

Original Research

The prevalence of complications and healthcare costs during pregnancy

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Abstract

Objective: To study the economic burden of pregnancy in the United States, common complications during pregnancy, and the incremental costs attributable to these complications.

Methods: We conducted a retrospective comparative cohort study of pregnant women ages 15-49 using de-identified medical and pharmacy claims from the Truven Health MarketScan Commercial Claims and Encounters database incurred between January 1, 2007 and December 31, 2011. We reported the total healthcare costs (adjusted to 2011 dollars) from the date of the first pregnancy-related claim through three months post-delivery and compared these costs to matched controls of non-

pregnant women. We categorized pregnancy-related complications, and estimated the incremental costs associated with each complication using multivariate analyses.

Results: A total of 322,141 eligible women with live births were studied. Compared to matched controls, the average costs of care for pregnant women were nearly \$13,000 higher through three months post-delivery. A total of 46.9% of women had at least one pre-specified pregnancy complication; the most commonly observed were fetal abnormality (24.7%) and early or threatened labor (16.3%). Multiple gestation (1.9%) resulted in the highest adjusted incremental cost (\$12,212; 95% CI: 11,298, 13,216); hypertension (\$6,152; 95% CI: 5,312, 6,992) and diabetes (\$5,081; 95% CI: 4,244, 5,918) were also among those complications that led to high incremental costs of care.

Conclusion: Pregnancy and delivery is frequently compounded by complications that lead to increased costs and resource utilization.

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TRANSPARENCY

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PLB, SC, JG and PJ are/were employees of Truven Health Analytics. AL, MM and RL are/were employees of Bayer and stockholders of Bayer at the time the study was conducted and the manuscript was developed. CDM received a consulting fee for his participation in this study; he is an employee and stockholder of Bayer; he receives grant support from Bayer and Amgen; he receives consulting income from Amgen, Bayer, BMS, Celgene, GSK, Janssen, Johnson & Johnson, Mitsubishi, Novartis and Pfizer; he receives payment from Genentech for lecturing and speaking engagements; he is a paid consultant to Amgen, Bayer, BMS, Genentech and Pfizer; he currently has grants pending with Bayer and Pfizer; he holds an advisory board membership with Bayer, Pfizer and Mundipharma.

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Conclusion: Pregnancy and delivery is frequently compounded by complications that lead to increased costs and resource utilization.

Keywords: Costs, Infants, Maternal complications, Pregnancy

INTRODUCTION

In 2008 there were slightly more than 6.5 million pregnancies in the United States, resulting in 4.2 million live births (1). During the last two decades, the manner by which women have given birth changed dramatically – with the Cesarean delivery rate increasing from 24.7% in 1992, peaking at 34.7% in 2006 (2) and was reported to be 32.8% in 2010-2011 (3). Using data from 2011 the Agency for Healthcare Research and Quality (AHRQ) found that women with private insurance were 11% more likely to have cesarean section delivery than those covered by Medicaid (4). Taking into account the total number of admissions, hospitalization for pregnancy, delivery, and newborn care was associated with the highest hospital bills among all conditions in both Medicaid and privately insured populations in 2008 (5). Hospital stays for maternal and newborn care accounted for 4.8% and 3.7% of the entire national hospital bill, respectively (5).

While pregnancy alone is a significant contributor to healthcare utilization and costs, pregnancy-related complications further add to healthcare costs and resource utilization (4). In general, uncomplicated Cesarean section (C-section) deliveries were costlier than uncomplicated vaginal deliveries; complicated deliveries, regardless of the mode, were more costly than uncomplicated deliveries. In 2008, the mean cost of vaginal delivery was \$2,900 without complications and \$3,800 with complications. Similarly, the average cost of cesarean delivery with and without complication was \$6,500 and \$4,700 respectively (6). Another recent analysis found that an average complicated pregnancy was associated with a total maternal cost of \$27,803 – approximately \$8,000 higher than an uncomplicated pregnancy (7). In recent years, the risk-adjusted rate of a major complication (infection, hemorrhage, severe laceration, and other major

operative and thrombotic complications) has declined (2); however, an estimated 94% of women hospitalized for pregnancy or delivery-related care had major or minor complications (8).

The purpose of this study is to provide an updated estimate of the costs and resource use associated with pregnancies that resulted in live birth deliveries in the US. Costs associated with vaginal and Cesarean deliveries, including the identification of common complications experienced during pregnancy and the incremental costs attributable to these complications, are reported.

MATERIALS AND METHODS

Study Design and Data Source

We conducted a retrospective comparative cohort study using de-identified medical and pharmacy claims from the Truven Health MarketScan Commercial Claims and Encounters database incurred between January 1, 2007 and December 31, 2011. This database contains information on the inpatient, outpatient, and outpatient prescription drug experience of over 45 million employees and their dependents enrolled annually covered under a variety of fee-for-service and managed care health plans. As the MarketScan database is de-identified in compliance with the Health Insurance Portability and Accountability Act (HIPAA) regulations, Institutional Review Board approval was not required.

Study Population

The primary study cohort (pregnant cohort) consisted of women aged 15-49 years who had at least two outpatient claims or one inpatient pregnancy-related claim between January 1, 2008 and September 30, 2011 and had at least one claim related to live-birth delivery within 42 weeks

following these initial claims (Supplemental Content, Appendix A). The date of the first pregnancy-related claim was defined as the first index date, and the date of delivery defined the second index date. To be considered for inclusion in the analysis, women needed to have continuous medical and drug benefit coverage for at least 12 months before the first index date and three months following the second index date, and have no evidence of termination of pregnancy between the first and second index dates (Appendix A). Only one pregnancy was included for each woman to avoid bias in the statistical tests between complicated and uncomplicated pregnancies due to within-person correlation.

A cohort of women, without any pregnancy or delivery-related claims during the study period, served as controls. To be included in the control cohort women needed to have continuous medical and drug benefit coverage for at least 12 months prior to and up to 12 months following a randomly assigned first index date. Women in the control group were matched to the pregnant cohort using a 1:1 matching ratio based on age at the index date. A second index date was assigned to women in this cohort based on the length of time between the first and second index dates of their respective match in the pregnant cohort.

Outcomes

The primary outcome of interest was the incremental total healthcare costs of pregnancy and post-pregnancy care from the first index date through the three months following the second index date. Average cost per woman was reported for all service types (total costs) as well as for unique service types (inpatient, emergency department (ED) visits, outpatient office and clinic visits, other outpatient services (such as lab and imaging), and prescription drug expenditures).

Healthcare utilization was also compared for each of these categories for women in the pregnant cohort relative to their non-pregnant controls. All costs were adjusted to 2011 dollars based on the medical component of the Consumer Price Index (CPI).

The types of pregnancy-related complications were also reported for women in the pregnant cohort. These complications were based on the AHRQ Clinical Classification Software (CCS) categories and were identified during the period of time between the first and second index dates (first pregnancy claim through the date of delivery) (9). A total of 19 categories of complications, defined using ICD-9-CM codes, were used, and only claims with a diagnosis of interest in the primary position were considered. Two of the more broadly defined pregnancy-related CCS categories —other complications of pregnancy (CCS 181) and complications of birth or puerperium affecting management of mother (CCS 195)—were disaggregated into 20 more distinct subcategories (Appendix). The frequency for each CCS category of interest, the total number of days for associated hospital stays, and the costs associated with each were compiled. Healthcare utilization and costs of care were compared for pregnant women with and without each complication. In addition, the costs of care for vaginal and Cesarean delivery were compared from the day of delivery through the following three months.

Statistical Analysis

Descriptive analyses were used to compare baseline characteristics for women in the pregnant cohort relative to their matched non-pregnant controls. Within the cohort of pregnant women, comparisons were made between women with and without complications. Unadjusted differences in average costs of care were calculated for pregnant and non-pregnant women,

pregnant women with and without complications, and women delivering vaginally or by Cesarean section.

Means, with standard deviation, and medians were reported for continuous variables; counts and percentages were reported for dichotomous or categorical variables. T-tests were used for the pair-wise comparison of continuous variables; Chi-square or Fisher's exact tests were used to evaluate the statistical significance of differences for dichotomous or categorical variables.

A general linear model (GLM) based on a log transformation of the expenditure data was used to determine adjusted incremental cost of care for pregnant women with specific complications (versus pregnant women without that specific complication). The GLM controlled for demographic characteristics (age, index year of pregnancy, insurance plan type, and geographic region) and a list of specific complications. Incremental costs were defined as the difference in estimated costs for those pregnant women with a given complication relative to pregnant women without evidence of the complication. All analyses were conducted using SAS Version 9.2.

RESULTS

Study Population

A total of 322,141 women with live births met the inclusion criteria and were matched to non-pregnant controls. The demographic characteristics for the two cohorts of women with and without live births were well balanced. More than two-thirds of the women were between the ages of 25 and 34, most resided in an urban area, and a large portion was from the southern

region of the United States. No significant differences existed between study groups for age variables; however, some small differences in baseline characteristics were observed. (Table 1)

Costs of Pregnancy

Compared to the cohort of women without evidence of pregnancy, the incremental cost of care during the pregnancy and post-pregnancy period was \$12,866. The primary driver of this difference was pregnancy-related inpatient care, which accounted for \$9,525 of the overall difference. The remaining cost difference was related to outpatient care, nearly all of which was accrued during the prenatal period and consisted primarily of lab or radiological services (Table 2). Paired comparisons in resource utilization indicated that differences observed between cohorts in the use of lab or radiological services were significant.

Costs of pregnancy also differed by the type of delivery. The majority of women in the pregnancy cohort had vaginal births (66%) and cost, on average, approximately \$6,000 less than care for women who underwent Cesarean section (mean: \$13,676/SD: \$14,943 and mean \$19,652/SD:\$19,913 respectively). These cost differences were largely accounted for by the quantity rather than the types of healthcare services. For example, women delivering by Cesarean section had longer inpatient stays, more radiological and lab services, and more prescription fills (results not shown).

When compared to their age-matched controls the average difference in the total costs of care for women with vaginal delivery were \$10, 926 (SD: 17,530) and \$16,707 (SD: 22,163) for women with Cesarean section delivery. Inpatient care costs were again the primary driver of cost differences.

Frequency of Complicated Pregnancy

Complications were categorized into 37 groups for analysis. Of the 322,141 pregnant women in the study population, 151,200 (46.9%) had at least one pre-specified pregnancy complication.

The most commonly observed pregnancy-related complications were fetal abnormalities affecting management of the mother (e.g. excessive or poor fetal growth, decreased fetal movements, rhesus isoimmunization affecting management of mother, chromosomal abnormality or hereditary disease) (24.7%), early or threatened labor (16.3%), and hemorrhage (10.6%).

Other frequently observed complications included other complications of pregnancy (24.3%) (e.g. vomiting, venereal disease, viral disease, hyperemesis), indications for care or intervention related to labor and delivery (13.1%) (e.g. failed induction, abnormal fetal heart rate/rhythm, generalized infection), and those related to a birth that affected the management of the mother (10.5%) (e.g. uterine rupture, postpartum or third-stage hemorrhage, obstetrical damage, injury, or hematoma). Diabetes or abnormal glucose tolerance (7.2%) and hypertension (7%) were also common complications among pregnant women in the study population. (Table 3)

Costs of Complicated Pregnancy

Unadjusted comparisons

The total costs of care for pregnant women with each complication were compared to pregnant women without each specified complication. With three exceptions (forceps delivery, prolonged pregnancy, and trauma to perineum and vulva), a complicated pregnancy resulted in higher average costs; the average cost of a pregnancy without any complications was \$12,261 (SD: 11,412.0). Outpatient care during the pregnancy period, in particular lab services and outpatient

visits (other than a physician office visit), was the primary driver of cost differences. Multiple gestation (1.9%) resulted in the highest average difference in costs (\$17,818, SD: 566). Although some costs for complications were negative, for complications associated with increased costs the difference was at least \$1,177 greater for women with a particular complication when compared to women without a particular complication. Complications observed less frequently resulted in some of the highest differences in costs, such as Cesarean delivery without indication (\$13,447, SD: 1,481), pericarditis, endocarditis, and myocarditis or cardiomyopathy (\$11,753, SD: 1,930), and coagulation defects (\$11,188, SD: 1,113). (Table 3)

Some differences were observed in healthcare resource utilization. Presence of cardiovascular conditions, specifically CCS category 97: pericarditis, endocarditis, myocarditis or cardiomyopathy and CCS category 98: hypertension, were associated with higher use of lab services, other outpatient visits (other than physician office visits), and prescription fills.

Multivariate results

A multivariate model that included the 20 most commonly observed pregnancy complications was estimated to assess the incremental costs of each of the 20 complications, adjusted for age, the year of the pregnancy, insurance plan type, geographical region, and the presence of other complications. Covariates were not statistically significant. As in the unadjusted results, multiple gestation (N=73,179) resulted in the highest incremental cost of pregnancy care (\$12,212, SD: 11,298, 13,216); uterine size date discrepancy resulted in the smallest incremental cost (\$1,893, SD: 1,010, 2,777). Adjusted costs of care for two conditions prevalent in this population—diabetes and hypertension—were associated with some of the highest incremental costs: \$5,081

(SD: 4,244, 5,918) and \$6,152 (SD: 5,312, 6,992), respectively. For these complications, multivariate results differed only slightly from what was observed in the unadjusted analysis (increase by \$18 for hypertension and \$521 for diabetes). Early or threatened labor, another frequent complication, was associated with a reduced difference (\$501) in the cost of care compared to those observed in unadjusted analyses. Additionally, in this set of analyses, a prolonged pregnancy was observed to result in higher costs of care (\$1,962, SD: 1,122, 2,802) (Figure 1). Sensitivity analyses that included the trimming of cost outliers (both extreme high values and extreme low values) and the evaluation of the absolute and percentage differences in incremental costs were performed. We found that lowering the lower limit increased the incremental cost estimates of each complication from 2% to 21%. For significant incremental cost estimates, raising the upper trim point also led to higher estimates of incremental costs

DISCUSSION

This study demonstrated that the cost of care for pregnant women with live births, including the three months following delivery, significantly exceed those for similar, non-pregnant women over a similar period of time.

Among pregnant women, costs also differed by the type of delivery: Cesarean section birth costs were 40% higher than for vaginal deliveries. These estimates reinforce the substantial cost differences observed previously (10), but the magnitude of the differences is comparatively higher.

In both comparisons, inpatient care expenses drove the difference. Unlike their matched pregnant controls, only 2% of non-pregnant women were admitted for hospital care. Other notable differences included the use of lab and radiological services, as claims for these resources were reported nearly universally across the pregnant cohort- possibly a reflection of guideline-recommended care (11). Outpatient pharmaceutical costs differed in the matched pregnant and non-pregnant controls. Specific product use/costs were not analyzed but these costs would include those for contraceptive products.

Further analysis into the cost drivers of pregnancy revealed that complications throughout pregnancy and delivery were common. In the study population nearly half of pregnancies were associated with at least one complication; in particular, ‘fetal abnormalities affecting the management of the mother’ was present in a quarter of pregnancies. Most complications led to differences in adjusted costs of between \$2,000 and \$6,000. In both adjusted and unadjusted analyses, women with multiple gestations far exceeded this range while those experiencing trauma to the perineum and vulva had fewer costs.

Limitations

In order to produce reasonable incremental cost estimates, outliers were trimmed. Sensitivity analyses showed the likely effect of trimming was to underestimate the incremental cost of complications, and the magnitude of the underestimation was greater for complications for which the women had higher average costs. The current analysis was focused on identifying which maternal conditions were associated with higher incremental costs and did not evaluate any causal relationships. Factors such as maternal age, presence of pre-existing comorbidities, and

previous birth outcomes may be associated with the occurrence and cost of the outcomes identified and further analysis would be needed to determine any causal relationships. Because the study inclusion criteria required at least two pregnancy-related outpatient claims prior to live delivery, results are not likely to be generalizable to women without prenatal care or women with fetal deaths. Additionally, comparisons were made between cohorts of women with and without select complications; however, other conditions not examined may have been present and added to the costs or resource utilization of these women. As a result, the observed differences between women with and without a specified complication may be biased due to conditions not accounted for during the multivariate analysis. Variability in preconception/prenatal care which may impact the extent to which complications are captured and treated cannot be fully accounted for using administrative claims. While the results indicate that substantial resources were consumed by pregnant women prior to giving birth, we are unable to account for how guideline-recommended care was sought and received. Finally, the analysis was limited to a commercially-insured population; therefore, the results may not be generalizable to those covered under other types of insurance or who lack coverage. As this analysis was based on US data, the results presented herein may not be generalizable to countries with different clinical practices and/or reimbursement structures.

Implications

The treatment for pregnant women prior to and following delivery is accompanied by unavoidable costs, and may be further compounded by how complicated the pregnancy or delivery may have been. While some complications may be unpredictable, efforts should be made early and throughout the prenatal period to identify and control for risks that could lead to

significant issues later in the pregnancy, during delivery and post-birth. A future analysis considering the timing of certain complications and their downstream costs may provide guidance on when providers should screen for potential complications.

Efforts to limit complications and mitigate their severity should also include the following of guideline-recommended treatment by both providers and women as inadequate preconception/prenatal care has been linked to excess costs and adverse outcomes, including pre-term birth or low birth weight (12-16). Providers should stress the importance of this care by providing a link between the need for particular services and their contribution to maternal and newborn well-being.

Estimates suggest that up to half of all pregnancies in the United States are either mistimed or unwanted, and a disparate number occur in women who are either younger than age 24, of low income, have fewer years of formal education, or unmarried (17, 18). Moreover, annual medical costs to care for these pregnancies may be as high as \$5 billion (19, 20). Considering the nature of these pregnancies, it is possible that pre-existing medical conditions may place them at risk of a complicated pregnancy or delivery that could otherwise be avoided or effectively managed through proper family planning. To address the potential for undesirable outcomes and associated financial burden, providers should proactively counsel and manage ~~patients~~ women who have an increased risk for complications should they become pregnant unexpectedly.

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FIGURE LEGEND

Title: Incremental Costs of Care for Pregnancy Complications

Bars represent the frequency of each listed complication

Points indicate the incremental cost of each complication compared to mothers without the complication. Lines extending from each point represent the 95% confidence interval for each point estimate. Those lines crossing 0 indicate that a significant difference in costs was not observed; asterisks indicate statistical significance.

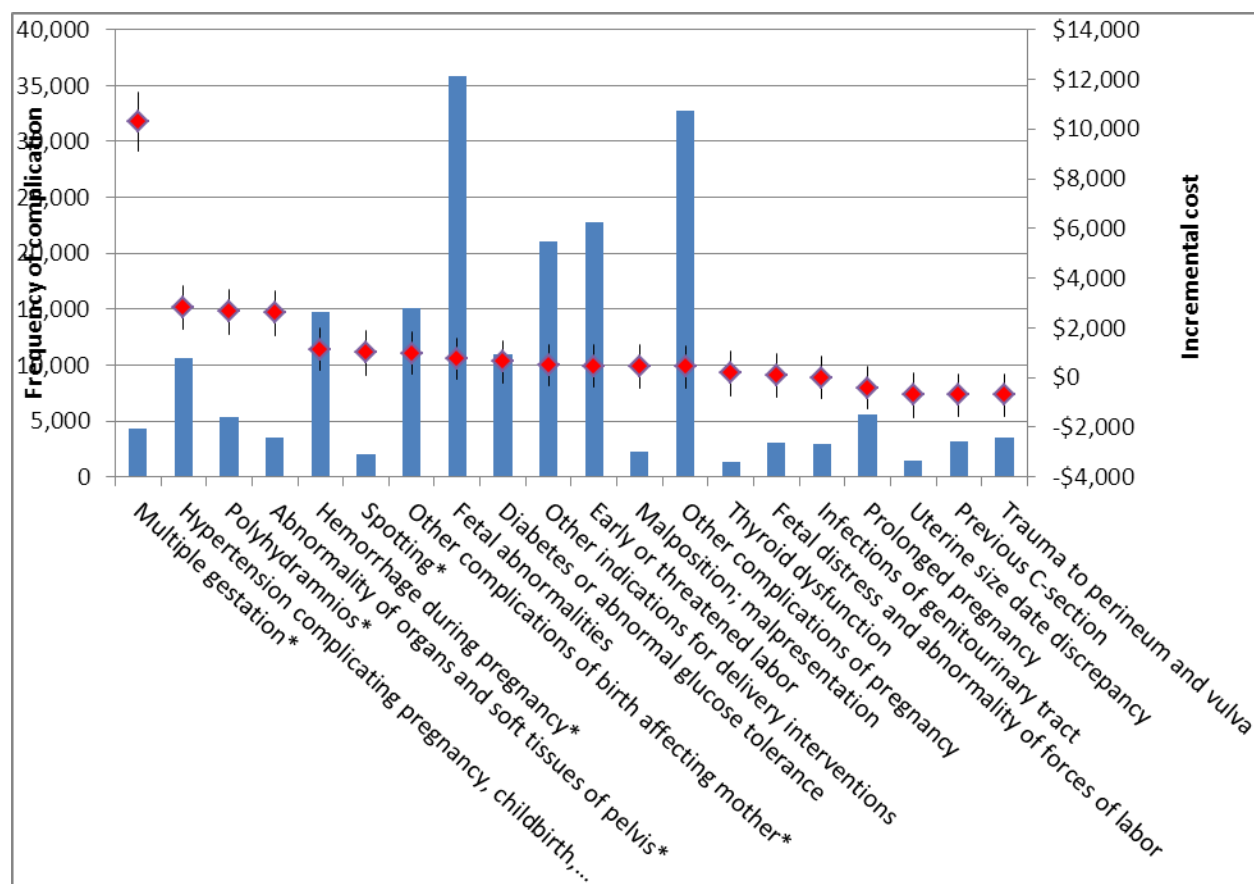


Table 1

*Data are presented as mean (+/-SD)

†Control subjects are composed of those women without a pregnancy with costs of care during a comparable time period as their matched case.

††The standardized difference is a better measure of balance than the p-value. It is the difference in means divided by the standard deviation (i.e. not the standard error of the mean) expressed as a percentage. A value less than 10% is often considered to indicate adequate balance (21).

Table 2

*Includes costs prior to live birth (and during the comparable time period for controls)

**Includes delivery costs and those accrued in the three months following live birth (and during the comparable time period for controls)

***Includes costs accrued during pregnancy and the three months following live birth (and during the comparable time period for controls)

† Control subjects are composed of those women without a pregnancy with costs of care during a comparable time period as their matched case

††All p-values <0.001

Table 3

N represents count of women with the complication listed

Costs represent those accrued during pregnancy, delivery, and the three months following live birth

Average cost of an uncomplicated pregnancy (N=80, 481): \$12,261 (SD: 11,412.0)

For differences in averages costs, all p-values <0.001

*Indicates average cost with the complication minus the average cost without the complication.

TABLE 1. Subject Characteristics

Demographic and Clinical Characteristics	Women with Live Births		Controls†		Standardized Difference
	N	%	N	%	
N	322,141		322,141		
Age*	29.48	5.32	29.48	5.32	0.00%
Age Group					
15-19	14,918	4.6	14,918	4.6	0.00%
20-24	36,144	11.2	36,144	11.2	0.00%
25-29	109,158	33.9	109,158	33.9	0.00%
30-34	107,359	33.3	107,359	33.3	0.00%
35-39	46,303	14.4	46,303	14.4	0.00%
40-44	7,744	2.4	7,744	2.4	0.00%
45-49	515	0.2	515	0.2	0.00%
Population Density					
Urban	274,547	85.2	273,109	84.8	1.25%
Rural	44,792	13.9	45,878	14.2	0.97%
Unknown	2,802	0.9	3,154	1.0	1.14%
Geographic Region					
Northeast	40,684	12.6	38,678	12.0	1.89%
North Central	81,798	25.4	75,441	23.4	4.59%
South	131,010	40.7	140,627	43.7	6.05%
West	65,614	20.4	63,972	19.9	1.27%
Unknown	3,035	0.9	3,423	1.0	1.21%
Health Plan Type					

Comprehensive	2,302	0.7	3,162	1.0	2.91%
HMO	69,896	21.7	65,648	20.4	3.24%
POS	25,951	8.1	30,363	9.4	4.85%
PPO/EPO	192,644	59.8	191,621	59.5	0.65%
CDHP/HDHP	17,609	5.5	20,012	6.2	3.18%
Other/Unknown	13,739	4.3	11,335	3.5	3.86%
Index Year					
2008	94,477	29.3	79,575	24.7	10.42%
2009	104,144	32.3	104,068	32.3	0.05%
2010	99,563	30.9	109,421	34.0	6.54%
2011	23,957	7.4	29,077	9.0	5.78%

TABLE 2. Total and Incremental Costs of Pregnant Women Compared to Matched Controls

Costs of Care	Women with Live Births		Controls†		Average Difference in Cost††	
	Mean (\$)	SD	Mean (\$)	SD	Mean (\$)	SD
Pre-Delivery Care *						
Inpatient	1,417	6,486.2	268	4,196.3	1,149	7,722.8
Total Outpatient	2,961	4,001.8	1,123	4,189.9	1,838	5,725.8
<i>Emergency Room</i>	189	671.1	100	591.3	88	893.4
<i>Physician Office</i>	2967	420.8	197	290.3	99	497.8
<i>Lab Service</i>	665	901.8	128	451.0	537	999.6
<i>Radiology Service</i>	1,001	1,264.8	144	757.23	858	1,459.5
<i>Other Outpatient</i>	998	3,051.7	654	3,617.0	344	4,718.6
Outpatient Pharmacy	273	1,044.2	393	1,480.2	-120	1,802.4
Total Costs	4,840	8,401.4	1,885	7,005.3	2,956	10,859.6

Delivery and Post-Discharge Care**						
Inpatient	9,459	13,256.8	132	2,876.9	9,326	13,569.8
Total Outpatient	812	2,235.0	548	2,419.5	264	3,297.0
<i>Emergency Room</i>	63	399.0	50	375.0	13	547.9
<i>Physician Office</i>	97	176.4	95	160.8	2	238.8
<i>Lab Service</i>	89	265.5	63	270.2	26	379.0
<i>Radiology Service</i>	75	494.3	71	538.5	5	731.4
<i>Other Outpatient</i>	550	1,952.6	319	2,089.8	231	2,861.9
Outpatient Pharmacy	112	411.0	190	709.3	-78	819.9
Total Costs	10,446	13,624.6	921	4,302.3	9,525	14,295.2
Total Costs of Care***						
Inpatient	11,272	15,355.7	403	5,429.0	10,869	16,253.9
Total Outpatient	3,773	5,016.7	1,676	5,739.6	2,097	7,567.5
<i>Emergency Room</i>	252	822.5	151	761.8	101	1,121.0
<i>Physician Office</i>	394	496.0	294	389.0	100	618.0
<i>Lab Service</i>	754	964.5	191	587.2	563	1,121.7
<i>Radiology Service</i>	1,077	1,393.8	215	1,019.1	862	1,711.9
<i>Other Outpatient</i>	1,549	4,018.6	976	4,951.7	572	6,367.5
Outpatient Pharmacy	385	1,259.0	586	2,067.3	-201	2,412.5
Total Costs	15,682	17,011.6	2,816	9,542.5	12,866	19,403.1

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Complication	N	Cost with Complication, mean (SD)	Cost without Complication, mean (SD)	Difference in Mean Costs (SD)*	Cost with Complication, Median (IQR)	Cost without Complication, median (IQR)	Difference in Median Costs
Multiple gestation	6,050	33,166 (43,957.4)	15,347 (15,874.3)	17,818 (565.8)	24,003.88 (17,807.22 - 34,395.11)	12,892.85 (9,896.84 - 17,346.67)	\$11,111 .03
Coagulation defects	848	26,840 (32,398.2)	15,653 (16,942.9)	11,188 (1,113.0)	21,134.04 (15,972.21 - 29,585.18)	12,987.51 (9,939.14 - 17,572.77)	\$8,146. 53
Peri-, endo-, or myocarditis and cardiomyopathy	207	27,427 (27,767.3)	15,674 (16,999.9)	11,753 (1,930.2)	20,785.71 (14,296.20 - 31,229.26)	12,997.84 (9,943.69 - 17,597.28)	\$7,787. 87
Other cardiovascular diseases	725	26,671 (31,252.4)	15,657 (16,958.0)	11,014 (1,161.1)	20,342.93 (14,690.08 - 28,981.60)	12,990.30 (9,940.27 - 17,579.36)	\$7,352. 63
C-section without indication	957	29,090 (45,844.2)	15,642 (16,836.3)	13,447 (1,482.2)	19,451.43(12,845.05 - 27,852.67)	12,986.47(9,938.78 - 17,574.92)	\$6,464. 96
Bariatric surgery status	152	24,637 (22,824.2)	15,678 (17,007.3)	8,960 (1,851.5)	18,987.13 (14,605.09 - 26,500.88)	12,998.95 (9,943.74 - 17,599.39)	\$5,988. 18
Congenital cardiovascular disorders	380	26,557 (44,540.2)	15,669 (16,948.7)	10,888 (2,285.1)	18,945.53(14,052.79 - 27,526.52)	12,995.78 (9,942.09 - 17,593.91)	\$5,949. 74

Unspecified renal disease	1,261	24,548 (38,216.5)	15,647 (16,866.7)	8,901 (1,076.6)	18,728.61 (13,629.17 - 27,275.34)	12,985.45 (9,936.57 - 17,570.01)	\$5,743.15
Epilepsy	221	22,553 (12,457.1)	15,677 (17,013.3)	6,876 (838.5)	18,647.42 (15,172.84 - 26,035.73)	12,997.76 (9,943.40 - 17,597.68)	\$5,649.66
Abnormality of organs/soft tissues of pelvis	6,973	25,625 (33,154.2)	15,462 (16,408.7)	10,163 (398.1)	18,548.33 (13,910.03 - 26,615.86)	12,911.99 (9,898.74 - 17,425.56)	\$5,636.35
Hypertension complicating pregnancy, childbirth, or the puerperium	22,426	21,389 (21,247.4)	15,255 (16,572.6)	6,134 (145.1)	17,158.68 (12,989.57 - 23,758.40)	12,755.77 (9,805.58 - 17,148.43)	\$4,402.91
Obesity	1,294	21,133 (18,874.0)	15,660 (17,000.1)	5,473 (525.5)	17,175.15 (13,059.89 - 23,923.45)	12,986.39 (9,938.58 - 17,577.43)	\$4,188.75
Other complications of birth affecting mother	33,951	21,212 (22,850.7)	15,031 (16,060.7)	6,181 (127.6)	16,619.56 (12,391.43 - 23,402.17)	12,674.64 (9,764.67 - 16,981.22)	\$3,944.93
Diabetes or abnormal glucose tolerance	23,097	19,915 (14,949.5)	15,355 (17,117.1)	4,560 (103.2)	16,604.04 (12,521.99 - 22,814.46)	12,778.73 (9,817.72 - 17,188.75)	\$3,825.31
Malposition or malpresentation	4,507	20,123 (15,883.9)	15,619 (17,018.7)	4,504 (238.5)	16,686.56 (12,948.25, 22,508.13)	12,953.69 (9,917.69 - 17,539.88)	\$3,732.86
Polyhydramnios	10,8	21,232	15,489	5,744	16,602.54 (12,460.95 -	12,900.67 (9,888.72 -	\$3,701.

	42	(32,356.4)	(16,183.4)	(312.1)	22,924.29)	17,416.21)	87
Thyroid dysfunction	2,79	20,005	15,644	4,361		12,973.09	
	1	(18,452.4)	(16,993.6)	(350.6)	16,464.88 (12,679.24 - 22,180.39)	(9,927.65 - 17,560.55)	\$3,491.79
Fetopelvic disproportion or obstruction	2,30	18,972	15,658	3,314		12,979.17	
	9	(11,395.3)	(17,043.1)	(239.1)	16,335.95 (12,571.40 - 22,021.67)	(9,931.47 - 17,567.04)	\$3,356.77
Other indications delivery interventions	42,2	19,439	15,115	4,324		12,605.66	
	29	(19,838.5)	(16,468.9)	(101.4)	15,948.77 (12,266.38 - 21,531.95)	(9,706.80 - 16,958.62)	\$3,343.11
Disorders of back pelvis and lower limbs	1,97	20,414	15,653	4,761		12,983.54	
	0	(21,132.8)	(16,979.1)	(477.1)	16,287.90 (12,450.49 - 22,426.51)	(9,934.56 - 17,571.04)	\$3,304.36
Other complications of pregnancy	78,3	18,928	14,639	4,289		12339.72	
	23	(19,919.3)	(15,824.8)	(78.1)	15,448.89 (11,739.97- 21,171.88)	(9,531.68 - 16,467.77)	\$3,109.17
Infections of genitourinary tract	8,30	19,860	15,571	4,288		12937.23	
	6	(20,134.0)	(16,907.1)	(223.0)	16,000.21 (11,952.70 - 22,322.41)	(9,908.54 - 17,485.49)	\$3,062.98
Fetal distress and abnormality of forces of labor	5,64	18,559	15,631	2,928		12,955.00	
	4	(12,023.5)	(17,082.9)	(162.9)	15,919.73 (12,140.64 - 21,332.96)	(9,918.14 - 17,529.93)	\$2,964.73
Hemorrhage during pregnancy	34,1	19,693	15,207	4,485		12734.17	
	03	(27,218.2)	(15,291.1)	(150.1)	15539.76 (11,863.28 - 21,315.63)	(9,778.79 - 17,162.26)	\$2,805.59

Previous C-section	6,485	18,880 (19,440.5)	15,616 (16,951.7)	3,264 (243.3)	15,614.47 (12,444.42 - 20,865.90)	12945.27 (9,907.37 - 17,530.72)	\$2,669. 19
Edema or excessive weight gain	1,754	18,797 (13,191.5)	15,665 (17,028.6)	3,132 (316.4)	15,645.83 (11,858.46 - 21,582.39)	12987.73 (9,937.13 - 17,579.71)	\$2,658. 10
Spotting	5,081	18,926 (15,234.4)	15,630 (17,033.5)	3,296 (215.9)	15,554.45 (11,799.79 - 21,298.91)	12,965.29 (9,922.41 - 17,544.10)	\$2,589. 16
Early or threatened labor	52,401	18,232 (17,612.0)	15,187 (16,847.7)	3,045 (83.5)	14,899.92 (11,331.35 - 20,475.69)	12,672.50 (9,729.47 - 17,045.57)	\$2,227. 42
Anemia	1,686	20,166 (36,045.9)	15,658 (16,851.6)	4,508 (878.4)	15,201.53 (11,015.70 - 21,789.65)	12,992.10 (9,940.94 - 17,583.94)	\$2,209. 43
Fetal abnormalities affecting management of mother	79,409	17,594 (19,124.9)	15,056 (16,211.8)	2,538 (75.4)	14,643.35 (11,254.57 - 19,681.68)	12,496.99 (9,603.94 - 16,875.01)	\$2,146. 36
Tobacco use disorder	255	17,981 (13,590.8)	15,680 (17,013.9)	2,301 (851.6)	15,117 (11,617.87 - 19,672.06)	12,999.29 (9,943.98 - 17,602.15)	\$2,117. 74
Umbilical cord complication	1,948	19,970 (56,767.0)	15,656 (16,475.6)	4,314 (1,286. 5)	14,666.68 (11,173.78 - 19,904.77)	12,992.20 (9,938.94 - 17,589.34)	\$1,674. 48
Uterine size date discrepancy	3,24	16,847	15,670	1,177	14,627.80 (11,274.20 -	12,984.55 (9,932.50 -	\$1,643.

	1	(10,265.6)	(17,066.0)	(182.8)	19,083.79)	17,584.34)	26
Prolonged pregnancy	12,092	15,543 (8,780.6)	15,687 (17,253.2)	15,653 (16,942.9)	13,632.10 (10,534.26 - 18,071.03)	12,974 (9,921.69 - 17,581.89)	\$657.61
Trauma to perineum and vulva	5,591	14,882 (9,821.6)	15,696 (17,111.1)	-814 (134.8)	12,971.66 (10,299.74 - 17,057.01)	13000.92 (9,938.35 - 17,616.38)	-\$29.26
Forceps delivery	167	13,006 (5,844.0)	15,683 (17,015.3)	-2678 (453.2)	11,532.68 (9,400.46 - 15,020.73)	13,001.06 (9,945.38 - 17,605.75)	- \$1,468.38

N represents count of women with the complication listed

Costs represent those accrued during pregnancy, delivery, and the three months following live birth

Average cost of an uncomplicated pregnancy (N=80, 481):
\$12,261 (SD: 11,412.0)

For differences in averages costs, all p-values <0.001

*Indicates average cost with the complication minus the average cost without the complication

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