the year 2000 ($3,208,974,247 in 2010 dollars). However, Flynn et al.[4] also did not include indirect costs that may have contributed to a greater annual economic burden.

Although medical and surgical expenses are clear contributors to the cost of uterine leiomyomata, the financial impact of fibroids extends beyond direct costs of treatment. More recent studies have examined the impact of both direct and indirect costs of uterine fibroids.[5, 6, 8] Absenteeism and disability contribute to the costs of leiomyomata, ranging from an average annual expense of $4,499,[6] to as high as $30,075[8] (2010 dollars) in women who undergo hysterectomy for fibroids, and up to $14,282[8] (2010 dollars) for women who manage their fibroids non-surgically. While these reports[5, 6, 8] estimated the annual cost of fibroids in terms of medical and occupational costs, they did not include the cost of obstetric complications related to fibroids when calculating the annual economic burden of fibroids.

Uterine leiomyomata significantly impact fertility and pregnancy. It is known that women with fibroids have lower pregnancy and live birth rates following assisted reproductive technologies (ART),[9] and those women who do conceive (naturally or through ART) are at higher risk for several obstetric complications,[10] including preterm delivery, spontaneous abortion, cesarean delivery, placenta previa, postpartum hemorrhage, and malpresentation.[11–18] Obstetric complications due to fibroids may result in substantial costs. The purpose of our report was to estimate the total annual direct and indirect costs of leiomyomata, including costs of leiomyomata-associated obstetric morbidity.

Materials and Methods

A systematic literature review was performed in August 2011. We did not obtain Institutional Review Board approval as all values used in this evaluation were collected from publicly accessible data or previously published results and no patient-specific data were collected or analyzed. Pubmed was thoroughly searched using key words “fibroid, leiomyoma, cost, economic, obstetric, pregnancy, preterm, miscarriage and hysterectomy.” Only those studies pertaining to women ages 25 to 54 in the United States were included. Relevance was evaluated from the titles and abstracts, and bibliographies of relevant publications were cross-referenced for additional pertinent citations. We also used data from the government (Centers for Disease Control, Bureau of Labor Statistics, US Census Bureau) and private sources (March of Dimes, Healthcare Cost and Utilization Project) to obtain specific values essential to our calculations.

The population included women ages 25–54 in the United States. The perspective of this analysis was an estimate of the total annual societal cost of uterine fibroids in the U.S. We calculated the total number of women seeking treatment for symptomatic fibroids each year by multiplying the total number of women aged 25 to 54 in the United States (63,930,821) based on 2010 census data[19] by 0.92%, the annual incidence of a new diagnosis of fibroids in the United States,[20] for a total of 588,164 women. We used the annual incidence of new diagnosis of fibroids (0.92%)[20] in the United States to calculate a conservative estimate of the number of women per year seeking treatment for symptomatic fibroids because studies have shown that 94% of women with a new diagnosis of fibroids have at least one procedure (diagnostic or surgical) in the year following their diagnosis.[5] Furthermore, Carls et al.[8] found that in patients treated non-surgically, the year following diagnosis was the peak period for medical treatment, and thus the most relevant time to measure treatment costs. The number of women per year seeking treatment for symptomatic fibroids was determined to be the most appropriate estimate since our goal was to calculate annual cost. Including women with asymptomatic fibroids, or an estimate of the prevalence of fibroids, would have led to an over-estimation of cost. In contrast, prevalence of fibroids in pregnancy (0.37%[21] to 10.7%[22]) and the number of pregnant women was used to estimate the cost of obstetric outcomes attributable to fibroids, as treatment costs in this instance are not necessarily dependent on fibroids being symptomatic and pregnancy is a transient, time-limited physiologic state (see below).

We used these estimates to calculate the annual direct and indirect (including obstetric) cost of leiomyomata. Unless otherwise specified, all costs have been adjusted to 2010 dollars (rounded to the nearest dollar) to remove the impact of inflation specific to medical costs and make all of our dollar values comparable. We used the Consumer Price Index (CPI) table for U.S. Medical Care for All Urban Consumers[23] as our inflation adjustment factor with the formula:

$$\$_{2010} = \$_t * (\mathrm{CPIm}_{2010} / \mathrm{CPIm}_t)$$

t = initial year (The year in which each study assigned a dollar value to its estimated cost).

CPIm = Consumer Price Index for medical care (A measure of the average change over time in the prices paid by consumers for medical care).

Direct Costs

We estimated direct costs of leiomyomata, including surgery, hospitalization, outpatient encounters, and prescription medications, by multiplying the number of women seeking each treatment for fibroids annually by a range of published estimates of direct costs.[5–8] Hysterectomy is the most commonly performed surgery for management of leiomyoma (21%[5] to 52.9%[8]) followed by myomectomy (1%[24] to 5.93%[25]), uterine artery embolization (0.2%[24] to 1.77%[25]), and endometrial ablation (0.16%[5] to 2.43%[25]). Therefore, we calculated that between 36.97% and 77.64% of women managed their symptoms without surgery. We estimated the number of women who underwent each surgical therapy by multiplying the total number of women annually seeking treatment for symptomatic fibroids by the percentage of women with fibroids who undergo each surgical modality. We estimated the total cost of surgical management by multiplying the number of women undergoing each type of therapy by the cost of each surgical therapy. Reimbursement rates for myomectomy were highest ($6,805 to $14,850 per case),[7] followed by hysterectomy ($6,287[7] to $11,538[8] per case). We calculated the costs of medical management in a similar

fashion using costs for hospitalization, outpatient treatment, and pharmacologic treatment from previously published reports.[5, 6]

Estimates for lost work

We estimated the total annual cost of lost work by multiplying our estimate of the total number of women seeking treatment annually for symptomatic fibroids by a range of published annual cost estimates of lost work attributable to fibroids ($4,449[6] to $30,075[8] per patient). As the cost of lost work was affected by treatment modality, we multiplied the number of women seeking treatment for symptomatic fibroids by the percentage of women who underwent each surgical therapy. We estimated the percentage of women with symptomatic fibroids who did not have surgery by subtracting the total percentage of women who received different surgical procedures from the total number of women seeking treatment for symptomatic leiomyomata (36.97% to 77.64%). The number of women receiving each treatment (surgical or medical) was then multiplied by the respective lost work costs for each category of treatment to reach a total annual cost from lost work.

Pregnancy Complications

To calculate the estimated annual cost of obstetric complications related to uterine fibroids, we used rates of obstetric complications and current cost estimates. The most current National Vital Statistics Report included birth data through 2009,[26] but pregnancy data only through 2005,[27] thus we calculated the contribution of leiomyomata to pregnancy losses and timing/route of delivery using the most current data available.

We first calculated the number of spontaneous abortions, preterm deliveries, and cesarean deliveries annually in the United States. To estimate the number of spontaneous abortions per year, we multiplied the most currently available estimate of annual pregnancies (6,408,000)[27] by a prevalence of 15%.[28] As not all spontaneous abortions require surgical management, the estimated number of annual cases of spontaneous abortions (961,200) was multiplied by the percentage of cases expected to subsequently undergo dilation and curettage (19.9%.).[28] Likewise, we multiplied the number of births in the United States in 2009 (4,131,019)[26] by the prevalence of preterm delivery (12.18%)[26] and cesarean delivery (32.9%)[26] to determine yearly estimates of these outcomes.

The proportion of each complication attributed to uterine fibroids was then calculated based on the method reported by Adams et al.[29]

$$\text{Proportion Attributable} = \frac{p(OR - 1)}{p(OR - 1) + 1}$$

p = prevalence of fibroids in pregnancy.

For each obstetric outcome, previously published odds ratios (OR) were used[13] and two calculations were performed based on low and high probabilities published for the prevalence of fibroids in pregnancy ranging from 0.37%[21] to 10.7%.[22] This was used to determine the number of cases of each outcome annually attributed to fibroids. Previously published cost estimates were converted to 2010 dollars and used to determine the range of costs for each case of dilation and curettage ($2,335[30] to $9,157[29]), lifetime expense of a preterm infant ($57,458),[31] and cesarean delivery ($13,745[32] to $20,298[33]). Since the previously published costs for care of a preterm infant [$51,589 (2005 dollars)][31] included maternal delivery cost [$3,812 (2005 dollars)], the maternal delivery costs were subtracted to prevent overestimation of cesarean costs.

Results

Based on a 2010 population estimate of women ages 25 to 54 years old (63,930,821)[19] and an estimated 0.92%[20] of women seeking treatment for symptomatic fibroids annually, approximately 588,164 women seek treatment for fibroids annually. The annual direct cost of fibroids, including surgery, hospital admissions, outpatient visits, and prescription medications ranged from 4.1 to 9.4 billion dollars (Table 1). Based on a cost per patient of $5,563 to $8,665 for non-surgical management of clinically significant fibroids (including hospitalization, outpatient physician encounters, and prescription medications), the cost of nonsurgical management of fibroids contributed 3.27 to 5.1 billion dollars annually to the total direct costs of fibroids. Surgical management added 829 million to 4.3 billion dollars annually to these total direct costs (Table 1).

The cost of lost work (absenteeism and short-term disability) differed according to management strategy for fibroids. Annual short-term disability and lost-work expenses were highest for those women who underwent hysterectomy, ranging from $4,449 to $30,075, and lowest for those who underwent endometrial ablation or no surgical treatment (Table 2). While most women manage their symptoms non-surgically, this subset of women still had an annual absenteeism and short-term disability cost of 967 million to 6.5 billion dollars. The total estimated annual cost of absenteeism and short-term disability resulting from uterine fibroids was 1.55 to 17.2 billion dollars.

Fibroids contribute to a large number of pregnancy-related complications, of which we focused on spontaneous abortion, preterm delivery and cesarean delivery (Table 3). There were 6.4 million pregnancies in 2005; 0.37 to 10.7% were in women with uterine fibroids.[21, 22] The presence of uterine fibroids in pregnancy has been associated with an increased rate of spontaneous abortions.[13] Based on a miscarriage rate of 15%,[28] 19.9% of miscarriages requiring surgical management,[28] and 0.22% to 6.32% of miscarriages being attributed to fibroids, we calculated 2,115 to 60,748 spontaneous abortions per year attributable to fibroids, 421 to 12,089 of which require dilation and curettage. This resulted in an estimated cost of $983,035 to $110,698,973 for surgical management of spontaneous abortions attributed to uterine fibroids (Table 4).

We estimate that of 503,158 preterm births in the United States annually, 0.18 to 5.08% of cases could be attributed to the presence of uterine fibroids (Table 3). This results in an estimated 906 to 25,560 preterm deliveries each year that were associated with leiomyomata. With a published lifetime cost of $57,458 per preterm infant, 52 million to 1.47 billion dollars is spent annually to care for preterm infants born as a consequence of uterine fibroids (Table 4).

Cesarean delivery is the obstetric outcome that has the strongest association with fibroids with an odds ratio of 3.7 (95% CI 3.5–3.9)[13] (Table 3). The indication for cesarean delivery in these cases is most commonly due to mal-presentation,[13] but may also be due to the presence of placenta previa. Of 4.13 million births in 2009,[26] and a 2009 national cesarean rate of 32.9%,[26] approximately 1.36 million deliveries were performed via cesarean section in 2009. Our calculations suggested that 0.99 to 22.4% of cesarean sections were attributable to uterine fibroids, and thus the presence of fibroids results in 13,455 to 304,440 cesarean sections per year (Table 3). The costs for cesarean delivery range from $13,745[32] to $20,298 [33] per case, resulting in an estimated cost of 185 million to 6.18 billion dollars annually for cesarean sections due to leiomyomata (Table 4).

The total direct and indirect costs of leiomyomata, including associated obstetric complications, were calculated to result in 5.89 to 34.37 billion dollars annual cost to the

healthcare for women in the United States (Table 5). Of note, obstetric outcomes attributable to fibroids accounted for 238 million to 7.76 billion dollars (4% to 22.6%) of this total cost.

A sensitivity analysis (Tables 6, 7, 8, and 9) was performed on the cost of lost work for women undergoing hysterectomy and women undergoing non-surgical management, as these groups represented the largest percentage of and the widest range of total costs attributable to uterine fibroids (Table 2 and 5). Based on this analysis, the implied cost savings as a percentage of total annual costs was also calculated. This analysis revealed that if the percentage of women undergoing hysterectomy was minimized as was the cost of lost work for these women, it would result in a 25.6% savings in the total annual costs due to uterine fibroids. Even if the maximum percentage of women underwent a hysterectomy but the cost of lost work was minimized, it would still result in a 23.2% savings on the total annual costs attributable to uterine fibroids, indicating that lost work was a significant driver in the analysis. Similar results were found from analysis of women who had no surgical treatment.

Comment

These results show that uterine fibroids may result in up to 34.4 billion dollars in total annual societal cost, and emphasize the importance of developing new effective treatments for fibroids.

This manuscript includes direct, indirect, and associated pregnancy and obstetrical related costs in the assessment of the total societal cost of uterine fibroids.[4–8] Our calculations used pooled odds ratios when possible and reflect a large number of studies, thus resulting in a wide range of estimated costs. Conservative estimates were used when calculating the number of women per year seeking treatment for symptomatic fibroids, and not all possible complications of fibroids are accounted for, thus these calculations likely underestimate the total annual cost of fibroids. Whenever possible, low and high end ranges of the number of women undergoing and the cost of each intervention or outcome was used to provide the most accurate range of estimated total annual societal cost. It is clear that uterine fibroids account for billions of dollars annually to the U.S. health care system and represent a significant cost to society. Specifically, the costs of lost work may account for the largest proportion of the annual societal cost (up to $17 billion), and obstetric outcomes associated with fibroids are a major contributor (up to $7.8 billion).

The variation in cost estimates for surgical procedures may be a reflection of differences in surgical technique (invasive versus non-invasive procedures) and technology, which is not accounted for. The studies used in this analysis cited costs[5, 6, 8] (the actual value of the resources used), as opposed to charges (the amount billed by the hospital or physician) when assigning a dollar value to the procedure, though this was not consistent in Mauskopf et al.[7] However, using charges instead of costs would over-estimate the price of the procedure, and we used data from Mauskopf et al.[7] mainly as the low estimate of direct costs of procedures; thus this should not greatly influence our analysis. Medicare or third party reimbursement was often used to estimate costs,[5, 6, 8] which is acceptable when cost analysis is undertaken from a societal perspective,[34] though rates of reimbursement from different sources may contribute to the range of reported costs. It also should be noted that the cost estimates of surgery did not include the cost of complications, which have been reported as high as 16%.[35]

Flynn et al.[4] used national databases to estimate the annual direct cost of uterine fibroids (including office visits, hospital and outpatient procedures) in the United States, and calculated a cost of $2,151,484,847 in the year 2000 ($3,208,974,247 in 2010 dollars),

which is less than our low estimate of annual cost of $4,101,169, 903. Flynn et al.[4] found that the majority of costs were due to inpatient care, mostly related to hysterectomy. This cost difference may reflect a difference in study method, including different inclusion criteria. In part, the difference may be due to the fact that there are 2.2 million more women between the ages of 25 and 54 than there were in 2000.[19]

The cost for lost work due to fibroids is considerable. Previously published annual costs of absenteeism used in our study varied widely ($4,449[6] to $30,075[8]). It is feasible that the lower costs associated with women who underwent no surgical treatment, uterine artery embolization or endometrial ablation was because these women had less severe symptoms to begin with, causing them to miss less work. The range of estimated costs also may be caused by differences in data collection. The lower estimate was determined by Lee et al.[6] who estimated indirect costs attributable to uterine fibroids by comparing lost productivity data for women with known symptomatic fibroids to matched controls. The higher estimate came from Carls et al.[8] who calculated the cost of disability and absenteeism in a group of women with known fibroids in the year following surgery or nonsurgical treatment for their fibroids. Costs were stratified based on type of surgical treatment, as well as medical management.[8] Hartmann et al.[5] also compared women with a diagnosis of fibroids to controls and calculated the annual cost of work lost associated with fibroids to be $1,010 (converted to 2010 dollars). In contrast to Carls et al.[8] and Lee et al.,[6] Hartmann et al.[5] only counted days absent from work when doctor visits were made and did not account for missed work due to symptoms on days a patient did not seek medical attention; this may have resulted in an underestimation of days lost from work. For these reasons this lower indirect cost estimate was not used in our calculations.

The estimated cost of lost work (due to absenteeism and short term disability) was found to contribute 26.4% to 50.1% of the total annual costs attributable to uterine fibroids. Notably, the upper estimate of annual lost work costs ($17.2 billion) was greater than the lower estimate of total annual costs ($5.9 billion). In addition, the range of estimated annual costs for lost work ($1.6 to 17.2 billion dollars) was large; these costs were primarily driven by the proportion of women who undergo hysterectomy or receive no surgical treatment and the range of lost work costs related to those treatments. A sensitivity analysis (Tables 6–9) revealed the cost of lost work, not the number of women undergoing each treatment, appeared to be the principal driver of the large estimated annual cost of lost work. Even if the maximum estimated percentage of women undergo hysterectomy and non-surgical treatment each year, if lost work costs were minimized it would result in a 36.3% reduction (23.2% + 13.1% as calculated from Tables 7 and 9) in total annual costs due to uterine fibroids, resulting in an annual savings of up to $12 billion. We were unable to calculate the diminished productivity at work, “presenteeism,” [6–8] that may be experienced by women with symptomatic fibroids and could add to annual costs.

Evidence suggests that uterine fibroids increase the risk of spontaneous abortion and contribute to recurrent pregnancy loss.[12–15, 18] We calculated that 2,115 to 60,748 spontaneous abortions per year were attributable to fibroids, 421 to 12,089 of which required dilation and curettage. Since only 19.9% of spontaneous abortions are subsequently treated surgically with dilation and curettage,[28] we have not accounted for or estimated the cost of nearly 80% of the spontaneous abortions attributable to fibroids. Medical management of spontaneous abortions was not included in our cost estimates due to a lack of data regarding the cost.

Women with fibroids have been shown to be at increased risk of preterm birth, both before 37 weeks gestation and before 34 weeks gestation.[36] A limitation of our study is that we did not separately calculate costs based on gestational age for those infants with preterm births

associated with uterine fibroids. As the lifetime cost of caring for an extremely preterm infant is usually higher, this may impact the overall societal cost.

Several studies have documented higher rates of cesarean delivery in patients with uterine leiomyomata.[13, 21, 36–38] The absolute contribution of uterine leiomyomata is difficult to ascertain as the indication for cesarean is often not leiomyomata per se but a possible consequence of leiomyomata, such as mal-presentation (most common),[13, 21] dysfunctional labor,[21] placenta previa,[36] or prior myomectomy. A recent study by Stout et al.[36] found an increased risk of cesarean delivery in women with leiomyoma with an odds ratio of 1.2, which is much lower than the odds ratio of 3.7[13] we used in our calculation. However, Stout et al.[36] did not include breech presentation and placenta previa, but because malpresentation and placenta previa are possible sequelae of leiomyoma, we used the odds ratio of 3.7 determined by Klatsky et al.[13] The presence of leiomyomata in pregnancy has also been association with increased risk of additional obstetric outcomes including placenta previa, placental abruption, and preterm premature rupture of membranes[36] which were not individually accounted for in this study, and these may further contribute to the total societal cost of uterine fibroids.

Uterine fibroids result in significant annual societal cost in the United States, more than breast cancer, colon cancer or ovarian cancer[39], and nearly one fifth the annual cost of diabetes in the United States[40] (Table 10). Future research could provide an even more specific cost estimation of the total annual societal costs of uterine fibroids, as well as determine the most cost effective modalities for treating fibroids. Comparative effectiveness research could be utilized to compare various treatment options, and should include both direct and indirect costs as well as associated obstetric costs, as each of these contribute significantly to the total cost of fibroids. Furthermore, diminished work productivity and lost professional opportunity for those suffering from fibroids could be calculated and would further contribute to the already substantial estimated indirect costs of uterine fibroids.

It is also important to note that our calculation of total annual societal cost does not account for those women with symptomatic fibroids and no access to medical care. Given the already substantial societal cost of uterine fibroids, it is important that health care reforms provide women with early access to care for treatment of fibroids, before more costly treatments are necessary and expensive complications occur.

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Table 1

Estimated Direct Cost of Uterine Fibroids

	Range of Women Having Each Intervention			Cost Estimates			Estimate of Total Cost		
Medical Management									
Medications, inpatient admissions, outpatient visits				$5,563 [5]	-	$8,665 [6]	$3,271,956,332	-	$5,096,441,060
Surgical Management									
Hysterectomy	21.00% [5]	-	52.90% [8]	$6,287 [7]	-	$11,538 [8]	$776,532,518	-	$3,589,921,782
Myomectomy	1.00% [24]	-	5.93% [25]	$6,805 [7]	-	$14,850 [7]	$40,027,010	-	$517,938,300
Uterine artery embolization	0.20% [24]	-	1.77% [25]	$6,805 [7]	-	$12,863 [8]	$8,002,680	-	$133,916,693
Endometrial ablation	0.16% [5]	-	2.43% [25]	$4,943[8]	-	$4,943 [8]	$4,651,363	-	$70,645,356
Total Direct Costs							**$4,101,169,903**	-	**$9,408,863,191**

Note: Total women seeking treatment for fibroids was calculated by number of women aged 25–54 (63,930,821) multiplied by baseline prevalence of 0.92%=588,164.

All costs are reported in 2010 dollars

Table 2

Estimated Annual Lost Work Cost (Absenteeism and Short Term Disability)

Treatment	Range of Women Having Each Intervention			Range of Cost Estimates [6,8]			Estimate of Total Cost		
Hysterectomy	21.00% [5]	-	52.90% [8]	$4,449	-	$30,075	$549,513,786	-	$9,357,475,350
Myomectomy	1.00% [24]	-	5.93% [25]	$4,449	-	$25,164	$26,169,018	-	$877,669,992
Uterine artery embolization	0.20% [24]	-	1.77% [25]	$4,449	-	$18,836	$5,232,024	-	$196,101,596
Endometrial ablation	0.16% [5]	-	2.43% [25]	$4,449	-	$17,385	$4,186,509	-	$248,466,420
No surgical treatment	36.97%	-	77.64%	$4,449	-	$14,282	$967,408,356	-	$6,521,889,582
Total Cost of Lost Work							**$1,552,509,693**	-	**$17,201,602,940**

Note: Total women seeking treatment for fibroids was calculated by number of women aged 25–54 (63,930,821) multiplied by baseline of 0.92% = 588,164.

All costs are reported in 2010 dollars

Table 3

Estimated Number of Obstetrical Complications Attributable to Uterine Fibroids

Obstetric Outcome	Odds Ratio (95% CI)[a]	Percent of Cases Attributed to Fibroids			Estimated Annual Number of Cases Attributed to Fibroids			Estimated Number of Annual Cases Nationwide
		Low[b]		High[c]	Low		High	
Spontaneous abortion[d]	1.6 (1.3–2.0)	0.22%	-	6.32%	421	-	12,089	191,279
Preterm delivery	1.5 (1.3–1.7)	0.18%	-	5.08%	906	-	25,560	503,158
Cesarean delivery	3.7 (3.5–3.9)	0.99%	-	22.40%	13,455	-	304,440	1,359,105

Note:

[a] Odds ratio from Klatzkyet al. (13)

[b] Low attributable percent is based on prevalence of 0.37% of fibroids in pregnancy (21)

[c] High attributable percent is based on a prevalence of 10.7% of fibroids in pregnancy (22)

[d] Spontaneous abortion % cases attributed to fibroids refers to all cases of SAB, however estimated number of annual cases nationwide and estimated annual number of cases attributed to fibroids refers only to SABs requiring D&C

Table 4

Estimated Annual Cost of Obstetric Complications Related to Uterine Fibroids

Obstetric Outcome	Estimated Annual Number of Cases Attributed to Fibroids			Estimated Cost per Case			Estimate of Total Cost		
	Low		High						
Spontaneous abortion	421	-	12,089	$2,335 [30]	-	$9,157 [29]	$983,035	-	$110,698,973
Preterm delivery	906	-	25,560	$57,458 [31]	-	$57,458 [31]	$52,056,948	-	$1,468,626,480
Cesarean delivery	13,455	-	304,440	$13,745 [32]	-	$20,298 [33]	$184,938,975	-	$6,179,523,120
Combined Cost for Obstetrical Outcomes							**$237,978,958**	**-**	**$7,758,848,573**

Note: All costs are reported in 2010 dollars

Table 5

Total Annual Estimates of Costs Due to Uterine Fibroids

	Estimate of Total Cost			
	Low	% of Total	High	% of Total
Direct Cost				
Medications, Inpatient Admissions, Outpatient Visits	$3,271,956,332	55.54%	$5,096,441,060	14.83%
Surgery	$829,213,571	14.07%	$4,312,422,131	12.55%
Indirect Cost				
Lost work	$1,552,509,693	26.35%	$17,201,602,940	50.05%
Spontaneous abortion	$983,035	0.02%	$110,698,973	0.32%
Preterm delivery	$52,056,948	0.88%	$1,468,626,480	4.27%
Cesarean delivery	$184,938,975	3.14%	$6,179,523,120	17.98%
Total Annual Estimate	**$5,891,658,554**	**100.00%**	**$34,369,314,704**	**100.00%**

Note: All costs are reported in 2010 dollars

Table 6

Total Lost Work Cost Dependent on % who undergo Hysterectomy and Cost of Lost Work for those who undergo Hysterectomy

		Range of Cost Estimates for Lost Work in those who undergo Hysterectomy					
		$4,449	**$10,000**	**$15,000**	**$20,000**	**$25,000**	**$30,075**
Range of % of Women Undergoing Hysterectomy	**21.00%**	$549,513,786	$1,235,140,000	$1,852,710,000	$2,470,280,000	$3,087,850,000	$3,714,683,550
	26.00%	$680,354,427	$1,529,230,000	$2,293,845,000	$3,058,460,000	$3,823,075,000	$4,599,159,225
	31.00%	$811,190,619	$1,823,310,000	$2,734,965,000	$3,646,620,000	$4,558,275,000	$5,483,604,825
	36.00%	$942,026,811	$2,117,390,000	$3,176,085,000	$4,234,780,000	$5,293,475,000	$6,368,050,425
	41.00%	$1,072,863,003	$2,411,470,000	$3,617,205,000	$4,822,940,000	$6,028,675,000	$7,252,496,025
	46.00%	$1,203,699,195	$2,705,550,000	$4,058,325,000	$5,411,100,000	$6,763,875,000	$8,136,941,625
	52.90%	$1,384,257,411	$3,111,390,000	$4,667,085,000	$6,222,780,000	$7,778,475,000	$9,357,505,425

Table 7

% Total Cost Savings

		Range of Cost Estimates for Lost Work in those who undergo Hysterectomy					
		$4,449	**$10,000**	**$15,000**	**$20,000**	**$25,000**	**$30,075**
Range of % of Women Undergoing Hysterectomy	**21.00%**	25.6%	23.6%	21.8%	20.0%	18.2%	16.4%
	26.00%	25.2%	22.8%	20.6%	18.3%	16.1%	13.8%
	31.00%	24.9%	21.9%	19.3%	16.6%	14.0%	11.3%
	36.00%	24.5%	21.1%	18.0%	14.9%	11.8%	8.7%
	41.00%	24.1%	20.2%	16.7%	13.2%	9.7%	6.1%
	46.00%	23.7%	19.4%	15.4%	11.5%	7.5%	3.6%
	52.90%	23.2%	18.2%	13.6%	9.1%	4.6%	0.0%

Note: % total cost savings is calculated as absolute dollar savings from highest estimate (i.e. 52.90% of women undergoing hysterectomy and lost work costs at $30,075) in Table 6 as a percentage of the high total estimate of costs within Table 5.

Table 8

Total Lost Work Cost Dependent on % who undergo Non-Surgical Treatment and Cost of Lost Work for those who undergo No Surgical Treatment

		Range of Cost Estimates for Lost Work in those who undergo No Surgical Treatment					
		$4,449	**$5,000**	**$7,500**	**$10,000**	**$12,500**	**$14,282**
Range of % of Women who undergo No Surgical Treatment	**36.97%**	$967,408,356	$1,087,220,000	$1,630,830,000	$2,174,440,000	$2,718,050,000	$3,105,535,208
	40.00%	$1,046,698,434	$1,176,330,000	$1,764,495,000	$2,352,660,000	$2,940,825,000	$3,360,069,012
	45.00%	$1,177,534,626	$1,323,370,000	$1,985,055,000	$2,646,740,000	$3,308,425,000	$3,780,074,068
	50.00%	$1,308,370,818	$1,470,410,000	$2,205,615,000	$2,940,820,000	$3,676,025,000	$4,200,079,124
	55.00%	$1,439,207,010	$1,617,450,000	$2,426,175,000	$3,234,900,000	$4,043,625,000	$4,620,084,180
	60.00%	$1,570,043,202	$1,764,490,000	$2,646,735,000	$3,528,980,000	$4,411,225,000	$5,040,089,236
	65.00%	$1,700,883,843	$1,911,535,000	$2,867,302,500	$3,823,070,000	$4,778,837,500	$5,460,108,574
	70.00%	$1,831,720,035	$2,058,575,000	$3,087,862,500	$4,117,150,000	$5,146,437,500	$5,880,113,630
	77.64%	$2,031,640,299	$2,283,255,000	$3,424,882,500	$4,566,510,000	$5,708,137,500	$6,521,889,582

Table 9

% Total Cost Savings

		Range of Cost Estimates for Lost Work in those who undergo No Surgical Treatments					
		$4,449	**$5,000**	**$7,500**	**$10,000**	**$12,500**	**$14,282**
Range of % of Women undergoing Hysterectomy	**36.97%**	16.2%	15.8%	14.2%	12.6%	11.1%	9.9%
	40.00%	15.9%	15.6%	13.8%	12.1%	10.4%	9.2%
	45.00%	15.5%	15.1%	13.2%	11.3%	9.3%	8.0%
	50.00%	15.2%	14.7%	12.6%	10.4%	8.3%	6.8%
	55.00%	14.8%	14.3%	11.9%	9.6%	7.2%	5.5%
	60.00%	14.4%	13.8%	11.3%	8.7%	6.1%	4.3%
	65.00%	14.0%	13.4%	10.6%	7.9%	5.1%	3.1%
	70.00%	13.6%	13.0%	10.0%	7.0%	4.0%	1.9%
	77.64%	13.1%	12.3%	9.0%	5.7%	2.4%	0.0%

Note: % total cost savings is calculated as absolute dollar savings from highest estimate (i.e. 77.64% of women undergoing no surgical treatment and lost work costs at $14,282) in Table 8 as a percentage of the high total estimate of costs within Table 5.

Table 10

Estimated Annual Cost of Various Diseases in the United States

Disease	Estimated Annual Cost
Diabetes [40]	$192,728,897,856.00
Uterine Fibroids	$34,369,314,704.00
Breast Cancer [39]	$16,057,400,853.77
Colon Cancer [39]	$14,055,718,520.64
Ovarian Cancer [39]	$5,063,759,062.27

Note: All costs are reported in 2010 dollars