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High Premature Birth Rates Among U.S. Black Women May Reflect the Stress of Racism and Health and Economic Factors

DATE
January 21, 2021

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FOCUS AREA
Children, Youth, and Families

Racism-related stress may help explain why Black women in the United States are over 50% more likely to deliver a premature baby than white women.

Just over 14% of Black women have premature births compared with 9% of white women.[1] These stark racial disparities have been documented for more than a century, reports Catherine Cubbin of the University of Texas at Austin, who calls them "alarming."

Characteristics like a mother's health, education, and income account for less than half of the disparity, and researchers have long sought answers to further explain the gap.[2] Growing evidence suggests that racism-related stress may contribute to premature births.[3]

Premature or preterm birth (before 37 weeks of gestation) is one of the most common causes of infant mortality in the United States.[4]

"Many people think that small and premature babies will by and large 'catch up' in weight and live long and healthy lives—and fortunately, many do," Cubbin says. "What may come as a surprise though is that premature birth increases both the risk of death and multiple, serious disabilities for those babies. It also raises the risk of chronic diseases and early death when those babies become adults."

Racism-Related Stress Could Be Key to Explaining Black/White Gap in Premature Births

Researchers have been unable to fully explain the racial gap in premature births.

A large body of research shows that known risk factors for premature births—such as smoking during pregnancy—only explain a portion of this racial disparity, according to Cubbin. For example, a new study shows that a non-smoking Black woman faces the same odds of delivering prematurely as a white woman who smokes up to nine cigarettes per day before and during pregnancy.[5]

Babies born to women with more socioeconomic resources—more education, income, and wealth—tend to fare better, research shows. But the gap between Black and white women exists at all socioeconomic levels and may even be wider among women with college degrees, Cubbin points out.[6]

The growing evidence that racism-related stress contributes to these inequities in premature birth accounts for some of the dynamics that earlier studies couldn't unravel.

Stressful experiences that women face throughout their lives and across generations can have a powerful impact on the body, says Cubbin. "The stress can be related to interpersonal interactions like feeling socially isolated, getting passed over for a promotion, or being called racist labels, and to institutional discrimination, such as living in unhealthy neighborhoods or receiving inadequate medical care."

Chronic stress is a risk factor for premature and low-birthweight births, she explains. Stress affects the body by raising blood pressure, increasing stress hormones, triggering inflammation, and dampening the immune system in ways that affect a growing fetus, restricting growth and/or triggering premature labor, according to Cubbin.

New studies supported by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) are using innovative approaches to probe the racial disparity in premature births to better identify the root causes and address them.

Twitter May Offer a Barometer of Local Racism and Stress

Experiences of racism are hard to measure, but one research team has come up with a novel approach. They are using Twitter to examine state-level sentiment toward racial and ethnic minorities and compare it with patterns of premature births.[7]

They found that a higher level of negative sentiment toward Black people by Twitter users in a U.S. state was related to higher rates of premature and low-birthweight births in that state.

The study was conducted by an eight-member team including Thu X. Nguyen of the University of California, San Francisco and Quynh C. Nguyen of the University of Maryland. It was based on more than 1.2 million tweets containing at least one word pertaining to a racial or ethnic minority merged with data on all 2015 U.S. births (4 million). Negative comments included complaints, insults, or racial slurs, while positive sentiments expressed cultural pride or denied racial stereotypes.

The researchers divided states into categories of low, medium, and high on both positive and negative

sentiment. All mothers living in states with the lowest levels of positive sentiment toward Black people were 16% more likely to have a premature birth compared to mothers living in the states with the highest level.

The premature birth patterns they observed among minority subgroups were the same as those found for the full population. This similarity suggests that social environments with greater levels of hostility toward minority groups may have adverse effects for all.

Efforts to promote a more accepting and inclusive social environment may reduce premature and low-weight birth rates among all groups, the researchers suggest. An updated analysis using 2015 to 2017 birth data revealed similar findings.[8]

A Mother's Education, Health, Other Characteristics Contribute to Racial Disparities in Premature Births

More than one-third (38%) of the Black-white disparity in premature births can be explained by mothers' socioeconomic characteristics, such as her education level, aspects of her health, and where she lives, a new analysis shows.[9]

"Premature birth is influenced by multiple factors that we are still trying to understand," notes Marie Thoma of the University of Maryland. "The factors we identified could still be rooted in racism, if you think about structural barriers that reduce a Black woman's access to education and health care."

Using advanced statistical methods, Thoma and a team of researchers quantified the contribution of a variety of factors to the racial gap in premature births using data from more than 2 million 2016 U.S. birth certificates.

Their results showed that the largest contributors to these disparities were:

- **Mother's education**, which may be related to her income, health care, health insurance, access to health information, and her health habits. Her education level may also influence the physical demands of her job, her cognitive skills, and sense of control of her life.
- **Mother's marital status and whether the child's father was listed on the birth certificate**, which may reflect paternal involvement and financial support during pregnancy.
- **Her source of payment for delivery**, particularly Medicaid, which may reflect her ability to navigate the health care system and her access to ongoing care.
- **Chronic hypertension** (high blood pressure), not hypertension that developed during pregnancy (preeclampsia).

"Prenatal care did not contribute that much to explaining the disparity, which didn't surprise us," says Thoma. "Birth certificate data is not able to measure the quality of a woman's prenatal care or how satisfied she was with her care, which may be a better measure of potential bias in health care delivery."

To reduce the racial gap in premature birth, the researchers suggest that policymakers consider public health programs designed to expand health care access and enhance social support for pregnant Black women—such as prenatal care groups based in local clinics. They also recommend improving primary health care for Black women before conception, specifically targeting hypertension.

Programs that can address preeclampsia and hypertension could reduce some of the disparity in the short term before other important structural changes can occur that address the root causes of these inequalities, Thoma points out.

Racial and Ethnic Composition of Mothers' Neighborhoods a Factor in Premature Birth Risk

The racial composition of a mother's neighborhood also appears to shape her risk of premature birth, a new study by Cubbin, Yeonwoo Kim formerly of the University of Michigan, Shetal Vohra-Gupta of the University of Texas at Austin, and Claire Margerison of Michigan State University finds.[10]

The researchers focused on all single babies born to non-Hispanic Black and white women in Texas between 2009 and 2011 (more than 477,000). They linked these birth certificate data with data on neighborhood racial and ethnic composition over 20 years rather than at just one point in time. They examined and classified the proportion of Latino, non-Hispanic Black, and non-Hispanic white residents in each neighborhood in 1990, 2000, and 2010, and any change in the population share held by each racial and ethnic group between 1990 and 2000 and between 2000 and 2010. Their analysis accounted for differences in parents' education, marital status, prenatal care, and neighborhood poverty, among other factors.

Key findings:

- No matter the racial and ethnic composition of their neighborhood, Black women have higher odds of having a premature birth than white women.
- Overall, both Black and white women are at higher odds of a premature birth if they live in a neighborhood with a persistently high concentration of Black residents.
- White women have lower odds of giving birth prematurely if they live in a neighborhood with a persistently high concentration of white residents.
- Black/white disparities are highest in neighborhoods with high ongoing concentrations of white residents (59% higher) and lowest in neighborhoods with persistently low concentrations of white residents (34% higher).

"If you have a white woman and a Black woman and all other things are equal [age, marital status, prenatal care, her education level and that of her partner, and neighborhood poverty level], the Black woman faces a higher risk of having a premature birth," Cubbin explains.

In predominantly Black neighborhoods, both Black and white women may have limited access to health care services, lack educational and employment opportunities, and feel less safe than women living in other neighborhoods, Cubbin suggests.

In an earlier study, the researchers showed that neighborhood poverty and inequality was related to premature births but did not explain Black/white differences, suggesting that all mothers are affected by high-poverty neighborhoods and high levels of income inequality in a harmful way. But, in fact, Black women are impacted more severely.[11]

The researchers argue that racially inclusive policies can improve the health of mothers and prevent premature birth among Black women in predominantly non-white neighborhoods by addressing key factors shaping health such as limited opportunities for adequate and affordable housing, access to health care, high-quality minority-focused health resources, sustainable income, and quality education.

This article was produced under a grant from the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD). The work of researchers from the following NICHD-funded Population Dynamics Research Centers was highlighted: University of Texas at Austin (5P2CHD042849-18), University of Maryland (5P2CHD041041-18), and University of Michigan (5P2CHD041028-18).

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Review

Maternal Outcomes in Birth Centers: An Integrative Review of the Literature

Jill Alliman, CNM, DNP, Julia C. Phillippi, CNM, PhD

Introduction: The birth center, a relatively recent innovation in maternity care, is an increasingly popular location of birth. The purpose of this integrative literature review is to assess the research on maternal outcomes from birth center care.

Methods: Using methods by Whittemore and Knafl, we conducted an integrative review of studies of birth centers published in English since 1980. Twenty-three quantitative sources and 9 qualitative sources describing maternal outcomes of birth center care were reviewed and synthesized.

Results: Outcomes for women receiving birth care were positive. Spontaneous vaginal birth rates and perineal integrity were higher for women beginning care in a birth center compared to women in hospital care. Rates of cesarean birth were also lower for women planning birth center care. Transfer rates are difficult to compare across studies, but antepartum transfer rates ranged from 13% to 27.2%. Intrapartum transfer rates ranged from 11.6% to 37.4%, and from 11.6% to 16.5% in studies published from 2011 to 2013. Nulliparous women had higher rates of transfer than multiparous women. Few severe maternal outcomes and no maternal deaths were reported in any studies. Women were satisfied with the comprehensive, personalized care that they received from birth centers.

Discussion: Quantitative studies reviewed included more than 84,300 women. The heterogeneity of the studies and variations of practice limit generalization of findings. However, even with multisite studies enrolling a variety of birth centers and practice changes over time, the consistency of positive outcomes supports this model of care. Policy makers in the United States should consider supporting the birth center model as a means of improving maternal outcomes.
J Midwifery Womens Health 2016;61:21–51

Keywords: birthing centers, freestanding, birth, prenatal care, midwifery, integrative review

INTRODUCTION

The number of US births in freestanding birth centers grew by more than 75.8% from 9620 in 2004 to 16,913 in 2013, which is a 87% increase in the proportion of US births that take place in birth centers.[1,2] As part of national and international calls to improve maternal health, the birth center model of care has gained widespread attention as a location of birth for low-risk women.[3,4] Birth centers are a fairly recent location for birth, with the first studies on this model published in the 1980s.[5,6] However, there is a growing body of useful literature on this model of care. The purpose of this integrative review is to assess and summarize the current literature on maternal outcomes in birth centers to provide clear information for clinicians, administrators, and policy makers.

Although birth centers exist across the globe, the definition of this model is not standardized. With a broad definition, *birth centers* are locations for birth. As described in the literature, a birth center can be a discrete floor, a set of rooms within the hospital environment,[7,8] or a freestanding facility devoted solely to low-risk perinatal care.[9–12] Nearly all birth centers identify as a place of birth for low-risk women that is integrated within the health care network.[4]

There are a variety of official definitions of birth centers within the United States. The federal definition of a freestanding birth center is "a health facility that is not a hospital or physician's office, where childbirth is planned to occur away from the pregnant woman's residence that is licensed or otherwise approved by the state to provide prenatal labor and delivery or postpartum care and other ambulatory services that are included in the plan."[13] The American Association of Birth Centers (AABC) further defines a freestanding birth center as "a home-like facility existing within a health care system with a program of care designed in the wellness model of pregnancy and birth."[14] *Standards for Birth Centers* were developed in 1985 and are maintained by AABC to provide guidance for quality and safety in this model.[15]

Licensure and accreditation of birth centers varies. In the United States, freestanding birth centers are licensed or recognized by statute, regulation, or Medicaid in 42 states.[14] In 7 states, birth centers may operate without licensure.[14] Only in North Dakota are birth centers not a legal option for perinatal care.[14] Currently, 2 organizations in the United States accredit birth centers: the Commission for the Accreditation of Birth Centers and The Joint Commission. The Commission for Accreditation of Birth Centers requires centers to adhere to the AABC standards.[14] As of January 2015, there were 310 known birth centers in the United States, 82 of which were accredited by the Commission for the Accreditation of Birth Centers.[16] In addition, there are many birth centers that adhere to the AABC standards but are not accredited.

The birth center model of care is increasing in popularity. Clear information on the maternal benefits and risks of this model are needed for women, clinicians, administrators, and policy makers as the United States and other countries work to improve maternal perinatal outcomes while maintaining a patient-centered and compassionate approach to care. This integrative review will provide a comprehensive assessment of

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1526-9523/09/$36.00 doi:10.1111/jmwh.12356

Quick Points

- The number of US births in freestanding birth centers grew by more than 75% from 9620 in 2004 to 16,913 in 2013.
- This integrative review of maternal outcomes in birth centers includes 23 quantitative and 9 qualitative articles from studies performed in the United States and internationally.
- The birth center model of care is associated with greater rates of spontaneous vaginal birth and lower rates of assisted vaginal and cesarean birth when compared to hospital care. Severe adverse maternal outcomes were very rare, and no maternal deaths were reported.
- These data, including outcomes from more than 84,000 women, clearly support that birth centers are a safe model of care for low-risk women when associated with a health system able to provide higher-level care.
- Policy makers in the United States should consider supporting the birth center model to improve local, state, and national maternal outcomes; and health plans should ensure that women have access to birth centers.

the literature on the birth center model of care for low-risk women.

METHODS

Integrative reviews are summaries of original research on a specific subject to provide a comprehensive understanding of the topic.[17] The methodology outlined by Whittemore and Knafl was chosen for this review and includes: problem identification, literature search, data evaluation, data analysis, and presentation of review findings.[17] In this review, we have combined data analysis and presentation of review findings in the Results section.

Problem Identification

Walsh and Downe published a systematic review of birth center care in 2004.[18] Since this review was published, several data-based studies have been released. These new studies, especially the Stapleton et al study of more than 15,000 women, require reassessment of the literature on birth center care.[12] Although there is no recent integrative or systematic review of the literature of maternal outcomes in birth centers, there have been several recent studies of neonatal outcomes for out-of-hospital births that have generated controversy, and interested readers are referred directly to these articles.[19–23] Therefore, we focused on maternal outcomes in recognized, accredited, or licensed birth centers in the developed world.

Literature Search

In November of 2014, we conducted a search in Google Scholar, PubMed, and CINAHL databases using the search terms: "birth center"/"birthing center" and "outcomes." We limited the search to articles published in English after 1980. More than 2000 articles were located through Google Scholar; 22 articles through CINAHL, and 115 applicable publications through PubMed. The title and abstract of all articles in the CINAHL and PubMed searches were reviewed, and articles published in peer-reviewed journals containing data on maternal outcomes were obtained. Thirty-nine studies were obtained for full review. After obtaining articles, ancestry searches located 4 additional sources.

Data Evaluation

After an initial review, 11 studies were eliminated. Four were studies of in-hospital birth centers that did not define their birth center practice model,[24–27] and 7 studies focused only on one aspect of care[28,29] or cost[30–32] and did not provide comprehensive data about maternal outcomes.[28,29]

Not all studies provided clear information on the location of the birth center. We excluded studies that specifically stated the birth center was located within an obstetric hospital unit because this is not reflective of US standards, but we retained studies that did not clearly stipulate the birth center location. We retained 4 articles from 2 international studies set in birth centers nestled within clinics or very small hospitals that did not provide surgical obstetric services as these studies clearly stated the birth center was designed for low-risk women.[8,33–35] We also included a series of articles from one randomized controlled trial conducted on a separate floor of a hospital because the birth center standards were clearly outlined and matched AABC standards.[7,36,37] Qualitative studies were included if they reported the woman's perspective of care in the birth center, antepartum or intrapartum.

RESULTS

Data Sets

After careful evaluation and screening, 23 quantitative publications representing 14 data sets (Table 1) and 9 qualitative publications (Table 2) were included in the integrative review. Data from one research study was often reported in several articles. Those with overlapping data sets include: 1) the Rooks et al articles,[9,38–40] 2) Waldenström and Nilsson publications,[7,36,37] 3) Jackson et al[10] and Nguyen et al,[41] 4) Brocklehurst et al[11] and Rowe et al,[42] and 5) Overgaard et al.[8,33,34]

Study Settings

Country

Of the 32 sources reviewed, 18 were from the United States[5,9,10,12,20,38–41,43–51]; 3 from England[11,42,52]; 3 from Sweden[7,36,37]; 3 from Denmark[8,33,34]; 2 from Australia[53,54];

Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
Scupholme[5]	Matched pair cohort	**Transfer rate after admission to FBC**
1986, 1982-1984	Outcomes from an urban, FBC using CNMs to provide care were compared	IP: 21% (women transferred intrapartum/women presenting in labor)
Florida, United States	with a tertiary care hospital with obstetricians providing care.	PP: 1.5% (appears to be women transferred/women giving birth at FBC)
	250 women who were admitted to the birth center in labor matched after birth	**Mode of birth**
	with 250 women in standard care with same risk factors and demographics.	SVB: FBC 92%; hospital 83%[a]
	Birth center group was more educated than control group.	AVB: FBC 2%; hospital 3%
	Birth center group race/ethnicity: 52% white, 17% black, 31% Hispanic	Cesarean: FBC 6%; hospital 14%
		Pharmacologic pain relief
		Narcotic analgesia: FBC 31%; hospital 41%[a]
		Length of labor: significantly longer labors in the FBC group[a]
		First stage:
		13-24 hours: FBC 55%; hospital 69%
		>24 hrs: FBC 6%; hospital 2%[a]
		Second stage > 2 hours: FBC 5.4%; hospital 2.4%
		Oxytocin use in labor: FBC (after transfer) 12.4%; hospital 24%[a]
		Postpartum hemorrhage
		FBC 5%; BC hospital 1.4%
Scupholme[43]	Matched cohort	**Transfer rate**
1987, 1984-1985	Outcomes from an urban FBC using CNMs to provide care were compared	AP: 20% of women receiving prenatal care were transferred for medical reasons
Florida, United States	with a tertiary care hospital with obstetricians providing care.	(women transferred/women in prenatal care)
	494 women gave birth in a FBC during the study period. Women who	IP: assigned 24%; self-selected 26% (women transferred/women admitted to FBC in
	self-selected FBC care were matched with women who were assigned to the	labor)
	birth center related to relieve hospital overcrowding. Attempt was made to	**Mode of birth**
	match groups for age, parity, financial status, and level of education.	SVB: assigned 93%; self-selected 90%
	Sample was 148 women assigned to birth center care compared to 148 women	Overall cesarean rate: 5% (assigned 5%; self-selected 5%)
	who selected BC care. The assigned group had significantly younger and less	**Pharmacologic pain relief**
	educated women and more women who were black or of Hispanic ethnicity.	Analgesia use: assigned 39%; self-selected 43%
Feldman[44]	Retrospective matched cohorts from women who chose either FBC or	**Transfer rate for FBC group after 37 weeks' gestation**
1987, 1981	hospital care	AP: 8% (women transferred between 37 weeks' gestation and labor/number of
New York City, United States	Outcomes from an urban FBC in New York, United States, using CNMs to	women in study at 37 weeks' gestation)
	provide care were compared with a tertiary care hospital with obstetricians	IP: 14% (number of women transferred at any point in labor/number of women in
	providing care.	study at 37 weeks' gestation)

(*Continued*)

Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
	77 women planning birth center birth at 37 weeks' gestation matched to low-risk group of 72 women with hospital births FBC group had significantly more white and college-educated women. Hospital group had significantly more women of Hispanic ethnicity.	**Mode of birth** SVB: FBC 93.5%; hospital 88.7% Forceps: FBC 5.6%; hospital 43.7%[a] Cesarean: FBC 6.5%; hospital 11.3% **Pharmacologic pain relief** Epidural: FBC 2.7%; hospital 47.6% ($P < .0001$) Demerol: FBC 19.5%; hospital 26.8% **Length of labor** 1st stage > 12 hours: FBC 26.1%; hospital 1.6%[a] 2nd stage > 2 hours: FBC 18.8%; hospital 4.8%[a] **Oxytocin use in labor** Induction: FBC 1.3%; hospital 4.2%[a] Augmentation: FBC 9.1%; hospital 59.5%[a] **Perineal integrity** Episiotomy rate: FBC 47.2%; hospital 78.1%[a] Intact perineum: FBC 25%; hospital 6.3%[a] **Third stage** Manual removal of the placenta: FBC 1.4%; hospital 9.5%[a] Postpartum hemorrhage: FBC 2.7%; hospital 1.6%
Rooks[9,b] 1989, 1985-1987 United States	Prospective cohort, observational study Women admitted for labor in 84 FBC birth centers in 35 states Care providers within the birth centers included CNMs, SNMs, obstetrician-gynecologists, licensed or lay midwives, and registered nurses. 1,1814 women admitted in labor to 84 FBCs Compared to 1986 birth certificate data, women choosing birth center care were more likely to be white and of Hispanic ethnicity than the general population. They were also more likely to have finished college.	**Transfer rate** AP (including medical and nonmedical reasons): 33.8% (number of women transferred prior to admission to FBC in labor/number of women enrolled in study IP: 11.9% (number of women transferred prior to birth/number of women admitted in labor) PP: 0.8% (number of women transferred after birth but prior to discharge/women admitted to birth center in labor) Timing after admission to center unknown: 1.4% **Mode of birth** SVB: not clearly reported for women admitted in labor AVB: not clearly reported for all admitted women; forceps and vacuum were applied within the birth center in 0.6% of births Cesarean: 4.4% overall; 9.9% for nulliparous women

(*Continued*)

Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
		Pharmacologic pain relief Analgesia or sedative IP: 24% of nulliparas; 6.2% of multiparas PP analgesia beyond local lidocaine: 3% **Oxytocin use in labor** Augmentation with oxytocin at the birth center: 1.4% (not acceptable by current standards) **Perineal integrity** Episiotomy rate: 17.6% Intact perineum: 34% **Third stage** Postpartum hemorrhage requiring transfer: 0.5% **Severe adverse maternal outcomes** 0.01% PP eclampsia satisfaction: 94% would use center again 98.9% would recommend to a friend Of women transferred: 83.3% would use center again 96.9% would recommend BC
Rooks[38,b] 1992, 1985-1987 35 states in the United States	Prospective cohort, observational study Women seeking prenatal care or admitted for labor in 84 FBCs in 35 states within the United States. Care providers within the FBCs included CNMs, SNMs, obstetrician/gynecologists, other licensed or lay midwives, and registered nurses. 1,7856 women who received care from 84 birth centers 1,1814 women admitted in labor to FBC.	**Transfer rates** AP (including medical and nonmedical reasons): 28.8% (women transferred prior to admission/women enrolled in study who had complete information) Prenatal complication: 13.8% Nonmedical reason: 4.2% Desired hospital birth: 4.1% Spontaneous or induced abortion: 2.08% Fetal death: 0.3% Lost to follow-up/other: 3.2% **Characteristics of women admitted in labor to the FBC** 92% married or living with partner 90% of women aged 18-35 years 69.1% of midlevel socioeconomic status 39.3% nulliparous

(*Continued*)

Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
Rooks[40,b] 1992, 1985-1987 35 states in the United States	Prospective cohort, observational study Women admitted for labor in 84 FBC in 35 states Care providers for labor within the FBCs included CNMs (76% of admitted women), registered nurses (7.7% of admitted women), obstetrician/gynecologists (7.4% of admitted women), licensed or lay midwives (3.8% of admitted women), SNMs (3% of admitted women), and family practice physicians (2.5% of admitted women). 1,1814 women admitted in labor to FBCs.	**Transfer rate for women admitted for intrapartum care** IP: 12.4% (number of women transferred after admission/women admitted to birth centers for intrapartum care) PP: 3.4% (number of women transferred after birth/number of women admitted to birth center) **Mode of birth for women giving birth within the FBC** SVB: 99.4% AVB: Vacuum 0.4%; low forceps 0.2% **Pharmacologic pain relief** Central nervous system (CNS) depressants including narcotics: 13.1% Nulliparous women 3 times more likely than multiparous women to use CNS depressants for pain Anesthesia (only stated for women giving birth within the FBC, not all admitted women): None: 44% Local anesthesia only: 52.9% Paracervical block: 1.7% Pudendal block: 1.3% Inhalation anesthesia: 0.02% Epidural, caudal, or spinal anesthesia: 0.01% 39 women were transferred solely for inadequate pain relief **Induction of labor for those admitted for intrapartum care** Castor oil: 8.7% Amniotomy prior to contractions: 1% Oxytocin: 0.4% **Augmentation of labor for those admitted to birth center** Amniotomy: 51% Nipple stimulation: 12.7% Oxytocin: 1.5% **Perineal integrity for women giving birth in the FBC** Intact perineum: 34% Episiotomy rate: 23%

(*Continued*)

Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
Rooks[39,b] 1992, 1985-1987 35 states in the United States	Prospective cohort, observational study Women seeking prenatal care or admitted for labor in 84 FBCs in 35 states within the United States. Care providers within the FBCs included CNMs, SNMs, obstetrician/gynecologists, licensed or lay midwives, and registered nurses. 1,7856 women who received care from 84 birth centers 1,1814 women admitted in labor to FBCs with a focus on women and newborns experiencing complications within the birth center itself. Maternal complications following transfer were not included.	**Antepartum transfer:** 1/3 of women seeking care were transferred. More than half of antepartum transfers were nonmedical. 14% of women seeing birth center care were referred prior to labor. 90% of referrals were during the third trimester, and postterm pregnancy was most frequent reason (number of women transferred prior to admission in labor/women enrolled in study). **Transfers after admission to the FBC** 12.4% of women admitted to the FBC (women transferred before birth/women admitted to birth center) **78% of transfers occurred intrapartum** First stage: 9.5% of all women admitted for FBC in labor 59.8% of all transfers Second stage: 2.2% of all women admitted for FBC in labor 14.1% of all transfers **22% of maternal transfers occurred postpartum** 0.9% of all women admitted for FBC in labor 5.4% of all transfers **Intrapartum complications at the FBCs** Failure to progress in the first stage of labor: 8.3% of women admitted in labor 43.2% of transfers after intrapartum admission Fetal distress in first stage: 7.8% of women admitted in labor 2.9% of transfers after intrapartum admission Postpartum hemorrhage: 6.2% of women giving birth in the FBC **Women experiencing complications:** authors categorized complications as none, minor, intermediate, and serious. However, the perceived seriousness of complications may be different than current perceptions. Therefore, only the categories of no and serious complications are reported. Labor complications for women admitted to FBC: none 60.8%; serious 5.7%

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
		Birth complications for women birthing in FBC: none 76.1%; serious 0.2% Immediate postpartum complications for women who gave birth in FBC: none 48.3%; serious 0.5%
Waldenström[7,c] 1993, 1989-1992 Sweden	Randomized, controlled trial 1230 nonsmoking, Swedish-speaking women without complications randomly assigned to in-hospital birth center care (n = 617) or the control group of standard care in the hospital (n = 613) The same team of midwives were the primary care provider for both groups.	Main outcome measure was satisfaction with care. **Transfer rates for birth center group** AP including medical and nonmedical reasons: 17% (women leaving birth center care before labor/women in study group) IP: 37.3% (women transferred in labor/women in study group) PP: 1.1% (women transferred after birth/women in study group) **Satisfaction** Women assigned birth center care were more satisfied ($P < .001$) with their prenatal, intrapartum, and postpartum care than the control group of standard hospital care. More women in the birth center group felt AP care raised self-esteem (63% BC; 18% hospital; $P < .001$) More women assigned to the birth center group would use the same model in the future[a] (88% BC; 46% hospital).
Waldenström[36,c] 1994, 1989-1992 Sweden	Randomized controlled trial 1230 nonsmoking, Swedish-speaking women without complications randomly assigned to in-hospital birth center care (n = 617) or the control group of standard care in the hospital (n = 613) The same team of midwives were the primary care provider for both groups.	Main outcome measures were use of labor analgesia and experience of pain in labor. Groups were analyzed as intent-to-treat beginning with group allocation. **Transfer rates for birth center group** Withdrawal from study: primiparas 2.3%; multiparas 4.5% AP (medical reasons): primiparas 1.8%; multiparas 9.4% IP: primiparas 27.3%; multiparas 4.5% PP: primiparas 1.1%; multiparas 1.1% **Pharmacologic pain relief** Epidural: Primiparas: BC 16.9%; hospital 22.5%[a] Multiparas: BC 1.6%; hospital 2.3% Pethidine: Primiparas: BC 4.2%; hospital 20.1%[a] Multiparas: BC 1.6%; hospital 7.0%[a]

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
		Nitrous oxide: Primiparas: BC 18.4%; hospital 54.4%[a] Multiparas: BC 3.5%; hospital 32.9%[a] Pudendal block: Primiparas: BC 0.3%; hospital 2.15%[a] Multiparas: BC 0.4%; hospital 4.3%[a] Paracervical block: Primiparas: BC 0.3%; hospital 2.1%[a] Multiparas: BC 0%; hospital 0.4%[a] Sterile water: Primiparas: BC 16%; hospital 11.7%[a] Multiparas: BC 5.5%; hospital 5% **Experience of pain at 2 months postpartum** Rating of pain intensity: no significant difference between BC and hospital groups Women's attitudes to labor pain as positive or negative: no significant difference between BC and hospital groups **Experiences of birth at 2 months postpartum** Women's overall experience of childbirth: no difference between BC and hospital groups Anxiety during birth: no statistically significant difference between BC and hospital groups Support from husband: no statistically significant difference between BC and hospital groups

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
		Experiences of care at 2 months postpartum
		Support from midwife: significantly greater for BC group
		Freedom to express feelings in labor: significantly greater for BC group
		Satisfied with achievement during birth: significantly greater for BC group
Waldenström[37,c]	Randomized controlled trial	Main outcome measures were medical interventions and outcomes. Groups were analyzed as intent-to-treat beginning with group allocation. Women were permitted to have birth center care with a previous cesarean if their last birth was vaginal.
1997, 1989-1993	928 Swedish-speaking women without complications randomly assigned to in-hospital birth center care and 932 to standard care in hospital	
Sweden	The same team of midwives were the primary care provider for both groups.	
		Transfer rates
		AP: 13% (women transferred before labor/women in study group)
		IP: 19% (significantly different between primiparous women and multiparous women)
		(51% of primiparous women assigned to the BC group gave birth in the BC)
		PP: 1.8%
		Length of labor from start of contractions to birth[a]
		BC 15 hours; hospital 14 hours[a]
		Pain relief
		Epidural: BC 12.1%; hospital 15.1%[a]
		Pethidine: BC 3.7%; hospital 13.4%[a]
		Nitrous oxide: BC 14.3%; hospital 46.6%[a]
		Pudendal block: BC 3.4%; hospital 5.6%[a]
		Local analgesia postpartum: BC 4.2%; hospital 20.1%[a]
		Mode of birth
		SVB: not reported
		Vacuum: BC 3.9%; hospital 4.4%

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
		Forceps: BC 3.9%; hospital 4.4% Cesarean: BC 7.1%; hospital 8.9% (Author noted that low baseline cesarean rate decreased power to see group differences) **Oxytocin use in labor** Induction of labor: BC 2.7%; hospital 4.6%[a] Augmentation with oxytocin 1st stage: BC 15.6%; hospital 39.3%[a] 2st stage: BC 17.9%; hospital 29.5%[a] **Perineal integrity** Episiotomy rate: BC 7.8%; hospital 8.3% **Third stage** Postpartum hemorrhage > 600 mL: BC 12.5%; hospital 12.7% Postpartum hemorrhage with transfusion: BC 0.7%; hospital 0.6% **Severe adverse maternal outcomes** One in each group with no residual effects
Fullerton[51] 1997 1993-1994 & 1985-1987 California, United States	Comparison of transfer data from 2 birth centers (women enrolled prospectively) is compared with data from a large, multi-site prospective trial. Data from women admitted to 2 FBCs were compared with the National Birth Center Study.[9,38–40] The Birthplace had 1698 admitted women, and the Irvine center had 515 participants. The Irvine center allowed low-dose oxytocin to be administered, which is not consistent with current national standards. CNMs were the intrapartum care provider in the 2 California birth centers, and the National Birth Center Study had diverse providers as described above.	**Transfer rates** AP: (women transferred antepartum/women enrolling in prenatal care) Total: birthplace 28.3%; Irvine 19.1%; national study 28.8% Nonmedical reasons: birthplace 10.2%; Irvine 8.6%; national study 15.1% Medical reasons: birthplace 18.1%; Irvine 10.5%, national study 13.8% IP: 19% (women transferred intrapartum/women admitted in labor) birthplace 25.1%; Irvine 20%; national study 12.4% Percent of women transferred IP who were nulliparous: birthplace 75%%; Irvine 71.8%; national study 79.1% Most common reasons for IP transport across studies: failure to progress, prolonged rupture of membranes, thick meconium, elevated blood pressure PP (women transferred after birth/women giving birth in the FBC): birthplace 1.1%; Irvine .97%; national study 1%

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
David[56] 1999, 1992-1994 Berlin, Germany	Retrospective cohort with hospital comparison group selected from women with no risk factors and spontaneous labor. The birth center group consisted of women admitted into labor (n = 801) at 2 Berlin birth centers compared with a control group of hospital births in Berlin meeting birth center admission criteria (n = 3271). All women were citizens of Germany, the US, or Northern and Central European countries. Midwives (of unspecified type) were the care provider for the birth centers, and midwives and obstetricians were care providers at hospital births. No data on the percent of midwife-attended births in hospital was reported.	The birth center group was formed on admission to the birth center in labor and then analyzed using an intent-to-treat approach. **Transfer rates** IP: 18.2% (women transferred intrapartum/women admitted in labor) PP: 3.6% (women transferred after birth/women admitted in labor) **Mode of birth** SVB: FBC 91.4%; hospital 84.3%[a] AVB: FBC 5%; hospital 11%[a] Cesarean: FBC 3%; hospital 4.6% Primiparous cesarean rate: FBC 4%; hospital 6.6%[a] **Perineal integrity** Episiotomy rate: FBC 15.7%; hospital 54.8%[a] Intact perineum: FBC 30%; hospital 22%[a] **Third stage** No significant differences in complications **Serious adverse maternal outcomes** FBC, none; hospital, one maternal death
Roberts[45] 2001, 1997-1999 Utah, United States	Retrospective cohort of women admitted to FBC 231 women evaluated at FBC over 2 years, 220 admitted in labor. Nurses or CNMs perform the initial labor evaluation and CNMs are the primary care provider for laboring women. 96% of admitted women were white and non-Hispanic.	The birth center group was formed on admission to the FBC and an intent-to-treat approach was used for data analysis. **Transfer rates** IP: 2% admitted to hospital after initial evaluation. 8.2% transfer rate after admission in labor PP: 0.5% (women transferred after birth/women admitted in labor) **Mode of birth for women admitted to the birth center** SVB: not clearly stated; appears to be 97% AVB: 1% vacuum; 1% forceps Cesarean: 1% **Pharmacologic pain relief** Narcotics: IP 16% Epidural: not clearly stated, but 1.8% of women were transferred due to desire for epidural

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
		Oxytocin use in labor: stated as 0.5% in one location, but 4.5% of admitted women were transferred due to arrest of labor
Jackson[10,d] 2003, 1994-1996 California, United States	Prospective cohort with concurrent comparison group Birth center group self-selected to FBC care (n = 1808). The comparison group was recruited from local prenatal care clinics. Low-income women were the target population; women with private or military insurance were excluded. 86.3% of the FBC group was white, Hispanic compared with 61.2% of the hospital group. The FBC group had a significantly lower proportion of white, African American women. Care providers at the birth center were CNMs and obstetricians. The hospital group was cared for by obstetricians or obstetric residents.	The birth center group formed at the beginning of prenatal care and outcomes analyzed using an intent-to-treat approach. Women attempted a trial of labor after one cesarean were permitted in the FBC group. (Adjusted Wald estimates of 95% CIs are used to determine significant differences between groups because *P* values were not presented.) **Transfer rates** Prior to study admission 6.6% of women choosing FBC care were excluded from study; and 14.7% of women choosing hospital care were excluded from the study. AP: medical 27.2%; nonmedical 8.5% IP: 18.5% (women transferred after admission in labor/women in study group) Of women choosing FBC care; 45.3% of women remained low risk to give birth at the FBC. **Mode of birth** SVB: FBC 80.9%; hospital 62.9%[a] AVB: FBC 8.4%; hospital 18.1%[a] Cesarean: FBC 10.7%; hospital 19.1% **Pharmacologic pain relief** Narcotic: FBC 29.2%; hospital 33.2% Epidural: FBC 29.8%; hospital 68.6%[f] **Oxytocin use in labor** Induction with oxytocin/prostaglandin FBC 8.4%; hospital 14.7%[a] Augmentation with oxytocin: FBC 15.8%; hospital 26.5%[a] **Perineal integrity** Episiotomy rate: FBC 13.1%; hospital 37.8% **Postpartum maternal readmission:** FBC 0.4%; hospital 1% Of women choosing FBC care, 45.7% of women remained low risk to give birth at the FBC.

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
Nguyen[41,d] 2009, 1994-1996 California, United States	Targeted multivariate predictive analysis of transfer data from a prospective longitudinal study This study used the dataset described in Jackson et al, 2003, but only analyzed information from the subset of women planning to give birth within the FBC (n = 1808). Of these, only women who were low risk with complete chart data were included in the analysis (n = 1028). Only antepartum and intrapartum transfers were studied. Care providers at the birth center were CNMs and obstetricians. Women with a previous cesarean birth were accepted into birth center care.	**Transfer rates** AP: 37.6% of women desiring birth center birth (defined as women presenting to the hospital in labor) Of AP transfers: medical 66.6%; nonmedical 23%; unknown 10% IP: 19.6% of women desiring birth center birth (defined as women who present to the birth center in labor but give birth at the hospital and women with preterm labor or rupture of membranes) Of IP transfers: medical 96.9%; maternal choice 2.3%; unknown 0.8% Of women choosing FBC care: 45.3% of women remained low risk to give birth at the FBC. **Risk factors associated with overall (medical and nonmedical) transfer** History of cesarean birth (2.2 times greater risk) Nulliparity (1.8 times greater risk) History of previous hospital birth (1.5 times greater risk)
Wax[20] 2010 2006 birth certificate data 19 states in United States	Retrospective cohort-based study of 2006 birth certificate data from low-risk births from the 19 states using the 2003 revised birth certificate 745,690 births: 97% in hospital (n = 733143); 0.6% in a birth center (n = 4661), and 0.9% at home (n = 7427). This sample represents 49% of US births in 2006.	Data were analyzed by location of birth with FBC births and home births being compared (as one group) with hospital births. Women having out-of-hospital births are more likely to be older,[a] multiparous,[a] and white[f] than mothers giving birth in the hospital in these states. FBC and home births had less frequent chorioamnionitis, fetal intolerance of labor, and meconium staining.[a]

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
	Physicians, CNMS, "other midwives" and "not stated" were care providers. Data was analyzed by location of birth, not care provider.	Women giving birth in FBC and at home more often had prolonged[a] and precipitous[a] labors than women giving birth in the hospital.
Overgaard[8,f] 2011 2004-2008 Rural Denmark	Prospective cohort with matched control group 839 women admitted to 2 midwifery units within a hospital that had an intensive care unit but no obstetric service (due to the rural hospital location) were matched with 839 low-risk women receiving care at an urban obstetric unit who had similar demographic characteristics.[e] 96% of the women were Nordic or of Western European ancestry in both groups. Care in the BC was provided by midwives with 2 years of experience and advanced training in vacuum birth.	The birth center (a midwifery unit within a rural hospital without an obstetric service) and hospital cohorts were formed on admission to the units in labor and then analyzed with an intent-to-treat approach. **Transfer rate** Transfers intrapartum and up to 2 hours postpartum: 14.8% (number of women transferred/women admitted in labor) Primipara: 36.7% of primiparous women admitted were transferred Multipara: 7.2% of multiparous women admitted were transferred IP: 11.6% (women transferred intrapartum/women admitted in labor) PP: 4.7% (number of women transferred to the hospital prior to discharge/women admitted in labor) **Mode of birth** SVB: BC 94.9%; hospital 89.5%[a] AVB: BC 3.0%; hospital 7.8%[a] Cesarean: BC 2.3%; hospital 4%[a] **Pharmacologic pain relief** Epidural: BC 4.2%; hospital 10.3%[a] **Oxytocin use in labor** Augmentation: BC 8.2%; hospital 18.6%[a] **Perineal integrity** Intact perineum: BC 61.3%; hospital 55.5%[a] Perineal suturing: BC 35%; hospital 43.6%[a] 3r[d]- and 4th-degree lacerations: BC 2.3%; hospital 2.9% **Third Stage** Postpartum hemorrhage >500 mL: BC 3.5%; hospital 8.1%[a] **Readmission or outpatient visit within 28 days:** BC 2.9%; hospital 4.8% **Severe adverse maternal outcomes:** none in the BC group, one in the hospital group; low numbers preclude significance testing

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First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
Brocklehurst[11,e] 2011, 2008-2010 England	Prospective national cohort study commonly known as the Birthplace Study Data were collected from: 142 home birth practices (97% of the total in England), 53 birth centers (95% of the total in England), 43 alongside midwifery units within the hospital (84% of the total in England), and 31 hospital obstetric units. 64,538 low-risk women were included in one of 3 groups by their planned location of birth at the beginning of labor: home, freestanding midwifery unit (noted here as BC for birth center), alongside midwifery unit in hospital, or obstetric unit in hospital. Midwives were the primary care provider in all settings except the hospital obstetric units.	Groups for analysis formed by the woman's choice of birth location at the beginning of labor: home, freestanding midwifery unit (BC), alongside midwifery unit within the hospital, or within obstetric unit within the hospital. All groups were compared with the obstetric hospital unit to determine statistical differences. (Adjusted Wald 99% CIs were used to determine statistical significance.) Women planning to give birth in freestanding midwifery units were 3 times more likely to have no complicating conditions at the start of labor when compared with women planning hospital births.[a] **Transfer rate for freestanding midwifery units** IP: 16.5%; nulliparous women 29.6%; multiparous women 5.3% (women transferred in labor/women planning to birth in BC) PP: 4.8%; nulliparous women 5.9%; multiparous women 3.9% (women transferred postpartum/women planning to birth in BC) Timing after transfer unknown: 0.5% **Mode of birth for women planning birth in freestanding midwifery units** Spontaneous vertex birth: BC 90.7%; hospital 73.8%[a] Vacuum: BC 2.7%; hospital 8.1%[a] Forceps: BC 2.9%; hospital 6.8%[a] Cesarean: BC 3.5%; hospital 11.1%[a] **Pharmacologic pain relief** Epidural anesthesia: BC 10.6%; hospital 30.7%[a] General anesthesia: BC 0.5%; hospital 1.5%[a] **Oxytocin use in labor:** Augmentation with oxytocin: BC 7.1%; hospital 23.5% **Perineal integrity** Episiotomy rate: BC 8.6%; hospital 19.3%[a] 3r[d]- and 4th-degree lacerations: BC 2.3%; hospital 3.2% **No active management of third stage:** BC 22.1%; hospital 6.1%[a] **Blood transfusion:** BC 0.5%; hospital 1.2%[a] **Transfer to a higher level of care:** BC 0.2%; hospital 0.6%[a]

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
Overgaard[33,f] 2012, 2004-2008 Rural Denmark	Mailed questionnaire to a subset of a larger prospective cohort with matched control group study Women who were admitted to one of 2 midwifery units within a hospital that had an intensive care unit but no obstetric service (due to the rural hospital location) (n = 185) completed questionnaires along with an equal number of low-risk women with planned hospital births (n = 190) who had been matched to BC participants by demographic characteristics. Midwives are the primary care providers in the BCs. The primary hospital care provider was not specified, though midwifery care of women across birth centers was reported as common in Denmark.	Women were included in the BC group as long as they had been admitted to a BC in labor, regardless of eventual birth location. The questionnaire used had been pilot tested by the authors and had sufficient internal reliability scores, but had not been previously validated. The level of significance difference between questionnaire scores was set at $P < .0025$ after the Bonferroni correction. **Response rates:** BC 85%; hospital 87% Women admitted to BCs had significantly more positive assessment of: Overall birth experience[a] Satisfaction with care[a] Support from midwife[a] Midwife present when wanted[a] Attention to psychosocial needs[a] Feeling listened to[a] Level of information provided[a] Participation in decision making[a] Consideration of birth wishes[a] Staff support for partner[a] **The was no significance difference between the BC and hospital groups in:** Suggestions for pain relief Undisturbed contact with newborn Support provided by partner Loss of control over labor or staff actions
Overgaard[34,f] 2012, 2004-2005 Rural Denmark	Secondary analysis of data from a prospective cohort with matched control group 839 women admitted to 2 midwifery units within a hospital that had an intensive care unit but no obstetric service (due to the rural hospital location) were matched with 839 low-risk women receiving care at an urban obstetric unit who had similar demographic characteristics.	The primary outcome measure was whether birth interventions, pain relief, upright position for birth, and perinatal outcomes differed by level of social disadvantage as operationalized as no college education. The birth center (a midwifery unit within a rural hospital without an obstetric service) and hospital cohorts were formed on admission to the units in labor and then analyzed with an intent-to-treat approach. Combined IP and PP transfer rate of participants admitted to the BC in labor: 14.8%

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
	Secondary analysis of data from a prospective cohort with matched control group 96% of the women were Nordic or of Western European ancestry in both groups. Care in the BC was provided by midwives with 2 years of experience and advanced training in vacuum birth. When women were transferred the BC midwife remained with the woman and continued to assist in her care in conjunction with an obstetrician. Midwives were the primary care provider for low-risk women giving birth in the hospital.	There were significant differences between the birth center and hospital groups as reported above in Overgaard.[8] However, no measures showed significant differences by educational level of the mother.
Stapleton[12] 2013, 2007-2010 33 states in the United States	Prospective cohort 15,574 women planning birth in one of 79 FBCs and eligible for FBC care at onset of labor Participating women were: 77.4% white, non-Hispanic; 11.2% white, Hispanic 80% were married 53.5% had private insurance 71.8% had some amount of college education with 51.8% having 16 or more years of education. Women attempting a trial of labor after previous cesarean were included in some FBCs. Two types of midwives provided intrapartum care including CNMs (80%), licensed midwives (14%), and teams consisting of a variety of types of midwives (6%). The majority (63%) of participating FBCs were accredited by the Commission for Accreditation of Birth Centers	Data were collected on 22,403 women seeking care at 79 FBCs and the antepartum transfer rates noted below. Women seeking FBC care at the onset of labor (n = 15,575) formed the sample for the remainder of the study and data on their outcomes analyzed in various ways, such as outcomes of women admitted to the birth center or giving birth in the center. **Transfer rates** AP Nonmedical: 15.1% (women leaving FBC/women entering prenatal care at FBCs) First trimester pregnancy loss: 4.2% (women having loss/women entering prenatal care at FBCs) Medical: 13.7% (women requiring antepartum referral/women establishing care at FBCs) IP Transfer during labor but prior to FBC admission: 4.5% (women transferred after initial evaluation on labor but prior to admission/women planning FBC birth at the beginning of labor) Transfer rate for women admitted to the FBC: 12.4% (women transferred after admission/women admitted) Nulliparas accounted for 81.6% of the intrapartum transfers PP transfer rate for women giving birth at the FBC: 2.4% (women transferred after birth but prior to discharge/giving birth in FBC)

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
		Mode of birth for all women planning a FBC birth at labor onset (n = 15,575)
		SVB: 92.8% (including 0.3% VBACs)
		AVB: 1.2%
		Cesarean: 6.1%
		Third stage:
		Postpartum hemorrhage requiring transfer: 36/67 emergency transfers Postpartum hemorrhage was 68% of postpartum complications.
		Severe adverse maternal outcomes: no maternal deaths
Benatar[46]	Retrospective cohort comparison using propensity score modeling and instrumental variable analysis	Women who received at least 2 prenatal visits at one FBC are compared with all women giving birth in Washington, DC, during the study time frame who meet propensity score analysis to match the low-risk criteria of the FBC. Groups were set by the presence of 2 visits at the birth center (regardless of intended birth location) and analyzed with an intent-to-treat approach.
2013		
2005-2008 birth certificates	Women who had at least 2 prenatal visits at one FBC and gave birth to a singleton newborn at ≥ 24 weeks' gestation (n = 872) are compared with women who gave birth in the District of Columbia between 2005-2008 and who meet propensity score analysis to match with birth center risk factors (n = 42,987).	
Washington, DC		
United States		
	Intended birth site was not a study consideration. Approximately 70% of women seeking care at this FBC choose hospital birth.	**Transfer rates:** unavailable related to study design
		Mode of birth
	85% of women included were of black, non-Hispanic race/ethnicity.	AVB: FBC 2.1%; hospital 4.4%[a]
	CNMs provided prenatal, intrapartum, and postpartum care at the FBC. Women in the control group had a variety of provider-types.	Cesarean: FBC 19.7%; hospital 29.4%[a]
		Vaginal birth after cesarean: FBC 26.7%; hospital 9.4%[a]
		Preterm birth rate (≤ 36 weeks' gestation): FBC 7.9%; hospital 11%[a]
Rowe[42,e]	Secondary analysis of data from national prospective cohort study, known as the Birthplace Study	Primary outcome measures were transfer time from FBCs and homes and reasons for transfer, reported by parity
2013, 2008-2010		
England	Women planning to birth at home or in an FBC at the beginning of labor (n = 27,842) as described in the National Perinatal Epidemiology Unit study or Birthplace study	**Characteristics of women transferred from FBCs**
		Nulliparous: 78% of women transferred
	FBC participants were 91% white and 97% fluent in English.	one previous pregnancy: 16.6%
		2 previous pregnancies: 4.8%
	Midwives were the primary intrapartum care provider.	3 or more previous pregnancies: 1.8%
		Timing of transfer from FBC for all women admitted (statistics separate nulliparous and multiparous women, but the denominator is all women planning FBC birth at beginning of labor regardless of parity):
		IP: nulliparous 26.9%; multiparous 4.9%

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Table 1. Quantitative Studies of Birth Center Care Published in Peer-Reviewed Articles

First Author, Publication Date, Data Collection, Location	Design/Setting/Sample	Results
		PP: nulliparous 6.0%; multiparous 3.9% Timing after admission to center unknown: nulliparous 1.5%; multiparous 0.5% **Reasons for transfer** Nulliparous: Failure to progress in the 1st stage Meconium staining Failure to progress in the 2nd stage Multiparous: Retained placenta Failure to progress in the 1st stage Postpartum hemorrhage **Urgency of Transfer** (statistics separate nulliparous and multiparous women, but the denominator is all women planning FBC birth regardless of parity) Potentially urgent intrapartum: nulliparous 9.5%; multiparous 1.5% Nonurgent intrapartum: nulliparous 10.3%; multiparous 1.5% Potentially urgent postpartum: nulliparous 0.7%; multiparous 0.9% Urgency unknown: nulliparous 14%; multiparous 5.3% **Overall transfer time (time from decision until evaluation by a provider at the receiving hospital)** Overall transfer time regardless of indication: 60 minutes Potentially urgent IP transfers: 50 minutes Nonurgent IP transfers: 60 minutes Potentially urgent PP transfers: 60 minutes Increasing distance to the transferring hospital unit was associated with increased transport time, although statistical correlation was not performed.

Abbreviations: AP, antepartum; AVB, assisted AVB vaginal birth; BC, in-hospital birth center meeting criteria; CI, confidence interval; CNM, certified nurse-midwife; FBC, freestanding birth center; IP, intrapartum; PP, postpartum; SVB, spontaneous vaginal birth.

[a] $P < .05$.

Several articles use the same data set or participants:

[b] Report on data from The National Birth Center Study.

[c] Report on data from the Stockholm Birth Center Trial.

[d] Data from the San Diego Birth Center Study.

[e] Report on data from the Birthplace Study.

[f] Report on data collected in one geographic area as part of a multifaceted study.

Table 2. Qualitative Studies of Birth Center Care Published in Peer-Reviewed Articles

Author, Publication Date, Data Collection	Study Design	Participants and Research Context	Themes
Annandale[55] 1987	Longitudinal qualitative research, involving 18 months of participant observation, repeated focused participant interviews, attendance at prenatal visits, and association of data with quantitative information from the medical record Exploration of patient desires for control and the extent and meaning of patient control	46 pregnant and postpartum women getting care at a FBC The birth center was located "on the campus of a community hospital." And nurse-midwives were the primary care providers. Obstetricians provided care at the hospital following transfer. Scotland	Women made a deliberate decision to choose birth center care for reasons including: a reaction against hospitals, hospital practice, and reaction against the lack of control in the hospital environment. Women had some ambivalence about the birth setting due to concerns of health risks and conflict between the birth center and the hospital, especially over the management of post-date pregnancies. The meaning of control during birth was also a theme and included facets of balance, health maintenance, and control of self.
Chamberlain[35] 1997 1995-1997	Semi-structured interviews assessed perceptions of the birth center on the community. Only preliminary results reported, no subsequent publication with full results	45 individuals including women who had been consumers of birth center care: male consumers, nurses, midwives, community health workers, regional health staff, and community members The birth center is housed within a health center with an onsite laboratory and basic blood bank. It was created to provide local care to birthing women to decrease women leaving the community to birth Care in the birth center was provided by midwives and a maternity worker. Rural Northwest Territories, Canada	Women who gave birth in the birth center were satisfied with their birth and midwifery care. Women who received midwifery care but gave birth in hospital, away from the community, were satisfied with midwifery care but not with hospital. Women who gave birth outside the community, in the hospital, were dissatisfied with being away and felt they had few choices at the time of birth.
Esposito[47] 1999 1991-1992	Ethnography with open-ended interviews and participant observation of the immediate neighborhood, birth center daily activities, and births	29 women receiving care at the FBC, 5 midwives, and 6 staff members participated in interviews. Only comments from interviews of women who had previous hospital births are included in the article. Nurse-midwives were the care providers at the center which is located in an inner-city neighborhood where residents are 50% African American, 21% of European American, and 12.4% of Hispanic ethnicity. The racial identification of participants is not identified. Washington DC, United States	Women mentioned the accessibility of the center and the intimacy of the connections developed with the CNMs. At the beginning of care, not all of their perceptions of the center were positive. However, women who had a previous hospital birth disliked the hospital setting even more, especially the lack of control and racial stereotyping. Over time, the women learned more about the centers and became very comfortable with the people and the model of birth center care and valued their intimate connection with the staff.

(*Continued*)

Table 2. Qualitative Studies of Birth Center Care Published in Peer-Reviewed Articles

Author, Publication Date, Data Collection	Study Design	Participants and Research Context	Themes
Coyle[53,54] 2001 1996-1997	Qualitative semi-structured interviews analyzed with a modified Straus & Corbin grounded theory method	17 women (16 Caucasian and one Maori) who gave birth at one of 3 FBCs in Australia. Inclusion criteria included continuity of care components and at least one previous hospital birth. Care at the birth centers were provided by midwives. Western Australia	**Beliefs about pregnancy and birth** Birth as a normal life event including birth as a natural process, carer's non-interventionist approach Birth as a disease process in the hospital including birth being viewed as an illness and the carer's interventionist approach that results in physical interference with birth processes **Nature of the care relationship** Collaborative relationship in the birth center including equality with carers and pregnant women as the primary decision-makers Provider dominated relationship in previous hospital care that included health professional superiority and pregnant women as passive participants **Care interactions** Cumulative interactions including the women feeling comfortable with the carers and being known as individuals was compared with Noncumulative interactions that result in a lack of rapport with providers and women being unknown to the care provider **Care structures** Woman-tailored care was provided in the birth center. Personalized care was provided by the midwives.

(*Continued*)

Table 2. Qualitative Studies of Birth Center Care Published in Peer-Reviewed Articles

Author, Publication Date, Data Collection	Study Design	Participants and Research Context	Themes
Pewitt[48] 2008 (Data collection dates not provided)	Semi-structured interviews analyzed with Sandelowski's qualitative descriptive method	7 adult, primiparous Caucasian postpartum women with insurance who gave birth in one FBC Rural Tennessee, United States	Empowerment – the women felt their experienced increased their confidence in their capacity to handle challenges. Sense of motherhood – although the women had anxieties about parenthood, the care improved their confidence. Establishing and strengthening relationships – Participants stated they grew new connections and relationships throughout their perinatal care. Participants attributed their satisfactory experiences to close, caring relationships to care providers.
Walsh[52] 2006 (No dates of data collection provided)	Ethnographic study using unstructured interviews and participant observation of births and the clinic environment	Interviews were conducted with 10 midwives, 5 maternity care assistants, and 30 women who had given birth in the birth center. The birth center was located within a small hospital that did not have an obstetric service. Midwives were the care providers within the birth center and obstetricians and midwives provided care at the referral hospital. England	The turn to birth environment and setting – women used previous experiences and the recommendation of family and friends to find the birth center. Effect of the first visit – women enjoyed the friendliness of the staff. Nesting responses – women felt the staff created an emotional environment that made them feel safe. Vicarious nesting – staff worked to create a physical environment that comforted the woman. Care as mothering – the staff cared for patients as individuals and provided care tailored to their needs, as a mother would.

(*Continued*)

Table 2. Qualitative Studies of Birth Center Care Published in Peer-Reviewed Articles

Author, Publication Date, Data Collection	Study Design	Participants and Research Context	Themes
Palmer[49] 2009 2007	Comparative case studies from 3 models of care delivery using semi-structured interviews, structured observation, and focus groups	Interviews of 9 women receiving prenatal care in an obstetric clinic associated with a large teaching hospital, 7 women in FBC care; 9 women in federally-qualified health center. Focus groups were conducted with women receiving care in the birth center and the health center. Structured observation was also conducted at the FBC and the health center. District of Columbia, United States	Compared with other groups, women receiving care at the birth center perceived care as very comprehensive that included more personal attention compared to previous care experiences in other locations (eg, CNMs called them to check on them). Participants' suggestions for improvement focused on improvements in clinical care and space for the 2 clinics, whereas comments for the FBC focused on administrative concerns.
Phillippi[50] 2014 2011	Qualitative descriptive study using semi-structured interviews and demographic questionnaires	29 women receiving prenatal care in an FBC were interviewed about facilitators of prenatal care access. Nurse-midwives were the care providers in the birth center. Rural Tennessee, United States	**Facilitators of prenatal care** Access to Medicaid and other insurance coverage **Provider attributes** Provision of personalized care in an unrushed prenatal visit, having questions answered, birth center setting, family friendly and relaxing atmosphere **Clinic attributes** Participants commented that the clinic had an alternative approach to care, a relaxing, family-friendly environment, a wide range of appointment times, and short waits for appointments.

Abbreviations: CNM, certified nurse-midwife; FBC, freestanding birth center.

and one each was from Canada,[35] Scotland,[55] and Germany.[56] Eight of the studies specified locations in rural settings[8,33–35,48,50,52]; 9 in urban settings[5,41,43,44,46,47,49,51,56]; and 15 were not specified, or they included multiple sites.

Providers of Care

There was a diversity of providers in the studies. Twelve of the articles stated that certified nurse-midwives (CNMs) were the primary providers of intrapartum care.[5,43–51,55,56] Thirteen articles stipulated that midwives provided intrapartum care within the birth center but did not specifically outline the midwife's prior education.[7,8,11,33–37,42,52–54] A mix of intrapartum providers including physicians, CNMs, and other legally practicing midwives were reported in 7 articles drawing from 4 datasets.[9,10,20,38–41]

Differences in Practice (Time and Geography)

Data for the studies were collected from the early 1980s through 2011, and maternity care varied greatly over time. For example, baseline rates of episiotomy decreased in all locations over time, whereas epidural analgesia and cesarean rates increased. Geographic location also affected results; the Waldenström and Nilsson study was one of the few without significantly lower rates of cesarean birth for women in the birth center, in part because of low statistical power to detect differences from the hospital's 8.9% cesarean rate, which is a typical rate in Sweden.[37] This heterogeneity makes rigid statistical comparisons difficult but provides insight into larger trends in maternity care.

Samples

Race/Ethnicity

Thirteen of the quantitative articles and 4 qualitative articles included information on race, ethnicity, or cultural identity of participants.[7,8,12,20,33–40,42–46,49,53,54] These sources varied in the populations served, but the majority of women receiving care in birth centers were identified as white or Caucasian.[7,8,12,20,33,34,36–40,42–44,53,54] A large number of participants in 4 studies were white women with Hispanic ethnicity.[9,10,12,43] The majority of participants in 2 studies were black women,[46,49] and a single study involved Inuit women.[35]

Educational Level

Women in birth center care were typically more educated than the general population.[5,9,12,43,44] The multisite study of Stapleton et al found that 71.8% of women admitted to freestanding birth centers had attended college, and 51.8% were college graduates.[12]

Socioeconomic Status

Three studies targeted women with lower socioeconomic status and compared women in birth center care to women in hospital care.[10,34,47]

Study Design

The most common study design was a matched cohort comparison. Eleven of the reviewed articles compared a cohort of women planning or beginning labor in the birth center with a similar group of women in the hospital.[5,8,10–12,20,33,34,42–46,56] Six articles (4 from analyzing a single dataset) reported cohort studies of freestanding birth center care that did not employ a matched comparison group.[9,38–40] Cohort studies used a prospective design in 13 articles based on 7 datasets.[5,8,10–12,33,34,38–40,43] There were 5 retrospective cohort studies.[20,44–46,56] Although a Scupholme study allocated women to the birth center due to hospital overcrowding,[43] only Waldenström and Nilsson randomized participants to the birth center or hospital care.[7,36,37]

Study Samples and Statistical Analysis

The number of women entering and establishing care at a birth center is related to the centers' clinical practice guidelines and when initial screening for low-risk status takes place. For instance, at some birth centers all woman are seen for an initial visit, whereas at others a receptionist is asked to perform a basic screening for risk factors prior to booking an appointment. Once women enter care, birth centers use varying guidelines to determine if a center birth is appropriate, and they refer women who need a higher level of care. At the beginning of labor, care providers again determine if a woman is an appropriate candidate to give birth out of the hospital, and women who need additional care are referred. Once admitted, care providers closely monitor the mother and newborn and transport women or newborns if they no longer meet low-risk criteria. Over time, these referrals gradually reduce the number of women receiving birth center care. Researchers handle this attrition in a variety of ways. Researchers can use an intent-to-treat analysis that allocates groups at a fixed point and retains the original groups throughout the study. The intent-to-treat approach has limitations, especially when there is a large amount of crossover from one group to another prior to the event of interest. For instance, it is minimally helpful to know the postpartum referral rate for all women entering birth center prenatal care because nearly half of those women would have been referred to the hospital prior to giving birth. With fairly high transfer rates from one group to another, it can be useful to know outcomes for women in smaller subsets of the original group, for instance, the postpartum transfer rate for women who gave birth in the center. This approach provides more clinically applicable information and greater statistical power to detect differences between groups. Therefore, many researchers perform subgroup analyses to provide more relevant information. However, subgroup analyses can be problematic because they increase the influence of confounding variables, and the lack of standardized approaches to group formation makes comparison across studies difficult. For clarity, we have noted the denominator for all transfer rates in Table 1.

Outcomes of Care

Mode of Birth

Mode of birth was an outcome variable in 13 articles, and the majority of these categorized the mode of birth as

spontaneous vaginal, assisted vaginal, or cesarean.[5,8–12,37,40,43–46,56] In 4 studies, assisted births were further divided into forceps and vacuum.[11,37,40,45] Spontaneous vaginal birth rates were higher for women beginning care in a birth center when compared with women receiving care in hospitals in all studies. Five studies with groups of women in birth center care matched with low-risk women in hospital care had significantly higher rates of spontaneous vaginal birth.[5,8,10,11,56] Studies without comparison groups examined vaginal birth rates in birth center cohorts compared to national averages.[9,12,38–40]

Although forceps and vacuum devices cannot be used within birth centers accredited by the Commission for the Accreditation of Birth Centers, they can be used following transfer to a hospital. Women who begin care at a birth center had significantly lower rates of assisted vaginal births when compared with women initially admitted to hospitals in 6 studies.[8,10,11,44,46,56] One additional study also found a lower rate of assisted birth that failed to reach statistical significance.[5]

Corresponding to higher rates of spontaneous vaginal birth, rates of cesarean birth were decreased in women planning birth center care. All of the studies with comparison groups found lower rates of cesarean births among women in birth center care compared to women in standard hospital care.[5,10,37,44,56] Three of the studies found significantly lower cesarean birth rates for women beginning labor at a birth center as compared to a hospital.[8,11,46] Low baseline hospital cesarean rates in 2 European studies decreased the statistical power to detect a significant change, but the women beginning labor in birth centers did have a lower cesarean rate.[37,56] In cohort (observational) studies without comparison groups, cesarean birth rates for women seeking birth center care were low compared to national rates for low-risk women.[9,12,43]

Pain Relief

Common methods of intrapartum pain relief and their frequency of use varied over time, providing chronologic information about intrapartum interventions and physiologic birth. Two of the earlier studies found significantly lower rates of narcotic analgesia in birth center groups when compared with hospital groups.[5,36] This variable was not reported in later studies. In 1994, Waldenström and Nilsson identified significantly higher utilization of pharmacologic pain relief methods in the hospital setting, including nitrous oxide, pudendal, and paracervical block contrasted with significantly higher rates of sterile water papule use in the birth center.[36]

Rates of epidural analgesia use for all women varied greatly over time and with study location. Although epidural analgesia is not available in a freestanding birth center, it is used by women after transfer. When reported, epidural analgesia rates for women planning or beginning birth center care were significantly lower than for women planning hospital care.[8,10,11,36,37,44] However, women planning hospital birth may have different preferences for labor coping than women planning birth center birth.

Perineal Integrity

Episiotomy rates decreased over time throughout the studies and in all sites. Three studies found significantly lower rates of episiotomy in birth center groups as compared to hospital groups.[11,44,56] In a 1987 study by Feldman and Hurst, the episiotomy rate in the birth center was 47.2%, and in the hospital it was 78.1%.[44] In 1999, David et al found that freestanding birth centers in Berlin had a 15.7% episiotomy rate compared to a rate 54.8% at hospitals in the same city.[56] In a 2011 study, the episiotomy rate in freestanding birth centers (8.6%) was still significantly less than within the hospital (19.3%).[11]

In 3 studies, rates of women having an intact perineum following vaginal birth were significantly higher in the birth center group when compared with a hospital group.[8,44,56] Intact perineum rates in the birth centers, when reported, ranged from 25%[44] to 61.3%.[8] Although the rates of episiotomy were lower in the birth center groups and the rates of perineal integrity were higher, there was not a significant difference in the rate of third- and fourth-degree lacerations between groups in the 2 studies reporting this measure.[8,11]

Oxytocin Use in Labor

Whereas oxytocin is not used prior to birth at freestanding birth centers following AABC standards, studies using intent-to-treat analysis provide insight on the rates of women needing oxytocin induction or augmentation. Oxytocin use during labor was significantly lower among intended birth center groups in all 6 studies reporting this variable.[5,8,10,11,37,44]

Length of Labor

Three sources measured length of labor and found that women beginning labor in birth centers had significantly longer labors than women beginning labor in the hospital.[5,37,44] An analysis of more than 745,000 births in a variety of settings in the United States found that 4661 women who gave birth in freestanding birth centers were significantly more likely than women who gave birth within the hospital to have prolonged or precipitous labors, although a definition of *prolonged labor* was not provided.[20]

Transfers

Transfer rates during antepartum, intrapartum, and postpartum care were reported in 18 studies. However, definitions were not uniform across studies, making comparisons difficult. For instance, some studies separated antepartum transfers into medical and nonmedical,[10,12,36,38,42,43] whereas other studies did not differentiate.[7,44] In addition, one study had a unique category for women experiencing a first trimester loss.[12] Rates of antepartum transfer for medical reasons during pregnancy ranged from 13%[37] to 27.2%.[10] The most recent antepartum medical transfer rate, which was reported by Stapleton et al, was 13.7%.[12] Waldenström and Nilsson were the only authors to differentiate antepartum transfer rates by parity, and multiparous women were transferred in the antepartum period at a rate 5 times greater than that of nulliparous women.[36]

Intrapartum transfer rates ranged from 11.6%[8] to 37.4%.[7] In studies from the past 5 years, intrapartum transfer rates ranged from 11.6%[8] to 16.5%.[11] Researchers did not have a uniform approach to defining this variable and calculated rates using a variety of denominators ranging from

all women entering birth center care prenatally to women admitted to the birth center in labor. For example, birth centers assess laboring women and determine if they meet admission criteria. Women who are transferred after this initial intrapartum assessment but prior to admission (known as a *preadmit intrapartum transfer* in 2 studies[12,45]), are included in the intrapartum transfer data of some but not all studies, affecting the ability to compare rates across studies. Twelve articles reported intrapartum transfer rates as a ratio of women transferred following admission in labor to all women admitted.[8,9,12,34,39,40,43,45,51,56] Four articles calculated intrapartum transfer rates from a denominator of women planning birth center birth at the beginning of labor.[5,11,41,42] Three studies, published in 5 articles, calculated intrapartum transfer ratios by dividing the number of women transferred intrapartum by the number of women in prenatal care or the study group.[7,10,36,37,44] These discrepancies in denominators, combined with differences across countries, make it difficult to make conclusive statements about transport rates.

Transfer from freestanding birth centers during labor and postpartum was the focus of 4 articles.[39,41,42,51] The most common reasons for intrapartum transfer were failure to progress, rupture of membranes without labor, and prolonged labor.[12,41,42,51] In all studies reporting transfer data, the leading reasons for transfer were nonemergency conditions. Rowe et al reported on transfer time and reported that average time from decision to transfer to being assessed at the hospital was 60 minutes, but the transfer time was significantly decreased for emergency transfers.[42] Nonreassuring fetal heart rate was the leading indication for emergency intrapartum transport.[12,41,51]

Intrapartum transfer rates for nulliparous women were at least 5 times higher than for multiparous women.[8,11,36,42] When reported, intrapartum transfer rates for nulliparous women ranged from 27.3%[36] to 29.6%[11,42] and for multiparous women from 4.9%[42] to 5.3%.[11] In a large study from England, 78% of women transferred from freestanding birth centers were nulliparous.[42] In the Stapleton et al study in the United States, nulliparous women accounted for 81.6% of intrapartum transfers.[12]

Postpartum transfer rates were reported in 11 studies[5,8,11,12,36,37,39,42,44,45,56] and ranged from 0.5%[45] to 4.8%,[11] with postpartum hemorrhage and retained placenta as the most common reasons.[9,11,12] Three sources calculated postpartum transfer rates by dividing the number of women needing postpartum transport by the total number of women giving birth in the center.[9,12,39] Other studies used the larger denominator of women admitted to the birth center[5,8,11,42,45,56] or planning birth center birth.[7,36,37]

Women transfer from birth center care due to medical or nonmedical reasons at any point in pregnancy, labor, or postpartum, resulting in gradual attrition from the birth center group. Two studies provided data on the percent of women who began care in a freestanding birth center and remained low risk and gave birth within the center. In 1992, Rooks et al reported that of women who had at least one prenatal visit, 52.5% of them gave birth in the birth center.[39] Of women who had regular antepartum care, 56.5% gave birth at the birth center.[38] In 2003, Jackson et al reported that 45% of women who entered antepartum care gave birth at the center.[10] No articles provided data on the percent of women who began prenatal care at a birth center and completed their entire peripartum care through to postpartum at the birth center.

Three studies examined the rate of emergency (emergent) transfers in comparison to nonemergency (nonemergent) transfers.[12,39,42] Rooks et al reported 7.9% of women or newborns experience emergency complications, but half were managed at the birth centers and half transferred to hospitals.[9,39] In Stapleton et al, of the 12.4% intrapartum transfers, 1.9% were reported as emergencies.[12] Rowe et al analyzed transfer data from the Birthplace study[11] and found that nulliparous women had a 9.5% "potentially urgent" transfer rate in labor, whereas multiparous women had only a 1.5% "potentially urgent" transfer rate.[42] In all studies examining transport, the majority of intrapartum transfers involved nonemergency conditions.[9,12,39,42]

Serious Maternal Outcomes

The incidence of serious maternal morbidity and mortality is low in the developed world, resulting in low statistical power to see differences between hospital and birth center groups. Nearly all studies collected data on the incidence of serious maternal complications, although the definition of this variable was not well defined, and few reported any serious complications for women planning birth center or hospital care. The Waldenström and Nilsson 1997 study reported one case of severe maternal morbidity requiring admission to the intensive care unit in each group.[37] (One woman in the birth center had water poisoning with electrolyte imbalance, and one in the hospital group had severe toxemia.) Both women fully recovered.[37] Overgaard et al reported no severe adverse maternal outcomes in either group.[8] David et al had one maternal death in the hospital group and none in the birth center group, but they did not elaborate on the circumstances.[56] A large 2011 study of birth in all settings in the United Kingdom reported a significantly lower rate of blood transfusions and transfer to a higher level of care when comparing women who planned freestanding birth center care at the beginning of labor to hospital care.[11]

Satisfaction

Four quantitative and 2 qualitative studies reported measures of maternal satisfaction. Two studies with comparison groups found significant differences in satisfaction with prenatal, intrapartum, and postpartum care compared to the control groups of standard hospital care.[7,9,36] Women beginning labor in a birth center had significantly improved quantitative measures of satisfaction when compared with women planning hospital births.[33] Significantly more women in the birth center group felt that antepartum care raised their self-esteem and that they would use the same model in the future.[7]

Two of the 8 qualitative studies included findings specifically about satisfaction,[35,48] and all other qualitative studies had results loosely related to this concept.[47,49,50,52] Women in birth center care were satisfied with the comprehensive, personalized care that they received[49] and the overall environment of the center.[47,48,50,52] Positive relationships with midwife caregivers were a theme in 4 qualitative

studies.[47,48,52–54] Participants valued the connections with midwives.[47] Women stated that their relationships with birth-center midwives were more egalitarian than with previous hospital providers,[53] and this personal connection enabled them to be active participants in health care decisions.[53] Participants in the Pewitt study felt that the close relationship with the birth center midwives care increased their confidence, and that their birth experiences demonstrated their capacity to handle life challenges.[48] As a result of these experiences, they felt more confident as parents.[48] Satisfaction with the relaxing birth center environment was a theme in 3 qualitative studies.[47,50,52] Women were also pleased with the birth center physiologic approach to care in comparison with previous hospital experiences.[53,54]

DISCUSSION

This is the first integrative review of maternal outcomes in birth centers and clearly supports that birth centers are safe locations of birth for low-risk women as part of a leveled approach to maternity services.[3,4] The quantitative studies reviewed included more than 84,300 women seeking birth center care, and few severe adverse maternal outcomes and no maternal deaths were reported in the birth center groups. Rates of spontaneous vaginal births were high compared with hospital groups or national averages,[5,8–12,44,56] and the cesarean birth rates were lower than similar hospital comparison groups.[5,10,37,44,56] In addition, qualitative reports support that birth centers provide patient-centered care, consistent with current goals for patient engagement in health care decisions.

Summary of Maternal Outcomes

Maternal outcomes for birth centers were equivalent or improved when compared with hospital groups or national averages in all studies. Serious maternal outcomes were exceedingly rare, and no maternal deaths occurred following admission to the birth center in any of the studies. The rates of cesarean birth were lower for women admitted to a birth center in labor when compared with women admitted to hospitals in all studies, and larger studies with adequate statistical power found statistically significant differences between the groups.[5,10,37,44,56] The rate of assisted birth was also less for women who started labor at the birth center. Correspondingly, rates of vaginal birth were higher, or significantly higher, for women receiving intrapartum birth center care in all studies.[5,8–12,44,56]

Use of pharmacologic pain relief was significantly decreased for women beginning labor in birth centers when compared with women laboring in hospitals,[5,8,10,11,44] even in studies that randomized women to birth location.[36,37,43] Length of labor was significantly increased in birth centers when compared with hospital groups.[5,20,37,44] However, use of oxytocin was significantly decreased for women starting labor in the birth center when compared with their hospital counterparts.[5,8,10,11,37,44] Birth center care in labor and during birth was associated with lower rates of episiotomy[8,10,11,44,56] and higher rates of perineal integrity[8,44,56] when compared with hospital care.

Women, including those transferred to other facilities, reported satisfaction with the birth center model in both quantitative and qualitative studies.[7,33,36,47,48,52,53] Women were pleased not only with the environment, services, and providers, but also reported a new sense of self-confidence and empowerment following birth. Engagement in ongoing decision making was mentioned in qualitative studies.[53–55]

However, whereas birth centers have positive maternal outcomes, not all women are appropriate candidates for birth center birth. Total transfer rates of women from entry into prenatal care to birth range as high as 54.7%.[10] Multiparous women were more likely to be transferred antepartum,[36] and nulliparous women were more likely to be transferred intrapartum.[11,12,39,42] Emergent transfers from birth centers were a small percentage of all transfers, and the most common reason for intrapartum transfer was lack of progress.[12,42]

These results provide information that birth centers are a safe option for low-risk women who chose an out-of-hospital model of care. However, there are caveats to the generalizability of the findings. For example, in all but one study, participants were women who specifically wanted a birth center birth; pregnant women are a vulnerable research population, and assigning them to give birth in a specific location has ethical implications. Only the 1986 Scupholme et al study had a forced allocation to the birth center related to hospital overcrowding.[5] Even the randomized controlled trial conducted by Waldenström and Nilsson enrolled only women desiring the birth center; therefore, the sample may have been different than the general population of pregnant women.[7,36,37]

The population of women seeking birth center care often had characteristics associated with positive perinatal outcomes. In the majority of studies, women who sought birth center care were more educated and from ethnic or racial groups associated with improved maternal outcomes in comparison with hospital cohorts.[2,7–9,12,33,34,36,37,45,56] However, improved perinatal outcomes were found even in studies that included or targeted women from marginalized racial groups.[43,46]

The heterogeneity of the studies and the variations of practice also limit generalization of findings. Maternity care practices change over time and vary dramatically by country. Even when the country and time were held fairly constant, there were still variations in practice within multisite trials. The 2 large studies of birth center care in the United States, led by Rooks et al and Stapleton et al, enrolled a variety of accredited and unaccredited centers.[9,12,38–40] However, even with this diversity of sites, these studies had outcomes similar to research from more uniform datasets. Although there are limitations to the literature on birth center care, the consistency of positive maternal outcomes across studies supports this model.

High rates of transfer may contribute to the positive birth outcomes in birth centers due to selection bias. However, when studies used an intent-to-treat analysis, the risk of intrapartum interventions, including cesarean, was consistently lower for women who were admitted to birth centers in labor.[5,8–12,44] Taken as a whole, the data supports that birth centers are appropriate for low-risk women who want this approach to maternity care.

Practice Implications

Maternal outcomes following birth have received increased attention because the United States and other developed nations have experienced a rise in maternal morbidity and mortality.[57] Allowing or even encouraging low-risk women to choose birth center care could reduce cesarean rates, an important goal in improving maternal outcomes immediately and with subsequent pregnancies.[3,58,59] In 2015, a statement endorsed by the American College of Obstetricians & Gynecologists, AABC, and the American College of Nurse-Midwives acknowledged the birth center as an appropriate location of birth as part of a leveled approach to maternity services based on maternal risk status. A British organization, the National Collaborating Centre for Women's and Children's Health, went even further in supporting birth center care by stating that all low-risk women should be encouraged to choose out-of-hospital models for birth to increase their likelihood of positive perinatal outcomes.[3]

However, the literature does not support that all low-risk women should be required to use birth center care. All but one study included only women who wanted birth center care, creating allocation bias within the studies. In this research, women who wanted to give birth in birth centers had superior maternal outcomes. However, this positive effect may not remain if women were required to begin their labor in this location. Although allocation bias is problematic for research generalization, patient autonomy and patient-centered care put the woman's priorities for care as a paramount consideration. Whereas the positive aspects of birth center care may not remain if all low-risk women were required to utilize birth centers, women should be allowed to choose their location of birth.

Based on this integrative literature review, a woman who desires birth center care should be encouraged to find a birth center operating under the AABC standards that meets her needs. Although the birth center model has clear benefits for low-risk women, information on the likelihood of transfer needs to be included as part of a larger patient-centered conversation about informed choice.

Research and Policy Implications

Whereas this review demonstrates that high-quality studies performed across time and in a variety of locations support the birth center model, further research is needed. Although it would be ideal to have comparative effectiveness research with hospital comparison groups carefully matched to birth center groups for risk status, educational level, and race/ethnicity, women who opt for birth center care may have a different philosophy or approach to birth, as stated in qualitative studies, that acts as a confounding variable. Instead, more research with large datasets would increase the strength of the evidence. Ideally, these data sets could be gathered from birth centers providing care according to the AABC standards.

Currently, the lack of standardized definitions of key measures of birth center care, including intrapartum transfer, limits the generalizability of studies. Researchers should strive toward uniform definitions of these concepts, such as those in the AABC Perinatal Data Registry.[60] In addition, authors should also present the denominator of all subgroup analyses for clarity and to allow outcome comparisons across studies.

This integrative review focused solely on maternal outcomes. Many of the reviewed studies include information on neonatal outcomes in birth centers, and other publications study solely neonatal outcomes. Clinicians could benefit from a comprehensive appraisal of the literature on neonatal outcomes to provide information to women considering birth center care.

Although the birth center model results in fewer intrapartum interventions and positive maternal outcomes, cost savings of this model, when compared to hospital care, has not been established. Cost analyses should include fees associated with transfer and savings from prevention of first and subsequent cesarean births to provide a comprehensive estimate of the cost of birth center care. Cost comparisons would provide valuable information to understand if this model, even with high rates of consultation and transfer, provides an overall financial benefit that is consistent with current initiatives to encourage evidence-based, efficient care.[61]

Transfer is a relatively common event for women admitted to birth centers. Researchers should assess women's experience of transfer to provide information on best practices for this vulnerable moment. Information from the literature on home birth may have applicability to this population, but this needs further exploration.[62]

Birth center care is consistent with current national priorities for health promotion, shared decision making, and appropriate use of medical technology and services. To increase access to freestanding birth centers, barriers to operations and sustainability need to be addressed at the local, state, and national levels. Recent national and international reports support birth centers as a vital component of a comprehensive maternity care system.[3,4] Ideally, local providers, state regulators, and insurance companies will review the evidence and support the birth center model of care.

CONCLUSION

Birth centers are a maternity care model for low-risk women leading to positive outcomes. Women who receive birth center care have higher rates of spontaneous vaginal birth and postpartum perineal integrity when compared with matched hospital cohorts. Using intent-to-treat analysis, intrapartum birth center care was also associated with lower rates of medical interventions and procedures including oxytocin augmentation, episiotomy, assisted vaginal birth, and use of pain medication. Quantitative and qualitative studies found that women were very satisfied with birth center care. Overall transfer rates from the birth center ranged up to 54.7% of women beginning prenatal care, but the majority of transfers were for nonemergency conditions. This data clearly supports that birth centers are a safe model of care for low-risk women when associated with a health system able to provide higher-level care. Although more research is needed, birth centers should be supported by clinicians, policy makers, and health insurance carriers to enable low-risk women to access this evidence-based model of care.

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CONFLICT OF INTEREST

Jill Alliman, CNM, DNP, is an employee of the American Association of Birth Centers. Julia Phillippi, CNM, PhD, FACNM, has no conflicts of interest to disclose.

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Original Review

Outcomes of Care in Birth Centers: Demonstration of a Durable Model

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Introduction: The safety and effectiveness of birth center care have been demonstrated in previous studies, including the National Birth Center Study and the San Diego Birth Center Study. This study examines outcomes of birth center care in the present maternity care environment.

Methods: This was a prospective cohort study of women receiving care in 79 midwifery-led birth centers in 33 US states from 2007 to 2010. Data were entered into the American Association of Birth Centers Uniform Data Set after obtaining informed consent. Analysis was by intention to treat, with descriptive statistics calculated for maternal and neonatal outcomes for all women presenting to birth centers in labor including those requiring transfer to hospital care.

Results: Of 15,574 women who planned and were eligible for birth center birth at the onset of labor, 84% gave birth at the birth center. Four percent were transferred to a hospital prior to birth center admission, and 12% were transferred in labor after admission. Regardless of where they gave birth, 93% of women had a spontaneous vaginal birth, 1% an assisted vaginal birth, and 6% a cesarean birth. Of women giving birth in the birth center, 2.4% required transfer postpartum, whereas 2.6% of newborns were transferred after birth. Most transfers were nonemergent, with 1.9% of mothers or newborns requiring emergent transfer during labor or after birth. There were no maternal deaths. The intrapartum fetal mortality rate for women admitted to the birth center in labor was 0.47/1000. The neonatal mortality rate was 0.40/1000 excluding anomalies.

Discussion: This study demonstrates the safety of the midwifery-led birth center model of collaborative care as well as continued low obstetric intervention rates, similar to previous studies of birth center care. These findings are particularly remarkable in an era characterized by increases in obstetric intervention and cesarean birth nationwide.
J Midwifery Womens Health 2013;58:3–14

Keywords: birth center, midwifery, perinatal outcomes

BACKGROUND

For 32 of the last 40 years, US health care costs have grown faster than the country's gross domestic product (GDP)[1] and are projected to be greater than $3 trillion in 2014, or 18% of the GDP.[2] Childbirth is the leading cause of hospitalization in the United States, with mothers and newborns accounting for 23% of all hospital discharges in 2008.[3] Five of the 10 most commonly performed procedures are associated with childbirth, and cesarean birth is the most common inpatient surgical procedure.[4] In 2008, hospitalization for pregnancy, birth, and care of the newborn resulted in total hospital charges of $97.4 billion, making it the single largest contributor as a health condition to the national hospital bill.[5] Average US payments for vaginal births are far higher than in many countries, including Canada, France, and Australia.[6]

At the same time, many other countries have better birth outcomes than the United States. In 2010, 33 countries had lower maternal mortality rates, 37 countries had lower neonatal mortality rates, 65 countries had lower rates of low birth weight, and 32 countries had higher rates of exclusive breastfeeding to at least 6 months than did the United States.[7]

Federal and state policy makers in the United States are working to identify and promote lower-cost, higher-quality models of care. This concept of better outcomes at lower costs, or "high-value" care, is a driving force in the Patient Protection and Affordable Care Act (PPACA).[8] Among several important provisions targeted to the care of pregnant women that the act mandates are payments for facility services to birth centers across the United States (Section 2301 [S.3590]).[9] The Centers for Medicare and Medicaid Services underscored the importance of examining the birth center model as means of providing high-quality care by including birth center care as one of 3 options for enhanced prenatal care under the Strong Start Initiative in 2012.[10] In addition, both the Institute of Medicine and Childbirth Connection have called for further research about the birth center model of care.[11,12] The birth center model was established as a high-value model of care by the landmark National Birth Center Study (NBCS, 1985-1987) and the San Diego Birth Center study (1994-1996).[13,14] These studies demonstrated that birth centers could provide maternity care to low-risk pregnant women, who make up approximately 85% of pregnant women in the United States,[15] safely, effectively, with less resource utilization, and with a resultant high level of patient satisfaction.

The American Association of Birth Centers (AABC) defines the birth center as "a homelike facility existing within the health care system with a program of care designed in the wellness model of pregnancy and birth. Birth centers provide family-centered care for healthy women before, during, and after normal pregnancy, labor, and birth."[16] The birth center is a collaborative model. Most birth centers have midwives as the primary care providers working with physicians and hospitals in a team approach to maternity care. The AABC has established national *Standards for Birth Centers* that are

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1526-9523/09/$36.00 doi:10.1111/jmwh.12003

Quick Points

- Of 15,574 women planning and eligible for a birth center birth at the onset of labor, 93% experienced a spontaneous vaginal birth regardless of where they ultimately gave birth, whereas 6% had a cesarean birth.
- Eighty-four percent of women planning a birth center birth at the onset of labor gave birth there, with approximately 2.5% of mothers or newborns requiring transfer to the hospital after birth. Emergent transfer before or after birth was required for 1.9% of women in labor or for their newborns.
- There were no maternal deaths. The intrapartum fetal mortality rate for women who were admitted to the birth center in labor was 0.47/1000, and the neonatal mortality rate was 0.40/1000 excluding anomalies.
- The study provides important information for childbearing families for informed decision making regarding their choice of maternity care provider and birth location.
- This study demonstrates the safety of birth centers and consistency in outcomes over time despite a national maternity care environment with increasing rates of intervention.

used by the Commission for the Accreditation of Birth Centers (CABC), an independent authority that accredits birth centers in the United States.[17,18] Most birth centers are located outside of hospitals. Some birth centers are physically located inside a hospital building but meet AABC standards for autonomy and are separate from the hospital's acute care obstetric services. In its 1982 policy statement, the American Public Health Association issued guidelines for licensure of birth centers,[19] and birth centers are now licensed in 41 states.[20] This infrastructure of standards, accreditation, and licensure provides the foundation for US birth centers and may influence birth center outcomes. According to Centers for Disease Control and Prevention (CDC) data, 0.3% of all US births in 2010 occurred in freestanding birth centers.[21]

In the years since the national and San Diego birth center studies were conducted, maternity care in the United States has become increasingly interventional. A 2005 national survey reported that 90% of women had continuous electronic fetal monitoring, and 76% of women received epidural analgesia during labor.[22] According to CDC data, induction of labor was performed in 22.8% of all births in 2007, an increase of 140% since 1990 (9.5%).[23] The cesarean birth rate increased from 4.5% in 1965 to 22.7% in 1985 and to 32.8% in 2010.[21,24,25] In light of these changes in the overall US maternity care environment, this study aimed to describe the outcomes of birth center care in the current era so that consumers, providers, policy makers, and insurers have up-to-date, evidence-based information.

METHODOLOGY

Data Collection

Data were collected using the AABC Uniform Data Set (UDS), an online data registry developed by the AABC with a task force of maternity care and research experts. The UDS was developed in accordance with the guidelines for data registries developed by the Agency for Healthcare Research and Quality.[26,27] Participation in the registry is voluntary, and 78% of AABC-member birth centers contribute to the registry. Forty-one percent of all US birth centers known to the AABC are members.

Written informed consent is obtained from all participants prior to entry into the registry. The data are stored securely in a password-protected database. The AABC maintains a data access policy that requires investigators to request access to the data. Requests are reviewed by the AABC Research Committee, and determinations of appropriate access to and use of data are made in accordance with the Federal Policy for the Protection of Human Subjects.[28] The University of Arkansas institutional review board determined this descriptive study using registry data to be exempt from approval because the data do not include any personal identifiers.

The AABC UDS collects data on 189 variables that describe the demographics, risk factors, processes of care, and maternal-infant outcomes of women receiving care in birth centers. Data are collected prospectively, with the patient record created during the initial prenatal visit. Data on the patient's antenatal course are summarized when she either terminates prenatal care prior to labor or is admitted for intrapartum care. Data to describe intrapartum, immediate postpartum, and neonatal courses are entered after the birth. Data to describe the postpartum and neonatal course are entered following a visit 4 to 6 weeks after the birth. Outcome data are collected on all mothers and infants who remain in care, regardless of place of birth. All data are collected by the woman's primary care provider. Providers enter data directly, or trained clerical staff enters data from paper forms completed by providers via a secure Web-based portal, and the data are stored in a MySQL database.

Those entering data were provided with a detailed *UDS Instruction Manual* that includes data definitions, use of the Web-based collection tool, data collection procedures, and implementation of a data entry system within the practice.[29] Training workshops were presented by the AABC Research Committee throughout the study period. Research team members were available to provide support such as interpretation of data definitions and coding decisions in specific cases. AABC newsletters and e-mails were used to communicate with birth centers regarding any common data quality issues identified.

Once the data have been entered, a designated on-site UDS coordinator reviews entries, and errors are corrected prior to final submission of the data to the database. The UDS online form includes required fields to ensure that the form cannot be submitted without certain critical data such as transfer information and important perinatal outcome data. The UDS data are monitored by the AABC research team for records that have not been completed by established deadlines, coding errors, and unexpected discrepancies, using established validation parameters such as logical consistency to other data fields for the same patient. Birth centers are queried via e-mail or phone to obtain correct information. A log is maintained of all data modifications for correction of errors.

A validation study of the UDS was conducted in 2010 and found a high level of consistency between UDS registry data and matched medical records in 5 birth centers that were representative of those contributing data to the registry. Registration and birth logs were reviewed to confirm that all women who registered for care in each practice and consented for data collection had been entered in the UDS. At least 2% of each practice's records were randomly selected and audited for 25 key variables, with the medical record as the criterion standard. All variables audited showed at least 90% consistency between the 2 data sources, and there was 100% consistency for 10 variables.[30] All women in the audited practices were presented the option of participating in the UDS data registry. Women declined participation very rarely, and there were no recorded instances of women choosing to withdraw.[31] All study variables used in the current analysis are among the variables included in the validation study.

Inclusion Criteria

This report examines intrapartum care and perinatal outcomes of women who received care in birth centers that contributed to the UDS, entered labor eligible for and planning a birth center birth, and had estimated dates of birth during 2007 through 2010. Eligibility criteria for birth center birth were established by the AABC and CABC and included singleton, full-term gestation in vertex presentation with no medical or obstetric risk factors precluding a normal vaginal birth or necessitating interventions such as continuous electronic fetal monitoring or induction of labor.[17] Estimated date of birth, rather than actual date of birth, was used for establishing eligibility to ensure the inclusion of participants who transferred care during the antepartum period for whom date of birth was less likely to be available. All study variables (Appendix 1) were analyzed for both those women who gave birth in the birth center and those who required transfer to hospital care after onset of labor.

Data Analysis

Data were transferred from the MySQL database to SAS version 9.1 (Cary, North Carolina) for analysis. Descriptive statistics for demographic variables and perinatal outcomes were calculated, and frequencies are reported. Denominators were adjusted to account for missing data and are reported with frequencies.

RESULTS

A total of 79 birth centers in 33 US states (Appendix 2) contributed data to the AABC UDS during the study period of January 1, 2007, to December 31, 2010. Birth centers participating in this study were representative of overall AABC-member birth centers in terms of provider type, geographic distribution, payer mix, volume, and demographics of women served.[32] No birth centers were excluded from the study, as all had acceptable data, which was defined as no more than 5% incomplete records. Fifty-nine birth centers (75%) contributed data throughout the study period, 15 (19%) began contributing data after 2007, and 5 (6%) closed during the study period. Fifty of the birth centers contributing data (63%) were accredited by the CABC, 3 of those were accredited by both the CABC and the Joint Commission, and 29 (37%) were not accredited. Certified nurse-midwives (CNMs) were the primary care providers in 63 of the birth centers (80%). Certified professional midwives (CPMs) or licensed midwives (LMs) provided care in 11 participating birth centers (14%). In 5 participating centers (6%), care was provided by teams of CNMs, CPMs, and LMs. A comparison of the professional midwifery credentials in the United States is available from the American College of Nurse-Midwives.[33]

There were 22,403 complete client records in the UDS for women with an estimated date of birth between January 1, 2007, and December 31, 2010, who intended to give birth in a birth center when registering for prenatal care (Figure 1). The most common reasons for leaving birth center care during pregnancy were nonmedical (15.1%), such as moving to another area or changing provider or planned birth location. Nearly a thousand women (4.2%) did not remain pregnant past the first trimester because of spontaneous or induced abortion or ectopic pregnancy. Of the 18,084 women who continued in birth center care, 2474 women (13.7%) were referred to physician care for medical or obstetric complications precluding birth center care. Of these antepartum medical referrals, the most common indications were postdates (10.7%), malpresentation (10.4%), preeclampsia (9.3%), and nonreassuring fetal testing (8.6%). Thirty-six women (0.2%) never presented to the birth center in labor because of nonmedical reasons such as choosing to present at a hospital en route or giving birth at home because of precipitous labor. The remaining 15,574 women planned and were eligible for birth center birth at the onset of labor and make up the study sample presented in the results that follow.

Demographic Characteristics

Demographics for the study participants are presented in Table 1. Federal or state government programs (Medicaid, Medicare, Children's Health Insurance Program [CHIP], or TRICARE) were the primary payers for nearly a third of births. The majority of the study population was white, non-Hispanic; aged between 18 and 34 years; and had a college degree. Slightly fewer than half were nulliparous. The most common issue from medical history was overweight/obesity (5.7%), followed by depression or psychiatric disease requiring treatment (3.3%). The reported rates of smoking (1.5%) and substance abuse (0.5%) were very low. Problems in the

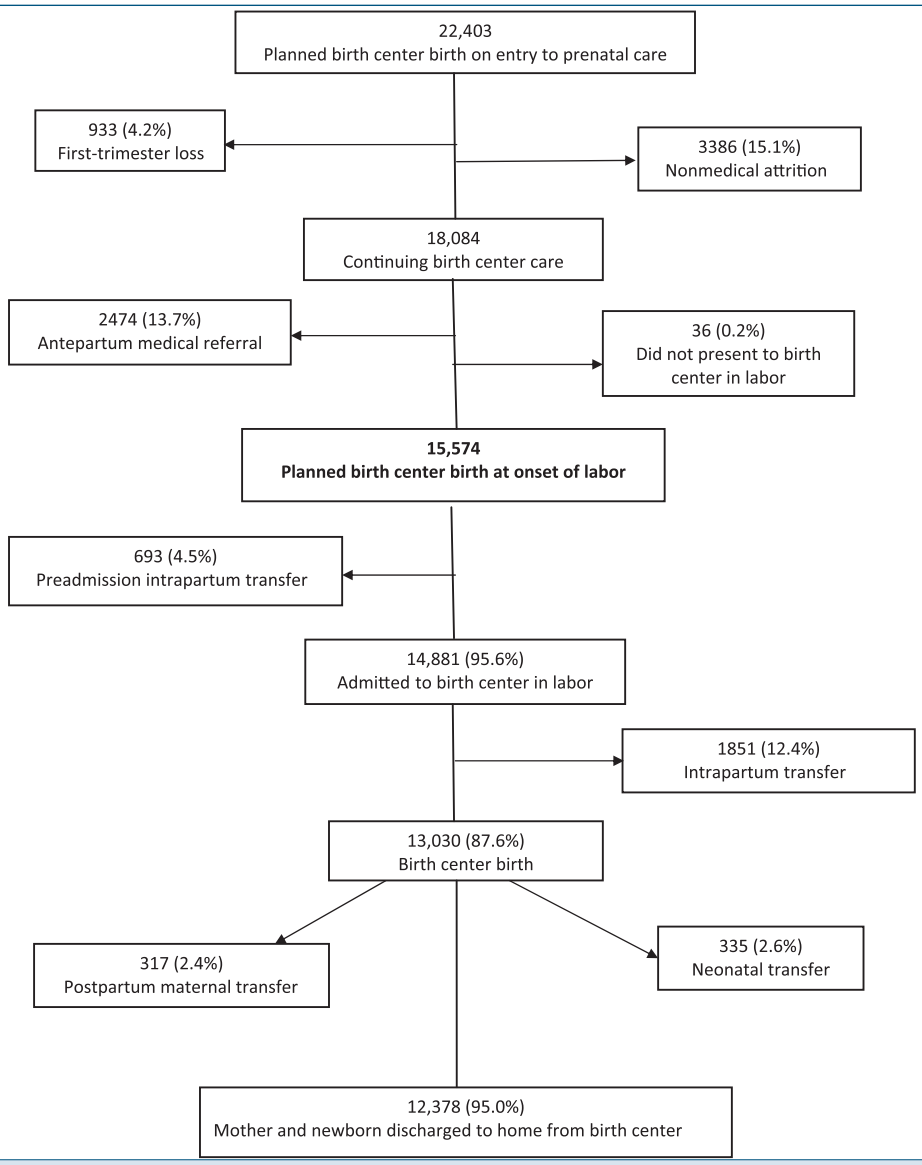

Figure 1. Study Flowchart

current pregnancy occurred in 17.5% of women, the most common of which were infections (4.6%), anemia (2.9%), and postdates (2.6%).

Intrapartum Admissions and Transfers

Of the 15,574 women who planned birth center birth at the onset of labor, 95.6% were admitted to the birth center in labor, and 4.5% were referred to hospital care before being admitted to the birth center. Among those referred to the hospital prior to admission, the most common reasons were term rupture of membranes without labor (20.4%), client choice (10.0%), and malpresentation (9.1%).

Of the 14,881 women who were admitted to the birth center in labor, 87.6% gave birth there, whereas 12.4% were transferred to the hospital prior to giving birth, with 11.5% referred to the hospital nonemergently. The majority (63.6%) of the nonemergent intrapartum referrals after admission to the birth center in labor were for prolonged labor or arrest of labor. Arrest during the first stage of labor occurred 3 times more frequently than arrest in the second stage of labor. Fewer than 1% of the women (0.9%) required emergent intrapartum transfers. Half the emergency intrapartum transfers were responses to nonreassuring fetal heart rate patterns noted with intermittent auscultation (Table 2). Nulliparas accounted for 81.6% of the intrapartum referrals and transfers. The AABC's definitions of referral and transfer with examples of each type can be found in Appendix 3.

Mode of Birth

Cephalic spontaneous vaginal births were the most common (92.3%), cesarean births and operative vaginal births were uncommon, and spontaneous breech vaginal births were the least common (Table 3). Trial of labor after cesarean (TOLAC) was infrequent in this population, as few birth centers were allowing TOLACs during the study period. Seventy percent of the 56 TOLACs were successful. Of the 1851 women who

Table 1. Demographic Characteristics of Women Planning Birth Center Birth at Onset of Labor (N = 15,574)

	n (%)
Age, y[a]	
<18	171 (1.1)
18-34	13,218 (85.4)
≥35	2093 (13.5)
Race[b]	
Non-Hispanic White	11,810 (77.4)
Hispanic	1711 (11.2)
Black	840 (5.5)
Asian or Pacific Islander	349 (2.3)
Native American or Native Alaskan	101 (0.7)
Unknown or other	440 (2.9)
Marital status[c]	
Married	12,109 (80.1)
Unmarried	3015 (19.9)
Parity at onset of labor	
Nulliparous	7355 (47.2)
Parous	8219 (52.8)
Payment method	
Private insurance	8325 (53.5)
Medicaid	3701 (23.8)
Self-pay	2261 (14.5)
Military coverage	411 (2.6)
Other insurance/grants	406 (2.6)
Medicare	374 (2.4)
Unknown	96 (0.6)
Education, y[d]	
<12	1184 (8.7)
12	2669 (19.6)
13-15	2727 (20.0)
≥16	7067 (51.8)

[a] n = 15,482 due to missing data.
[b] n = 15,251 due to missing data.
[c] n = 15,124 due to missing data.
[d] n = 13,647 due to missing data.

Table 2. Emergency Transfer Indications

	n (%)
Intrapartum, n = 140	
Nonreassuring fetal heart rate pattern[a]	72(51.4)
Arrest of labor[b]	24 (17.1)
Malpresentation[c]	14 (10.0)
Abnormal intrapartum bleeding[d]	7 (5.0)
Pregnancy-induced hypertension/preeclampsia[e]	6 (4.3)
Cord prolapse[f]	4 (2.9)
Seizure	1 (0.7)
Other	12 (8.6)
Postpartum, n = 67	
Postpartum hemorrhage[g]	36 (53.7)
Retained placenta[h]	23 (34.3)
Pregnancy-induced hypertension/preeclampsia[e]	1 (1.5)
Other	5 (7.5)
Unknown	2 (3.0)
Newborn, n = 94	
Respiratory issues[i]	66 (70.2)
5-Minute Apgar <7	11 (11.7)
Birth trauma[j]	3 (3.2)
Small for gestational age[k]	1 (1.1)
Prematurity[l]	1 (1.1)
Other	12 (12.8)

[a] Nonreassuring fetal heart rate pattern: includes prolonged bradycardia, severe variables, and late decelerations.
[b] First-stage prolonged/arrest of labor: slower than expected labor progress *or* patient in active labor who has had cervical change, then has no further progress for at least 2 hours. Second-stage prolonged/arrest of labor: slower than expected descent *or* no descent after 2 hours for primigravida or one hour for multigravida without epidural or after 3 hours for primigravida or 2 hours for multigravida with epidural.
[c] Malpresentation: breech, face, brow, compound, transverse lie.
[d] Intrapartum bleeding: greater than expected for "bloody show."
[e] Pregnancy-induced hypertension/preeclampsia: systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg with or without signs and symptoms of preeclampsia.
[f] Cord prolapse: cord is presenting in front of the presenting part, including frank or occult prolapse.
[g] Postpartum hemorrhage: estimated blood loss >500 mL for vaginal birth and >1000 mL for cesarean birth.
[h] Retained placenta: placenta requiring manual removal or other out-of-the-ordinary third-stage interventions, regardless of the length of third stage.
[i] Respiratory distress: respiratory rate ≥ 60/minute accompanied by grunting and/or retractions. Includes apnea. Transient tachypnea: respiratory rate ≥ 60/minute without retractions or grunting.
[j] Birth trauma: fetal injury related to the process of birth or obstetric interventions, includes cephalohematoma, abscess at site of scalp lead or scalp blood sampling, subgaleal hematoma, significant caput succedaneum, abrasions and lacerations, brachial plexus injury, cranial nerve injury, laryngeal nerve injury, clavicular or long-bone fracture, hepatic rupture, and hypoxic-ischemic insult (confirmed by cord blood gases and other testing).
[k] Small for gestational age: weight <10th percentile for gestational age.
[l] Prematurity: less than 37 weeks' gestation by gestational age exam.

presented in labor and were transferred to hospitals, more than half (54.7%) had spontaneous vaginal births, 37.8% had cesarean births, and 7.5% had operative vaginal births.

Postpartum and Neonatal Complications

The immediate postpartum course was uncomplicated for 91% of the study population, regardless of where they gave birth. The majority of women experiencing postpartum complications had postpartum hemorrhage (68.2%). Most postpartum hemorrhages (92.6%) were managed in the birth center. Postpartum transfer to the hospital was required for 2.4% of women who gave birth in the birth center, with 1.9% referred nonemergently and 0.5% of women requiring emergent postpartum transfer. Postpartum hemorrhage was the most common reason for nonemergent referral and emergent transfers (Table 2).

Transport to the hospital was required for 2.6% of neonates born at birth centers, with 1.9% nonemergent referrals and 0.7% requiring emergent transfer. The most common indications for nonemergent referral and emergency transfer were respiratory issues (Table 2).

Overall, 79.4% of women who entered labor planning a birth center birth gave birth in the birth center and were

Table 3. Mode of Birth for All Women Planning a Birth Center Birth at Onset of Labor Regardless of Site of Birth (N = 15,574)

	n (%)
Spontaneous vaginal birth	14,437 (92.8)
Cephalic	14,373 (92.3)
VBAC	39 (0.3)
Breech	25 (0.2)
Assisted vaginal birth	188 (1.2)
Vacuum	148 (1.0)
Forceps	40 (0.3)
Cesarean birth	949 (6.1)
Primary	930 (6.0)
Repeat	19 (0.1)
With trial of labor	17 (0.1)
Without trial of labor[a]	2 (0.0)

Abbreviation: VBAC, vaginal birth after cesarean.
[a]Changed mind at onset of labor and presented at hospital for repeat cesarean birth.

discharged from there to home with their newborns. Fewer than 2% (1.9%) of the study sample required emergent transfer during labor or after birth of either the mother or newborn.

Mortality

There were no maternal deaths in the study population. There were 14 fetal deaths and 9 neonatal deaths. Seven of the fetal deaths (50%) occurred before women arrived at the birth center. Of these, 5 were diagnosed with intrauterine fetal demise (IUFD) on arrival at the birth center and then transferred directly to a hospital, whereas 2 were diagnosed with IUFD on arrival, but with birth imminent and no time to transfer. Seven fetal deaths (50%) occurred after women were admitted to the birth center in labor. Four of these occurred to women who were transferred emergently for nonreassuring fetal heart tones on auscultation and 3 to women who labored and had unexpected stillbirths at the birth center.

There were 9 neonatal deaths, of which 7 were unexpected. Two women whose infants had been prenatally diagnosed with lethal anomalies chose to give birth at a birth center, where one infant died shortly after birth and the other was discharged home with the family and died there. A third infant, transferred after birth, had a previously undiagnosed diaphragmatic hernia despite having had a second trimester fetal anatomy survey. Of the remaining 6 deaths, 3 were among infants whose mothers were transferred intrapartum. Two were emergent transfers for nonreassuring fetal status, and the respective causes of death were avulsion of a velamentous cord insertion and chronic fetal-maternal transfusion antenatally. The third was a nonemergent transfer for arrest of the first stage of labor with a subsequent cesarean for failed oxytocin augmentation; meconium aspiration was the probable cause of death. The other 3 infants were transferred emergently after birth: 2 had respiratory distress syndrome and one had hypoxic ischemic encephalopathy attributed to a prenatal insult documented on neuroimaging. All died within 7 days of birth. The intrapartum fetal mortality rate for the women who were admitted to the birth center in labor was 0.47/1000. The neonatal mortality rate was 0.40/1000 excluding anomalies.

DISCUSSION

These findings are consistent with those from Cochrane reviews of place of birth and midwifery-led care,[34,35] British studies of place of birth,[36,37] and US studies comparing midwifery and obstetric care,[38–40] which suggest that midwifery-led birth center care is a safe and effective option for medically low-risk women.

The intrapartum fetal and neonatal mortality rates found in this study are comparable to those reported in many studies of low-risk women. Women starting care in labor with midwives in a primary care setting in the Netherlands experienced an intrapartum fetal death rate of 0.96/1000 and a perinatal mortality rate of 1.39/1000, excluding newborns with congenital anomalies.[41] The US neonatal mortality rate in 2007 was 0.75/1000 for newborns weighing 2500 g or greater.[42] A study in Scotland of neonatal death rates by time of birth for term infants without anomalies reported an overall neonatal mortality rate of approximately 0.5/1000.[43] A National Perinatal Epidemiology Unit study of low-risk women in England found a neonatal mortality rate of 1.78/1000.[37] A comparison of outcomes for low-risk women under midwifery-led care and obstetrician care in Ireland found perinatal mortality rates of 2.76/1000 and 3.66/1000, respectively.[44] In a comparison of outcomes of planned home births attended by registered midwives, hospital births attended by registered midwives, and low-risk hospital births attended by obstetricians in British Columbia, Canada, perinatal death rates were 0.35/1000, 0.64/1000, and 0.57/1000, respectively.[45]

The findings of this study are also strikingly similar to those of the National Birth Center Study, which was based on data collected from mid-1985 through 1987. The authors reported an intrapartum fetal mortality rate of 0.3/1000 and neonatal mortality rate of 0.3/1000, excluding anomalies. Mortality, transfer, complication, and operative birth rates were similar despite differences in the 2 study populations that might be expected to contribute to more adverse outcomes in the current study; a higher proportion of women in the current study were aged 35 or older, black, unmarried, and nulliparous than the women in the National Birth Center Study.[13,46] This consistency speaks to the durability of the birth center model over time, despite increases in the rates of intervention and cesarean birth nationwide during the same period.

Strengths of the study include a relatively large sample size, geographic diversity of birth centers contributing data, and data collection over a period of 4 years. As with many multicenter studies, data were collected and entered by care providers. Although this creates a potential for bias and error, findings from the validation study[30] and the consistency of data across birth centers suggest that the data are reliable. Although there were missing demographic data, all other variables reported here are required fields in the UDS without which the form cannot be submitted; therefore, there were no incomplete data for other variables for this cohort.

The birth centers contributing data to the AABC UDS may have been different from those birth centers not contributing data. The study birth centers are AABC members and thus have access to continuing education activities and support the organization's model and *Standards for Birth Centers*.[17] This potential difference means that the findings may not be generalizable to all birth centers.

The provider made all coding decisions based on their interpretation of the data definitions, including the decision to designate a transfer as emergent. Review of the indications for emergency intrapartum transfer showed that some did not appear to be actual medical emergencies. For example, 24 women were transferred emergently for arrest of labor, which is unlikely to be a true medical emergency. Consequently, the incidence of actual medical emergencies requiring transfer is likely to have been lower than reported here.

The decreased direct and indirect costs to the health care system associated with birth center care make it a model that warrants thorough examination. Given that nearly half of all births in the United States (42.9%) are currently funded by Medicaid and CHIP programs,[47] it is worth considering the potential savings if more pregnant women receiving government-supported care gave birth in birth centers.

Despite the PPACA federal mandate, the AABC Legislative Committee reports that many states have not yet implemented appropriate birth center facility reimbursement. Medicaid facility reimbursement for birth centers varies widely across states in which birth centers are reimbursed; however, in 2011, the average Medicaid reimbursements in general were similar to national Medicare reimbursement rates.[48] The Medicare facility reimbursement for care of mother and newborn for an uncomplicated vaginal birth in a hospital in 2011 was $3998,[49] compared with $1907 in a birth center.[32] Thus, the 13,030 birth center births in this cohort saved an estimated $27,245,469 in payments for facility services compared with hospital vaginal births at current Medicare rates. Even with birth center facility reimbursement rates increased to more equitable levels, cost savings would remain significant.

The cesarean birth rate in this cohort was 6% versus the estimated rate of 25% for similarly low-risk women in a hospital setting.[21] Had this same group of 15,574 low-risk women been cared for in a hospital, an additional 2934 cesarean births could be expected. The Medicare facility reimbursement for an uncomplicated cesarean birth in a hospital in 2011 was $4465.[49] Given the increased payments for facility services for cesarean birth compared with vaginal birth in the hospital, the lower cesarean birth rate potentially saved an additional $4,487,524. In total, one could expect a potential savings in costs for facility services of more than $30 million for these 15,574 births.

The potential savings from the cost of care and lower intervention rates highlight birth centers as an important option for providing high-value maternity care. Cost analysis of birth center care is therefore an important area for future research, and fair and timely reimbursement for birth center care is important to the sustainability and further dissemination of the model.

The findings of this study also provide information to families considering birthing at a birth center. Among women who entered labor planning a birth center birth in this study, 83.7% gave birth there, and 79.4% ultimately were discharged from there to home with their newborns. Fewer than 2% (1.9%) required emergent transfer to a hospital for either mother or newborn. The total cesarean birth rate in the study sample was 6% regardless of where birth occurred. The fetal and neonatal mortality rates were consistent with those of births among low-risk women in previous studies including hospital settings. This information is helpful to families in making informed choices about their birth setting and maternity care provider.

This data set is rich and includes information on the elements of birth center care that have contributed to these outcomes. Future research should be carried out to describe the cost components of birth center care and strategies for optimizing and expanding this high-value care model. Qualitative studies exploring the experiences of childbearing women and families in birth center and hospital models of care are also critical.

Birth centers and their midwifery-led, collaborative model of maternity care continue to offer an important solution to many of the issues affecting the quality and cost of maternity care in the United States. This study confirms the findings of the National Birth Center Study and other studies of the birth center model of care and adds to the evidence demonstrating excellent maternal and infant outcomes for women receiving midwifery-led care in birth centers.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose

ACKNOWLEDGMENTS

The authors are deeply grateful to the American Association of Birth Centers (AABC) Foundation for their generous, unwavering support and recognition of the value of the AABC *Uniform Data Set*. They wish to thank Frontier Nursing Service Foundation for their significant support. They also thank the American College of Nurse-Midwives Foundation, Inc., and Childbirth Connection for their support of the project in the form of the 2010 Hazel Corbin Award.

The authors express their gratitude to the members of the AABC Research Advisory Committee who have contributed invaluable wisdom and expertise: Kenneth Blau, MD,

FACOG; Eunice K.M. Ernst, MPH, DSc(Hon), FACNM; Phyllis Leppert, MD, PhD; Evan Meyers, MD, MPH; SeanMulvenon, PhD; Judith Rooks, CNM, MPH, MS, FACNM; Mark Shwer, MD; and Nan Smith-Blair, PhD, RN, MSN.

Kate Bauer, Executive Director of the American Association of Birth Centers, has been instrumental in this project, providing invaluable administrative and technical support to the birth centers and the research team.

Jennifer Wright, MA, Research Associate, played an essential role on the research team by conducting data quality procedures and interacting with birth centers to verify and edit the data.

This study would not have been possible without the commitment of birth center midwives and staff to ongoing data collection and data quality. The authors especially thank providers and staff at the birth centers who collected data and responded to numerous requests from the research team (see Appendix 2).

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Appendix 1. Study Variables for Outcomes of Birth Center Care

- Demographics
  - Maternal age at presentation to prenatal care
  - Payment method
  - Education level
  - Maternal race/ethnicity
  - Marital status
  - Gravidity and parity
  - Medical history
  - Psychosocial history
  - Intended place of birth at onset of prenatal care
  - Estimated date of birth
- Antepartum referral
  - Antepartum complications
  - Type of antepartum referral
  - Primary indication for antepartum referral
- Intrapartum
  - Type of intrapartum transfer
  - Primary indication for intrapartum transfer
- Pregnancy outcome
  - Place of first admission to intrapartum care
  - Place of birth
  - Type of birth
  - Live birth
  - Intrapartum fetal death
- Postpartum
  - Type of postpartum transfer
  - Primary indication for postpartum transfer
  - Postpartum hemorrhage
- Neonatal
  - Type of neonatal transfer
  - Primary indication for neonatal transfer
  - Neonatal death
- Provider characteristics
  - Primary provider for prenatal care
  - Birth attendant

Appendix 2. Participating Birth Centers

Alaska Family Health and Birth Clinic, Fairbanks, Alaska
Allen Birthing Center, Allen, Texas
Auburn Birthing Center LLC, Auburn, Indiana
Austin Area Birthing Center, Austin, Texas
Babymoon Inn, LLC, Phoenix, Arizona
Bay Area Midwifery Center, Annapolis, Maryland
Best Start Birth Center, San Diego, California
Birth & Women's Health Center, Tucson, Arizona
Birth and Beyond, Grandin, Florida
Birth Care and Family Health Service, Bart, Pennsylvania
Birth Care and Women's Health, Alexandria, Virginia
Birth Center of Gainesville, Gainesville, Florida
BirthWise, Appleton, Wisconsin
Breath of Life Women's Health Services and Birth Center, Largo, Florida
Brooklyn Birthing Center, Brooklyn, New York
Cambridge Birth Center, Cambridge, Massachusetts
Central Montana Birth Center, Great Falls, Montana
Charleston Birth Place Charleston, Charleston, South Carolina
Columbia Birth Center Kennewick, Kennewick, Washington
Columbia Community Birth Center, Columbus, Missouri
Connecticut Childbirth and Women's Center, Danbury, Connecticut
Edenway Birth Center, Cleburne, Texas
Family Beginnings Birth Center at Miami Valley Hospital, Dayton, Ohio
Family Birth Center of Naples, Naples, Florida
Family Birth Center, LLC, Great Falls, Montana
Family Health and Birth Center, Washington, District of Columbia
Family Health and Birth Center, Savannah, Georgia
Family Maternity Center of the Northern Neck, Kilmarnock, Virginia
Footprints In Time Midwifery Services, Black River Falls, Wisconsin
Geneva Woods Birth Center, Anchorage, Alaska
Goshen Birth Center, Goshen, Indiana
Healing Passages Birth & Wellness Center, Des Moines, Iowa
Health Foundations Family Health and Birth Center, St. Paul, Minnesota
Heart 2 Heart Birth Center LLC, Sanford, Florida
Holy Family Birth Center, Weslaco, Texas
Infinity Birthing Center-Nashville, Nashville, Tennessee
Inland Midwife Services, Redlands, California
Juneau Family Birth Center, Juneau, Alaska
Katy Birth Center, Katy, Texas
Labor of Love Birth Center, Lakeland, Florida
Labor of Love Birth Center Dunedin, Dunedin, Florida

Continued

Appendix 2. Participating Birth Centers

Labor of Love Birth Center for Tampa, Tampa, Florida
Lisa Ross Birth and Women's Center, Knoxville, Tennessee
Madison Birth Center, Madison, Wisconsin
Mamatoto Resource and Birth Centre, Port of Spain, Trinidad and Tobago
Mat-Su Midwifery, Wasilla, Alaska
Memorial Hospital Family Birthing Center, North Conway, New Hampshire
Midwife Center for Birth and Women's Health, Pittsburgh, Pennsylvania
Midwifery Center at DePaul, Norfolk, Virginia
Morning Star Women's Health and Birth Center, Menomonie, Wisconsin
Morning Star Women's Health and Birth Center, St. Louis Park, Minnesota
Motherly Way Maternity Service, Midland, Texas
Mother's Own Birth and Women's Center, Temperance, Michigan
Mountain Midwifery Center, Englewood, Colorado
Natchez Trace Maternity Center, Waynesboro, Tennessee
Nativiti Women's Health and Birth Center, The Woodlands, Texas
Natural Beginnings Birth & Wellness Center, Whittier, California
North Houston Birth Center, Houston, Texas
Park Nicollet, St. Louis Park, Minnesota
Nurse-Midwifery Birth Center, Springfield, Oregon
Reading Birth & Women's Center, Reading, Pennsylvania
Rite of Passage Women's Health and Birth Center, Pearland, Texas
Sage Femme Birth Center of Kansas City, Kansas City, Kansas
Sage Femme Midwifery Service/Community Childbearing Institute, San Francisco, California
San Antonio Birth Center, San Antonio, Texas
South Coast Midwifery and Women's Health Care, Irvine, California
Special Beginnings Birth & Women's Center, Arundel, Maryland
The Baby Place, Meridian, Idaho
The Birth Center, Bryn Mawr, Pennsylvania
The Birth Center, Missoula, Montana
The Birth Center, A Nursing Corporation, Sacramento, California
The Birth Center: Holistic Women's Health Care, Wilmington, Delaware
The Birth Place, Taylor, Michigan
The Midwife's Place, Bellevue, Nebraska
Valley Birthplace and Woman Care, Huntingdon Valley, Pennsylvania
Women's Birth & Wellness Center, Chapel Hill, North Carolina
Women's Health and Birth Center, Santa Rosa, California
Women's Health & Birth Options, Missoula, Montana
Women's Wellness and Maternity Center, Madisonville, Tennessee

Appendix 3. American Association of Birth Centers Transfer Definitions[27]

Type of Transfer	Definition	Examples
Medical attrition	No birth after 20 weeks' gestation is expected.	SAB Induced abortion Ectopic pregnancy
Nonmedical attrition	Changed from practice or original decision for intended birth site for nonmedical reasons.	Moved out of area Client wanted another provider or place of birth
Antepartum medical referral	Risk factor develops during pregnancy that makes birth in intended location or with intended provider inappropriate.	Hypertension Postdates Multiple gestation Gestational diabetes Malpresentation IUGR Nonreassuring fetal testing
Preadmit intrapartum referral	Risk factor identified on initial evaluation in labor that makes birth in intended location or with intended provider inappropriate.	Malpresentation MSAF Elective or client choice Prolonged prodromal labor Nonreassuring FHR pattern Preterm labor Term prelabor ROM
Intrapartum referral	Risk factor identified after admission in labor that makes birth in intended location or with intended provider inappropriate.	Arrest of labor/prolonged labor Psychological factors MSAF Malpresentation Hypertension/preeclampsia Abnormal intrapartum bleeding Prolonged ruptured of membranes
Emergency intrapartum transfer[a]	Risk factor is identified in labor that requires transfer to acute care setting or to another provider. Situation is urgent, and rapid transport is required.	Cord prolapse Nonreassuring FHR pattern Seizure Abruption
Postpartum referral	Risk factor is identified during postpartum requiring referral to acute care or to another provider. Not an emergency situation; transport time is not a significant factor.	Maternal fever Laceration requiring repair by physician Retained placenta Mild/moderate PPH
Emergency postpartum transfer[a]	Risk factor during postpartum which requires transfer to acute care setting or to another provider Situation is urgent and rapid transport time is required.	Maternal seizure Severe PPH Retained placenta with PPH
Newborn referral	Newborn risk factor is identified that requires referral to acute care setting or another provider. Not an emergency; transport time is not a significant factor.	Transient tachypnea Temperature instability Congenital anomaly Suspected infection Mild respiratory distress
Emergency newborn transfer[a]	Newborn risk factor is identified that requires transport to acute care setting or to another provider. Situation is urgent, and rapid transport is required.	Significant respiratory distress Major congenital anomaly Resuscitation >5 minutes

Abbreviations: FHR, fetal heart rate; IUGR, intrauterine growth restriction; MSAF, meconium-stained amniotic fluid; PPH, postpartum hemorrhage; ROM, rupture of membranes; SAB, spontaneous abortion.
[a]Determination of whether transfer is emergency is made by provider.

frontiers in Sociology

POLICY AND PRACTICE REVIEWS
published: 26 March 2021
doi: 10.3389/fsoc.2021.618210

Pivoting to Childbirth at Home or in Freestanding Birth Centers[1] in the US During COVID-19: Safety, Economics and Logistics

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Birth-related decisions principally center on safety; giving birth during a pandemic brings safety challenges to a new level, especially when choosing the birth setting. Amid the COVID-19 crisis, the concurrent work furloughs, business failures, and mounting public and private debt have made prudent expenditures an inescapable second concern. This article examines the intersections of safety, economic efficiency, insurance, liability and birthing persons' needs that have become critical as the pandemic has ravaged bodies and economies around the world. Those interests, and the challenges and solutions discussed in this article, remain important even in less troubled times. Our economic analysis suggests that having an additional 10% of deliveries take place in private homes or freestanding birth centers could save almost $11 billion per year in the United States without compromising safety.

Keywords: COVID-19, cost effectiveness of homebirth, safety of homebirth, ACOG statements on homebirth, freesstanding birth centers, medical intervention, out-of-hospital birth

OPEN ACCESS

Edited by:
Robbie Elizabeth Davis-Floyd, Rice University, United States

Reviewed by:
Katharine McCabe, University of Michigan, United States
Kathleen Hanlon-Lundberg, Wayne State University, United States

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Specialty section:
This article was submitted to Gender, Sex and Sexualities, a section of the journal Frontiers in Sociology

Received: *21 October 2020*
Accepted: *19 January 2021*
Published: *26 March 2021*

Citation:
Daviss B-A, Anderson DA and Johnson KC (2021) Pivoting to Childbirth at Home or in Freestanding Birth Centers[1] in the US During COVID-19: Safety, Economics and Logistics. Front. Sociol. 6:618210. doi: 10.3389/fsoc.2021.618210

INTRODUCTION: TRYING TO STAY AT HOME FOR EVERYTHING DURING COVID: WHY WOULD YOU RISK GOING ANYWHERE ELSE FOR CHILDBIRTH?

Births at home or in a freestanding birth center were increasing in the US even before COVID-19, but since decisions around birth generally center on safety, giving birth during this pandemic has brought safety challenges to a new level. As hospitals began to apply COVID restrictions, increasing numbers of childbearers made the decision to be supported during labor by their partners in their private homes (See **Figures 1**–**4**), instead of facing birth alone in hospitals–in the very buildings that

[1]Note that some use the terms "in the community" or "community birth" to group together home birth and birth in freestanding birth centers. Others use "out-of-hospital-birth," a term that defines such births as what they are not, rather than what they are. Others think that when using the term "out of" anywhere, it is appropriate for referring to hospital births; they are "out-of-home births," as the childbearer would have had to leave home to get there, and indeed are called that in the Netherlands. In Australian literature, the term "out-of-hospital birth," also called "birth before arrival" refers to an unplanned home birth or a birth on the way to the hospital, i.e., a birth that was planned to be in hospital until circumstance got in the way. However, out of respect to the hospitals, in particular the hospitals that consider themselves to be "community hospitals," and in order to avoid any confusion, we will use the full terminologies "home birth" or "birth in private homes" and "freestanding birth centers" as much as possible throughout the article.

FIGURE 1 | Home birth in the time of COVID-19: Millennial father and lawyer, Robert Onley, who caught his own son in the pool in their master bedroom, puts aside his mask and iPhone momentarily, while midwives stand back for both photo-op and physical distancing and the father's real-time moment with the new baby. Midwife protocol is that the mother, Natasha Onley can birth without a mask. Daughter, Isabelle, stands by watching, still with her mask on, for the benefit of the midwives, who have to do births in other settings, and are therefore careful themselves as well to use Personal Protective Equipment (PPE). Photo by grandmother, Lori Szauter. Used with permission.

FIGURE 2 | Isabelle, age 5, one of the few children who will never ask "Where do babies come from?" cradles her new little brother, shortly after he comes out of the water. Midwife Ness Dixon, helping her, has already had both doses of the Pfizer vaccine, but both American and Canadian midwives continue to maintain caution, encouraging family members to wear masks, whether the baby is born at home or in hospital. Photo by Lorie Szauter. Used with permission.

take in the people who are sickest with this new plague (Davis-Floyd et al., 2020). While these personal safety threats to laboring people have relaxed in many areas to allow at least the partner into the hospital, and in spite of the vaccine being rolled out, it is not likely that other restrictions in hospitals, or the dangers, are going to disappear anytime soon.

Furthermore, amid the COVID-19 crisis, the concurrent work furloughs, business failures, and mounting public and private debt have made unnecessary personal and community/state expenditures an inescapable concern. For years, maternity and newborn care have constituted the largest hospital payouts from commercial insurers and state Medicaid programs, and the per-capita expenditures in the United States exceed those in every other high-resource country (Truven Health Analytics, 2013). Before COVID-19, the Committee on Assessing Health Outcomes by Birth Settings of the National Academies of Sciences, Engineering, and Medicine (NASEM, 2020: vii) clearly stated, to anyone still unaware at the beginning of 2020: "The United States spends more on childbirth than any other country in the world, with worse outcomes than other high-resource countries, and even worse outcomes for women of color."

As we will detail in this article, birthing persons have been continually achieving safe outcomes in private homes and freestanding birth centers with the assistance of midwives in the United States and abroad. Even so, there has been reluctance to include all nationally credentialed midwives in publicly funded US maternity care programs and state licensure policies. Resistance stems from beliefs that home or freestanding birth center births are riskier than hospital births[2].

COVID-19 has disrupted the perspective of actual safety because staying at home offers better protection from the pandemic for childbearers than sharing a hospital with disease-stricken patients. While freestanding birth centers, unlike hospitals, are not the settings where COVID-19 positive individuals go for treatment, they still present the risk of contamination from other patients, staff, and visitors. Yet as at hospitals, practitioners providing care in private homes and freestanding birth centers can take safety measures that include masks, sanitizing measures, and a minimized number of people at the birth (**Figure 1**–**2**), as other articles in this Special Issue demonstrate.

The economic analysis of public policy is usually a struggle with trade-offs. Consider a policy that increased the speed limit. It would save time, the trade-off being a predictable increase in traffic fatalities and carbon emissions. Yet in this article, we demonstrate how a public policy that expanded midwifery in the United States could save billions of dollars *without*

[2]For example, the Aetna insurance company states on its website that labor and delivery present "hazards" that "require standards for safety which are provided in the hospital setting and cannot be matched in the home situation" (Aetna, 2020).

necessitating trade-offs regarding safety. This is the first study to estimate the specific savings from public policy that increases births in private homes or freestanding birth centers by a given percentage. We intend to demonstrate that greater access to maternity care by credentialed and licensed midwives in these settings is a solution that is safe, cost effective, and increasingly popular.

For practical models, we can draw on the experiences of countries that have invested in publicly funded home and freestanding birth center births. For example, starting in the 1980s, the Canadian provincial governments charged lawyers and consultants to research a birth model that was safe, cost effective, and met the needs that childbearers were asking for. The solution: to give midwives legislative support and require the provision of a range of birth settings. Almost all provinces have implemented midwifery legislation since it was established in the province of Ontario in 1993. Now 11% of Canadian births are attended by midwives, and in the two provinces with the most midwives—B.C. and Ontario—25 and 15% of births respectively are under midwifery care (Canadian Association of Midwives, 2019). Midwives in Canada in almost all jurisdictions are required by their Colleges (their regulatory bodies) to provide both home and hospital births paid for through universal not-for-profit government agencies (**Figure 3**).

Two major breakthroughs in the last four years have occurred suggesting that former opponents to home birth and to the use of a specific group of midwives, Certified Professional Midwives (CPMs) may have softened their views:

(1) The statements on home birth during the last four years by the American College of Obstetricians and Gynecologists (ACOG, 2016) have acknowledged women's right to choose and agreed that home birth is safe in countries with well-integrated midwifery systems;
(2) Faced with the pandemic, an emergency Executive Order by Governor Cuomo of New York State permitted midwives licensed in other states or Canadian provinces, including Certified Professional Midwives, who had long been illegal in New York, to practice legally there for the initial period of major outbreak in the state (Executive Order #202.11). The timeline has continued to be extended[3].

To be clear, Certified Professional Midwives (CPMs) are the only US midwives whose educational standards require them to undergo specialized clinical training in private homes or freestanding birth centers as a condition of national certification. They are also the only US midwives who are not allowed to practice in hospitals, and they can practice legally in only 36 states, with legislation pending in others.

The pressing questions now are: Will the gaps in the US maternity care system, and the solutions generated during COVID-19 be recognized as important when the pandemic is gone? Will increasing the numbers of midwives trained to work in private homes and freestanding birth settings and fully integrating them into that system during COVID-19 finally be recognized as a paradigm shift that will serve birthing people in normal times?

In what follows, we examine the intersection of the *safety* and *economic efficiency* of birth in private homes and freestanding birth centers, which has become even more critical as the coronavirus ravages bodies and economies around the world. We contend that those interests, and the solutions of increased legislation, liability insurance, and better integration for midwives working in those settings remain important even in less troubled times.

The Pre-COVID-19 Increase in Home Births and Freestanding Birth Centers in the US

After a gradual decline from 1990 to 2004, the number of out-of-hospital births in the US increased from 35,578 in 2004 to 62,228 in 2017, so that 1 of every 62 births took place in homes and freestanding birth centers (1.61%) (Macdorman and Declercq, 2019). By 2015, there were more home births in the United States than in any other industrialized country (Martin et al., 2017)[4].

Who is available to provide births outside the hospital in the US? Certified Nurse-Midwives (CNMs) attend births primarily in hospitals; in 2018, 9,399—only 2.6% of the births that they attended were in private homes and 11,139 (5.1%) in freestanding birth centers (Martin et al., 2019). Medicaid care is mandatory in all states and most Medicaid programs reimburse CNMs at 100% of physicians' rates. The majority of states also mandate private insurance reimbursement for CNM/CM services (American College of Nurse-Midwives (ACNM), 2019).

In 2018, CPMs and other midwives who are not CNMs[5] attended 16,823 (55.7%) of their births in private homes and 7,127 (23.6%) in freestanding births centers. Clearly these groups specialize in birth in the larger community outside the hospital. Again, CPMs rarely—if ever—have hospital privileges. CPMs are not currently recognized under Medicaid at the federal level. However, as of December 2020, 14 of the states in which CPMs are legal have also opted, through a state plan amendment, to cover CPM services[6]. CPMs and families who want access to their

[3]This was an important recognition, as New York state has officially recognized only the Certified Nurse-Midwife (CNM) and Certified Midwife (CM) credentials. The CM credential is recognized in only 5 states and there are only around 120 practicing CMs, despite the fact that this credential was created by members of the American College of Nurse-Midwives (ACNM) in 1996. CMs go through the same training as CNMs (excluding the nursing component) and are certified by the same board. See May and Davis-Floyd (2006) for a full description of the creation of the CM and why it has not gone far. In contrast to the low numbers of CMs–which is also a direct-entry credential, there are around 3,000 CPMs practicing in the US.

[4]Percentage-wise, though, the rate of homebirths in the Netherlands is much higher than in the US, currently standing at 13%, while that of the US stands at under 2%. The point is that the homebirth rate is rising in the US. In seven states in 2018 it was 2.0% or above—in Idaho, Montana, Oregon, Utah, Vermont, Washington, and Wisconsin (see Table I–5 in Martin et al., 2019 at https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_13_tables-508.pdf).

[5]In most US states, a non-CNM/CM midwife must first be a CPM to obtain a license, but some such midwives, once they have obtained licensure, drop their CPM certification rather than taking the trouble to renew it every 3 years.

[6]http://narm.org/pdffiles/Statechart.pdf

services are seeking federal recognition to secure Medicaid coverage in all states in which CPMs are licensed and meet certain educational requirements[7].

It is important to emphasize that births attended in private homes and freestanding birth centers require providers specifically trained to do so with proper equipment, protocols in place for transport to hospital, and back up hospitals pre-arranged. As one physician reports:

> I have served as a collaborative physician for several CNMs making the transition from hospital to home birth practice and have seen how steep the learning curve is, especially in their first year. To focus on safety in home and birth center birth, then we have to admit that it requires a different skill set than hospital birth and that providers practicing in the community setting must be trained in that skill set to maintain the safety of the environment (Personal communication, Sarita Bennett, DO, CPM).

Although many Americans have assumed that more CNMs could start doing home births if they so desired, it appears difficult for the US administrative facilities to consider something the other way around--that CPMs could work in hospitals. Because Canada deliberately chose not to create distinctions between nurse-midwives and other midwives at legislation, it is rare that Registered Midwives in Canada are also nurses. Yet all midwives in the standard Canadian model must have hospital privileges and do at least some hospital births, as well as home births.

In Canada, in the US states that have legislated and adopted insurance coverage for CPMs, and in other countries that have discovered or continued to recognize the importance of midwives who provide care in the community outside the hospital, a critical commonality has emerged. Bringing these midwives out from underground economies to have them fully integrated into what the World Health Organizations calls "the Reproductive, Maternal, Newborn and Child Health (RMNCH) Continuum of Care[8]," secures the creative strategies most adaptable and safest for families of that community, not just for pandemics but for normal times.

In the US in 2018, midwives attended 10.2% of births (Martin et al., 2019), with a home birth rate of <2%. There are no data yet available to establish how much home births and freestanding birth center births are on the rise with COVID-19, but there is ample suggestive evidence from across the country that it is: in professional journals (see Davis-Floyd et al., 2020; The Trust Project, 2020, and other articles in this Special Issue), and in a substantial increase in news media coverage about midwives[9] and the increasing numbers of US families who are seeking to give birth with midwives outside the hospital. One website called "Birth Monopoly" helps consumers track hospital policies to decide which one might have the least restrictions or whether the family feels secure enough to allow the laboring mother to go in at all[10]. Thus, investigating the efficacy and feasibility of better integrating and increasing birth in alternative settings seems timely.

EVIDENCE OF SAFETY: OUTCOMES OF BIRTH IN HOSPITAL VS. IN PRIVATE HOMES AND FREESTANDING BIRTH CENTERS

The two most recent meta-analyses examining perinatal outcomes for birthing people with low-risk pregnancies in high-income countries have demonstrated similar levels of safety for hospital and planned, midwife-attended births in private homes or freestanding birth centers. An Australian meta-analysis (Scarf et al., 2018) found no significant difference in the odds of intrapartum stillbirth or early neonatal death (0–7 days), regardless of whether the birth was planned for home, birth center, or hospital, and no difference in those odds between parous and multiparous women. That meta-analysis of four studies of planned home births also identified significantly lower odds of NICU admission than for planned hospital births, with an odds ratio (OR) of 0.71 and a 95% CI of 0.55–0.92. Scarf et al. (2018) concluded that their findings "support the expansion of birth center and home birth options for women with low-risk pregnancies."

A 2019 Canadian meta-analysis found 14 eligible international studies—representing more than 500,000 home births—which met their strict criteria for comparing planned home to planned low-risk hospital birth (Hutton et al., 2019). Stratifying their analyses by whether or not the midwives attending the home births were well integrated into the health services, they found that in jurisdictions where midwives were well integrated, perinatal and neonatal mortality summary risk estimates were essentially identical for intended home births and intended hospital births. The summary OR was 1.07 (95% CI, 0.70–1.65) for primips and 1.08 (95% CI, 0.84–1.38) for multiparous women.

In less integrated settings, Hutton et al. (2019) found that there was a possible increase in perinatal and neonatal mortality with home birth compared to hospital birth. However, because both estimates had large confidence limits due to the small numbers of deaths on which they were based, chance cannot be ruled out for the increase—the estimate on primips was based on 1 newborn death in 897 home births (The estimate for primips was OR 3.17 (95% CI, 0.73–13.76), and for multips, 1.58 (95% CI, 0.50–5.03).

[7]https://www.georgiacpm.org/certified-professional-midwives-frequently-asked-questions

[8]The "Continuum of Care" for reproductive, maternal, newborn and child health (RMNCH) includes integrated service delivery for mothers and children from pre-pregnancy to delivery, the immediate postnatal period, and childhood. Such care is provided by families and communities, through outpatient services, clinics and other health facilities. . .[It] recognizes that safe childbirth is critical to the health of both the woman and the newborn child—and that a healthy start in life is an essential step towards a sound childhood and a productive life (https://www.who.int/pmnch/about/continuum_of_care/en/).

[9]https://www.pushformidwives.org/pushheadlines

[10]https://birthmonopoly.com/covid-19/

TABLE 1 | Estimated birth costs and annual savings from an additional 10% of deliveries occurring in private homes or freestanding birth centers.

	Home birth	Birth center birth	Hospital birth	Savings from additional 10% home and freestanding birth center births (US dollars)
Estimated cost for an uncomplicated vaginal birth	$2,870[a]	$7,240[b]	$12,156[c]	
Additional 5% home births and additional 5% freestanding birth center births	$1.811 billion[d]	$959 million[e]		$2.769 billion
Lower cesarean rate for low-risk birthing people				$299 million[f]
Reduced rate of low birthweight babies				$111 million[g]
If competition brought 10% reduction in hospital birth cost				$4.267 billion[h]
Reducing cesarean rates in hospitals to 15% as WHO recommends (i)				$3.422 billion[j]
Total potential cost savings				$10.868 billion[k]

[a]*This figure is from Anderson and Anderson (1999), updated (as are all figures) to 2019 dollars using the Consumer Price Index. More recent studies of home birth costs are scarce and these costs vary widely by location. The cost for the midwife here is an estimate for the birth only, in order for it to be comparable to hospital birth. Midwives generally include prenatal and postpartum care in their fee, but this care is not included in this analysis for any of the birth locations.*

[b]*This is the mean of the total of professional and facility charges for freestanding birth center births from the Practice Profile data collected from the Perinatal Data Registry by the American Association of Birth Centers (2015).*

[c]*This is the average facility, labor, and birth charge for a vaginal hospital birth with no complications in 2011 (updated to 2019 dollars) as reported by Childbirth Connection (2013), obtained from the US Agency for Healthcare Research and Quality, available at http://hcupnet.ahrq.gov/. Published costs that are much lower than this represent a subset of the costs of birth, and perhaps only the cost of the hospital stay itself.*

[d]*Calculated as 3.9 million births × 0.05 × ($12,156 - $2,870).*

[e]*Calculated as 3.9 million births × 0.05 × ($12,156 - $7,240).*

[f]*Low risk was defined as singleton, head-down term babies when data were obtained from the NVSS system to do the calculations for the "CPM 2000" study (Johnson and Daviss, 2005a). The savings from lowering the cesarean rate were calculated as [3.9 million × 0.05 × (0.19–0.052) × $5,735] + [3.9 million × 0.05 × (0.19–0.061) × $5,735].*

[g]*Calculated as 3.9 million × 0.10 × (0.024–0.011) × $21,876.*

[h]*Calculated as 3.51 million × 0.10 × $12,156.*

[i]*See http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/csstatement/en/.*

[j]*Calculated as 3.51 million × (0.32–0.15) × $5,735.*

[k]*Calculated as $1.811 billion + $959 million + $299 million + $111 million + $4.267 billion + $3.422 billion.*

Despite limited institutional support for credentialed midwives in the United States attending births in private homes and freestanding birth centers, the weight of evidence in US cohort studies indicates that births in these settings have good outcomes when the studies: 1) are based on charts rather than birth certificates, because the latter often lack accurate outcome and care details; 2) identified low-risk women; 3) are able to discern the planned place of birth, thereby avoiding counting accidental, unplanned out-of-hospital births; and 4) are conducted on a defined group of midwives with training standards. Where comparisons are possible, these US cohort studies (Murphy and Fullerton, 1998; Schlenzka, 1999; Johnson and Daviss 2005a; Stapleton et al., 2013), produced similar results for low-risk births at home, in birth centers or in hospitals, just as the international meta-analyses have found. Even where the defined group of practitioners had questionable homogeneity of education and a varying degree of integration into the US maternity care system, outcomes were similar to those in the other studies cited for low-risk birthing people (Cheyney et al., 2014).

EVIDENCE ON THE COSTS OF HOSPITAL VS. HOME AND FREESTANDING BIRTH CENTERS

Having the Safety for a Fraction of the Cost

This section demonstrates that births in homes and freestanding birth centers are far less expensive to society than hospital births. Combined with the evidence that outcomes are similar among low-risk mothers who plan their births in private homes, birth centers, or hospitals, this fact reveals a win-win situation: childbearers choosing their own home or a freestanding birth center can have the safety of hospital births at a fraction of the cost to families or insurers. The relevant discussion, then, is about whether the size of the "win" is worthwhile.

There are approximately 3.9 million births annually in the United States (Statista, 2019). The average charge by a midwife for an uncomplicated home birth is $2,870 (this and all costs are in 2019 inflation-adjusted US dollars (Anderson and Anderson, 1999). In freestanding birth centers, the average cost is $7,240 (American Association of Birth Centers, 2015). In hospitals, the average cost for an uncomplicated vaginal birth is $12,156 (Childbirth Connection, 2013).

Table 1 summarizes the potential savings from a modest increase in the use of private homes or freestanding birth centers in the United States. If an additional 5% of deliveries occurred in private homes rather than in a hospital, the savings would be $1.811 billion annually. If another 5% of deliveries occurred in freestanding birth centers rather than hospitals, the added savings would be $959 million annually. Note that about 10–20% of birthing people who plan to deliver at home or in a freestanding birth center transfer to a hospital during labor (Stapleton et al., 2013; Cheyney et al., 2014), so the number of planned out-of-hospital births would need to increase by about 6% in order for the actual increase to be 5%. For this analysis, we make the simplifying assumption that those transferred to hospital would pay the average costs associated with hospital births. **Table 1** is reproduced from Anderson et al. (2021).

Cesareans, Instrumental Deliveries, and Other Interventions: High Costs and Risks

In the Scarf meta-analysis (2018), women planning a hospital birth were nearly three times as likely to have a cesarean or instrumental (forceps or vacuum) delivery as those planning a home birth, and nearly twice as likely to have a cesarean as those planning a birth center birth. Similarly, there has been consensus across the literature for decades that planned home and birth center births in the United States entail significantly less medical intervention than planned hospital births (Johnson and Daviss 2005a; Cheyney et al., 2014; Hutton et al., 2019).

Our cost analysis of interventions focuses on cesareans because they are both the costliest intervention and the cause of numerous safety concerns. Cesareans are associated with a two-fold increase in maternal mortality, increased maternal blood loss, impaired neonatal respiratory function, increased incidence of maternal postpartum infections, increased fetal lacerations, trouble with maternal-infant interaction, extended length of stay and recovery, re-hospitalization, placenta accreta and previa, hysterectomies, transfusions of ≥4 units, maternal ICU admission, and uterine rupture (Spong, 2015). It is beyond our scope here to quantify the economic costs of a current cesarean on future pregnancies.

Although the risk of a serious problem during a typical cesarean birth is low, with almost one-third of US births being cesareans, problems occur and costs are high. The cesarean rate for planned hospital births in the United States is 32% (Martin et al., 2018), compared to 6.1% for planned birth center births (Stapleton et al., 2013) and 5.2% for planned home births (Cheyney et al., 2014). While some of the hospital births involve higher-risk childbearers with increased needs for cesareans, the majority of those cesareans are performed on those who were low-risk, begging the question, "Were they necessary?" To illustrate, data obtained from the National Vital Statistics System suggest that in 2000, when the overall US cesarean rate was 22.9%, low-risk women delivering in a hospital had a 19% cesarean rate, compared to a 3.7% rate for women who planned home deliveries with Certified Professional Midwives (Johnson and Daviss, 2005a).

A cesarean adds an average of $5,735 to the cost of a birth in the United States (International Federation of Health Plans, 2016). With the reduced likelihood of cesareans among the additional 5% home deliveries and the 5% birth center deliveries in our proposal, even if low-risk women still had only a 19% cesarean rate in hospital, the savings for families or insurance companies would be an additional $299 million annually.

The Costs of Low Birth Weight and Prematurity

When prenatal care is provided by credentialed midwives, the incidence of low birthweight decreases. For example, the rate decreased from 2.4 to 1.1% in a national study (Johnson and Daviss, 2005b) and from 2.8 to 1.8% in a study conducted in Washington State (Health Management Associates, 2007). As well, the premature birth rate at the National Institutes of Health (NIH) for non-Hispanic white births in hospital has been shown to be more than double the rate for clients cared for by Certified Professional Midwives (CPMs) at home births (Johnson and Daviss, 2005b). Low birthweight or premature birth adds an average of $21,876 to the cost of caring for an infant (Russell et al., 2007), with additional health and financial repercussions later in life. If the number of births at home and in freestanding birth centers each increased by 5%, and the decrease in the populations served reflected the prematurity rates described above, we estimate that the reduced likelihood of low birthweight alone would contribute an additional savings of $111 million.

Increased Competition for Hospitals

Competition is a moderating force for prices and an incentive for improved quality. Robinson (2011) found that hospitals with limited competition charged commercial insurers 13.0–25.1% more for specific procedures than hospitals in competitive markets. Again, CPMs can practice legally in only 36 states[11]. If legislation enables them to serve more of the 50 states and territories and join forces with the Certified Nurse-Midwives (CNMs) and Certified Midwives (CMs) who also attend births in homes and freestanding births centers, midwives can become low-cost, service-oriented hospital competitors.

The Big Push for Midwives is a national campaign in the US initiated and driven by consumers wanting to increase access to care by midwives attending births in the broader community, not just in the hospital. It focuses on increasing access to CPMs by pushing for legislation that legalizes them in the 14 holdout states and also on the need for CNMs to come out from the requirement of physician sign-off on their care:

> We like to emphasize that competition is valued as an economic concept because it reduces costs and increases access and quality of goods and services for consumers. As the Big Push for Midwives Campaign posted on social media December 30, 2020,[12] to the extent that public policy mandates hospitals or physicians to sign-off for a single visit, or that midwife-guidelines approval is granted to physicians, they have been handed the weapon they can use to limit the financial and clinical impact of competition. This is to provide clarification of the intent, and the possible negative effects, of organized medicine's involvement in out-of-hospital midwife or birth center legislation[13].

If stronger competition forced hospitals to reduce their price for an uncomplicated birth by 10%, the 3.51 million childbearers who would still deliver in the hospital under our scenario—or their insurers[14]—could save $4.267 billion. Because hospitals would still be the exclusive providers of care for complications, we assume here that only the price for an uncomplicated birth

[11]PushMap and PushChart: https://www.pushformidwives.org/what_we_do

[12]https://www.facebook.com/PushForMidwives/posts/3999886113363809

[13]https://www.facebook.com/PushForMidwives/posts/3999886113363809 in response to https://newrepublic.com/article/160706/midwives-appalachia-kentucky-maternity-care-desert

[14]In theory, it follows then, that if the insurers pay out less, they should be able to charge less.

FIGURE 3 | The family gathers together in the family bed. In Canada, all births–home, hospital, or birth center–are covered through government insurance. Families can choose where they want to deliver, unhampered by considerations of cost. Midwives stand back again while the family is afforded a photo without masks, taken by grandmother, Lori Szauter. Used with permission.

would decrease. There is substantial evidence that competition also affects treatment decisions in hospitals (Gaynor et al., 2015). Intensified competition from CPM-attended home births, which have a 5.2% cesarean rate (Cheyney et al., 2014), especially when accompanied by education for families about their options, should provide a financial incentive for hospitals to bring their cesarean rates within a more acceptable range (Again, the US national cesarean rate is 32%.) If US hospitals reduced cesareans to the 15% range, as the World Health Organization (WHO) has recommended since 1985, the savings for the birthing people who would still deliver in the hospital—and especially for their insurance companies--could be an additional $3.422 billion.

The total estimated savings from increased access to births outside the hospital as we have described above amount to $10.868 billion annually. This proposal to facilitate an increase in births at home or in freestanding birth centers, if implemented, would represent a huge win for the many constituents who want access to safe and normal physiologic childbirth with fewer interventions, freedom of choice for a variety of ideological, religious, cultural, financial or personal reasons, and lower maternity care costs for American society.

OBSTETRIC AND PUBLIC HEALTH STATEMENTS ON HOME BIRTH PRIOR TO COVID-19

The successful implementation of US policy to increase rates of home and freestanding birth center births would be facilitated by at least tacit support from the national obstetric and public health communities. Some support has emerged: in 2001, the American Public Health Association (APHA) passed a resolution entitled, "Increasing Access to Out-Of-Hospital Maternity Care Services through State-Regulated and Nationally-Certified Direct-Entry Midwives,"(American Public Health Association, Maternal and Child Health Division, 2001) after they saw the methodology and preliminary data from the "CPM 2000" study on home births (Johnson and Daviss, 2005a).

A detailed description of the history and politics behind the American College of Obstetrics and Gynecology (ACOG) statements on home birth and a rationale for better integrating midwives specializing in births at home and in freestanding birth centers in the US can be found in Anderson et al. (2021). Briefly, ACOG officially opposed home birth from the 1970s on; 2011 was the first year that any evidence was quoted to support ACOG's negative statements about it, but that evidence was based on part of a meta-analysis that was later discredited (Wax et al., 2010, analyzed in; Anderson et al., 2021). To their credit, ACOG removed the Wax et al. study from their equations about perinatal and neonatal mortality in the next ACOG statement on Planned Home Birth in 2016.

However, unfortunately, ACOG has not updated its analysis to include the two new home birth meta-analyses (Scarf et al., 2018; Hutton et al., 2019) that demonstrate no difference in safety among birth settings for low-risk childbearers. Instead, Table 2 in ACOG's homebirth statements since 2016 has continued to use a single study based on birth certificates in a single state (Snowden et al., 2015) to assert that home birth "is associated with a more than twofold increased risk of perinatal death (1–2 in 1,000)[15]." The analysis in Anderson et al. (2021) questions whether such a study can be generalized to other US. In short, the Snowden et al. study was conducted in Oregon, one of only two states where licensure was not required for midwives to practice legally at that time, and where family members, naturopaths, or unlicensed midwives managed more than a third of the births.

A subsequent interview published between the principal author of the study, Jonathan Snowden, and Melissa Cheyney, the midwife in the state who happened to be the principal author of the national homebirth study of the Midwives Alliance of North America (Cheyney et al., 2014) clarified that they had several common understandings: that the absolute risk of home birth in this and other studies is low; that the risk of having a cesarean in a planned hospital compared to planned home birth in Oregon and the rest of the US is dangerously high; that one should not assume that parents choose home birth for selfish reasons without taking their baby's safety into consideration; and that

[15]In its 2017–2020 homebirth statements, the only changes that ACOG made from its 2016 statement were in Table 2(a)the addition of another sign highlighted in yellow and explanation in the footnotes about what it meant: "includes planned birth center and home birth" and(b)the switching of signs ([‡] and [†]) that mark the Snowden et al. and Grunebaum et al. studies in the footnotes of Table 2. At first we thought they meant that the 3.9/1000 perinatal mortality figures were now being attributed to the Grunebaum study but we were mistaken. ACOG has continued to use the single study by Snowden et al. that reports 3.9/1000 perinatal deaths for planned home vs. 1.8/1000 perinatal deaths for hospital births (a "more than twofold risk") for the reporting of perinatal mortality in its statements from 2016 to 2020.

better integration and respect for midwives in Oregon as well as the rest of the US could improve outcomes (Cheyney, 2016).

By 2016, with pressure from other obstetric associations and studies that could no longer be ignored, ACOG (ACOG, 2016) accepted that home birth does occur safely in other high-resource countries and that "a characteristic common to those cohort studies reporting comparable rates of perinatal mortality" among care settings is the provision of care by midwives "well integrated into the health care system."

In their 2016–2020 statements (ACOG, 2016), ACOG also acknowledged that they would support the provision of care, not just by CNMs and CMs but by all midwives whose education and licensure meet the International Confederation of Midwives (ICM) Global Standards for Midwifery Education, which many CPMs do[16].

The other two ACOG statements on birth setting since COVID-19 will be discussed in *Then COVID-19 Struck: Highlights Even More, Need for Legislation and Health Insurance for Birth Outside Hospitals*.

FIGURE 4 | Nicholas Richer-Brulé holds the hands of his wife, Bernadette Betchi, during a contraction. They chose a home birth because "it is a safe place where we were able to deliver our baby in the comfort of an environment that we could control. This meant even more with the unpredictability that Covid-19 has had on our surroundings. It eliminated the stresses of traveling while in labor, of being separated from each other and our children and being subjected to the hospital's restrictions and rules" (personal communication, Bernadette). Photo by Elle Odyn Breathe In Photography Ottawa Ontario. Used with permission.

WHAT EVIDENCE DO WE HAVE ABOUT WHAT CHILDBEARERS WANT?

In the *Listening to Mothers* survey carried out by the California Health Care Foundation (2018), although 99% of women in the state had a hospital birth in 2016, a substantial portion expressed interest in using a freestanding birth center or their private home for a future birth. However, only 7% of women in California in the survey used midwives as their main prenatal care providers and 9% as their birth attendant:

> Less than 1 in 10 survey participants used either midwives or labor doulas . . . for their recent births. However . . . over 1 in 6 women would definitely want midwives or labor doulas for a future birth. In addition, more than 1 in 3 would consider using these care team members[17].

Some of this was the result of the lack of options of available insurance providers. For example, nearly 1 in 4 Black or Latina women had their prenatal care provider assigned to them, apparently by their primary provider, compared to less than 1 in 8 white women[17].

The financial impediment may explain some of why data from the National Vital Statistics database demonstrate that white women have 2 ½ times the rate of home births as American Indian or Alaskan Native women, three times the rate of Black women, and almost four times the rate of Hispanic women (Martin et al., 2019). (See **Figures 4**, **6**, what Indigenous, Black and Latina women deserve to have offered, and **Figure 5**, how it was taken from them in the 1980s.)

The current President of the Midwives Alliance of North America, Sarita Bennett, emphasizes that there is a balancing place in US society for those not ready to choose birth in their own home but do not want to go to a hospital, especially during the pandemic:

> While we can talk about legalizing CPMs, unless we also address changing birth center legislation that is restrictive rather than evidence-based, there will still be limited options, especially for those who might accept birth center birth but aren't ready to make the leap to home birth. My birth center in a state with no birth center legislation has lots of those families who then choose home birth the next time (Sarita Bennett DO, CPM, personal communication, Jan. 2021).

Pain relief is a major concern of birthing persons, may determine where they seek care, and is related to delivery cost. In the national Listening to Mothers survey of 2013, 67% of respondents used epidural or spinal analgesia, 16% used narcotics, and 7% were given general anesthesia[18].

Some childbearers want to be more physically involved with their births and have fewer interventions. In the same survey, 17% said they used no pain medication, and 6% used nitrous oxide

[16]The complexities of which CPMs do and do not meet these ICM standards are too detailed to explain herein. For the standards themselves, see https://internationalmidwives.org/assets/files/general-files/2018/04/icm-standards-guidelines_ammended2013.pdf

[17]https://www.chcf.org/wp-content/uploads/2018/08/ListeningMothersCareTeam2018.pdf

[18]https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3894594/pdf/JPE23-1_PTR_A3_009-016.pdf

(the same "laughing gas" that dentists use), which is a client-controlled and effective method of pain relief and can be made available in birth centers and at home births. It is cheaper for birthing persons to use nitrous in home or birth centers, as hospitals can take advantage of the lack of regulation to charge what they want. For example, a hospital in Wisconsin bills more than $100 for every 15 minutes that the nitrous is sitting in the room, which, for one woman, resulted in a bill of $4,836, whereas the local freestanding birth center charges only a flat fee of $100 for its use, for as long as it is needed. An epidural in the same hospital in Wisconsin costs $1,500, a third of the price of the nitrous oxide[19].

In the aforementioned 2013 *Listening to Mothers* national survey, women reported using a variety of drug-free methods to increase comfort and relieve pain, with 73% using at least one non-pharmacologic method of pain relief, led by breathing techniques (48%), position changes (40%), hands-on techniques like massage (22%), and mental strategies (e.g., relaxation methods) (21%)[18].

THEN COVID-19 STRUCK: THE NEED FOR LEGISLATION AND HEALTH INSURANCE FOR BIRTH OUTSIDE HOSPITALS BECOMES URGENT

A birthing person's ability to pay for a birth in their private home or at a freestanding birth center is often limited by finances because most hospital births are paid for through public or private insurance, while births not in hospital are rarely afforded the same privilege. In 2017, more than 2/3 (67.9%) of planned home births and almost 1/3 (32.2%) of birth center births were paid for by the birthing persons themselves, while only 3.4% of women self-paid for hospital births (MacDorman and Declercq, 2019).

In 2020, the report Birth Settings in America: Outcomes, Quality, and Choice concluded:

> Models for increasing access to birth settings for low-risk women that have been implemented at the state level include expanding Medicaid, Medicare, and commercial payer coverage to cover care provided at home and birth centers . . . by certified nurse midwives, certified midwives, and certified professional midwives whose education meets International Confederation of Midwives Global Standards . . . the potential impact of these state-level models is needed to inform consideration of nationwide expansion, particularly with regard to effects on reduction of racial/ethnic disparities in access, quality and outcomes of care [National Academies of Sciences, Engineering, and Medicine (NASEM) 2020:12]

[19]https://www.npr.org/sections/health-shots/2019/05/28/726572880/bill-of-the-month-4-836-charge-for-laughing-gas-during-childbirth-is-no-joke

FIGURE 5 | Visiting "Miss Margaret" Charles Smith, age 98, the year she died (2004). She attended circa 3500 babies at home in Alabama, many during times when African American women were denied entry to hospitals. Betty–Anne (on the right), who attended homebrths in Alabama 1979–81, studied the statistics at that time in Russell County, Alabama, trying to understand why the "Black granny midwives"–who decided they would rather be called, the "Grand Midwives"—were having their licences revoked. She discovered their outcomes were good, but a Medicaid pay hike for physicians and the 1982 introduction of nurse-midwives had made poor African American pregnant women financially lucrative for hospital practitioners (Financial Planning Division, Alabama Medicaid 1995). Interviewing the midwives and women, Betty-Anne realized that nobody had asked the women what *they* wanted. Photo by Ken Johnson. Used with permission.

Even prior to COVID-19, this report's conclusions had drawn attention to the fact that there is a "mismatch" between the care needs of the population as a whole and what is available for them, in both rural and urban areas. The NASEM researchers concluded that for most childbearers, who are largely healthy, it is unnecessary to rely primarily on "a surgical specialty" (obstetrics) for frontline care. They pointed to a growing shortage of obstetricians due to job dissatisfaction and early retirement and to the next logical step—to use the already nationally credentialed midwives as primary care providers, as most other countries do. Furthermore, the report emphasizes a need to ensure that the workforce "resembles the racial/ethnic composition of the population . . . as well as its linguistic, geographic, and socioeconomic diversity," because research demonstrates that such measures increase safety and satisfaction (National Academies of Sciences, 2020: 13). (See **Figures 5** and **6**)

Enter COVID-19. As the pandemic increased the demand for birth setting options, frustrations for childbearers wanting care in their homes also increased, as did the racial and socio-economic disparities between those who can and cannot afford choice of birth setting. Countries like Canada with universal health care coverage have removed this artificial financial barrier to home births and also established some freestanding birth centers, articulating the obvious—that births outside the hospital are cheaper and more welcoming than engagement with the

FIGURE 6 | Midwives like Jennie Joseph (left), who practices in Florida, are picking up from where Miss Margaret and the other Grand Midwives of the South have left off -because the latter are no longer permitted to practice. However, even with her Certified Professional Midwife credential and state license, and in spite of the fact that she and her team have reduced prematurity and low birth weight rates within the Black, Indigenous, and People of Color community, their attempts to get any government support from grants or other public health or civic funds have been unsuccessful. She receives a meager fee of $1500 if clients are compensated through Medicaid, but even less for the over-proportion of indigent, undocumented and uninsured who aren't on Medicaid who come to her freestanding birth center at "Commonsense Childbirth" in Orlando who receive care for free if needed, or on a sliding scale. Not supporting all pregnant women to have health care, during pregnancy or any other time of their life, is unheard of in countries like the UK where Jennie was originally trained as a midwife. These intimate moments of shared trust and respect, illustrated here between client Kristen April Brown (on the right) and Jennie, is what researchers have determined may be behind the consistently better outcomes compared to other clinics and services where women from the same demographic receive maternity care (Joseph 2021:131-144). Photo from "the American Dream," videographer Paolo Patruno, see www.birthisadream.org and https://www.youtube.com/watch?v=Si_4xUQ2MK8&t=1s. Used with permission.

hospital enterprise; almost all provincial Canadian governments now cover the birth wherever it occurs.

Canada provides a good example of how it is easier to adapt when pandemics or other challenging events occur if midwives are available who can offer a choice of birth settings[20]. Of the births being attended just by the midwives in Ontario (not the family docs or obstetricians), the planned home birth rate was 13% in March 2020, when the effects of COVID-19 were just beginning to be felt. By May 2020, with COVID-19 in full swing, the planned home birth rate among midwife-attended births in Ontario had increased from that 13–20% (Daviss et al., 2021). This increase was easily facilitated because all infrastructures—legislation, insurance coverage, quality assurance programs and integration—were already well established for homebirth providers. In March and April, clients who had formerly considered a hospital birth did not have to switch providers. They simply told their midwives that they now preferred to stay home.

The US states without adequate provisions for care at home or in freestanding birth centers even in normal times have been caught more unprepared than those that already had instituted providers for those birth options prior to COVID-19. Some jurisdictions like Washington, D.C[21]. and Kentucky[22] managed to get legislation for CPMs passed just before the pandemic struck the US. Others (like Illinois, which has had a Home Birth Safety Act that would legalize CPMs on the books for about 10 years[23]) have remained sluggish at passing such legislation, in spite of obvious need (Ayres-Brown, 2020).

In New York, the strong need for increased access to births outside the hospital prompted Governor Cuomo's Executive Order to invite midwives from outside the state of New York to come and help. This highlighted, and brought into question, the fact that in normal times, CPMs cannot legally practice there, just as they cannot in Illinois nor in the other states where they are not legal. In fact, CPMs living in New York have been persecuted for practicing rather than embraced in the state, even though the state has long allowed CNMs and CMs to attend home births (May and Davis-Floyd, 2006; Chamberlain, 2020). This is also despite the fact that New York CPMs would qualify for licenses if the state midwifery board had properly implemented the licensing statute that was approved by the state legislature in 1992[24].

Vicki Hedley, Past-President of the Midwives Alliance of North America (MANA) and Senior Advisor to NYCPM—the New York State CPM organization—thinks that COVID-19 holds hope for change but explains the complications:

> I do believe that this pandemic has potentially opened the door to legalization for CPMs in NY. More and more people are asking for our (CPM) services and wanting home birth because of the safety aspects. The problem is access. Although NY requires that licensed providers be paid by insurer's reimbursements, many insurers require liability/malpractice insurance, which many home birth midwives cannot afford and more unfortunately cannot obtain due to the lack of state licensure. We are in a Catch-22. Straight Medicaid pays about $1,300 for [full-scope] maternity care, which is far from a living wage. Of course, these issues need to be addressed in order to create the access for birthing families that is so desperately needed (Personal communication, December 5, 2020).

Meanwhile, the temporary nature of the Governor's Executive Order has caused serious problems for any CPM who does want to practice in the state to meet the increased demand by mothers and families for out-of-hospital birth options. Ida Darragh, the

[20]For examples of effective care in the immediate aftermaths of earthquakes, tsunamis and floods, see Davis-Floyd et al., 2021; Lim and Davis-Floyd, 2021

[21]https://code.dccouncil.us/dc/council/laws/23-97.html. Accessed December 17, 2020.

[22]https://newrepublic.com/article/160706/midwives-appalachia-kentucky-maternity-care-desert

[23]https://www.ilga.gov/legislation/BillStatus.asp?DocNum=1754&GAID=14&DocTypeID=SB&LegID=104736&SessionID=91&SpecSess=&Session=&GA=100

[24]PushMap and PushChart: https://www.pushformidwives.org/what_we_do

Executive Director of the North American Registry of Midwives (NARM), the organization responsible for setting standards for CPM credentialing nationally, describes the urgent need for legislation:

> There is currently a proposal for licensure of CPMs in New York being drafted by the office of Dick Gottfried, the Chair of the Assembly Health Committee. It needs some better language before being submitted and the midwives are trying to communicate with the office about it. It is the optimum time to present a bill with several months of "legal" status during the pandemic already. The executive order is renewed monthly, but that means only that midwives with a license in another state can practice legally until that expiration date. Midwives and clients need more certainty than one month of legal status! (Personal communication December 5, 2020)

This ambiguous month-to-month situation puts the CPMs currently practicing in New York in a vulnerable state: being legal for a few months, but then with the potential to have their licensure removed just when their clients are actually due to have their babies!

ACOG and ACNM recognized early on that the pandemic had created an interest in home birth, alerting them to the fact that families were nervous about institutional birth settings. They issued a joint statement in March acknowledging the pandemic but assuring the public that "Hospitals and birth centers that are both licensed and accredited *remain safe places* to give birth in the United States[25]." (italics added).

Three weeks later, on April 20, 2020, ACOG's CEO issued a further statement:

> ACOG and its members, in collaboration with the health care team, are dedicated to providing patient-centered, respectful care. Obstetrician-gynecologists see first hand the stress and uncertainty facing pregnant people, families, and their support networks during the COVID-19 pandemic, and this includes questioning the settings in which to give birth. However, even during this pandemic, *hospitals and accredited birth centers remain the safest places to give birth* [italics added]. Physicians, certified nurse-midwives and certified midwives, and the entire health care team will work to ensure that precautions are taken to make labor and delivery safe, supportive and welcoming for their patients (Phipps, 2020).

Earlier in the Phipps statement is the quote about the "more than twofold increased risk of perinatal death" of ACOG's other statements over the last four years, which from the outset was rendered questionable, since the only source for such a claim in their Table on perinatal mortality is the single Oregon study of 2015, whose generalizability is doubtful for the other states (See *Obstetric and Public Health Statements on Home Birth Prior to COVID-19* above and Anderson et al., 2021). Instead, the states that legalize nationally certified midwives can benefit from cohort studies on midwives with like certification that demonstrate similar outcomes between home and hospital births (Murphy and Fullerton, 1998; Johnson and Daviss, 2005a; Stapleton et al., 2013).

Neither the ACOG nor the ACOG/ACNM statements provide any data to demonstrate that hospitals are now safe, safer, or "remain safer" than home births under COVID-19 pandemic conditions. As far as we know, there have been no data in the US comparing outcomes of different birth settings since COVID-19 began its surge across the country. There is, on the other hand, some data to indicate that it is reasonable for families to have concerns about entering the hospital if it is not necessary. Indeed, it is not necessary--in fact, may not be advisable–if you are a low risk birthing person.

Dr. Manoj Jain, an infectious disease specialist from Memphis, TN who recognized that a patient of his had likely acquired COVID-19 from staff (Jain, 2021) provides an example of what the academic literature has brought to light about possible infection in hospital. Front-line health care workers in the US have a three times greater risk of testing positive for COVID-19 than the general community (Nguyen et al., 2020). These providers can be highly contagious if they have COVID-19 themselves, prior to having any symptoms. While obstetricians, CNMs, and obstetric nurses are not usually considered front-line workers who deal with COVID-19 patients, they are walking in and out of the hospitals where COVID-19 patients gather, and, as the physician in the Memphis story points out, eat lunch without their masks on, with other health care workers, in the lounge or cafeteria.

The true wild cards in the hospital are the anesthesiologists and nurse anesthetists who, unlike obstetric providers, cannot limit where they work to one floor of the hospital. They don and doff—and sanitize--faithfully, but they may have to quickly move from an intubation on a COVID-19 patient in one ward to doing an epidural on a pregnant patient in another section of the hospital.

COVID-19 also adds a new dimension to avoiding the reality that ACOG has admitted: that there are increased cesarean births when low risk women choose hospital birth. Even if low risk women hope to be able to manage without an epidural, their likelihood of having a cesarean increases from 3.7% with a planned home birth to 19% if they plan a hospital birth (Johnson and Daviss, 2005a)[26], which also increases their risk of exposure to more healthcare professionals in the operating room.

[25]https://www.acog.org/news/news-releases/2020/03/patient-centered-care-for-pregnant-patients-during-the-covid-19-pandemic

[26]The cesarean rate is 5.2% overall in the more recent study (Cheyney et al., 2014) but it was difficult to find the rate among low risk women in hospital for a comparison to the study. In our 2005 report we were able to obtain it.

LIABILITY

Following the first large prospective home birth study that demonstrated similar safety between home and hospital births in North America (Johnson and Daviss, 2005a), out of thousands of responses to this study, the only response to the *British Medical Journal*, which published the study, from a practicing American physician iterated that he did "not mind" women choosing home birth, but that "our pernicious legal system prevents me from ever considering the practice" (Rivera, 2005).

The present liability system can create insurmountable financial risks for practitioners that make them reticent to offer valued services that childbearers are increasingly seeking. A team of researchers concerned about the impact of the present system identified seven aims for a high-functioning liability system and studied "whether 25 strategies that have been used or proposed for improvement have met or could meet the seven aims" (Sakala et al., 2013). They concluded:

> Ten strategies seem to have potential to improve liability matters in maternity care across multiple aims. The most promising strategy--implementing rigorous maternity care quality improvement (QI) programs--has led to better quality and outcomes of care, and impressive declines in liability claims, payouts, and premium levels. A number of promising strategies warrant demonstration and evaluation at the level of states, health systems, or other appropriate entities. Rigorous QI programs have a growing track record of contributing to diverse aims of a high-functioning liability system and seem to be a win-win-win prevention strategy for childbearing families, maternity care providers, and payers. Effective strategies are also needed to assist families when women and newborns are injured.

COVID-19 raises new questions about liability for midwives who practice in private homes or freestanding birth centers. If there is a shortage of legal midwives based outside of hospital in any state, whether or not they are invited to temporarily practice as in New York state, or left without legal accommodation as in Illinois, midwives from neighboring states will inevitably come to the rescue of women in need in the state, regardless of their legal status (Ayers-Brown, 2020).

Even if midwives are legally attending births in private homes or freestanding births centers in any given state, if they don't have hospital privileges, the increased restrictions of COVID-19 can have serious implications. Ida Darragh and Vicki Hedley explain that many hospitals are now allowing the father of the baby to attend the birth, and just recently in some places, a doula (often only if she is certified by the hospital or by an organization recognized by that hospital). However, when there is a transport from a home birth, the community midwife may not be able to enter the hospital along with her own client to provide the continuity of care that is so well proven in the literature to improve outcomes (Sandall et al., 2016). Thus important information that the midwife could provide can be missed--for example, the time of rupture of the membranes, the baby's presentation, a borderline history of pre-eclampsia, or the special cultural and personal needs of a family. This could implicate both the midwife and the hospital in subsequent litigation.

Although legal reform is beyond the scope of this article, we would like to point out here that there are underutilized options to discuss and disseminate transfer and practice guidelines, to encourage swift and fair settlements in legal disputes (Anderson, 2003), and there are less litigious societies whose policies can serve as models, such as those of Sweden and Germany (Lowes, 2003).

CONCLUSION: EXPANDED ACCESS TO BIRTHS IN PRIVATE HOMES AND FREESTANDING BIRTH CENTERS IN THE US IS WARRANTED

Home and birth center births are on the rise in the US, and COVID-19 has provided a catalyst/pivotal moment that directs us to the need for increased access to nationally credentialed, licensed midwives and options for women to birth outside the hospital. Many US women have already switched to these options to avoid both hospital contagion and the forced choice of only one (or no) personal birthing companion during these Covidian times.

As we have shown above, if only 10% more US women deliver at home or in freestanding birth centers, the savings could amount to $10.868 billion per year. Outcomes are similar for low-risk mothers regardless of setting in countries where midwives are well-trained and integrated into the Reproductive, Maternal, Newborn and Child Health (RMNCH) Continuum of Care in the community[27]. The US studies on birth settings demonstrate good and similar outcomes among home, birth center, and hospital births when: 1) they are based on charts for an identified cohort rather than on birth certificates; 2) they can identify low risk women; 3) they discern the planned place of birth, thereby avoiding counting accidental, unplanned out-of-hospital births; and 4) they have studied a defined group of midwives with training standards. Cost and safety issues suggest expanded access to home and freestanding birth centers as a solution to the shortage of appropriate services and maternity-care service providers that existed even before COVID-19.

Increased access to credentialed maternity-care providers requires new legislation for CPM licensure in some states and extended public insurance for home and freestanding birth center settings in all states. While the data on the safety of home and freestanding birth centers has convinced the APHA and many state legislatures over the last two decades to promote birth in these settings, COVID-19 and pure practicality have convinced more state politicians of the importance of credentialed and licensed midwives who offer these alternatives to hospital birth.

[27]https://d3n8a8pro7vhmx.cloudfront.net/pushformidwives/pages/1144/attachments/original/1585429341/The_Big_Push_for_Midwives_Campaign_Strategic_Priorities.pdf?1585429341

There are now two other important givens that mark change: First, ACOG has admitted that safe home birth is possible in other countries where midwives are well-integrated and in accredited birth centers in the US. Second, the New York State governor has invited licensed midwives, including CPMs from other states, to help out in his state during the pandemic (Executive Order, 2020), thereby recognizing their value and essential services in a state that has had former reserve towards CPMs.

Taking two critical further steps could integrate nationally credentialed midwives into the larger US health care system and help these midwives to meet demands of birthing people. The first is to build the infrastructure of legislation, insurance, and healthy Quality Improvement programs needed to support home, freestanding birth center, and hospital maternity care providers so they can be fully integrated into their local RMNCH Continuum of Care.

The second step is to encourage a culture in which all healthcare professionals recognize and encourage each other to offer the services for which they are best suited. This would include opening rather than limiting scope of practice, eliminating physician supervision but increasing collaboration, and encouraging autonomy of midwives and clients. It would also include debunking the myths of what is "safe" and "not safe."

The first step is foreseeable and has been accomplished at least in part in about two-thirds of the United States. One would think it should be relatively easy, given the models in the other states, but of course it requires some buy-in to the second step. The second step is dependent on the first; in fact one might say the two steps are co-dependent. The second step requires visionary leaders who can turn over 100 years of conflict aside, expose the overlapping systems of self-protective competitors, and transmute the US maternity care system into a best-practice, safer and less costly model that puts the interests of the birthing population first.

Whether the primary goal is safety, reproductive justice, cost savings, avoiding infection, or increasing freedom of choice and access to birth options for birthing people, public policies that support planned, midwife-attended births in private homes and freestanding birth centers are the appropriate and long overdue response.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

THE COST OF HAVING A BABY IN THE UNITED STATES

TRUVEN HEALTH ANALYTICS MARKETSCAN® STUDY

Prepared for:

Childbirth Connection
Catalyst for Payment Reform
Center for Healthcare Quality and Payment Reform

January 2013

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FOREWORD

Better care, better outcomes, and lower costs in health care are all possible through use of innovative delivery systems, supported by value-based payment systems and effective performance measurement. One of the greatest opportunities for improving health care value is in maternity care, which impacts everyone at the beginning of life and about 85% of women during one or more episodes of care. Most childbearing women are healthy, have healthy fetuses, and have reason to expect an uncomplicated birth, yet routine maternity care is technology-intensive and expensive: combined maternal and newborn care is the most common and costly type of hospital care for all payers, private payers, and Medicaid. Childbirth Connection, Catalyst for Payment Reform, and the Center for Healthcare Quality and Payment Reform commissioned this report to focus the attention of all stakeholders on the need to better align maternity care payment and quality.

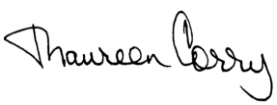
Significant improvements in quality and savings in costs can be achieved by reducing unwarranted practice variation and the overuse of some interventions and underuse of others. High-performing maternity care providers and settings and the women and families they serve demonstrate the potential for dramatic improvement in care, outcomes, and value relative to usual care and population norms. Childbirth Connection's multi-stakeholder, deliberative *Transforming Maternity Care* project developed two direct-setting consensus reports: "2020 Vision for a High-Quality, High-Value Maternity Care System" and a "Blueprint for Action" to chart the path toward such a system. From its inception, the project's key informants and Steering Committee members understood that a multi-faceted strategy, including payment reform, changes in benefit structures, public education, and provider engagement, is essential for successfully driving needed improvement. This new report on the *Cost of Having a Baby in the United States* clarifies that significant savings can be achieved by advancing priority Blueprint recommendations.

Catalyst for Payment Reform (CPR), a nationwide nonprofit coalition of large national employers and public payers, including several state Medicaid agencies, understands that maternity care is in need of significant payment reform, both to remove the perverse incentives for unnecessary intervention in labor and delivery and to increase incentives for better adherence to rigorous clinical guidelines. To help purchasers work with health plans towards this goal, CPR created its Maternity Care Payment Reform Toolkit, available to all stakeholders

The Center for Healthcare Quality and Payment Reform (CHQPR) has been working since 2009 to educate physicians, hospitals, health plans, employers, consumers, and policy makers about the barriers to higher quality, more affordable health care created by current health care payment and delivery systems and ways to overcome those barriers. CHQPR understands that one of the best opportunities for making health care more affordable and improving the health status of the public is through improving the way maternity care is delivered in America. More information and resources about ways to improve payment and delivery of maternity care are available on the CHQPR website.

The MarketScan Commercial and Medicaid databases provided a unique opportunity to understand levels of charges and payments for maternal and newborn care in 2010. This report offers detailed breakdowns by Commercial and Medicaid payers, primary insurer versus secondary insurer and out-of-pocket payment sources, vaginal and cesarean birth, type of service, and phase of care. Special analyses investigate variation in maternal charges and payments across five selected states, costs of care for newborns with stays in neonatal intensive care units, and the increase in payments for maternal care from 2004 to 2010.

We hope you find this information helpful, and we invite you to join us in working to improve how we pay for and deliver maternity care in the United States.



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EXECUTIVE SUMMARY

Childbirth is a major life and population event. In the United States, about four million women gave birth each year. Although childbirth is a common occurrence that has great impact on the healthcare system, our knowledge regarding the cost of childbirth is limited. This study updated a 2007 Thomson Healthcare report of maternity costs using the mothers' medical and drug claim records[1] and estimated the costs of the first three months of a newborn's life with newborn claim records (newborn costs) identified in the *MarketScan®* Commercial and Medicaid databases.

In this study, "cost" is measured by the amount that employers (for beneficiaries of Commercial, employer-sponsored insurance) or Medicaid managed care plans and Medicaid programs (for Medicaid beneficiaries) and others pay hospitals, clinicians, and other service providers, i.e., the cost of care to the organizations and individuals that *pay* for the care, not the costs incurred by organizations and individuals who provide care. The latter may be less or more than the former, but data are not available to determine which is the case. Actual payments for maternity and other health care are typically discounted considerably relative to the amount charged by the various service providers.

Babies are born either vaginally or by cesarean section. The study looked separately at costs for each of these methods of birth, since past studies have shown (and this study confirmed) that the costs differ significantly between the two methods. Since there is wide variation in the rate of cesarean section across states, across regions within states, and across hospitals and physicians within a region, it is more meaningful to describe the costs of each delivery method separately than to provide a single estimate of the cost of birth. Further analyses were conducted for source of payment (including out-of-pocket payments), type of service, phase of care, cost variation across selected states (maternal only), and neonatal intensive care unit costs.

TOTAL PAYMENTS FOR MATERNAL AND NEWBORN CARE

The study found that among women and newborns with employer-provided Commercial health insurance, average total charges for care with vaginal and cesarean births were $32,093 and $51,125, respectively. Average total Commercial insurer payments for all maternal and newborn care with vaginal and cesarean childbirths were $18,329 and $27,866, respectively. In Medicaid, average total maternal and newborn care charges for care with vaginal and cesarean births were $29,800 and $50,373, respectively. Medicaid payments for all maternal and newborn care involving vaginal and cesarean childbirths were $9,131 and $13,590, respectively. Both Commercial and Medicaid payers paid approximately 50% more for cesarean than vaginal births. For both types of birth, Commercial payers paid approximately 100% more than Medicaid.

The study examined the source of payments, which were the primary payer (employer-provided Commercial insurance or Medicaid), a secondary insurer such as a union, and out-of-pocket costs. Among total maternal-newborn payments for beneficiaries with Commercial insurance and vaginal births, on average the primary insurer paid the largest proportion of costs ($15,931 or 87%), out-of-pocket costs averaged $2,244 (12%), and secondary insurers covered a small portion ($153 or 1%). Among total maternal-newborn payments for beneficiaries with Commercial insurance and cesarean births, on average the primary insurer paid $24,949 (90%), out-of-pocket costs were $2,669 (10%), and secondary insurers paid $267 (1%) (numbers exceed 100% due to rounding). For both vaginal and cesarean births covered by Medicaid, Medicaid paid nearly all costs for vaginal ($9,002 or 99%) and cesarean ($13,327 or 98%) births.

Among total average Commercial payments for maternal-newborn care with vaginal births ($18,329), 59% went to facilities and 25% to maternity care providers, followed in descending order by payments for anesthesiology, radiology/imaging, laboratory, and pharmacy services. Among total average Commercial payments for maternal-newborn care with cesarean births ($27,866), 66% went to facilities and 21% to maternity care providers, followed in descending order by payments for anesthesiology, radiology/imaging, pharmacy, and laboratory services. Among total average Medicaid payments for maternal-newborn care with vaginal births ($9,131), 59% went to facilities and 23% to maternity care providers, while among total Medicaid payments for cesarean births ($13,590), 65% went to facilities and 20% to maternity care providers. For both types of birth, remaining Medicaid payments covered in descending order pharmacy, radiology/imaging, laboratory, and anesthesia services.

When examined by phase of care — prenatal, the intrapartum hospital stay for both women and newborns, and the care provided to them after the discharge from the birth hospitalization — 2010 payments were heavily concentrated in the

[1] Thomson Healthcare. *The Healthcare Costs of Having a Baby*. May 2007. http://www.kff.org/womenshealth/upload/whp061207othc.pdf.

intrapartum hospital stay. Our figures slightly overestimate payments for the intrapartum phase and slightly underestimate payments for care after discharge, as modest newborn payments for care after discharge are included in the intrapartum phase figures in this report. Commercially-insured intrapartum care involved 81% of maternal-newborn payments in vaginal births and 86% of maternal-newborn payments in cesarean births. In Medicaid, intrapartum payments were 70% of payments for vaginal births and 76% of payments for cesarean births.

PAYMENTS FOR MATERNAL CARE

The study separately analyzed maternal payments for maternity care and found that among women with employer-provided Commercial insurance, average payments in 2010 for all maternal care with vaginal and cesarean childbirths were $12,520 and $16,673, respectively. Since 2004, when a similar analysis was carried out, Commercial payments for maternal care with both vaginal and cesarean births increased by over 50%. In Medicaid, payments for all maternal care with vaginal and cesarean childbirths were $6,117 and $7,983, respectively. (No comparable 2004 Medicaid analysis is available.)

The study analyzed average maternal payments by payment source: the Commercial insurer or Medicaid, out-of-pocket payments, and payments from another party such as a union. In women with employer-provided Commercial insurance, the insurer covered the great majority of payments for vaginal (86%) and cesarean (87%) births, Nonetheless, women paid $1,686 and $1,948 for vaginal and cesarean births, respectively, a nearly fourfold increase in out-of-pocket costs in both cases since 2004. Medicaid paid virtually all maternal care payments for women covered by Medicaid.

A further analysis explored total maternal payments by type of service. For women with employer-provided Commercial insurance and vaginal births, the most costly types of services were facility (54% of maternal payments) and maternity care provider (23%) payments, with smaller percentages for, in descending order, anesthesiology, radiology/imaging, laboratory, and pharmacy services. For women with employer-provided Commercial insurance and cesarean births, total costs were higher, with a larger proportion of payments going to facilities (60%), a smaller proportion to maternity care providers (20%), and remaining payments, in order, for anesthesiology, radiology/imaging, pharmacy, and laboratory. For women with Medicaid coverage and vaginal births, facility (51%) and maternity care provider (24%) payments also predominated, followed in order by pharmacy, radiology/imaging, laboratory, and anesthesiology payments. For Medicaid beneficiaries with cesarean births, payments went in descending order to facility (55%) and maternity care provider (21%), followed by pharmacy, radiology/imaging, laboratory, and anesthesiology fees.

Maternal payments can be divided into three phases: payments for a woman's prenatal care (before labor and birth processes begin), payments for a woman's intrapartum care (labor, birth, and the rest of her hospital stay), and payments for a woman's postpartum care after hospital discharge. The analysis found:

- Maternal payments in 2010 were concentrated in the intrapartum hospital stay for Commercial beneficiaries and, to a lesser extent, for Medicaid beneficiaries. Average Commercial intrapartum payments were $9,048 for vaginal births (72% of all maternal care payments) and $12,739 for cesarean births (76% of maternal payments). Average Medicaid intrapartum payments were $3,347 for vaginal births (55% of maternal payments) and $4,655 for cesarean births (58% of maternal payments).
- Average maternal prenatal payments in 2010 far exceeded average postpartum payments. Among Commercial vaginal births, prenatal payments were $3,180 (25% of all maternal payments), in contrast to postpartum payments of $293 (2% of maternal payments). Among Commercial cesarean births, prenatal payments were $3,580 (21% of maternal payments), in contrast to postpartum payments of $354 (2% of maternal payments). Among Medicaid vaginal births, prenatal payments were $2,405 (39% of maternal costs), in contrast to postpartum payments of $365 (6% of maternal costs). Among Medicaid cesarean births, prenatal payments were $2,859 (36% of maternal payments), in contrast to postpartum payments of $469 (6% of maternal payments).

An analysis of variation in five selected states in average total maternal care costs for women with employer-provided Commercial insurance in 2010 found a large spread:

- In Louisiana, maternal payments were $10,318 for vaginal births and $13,943 for cesarean births.
- In Illinois, maternal payments were $11,692 for vaginal births and $15,602 for cesarean births.
- In Minnesota, maternal payments were $12,130 for vaginal births and $17,109 for cesarean births.
- In California, maternal payments were $15,259 for vaginal births and $21,307 for cesarean births.
- In Massachusetts, maternal payments were $16,888 for vaginal births and $20,620 for cesarean births.

PAYMENTS FOR NEWBORN CARE

The study separately analyzed newborn care payments, measured as payments for the hospital stay plus subsequent care to age three months. Total newborn Commercial payments were $5,809 for vaginal births and $11,193 for cesarean births. Total newborn Medicaid payments were $3,014 for vaginal births and $5,607 for cesarean births.

The study analyzed average newborn payments by payment source: the Commercial insurer or Medicaid, out-of-pocket payments, and a supplementary insurer. In newborns with employer-provided Commercial insurance, the insurer covered the great majority of payments for vaginal (90%) and cesarean (93%) births. Average out-of-pocket costs for newborn care were $558 and $721 for vaginal and cesarean births, respectively. Medicaid paid virtually all newborn care payments for newborns covered by Medicaid: 98% of vaginal birth payments and 97% of cesarean birth payments.

When analyzed by type of service, virtually all newborn payments were for facilities and professional fees. 2010 payments for newborns with employer-provided Commercial insurance and vaginal births were for facility (71%) and professional (28%) fees, with less than 2% on average for combined radiology/imaging, pharmacy, and laboratory fees. Commercial payments for newborns with cesarean births were for facility (75%) and professional (23%) fees, with 1% for combined pharmacy, radiology/imaging, and laboratory fees. Medicaid payments for newborns with vaginal births were for facility (77%) and professional (20%) fees, with less than 3% for combined pharmacy, radiology/imaging, and laboratory fees. Medicaid payments for newborns with cesarean births were for facility (79%) and professional (19%) fees, with less than 3% for combined pharmacy, radiology/imaging, and laboratory fees.

While we do not provide separate figures for newborn hospital and ambulatory costs, as with maternal payments those newborn payments are concentrated in the hospital phase of care.

Predictably, an analysis of newborns with stays in neonatal intensive care units (NICUs) found steeply increased average payment levels relative to payments for all newborns. For newborns with Commercial insurance, vaginal births, and NICU care, insurers paid $30,875, out-of-pocket costs were $1,241, and others (e.g., unions) paid $468. For similar newborns with cesarean births, insurers paid $45,496, out-of-pocket costs were $1,351, and others paid $735. Medicaid paid $13,875 for newborns with vaginal births and NICU care and $19,971 for newborns with cesarean births and NICU care. Modest other sources of payment for Medicaid were not separately identified.

KEY FINDINGS

The *MarketScan* databases provide a unique opportunity to understand recent, 2010, average payments for maternal and newborn care by Commercial insurers and Medicaid. Key findings are as follows:

- Average total payments for maternal and newborn care with cesarean births were about 50% higher than average payments with vaginal births for both Commercial payers ($27,866 vs. $18,329) and Medicaid ($13,590 vs. $9,131).
- Commercial payers paid an extra $1,464 to clinicians and $7,518 to facilities for cesarean versus vaginal births.
- Average total payments for maternal-newborn care by Commercial payers were about 100% higher than average Medicaid payments for both vaginal births ($18,239 vs. $9,131) and cesarean births ($27,866 vs. $13,590).
- Across the prenatal, childbirth hospitalization, and postpartum phases of care, average inpatient maternal-newborn payments predominated (from 70% to 86% of all payments) for both types of payers and both types of birth.
- Across the prenatal, childbirth hospitalization, and postpartum phases of care, average maternal payments to maternity care providers were concentrated in the hospitalization phase (from 70% to 84% of all maternity care provider payments, depending on type of payer and type of birth).
- Facility fees (from 59% to 66% on average) and professional service fees (from 20% to 25%) predominated over anesthesiology, laboratory, radiology, and pharmacy fees for both types of payers and both types of birth.
- For both Commercial and Medicaid payers, average total for maternal care payments were about twice as great as average total newborn care payments with vaginal births, and between 40% and 50% higher with cesarean births.
- Across five selected states, average Commercial insurer payments for all maternal care ranged from $10,318 (Louisiana) to $16,888 (Massachusetts) with vaginal births and from $13,943 (Louisiana) to $21,307 (California) with cesarean births.
- Average payments for babies with stays in neonatal intensive care unit nurseries far exceeded average payments for all newborns (from 3.7- to 5.6-fold) for both types of payers and both types of birth.
- From 2004 to 2010, average Commercial insurer payments for all maternal care increased by 49% for vaginal births and 41% for cesarean births.
- From 2004 to 2010, average out-of-pocket payments for all maternal care covered by Commercial insurers increased nearly fourfold for both vaginal (from $463 to $1,686) and cesarean (from $523 to $1,948) births.

METHODOLOGY

In the United States, approximately four million women gave birth to one or more newborns each year[2]. Pregnancy and childbirth-related and newborn conditions make up over 21 percent of hospital discharges in the United States. In recent years, major advances in technology as well as updated guidelines for prenatal care and childbirth such as high-resolution sonogram, new prenatal and newborn screenings, and growing rates of c-sections have significant cost implications. While some research has shown that maternal care can result in sizable out-of-pocket costs for families, very few new data have been collected or published on the costs of having a baby.

In 2007, Thomson Healthcare prepared *The Healthcare Cost of Having a Baby* report for the March of Dimes. More recently, Childbirth Connection, Catalyst for Payment Reform, and Center for Healthcare Quality and Payment Reform requested that Truven Health Analytics (formerly Thomson Healthcare) develop a maternity cost analysis using its *MarketScan*® book of business claims database, for both Medicaid and Commercial beneficiaries, in order to update but also broaden the scope of the previous maternity study. The purpose of this study was to quantify the overall costs of maternity care services for having a baby, including all prenatal care services, intrapartum care services, and postpartum care services for the mother. In addition, the partners requested that the current study provide newborn care costs, which included medical care services provided during the birth hospitalization and during the first three months of life.

To quantify these costs, this study analyzed health care claims data for a large population of people with commercial, employer-sponsored health insurance (referred to in the rest of the report as Commercial) and Medicaid claims data to understand maternal-related and newborn-related spending on facility fees, professional service fees, laboratory fees, radiology/imaging fees, and drug fees. The computation of costs included vaginal and cesarean childbirths among mothers and newborns. In addition, average costs are decomposed to show the insurance and employee out-of-pocket payments for Commercial populations.

The cost of having a baby includes costs for both the mother and her baby from prenatal through postpartum and newborn care. To estimate these costs, we analyzed inpatient and outpatient utilization and expenditure data throughout pregnancy for the mother and following birth for both mother and child. This study also reported maternal costs by childbirth type and type of service for selected states (California, Illinois, Louisiana, Massachusetts, and Minnesota) using the Commercial populations only. Additionally, this study captured newborn healthcare costs by childbirth type for both Commercial and Medicaid beneficiaries separately. A separate analysis identified Commercial and Medicaid payments for newborns who experienced one or more admissions into the intensive care unit during the observation period.

This report provides an overview of the study's methodology including a description of the data sources, the definition of the study population, the process used to identify maternal and newborn services, the analyses, and results showing the healthcare costs of having a baby.

DATA SOURCES

Truven Health Analytics used its proprietary *MarketScan*® Research Databases for this project. The 2009-2011 Commercial and Medicaid Databases were used to conduct the cost analyses in the study. These databases are constructed from paid medical and prescription drug claims from approximately 200 self-insured U.S. employers, 30 health plans, and 12 Medicaid agencies. It should be noted that this study does not include data for women with policies in the individual market and does not presume to represent the maternity care costs for this group of women.

The retrospective analyses were based on the *MarketScan* Commercial Claims and Encounters Database and the Medicaid Database. The largest of the *MarketScan*® Databases, the Commercial Database, contains the inpatient, outpatient, and prescription drug experience of several million employees and their dependents (annually), covered under a variety of fee-for-service and capitated health plans, including preferred provider organizations, point of service plans, indemnity plans, and health maintenance organizations. The *MarketScan* Medicaid Database contains the pooled healthcare experience of approximately seven million Medicaid enrollees from 12 contributors, which consists of seven

[2] Martin JA, Hamilton BE, Ventura SJ, Osterman MJK, Wilson EC, Mathews TJ. Births: final data for 2010. National vital statistics reports; vol 61 no 1. Hyattsville, MD: National Center for Health Statistics. 2012.

state contributors and five Medicaid managed care plans. It includes inpatient services and prescription drug claims, as well as information on enrollment, long-term care, and other medical care. Although we cannot release the identity of contributing states per contractual agreements, Table 1 shows the sex and age composition of Medicaid enrollees and all *MarketScan*® Commercial and Medicaid enrollees in 2010 compared to the national sex and age composition.

Table 1 shows that more than half of Medicaid enrollees in 2010 were female or age 0-17. Only about 23% percent of the Medicaid population was in the 18-44 age group compared to 41% of the entire *MarketScan*® enrollee population in the 18-44 age group and 37% of the U.S. population in the 18-44 age group. Additionally, Table 1 also shows household and regional information for the entire *MarketScan*® Commercial enrollee population and the U.S. population. A higher percentage of *MarketScan*® enrollees were the employee or head of the household compared to the national population. Conversely, a lower percentage of MarketScan® enrollees were a child/other compared to the national population. It is important to keep in mind that not all family members are covered in the same health insurance plan. For example, a covered employee may choose to purchase coverage for his/her children, but the spouse maybe covered by his/her employer. This fact influenced the design of this study and is discussed in the next section.

Table 1: MarketScan® Research Databases Demographic Comparison to Total U.S. Population

Characteristic	Commercial MarketScan Enrollees in 2010	Percentage of Total Commercial MarketScan Population	Medicaid MarketScan Enrollees in 2010	%of Total Mediciaid MarketScan Population	%of Total U.S. Population in 2010*
Sex					
Male	22,038,281	48.7%	2,737,216	43%	49.2%
Female	23,201,471	51.3%	3,679,312	57%	50.8%
Unknown	0	0.0%		0.0%	0.0%
Age					
0-17	11,818,322	26.1%	3,845,210	59.9%	24.0%
18-34	10,933,032	24.2%	1,094,309	17.1%	-
35-44	7,467,118	16.5%	349,797	5.5%	-
*18-44***	*18,400,150*	*40.6%*	*1,444,106*	*22.5%*	*36.5%*
45-54	8,324,590	18.4%	335,899	*5.2%*	-
55-64	6,696,690	14.8%	272,831	4.3%	-
*45-64***	*15,021,280*	*33.2%*	*608,730*	*9.5%*	*26.4%*
Age 65+	0	0.0%	518,482	8.1%	13.0%
Unknown	0	0.0%	0	0.0%	0.0%
Relationship Information					
Employee/Householder*	21,617,224	47.8%			37.5%
Spouse	9,058,222	20.0%			19.4%
Child/Other	14,564,306	32.2%			43.1%
Unknown	0	0.0%			0.0%
Census Regions					
New England Division	2,270,662	5.0%			4.7%
Middle Atlantic Division	4,493,491	9.9%			13.2%
ast North Central Division	8,852,088	19.6%			15.0%
est North Central Division	2,231,332	4.9%			6.6%
South Atlantic Division	8,566,759	18.9%			19.4%
ast South Central Division	2,627,723	5.8%			6.0%
est South Central Division	6,621,631	14.6%			11.8%
Mountain Division	2,657,881	5.9%			7.1%
Pacific Division	6,678,699	14.8%			17.4%
Other/Unknown	239,486	0.5%			0.0%

*Source: http://2010.census.gov/2010census/

**Published census age band divisions are 0-17,18-24,25-44,45-64, 65+

Overall, the geographic composition of *MarketScan*® Commercial enrollees is similar to the geographic composition of the U.S. population with several exceptions, which include the East North Central Division (~+5%), West South Central Division (~+3%), Middle Atlantic Division (~-3%), and the Pacific Division (~-3%).

PATIENT SELECTION

The populations defined for this study were women with live births in 2010 (maternal costs) and newborns born in 2010 (newborn costs). Replicating the March of Dimes analysis, additional requirements made in defining this population included:

- continuous enrollment in the nine months prior to childbirth (maternal costs only);
- continuous enrollment three months following childbirth or birth;
- drug data captured in the nine months prior (maternal costs only);
- drug data captured three months following birth;
- coverage through a fee-for-service plan;
- coverage through an employer-insured plan (Commercial costs only) ; and
- women ages 15-45 (maternal costs only).

The exclusions were the same exclusions applied in the original study and kept in order to compare the results of this study with the results from the original study. The observation periods for the mothers were defined using the hospital admission and discharge dates. The definition of the prenatal period included the nine months prior to the hospital admission date. The postpartum period was defined as three months following hospital discharge date. The observation period for newborns included birth and three months after the hospital discharge date. In addition, the continuous enrollment and drug data exclusions were applied in order to gauge access to care but does not assume that beneficiaries were actually receiving care throughout this period. This only guaranteed that if the beneficiaries did seek care, the utilizations and cost information would be in the *MarketScan*® Databases. This becomes evident when one looks at the cost quartiles for postpartum healthcare in Appendix B. Because full and partial capitation arrangements would distort the calculation of prenatal and postpartum healthcare costs, we excluded mothers or newborns covered by insurance arrangements where services were paid for by the plan on a capitated basis. Commercial beneficiaries were also dropped if their data came from a health plan as opposed to an employer, as health plan data in the *MarketScan*® Commercial Database are less complete than data from employers.

Table 2 shows the attrition and sensitivity analyses for women in the Commercial databases before and after all data exclusions. Exclusions were applied in a stepwise manner to evaluate their impact on the final study sample. Because this study focused on the costs of prenatal, delivery and postpartum care, only live births were included. Nine months of continuous enrollment were required to capture all services related to the prenatal period; however, women were not required to have received nine months of prenatal care in order to be included. Women under capitated arrangements would not have cost data on their encounter records whereas those under fee-for-service plans would have claims with payments reported. Thus, only women in FFS plans are included. Women were also required to have drug coverage in order to capture pharmacy costs. As noted above, women from health plan contributors to MarketScan were excluded. It appears that the exclusions changed the childbirth type distribution, but had minimal impact on average costs. Overall, costs for vaginal childbirths changed plus or minus one percent to twelve percent for both intrapartum and maternal health care costs. In contrast, costs for cesarean childbirths decreased by one percent to twelve percent for both intrapartum and maternal health care costs.

Table 2: Attrition and Sensitivity Analyses For Intrapartum and Maternal Health Care Costs among Commercial Beneficiaries, 2010

Commercial	1) Women with a **live** birth in 2010		2) Women with a live birth in 2010 and **continuous enrollment**		3) Women with a live birth in 2010 and in a **fee-for-service plan**		4) Women with a live birth and continuous enrollment through fee-for-service plan **(includes exclusion from columns 3 and 4 together)**		5) Women with a live birth in 2010 and continuous enrollment and an **employer-insured** and fee-for-service plan and **RX and age= 15-45**		6) Women with a live birth in 2010 and all exclusions and **outliers removal**	
N	362,992		226,028		304,707		177,640		68,535		67,977	
Vaginal-N (%)	253,055	70%	158,913	70%	211,965	70%	124,603	70%	52,160	76%	51,936	76%
Cesarean Section-N (%)	109,937	30%	67,115	30%	92,742	30%	53,037	30%	16,375	24%	16,041	24%
	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth
Average Intrapartum Costs												
Provider Charges	$16,301	$26,719	$16,364	$27,184	$16,397	$26,564	$16,518	$26,963	$16,417	$25,978	$16,165	$24,572
Allowed Paid Amount	$8,890	$13,222	$8,986	$13,532	$8,845	$12,972	$8,944	$13,195	$9,127	$13,288	$9,048	$12,739
Insurer Payments	$7,773	$11,818	$7,948	$12,220	$7,659	$11,522	$7,816	$11,809	$8,002	$11,931	$7,921	$11,375
Out-of-Pocket Payments	$1,013	$1,247	$955	$1,186	$1,120	$1,375	$1,074	$1,330	$1,036	$1,238	$1,038	$1,246
Third-Party Payments	$69	$94	$55	$79	$75	$98	$60	$82	$87	$111	$87	$113
Average Maternal Costs												
Provider Charges	$22,294	$34,772	$22,974	$35,968	$22,510	$34,741	$23,311	$35,939	$23,478	$34,669	$22,734	$32,062
Allowed Paid Amount	$11,925	$17,185	$12,348	$17,894	$11,909	$16,954	$12,354	$17,585	$12,832	$17,808	$12,520	$16,673
Insurer Payments	$10,263	$15,126	$10,736	$15,893	$10,128	$14,800	$10,586	$15,446	$11,030	$15,694	$10,726	$14,588
Out-of-Pocket Payments	$1,532	$1,869	$1,504	$1,841	$1,695	$2,059	$1,695	$2,060	$1,693	$1,966	$1,686	$1,948
Third-Party Payments	$86	$114	$69	$99	$93	$120	$76	$105	$107	$134	$107	$132

Table 3 shows the attrition and sensitivity analyses for women in the Medicaid databases before and after all data exclusions. The exclusions had minimal impact on the childbirth type distribution, but certain exclusions increased costs more dramatically. The continuous enrollment (column 2 vs. column 1) exclusion increased intrapartum Medicaid payments by three or four percent across both childbirth types. The charges and allowed payment for intrapartum care decreased by three percent to ten percent. In contrast, average total maternal costs increased by four to twenty-three percent for both childbirth types. Similarly, the fee-for-service exclusions dramatically increased average allowed payments and Medicaid payments for intrapartum and total maternal care (increase from 23% to 64%). Overall, the continuous enrollment and the fee-for-service exclusions combined (column 4 vs. column 1) increased intrapartum and maternal care costs (increases from 3% to 64%). The continuous enrollment inclusion could have restricted the population to women in poor medical conditions or with high-risk pregnancies. The fee-for-service exclusions eliminated women with incomplete health care cost information. Out-of-pocket costs are not included in Table 3 because Medicaid beneficiaries do not typically make out-of-pocket payments, which amounted to less than 1% of total payments. Similarly, Medicaid does not typically recover third-party payments.

Table 4 shows the enrollment patterns for women in Medicaid, and it shows that only 25% of women enrolled nine months before their admission date. Over half of all women enrolled in Medicaid seven to nine months before their childbirth admission date.

Table 3: Attrition and Sensitivity Analyses For Intrapartum and Maternal Health Care Costs among Medicaid Beneficiaries, 2010

Medicaid	1) Women with a **live** birth in 2010		2) Women with a live birth in 2010 and **continuous enrollment**		3) Women with a live birth in 2010 and in a **fee-for-service plan**		4) Women with a live birth and continuous enrollment through fee-for-service plan **(includes exclusion from columns 3 and 4 together)**		5) Women with a live birth in 2010 and continuous enrollment and fee-for-service plan and **RX and age= 15-45**		6) Women with a live birth in 2010 and all exclusions and **outliers removal**	
N	201,386		40,334		62,821		7,908		7,333		7,253	
Vaginal-N (%)	141,028	70%	28,423	70%	44,972	72%	5,472	69%	5,124	70%	5,094	70%
Cesarean Section-N (%)	60,358	30%	11,911	30%	17,849	28%	2,436	31%	2,209	30%	2,159	30%
	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth	Vaginal Childbirth	Cesarean Childbirth
Average Intrapartum Costs												
Provider Charges	$12,082	$19,157	$11,516	$17,721	$11,485	$19,719	$12,478	$20,507	$12,737	$21,235	$12,599	$20,680
Allowed Paid Amount	$2,681	$3,970	$2,568	$3,893	$4,389	$6,621	$3,298	$4,606	$3,367	$4,746	$3,347	$4,655
Medicaid Payments	$2,397	$3,529	$2,474	$3,689	$3,692	$5,506	$3,181	$4,355	$3,323	$4,697	$3,303	$4,604
Average Maternal Costs												
Provider Charges	$18,052	$26,657	$20,302	$28,453	$15,149	$24,693	$21,361	$32,073	$21,848	$33,159	$21,247	$31,259
Allowed Paid Amount	$3,995	$5,541	$4,596	$6,361	$5,780	$8,354	$6,124	$8,085	$6,266	$8,394	$6,117	$7,983
Medicaid Payments	$3,612	$4,995	$4,440	$6,081	$4,837	$6,974	$5,929	$7,725	$6,199	$8,320	$6,053	$7,908

Table 4: Medicaid Enrollment Patterns for Women with a Birth in 2010

	Vaginal Childbirth	% of	Cesarean Childbirth	%	Total	% of Total
First enrolled same month as childbirth admission date	20,057	71%	8,141	29%	28,198	13%
First enrolled 1 month before childbirth admission date	4,505	68%	2,159	32%	6,664	3%
First enrolled 2 months before childbirth admission date	5,473	71%	2,262	29%	7,735	4%
First enrolled 3 months before childbirth admission date	6,662	70%	2,799	30%	9,461	5%
First enrolled 4 months before childbirth admission date	7,697	69%	3,424	31%	11,121	5%
First enrolled 5 months before childbirth admission date	9,042	69%	4,019	31%	13,061	6%
First enrolled 6 months before childbirth admission date	12,205	68%	5,693	32%	17,898	9%
First enrolled 7 months before childbirth admission date	23,306	68%	11,101	32%	34,407	16%
First enrolled 8 months before childbirth admission date	18,664	68%	8,796	32%	27,460	13%
First enrolled 9 months before childbirth admission date	36,426	69%	16,488	31%	52,914	25%
Total	144,037	69%	64,882	31%	208,919	100%

Table 5 below shows that there were fewer live newborns born in 2010 than live births among women in 2010 identified in both the Commercial and Medicaid database, for several reasons. First, we excluded newborns whose record indicated they were a multiple birth because all cost and utilizations data was listed in one record and therefore, did not accurately capture average costs. Many, but not all, mothers and newborns were linked in the database. For example, a newborn may be covered under a different payer than the mother (e.g., under the father's insurance). In Medicaid, the mother may not have the required 12 months of Medicaid enrollment to be included in the study. In addition, a newborn who died within three months of birth will not have met the enrollment inclusion criterion. Given these circumstances, mothers and newborns were identified and analyzed independently.

Table 5: Attrition Analyses for Newborn Commercial and Medicaid Beneficiaries

Commercial	Single Live Newborns in 2010	Single Live Newborns in 2010 and **continuous enrollment**	Single Live Newborns in 2010 and in a **fee-for-service plan**	Single Live Newborns and continuous enrollment through fee-for-service plan **(includes exclusion from columns 3 and 4 together)**	Single Live Newborns and continuous enrollment through an **employer-insured** and fee-for-service plan and **RX** in 2010	Single Live Newborns and all exclusions and outliers removal in 2010
N (%)	246,037	154,894	213,824	130,750	45,056	44,621
Vaginal	169,620 (68.94)	106,821 (68.96)	147,335 (68.90)	90,232 (69.01)	30,705 (68.15)	30,453 (68.25)
Cesarean Section	76,417 (31.06)	48,073 (31.04)	66,489 (31.10)	40,518 (30.99)	14,351 (31.85)	14,168 (31.75)

Medicaid	Single Live Newborns in 2010	Single Live Newborns in 2010 and **continuous enrollment**	Single Live Newborns in 2010 and in a **fee-for-service plan**	Single Live Newborns and continuous enrollment through fee-for-service plan **(includes exclusion from columns 3 and 4 together)**	Single Live Newborns and continuous enrollment and fee-for-service plan and RX in 2010	Single Live Newborns and all exclusions and outliers removal in 2010
N (%)	185,416	169,253	56,919	40,188	40,187	39,991
Vaginal	135,955 (73.32)	124,168 (73.36)	42,151 (74.05)	29,850 (74.28)	29,849 (74.28)	29,764 (74.43)
Cesarean Section	49,461 (26.68)	45,085 (26.64)	14,768 (25.95)	10,338 (25.72)	10,338 (25.72)	10,227 (25.57)

ANALYSES

Using the 2009-2011 *MarketScan* Commercial and Medicaid databases, we identified all maternity-related services provided in a 9-month prenatal period, the childbirth hospitalization, and the 3-month postpartum period. Maternity-related services identified across all three maternity phases are defined as shown in Appendix F (Maternity-Related Service Codes); they capture medical services related to maternity and exclude medical services for unrelated but co-occurring medical conditions. Newborn services included the newborn hospitalization (when a separate hospital claim was generated for the newborn) and the first 3-months of newborn care. The birth of a newborn sometimes results in one hospital claim, with newborn billing included in mothers' billing. In order to keep the method of patient selection consistent with the previous maternity study, we estimated the cost of birth from the maternal birth claim.

Services were categorized based on a combination of claim type (facility vs. professional), service setting, procedure code, revenue code and provider specialty. We aggregated and calculated average provider charges and total payments. Total average payments were decomposed to average health-plan payments, patients' out-of-pocket payments, and third-party payments. We summarized all charges and payments within the following service categories:

- Facility
- Professional Service Fees (maternal costs only)
- Professional Anesthesiology Fees (maternal costs only)
- Laboratory
- Radiology/Imaging
- Outpatient Drug Costs (total drug costs in 12-month analysis window)

Population weights were developed based on age, sex, and region strata in the 2010 Medical Expenditure Panel Survey (MEPS) Database, and were applied to the *MarketScan* analysis results to enable generalizations to the national U.S. employer-sponsored insured population (N=157 million). Because the Medicaid database represented a small convenience sample of 7 states and 5 Medicaid managed care plans, the results were not weighted to the national Medicaid population. The results are partitioned into three major sections. The first major section presents highlights from the maternal costs analyses, while the second section highlights findings from the newborn care analyses, and the third presents total maternity care costs inclusive of maternal and newborn care. Please refer to Appendix B and Appendix C for a complete set of findings for Commercial and Medicaid beneficiaries, respectively.

SUMMARIZING COSTS

The *MarketScan* databases include only fully adjudicated and paid claims. Claims that were denied or pending were not included in this study. We reported "costs" as the average amount charged by facility (i.e., hospitals and other facilities) or professional providers (i.e., physicians, midwives, nurse practitioners, and other providers) and the average allowed payment (or average payments) to such providers. The *MarketScan* payment variable represents the total cost to the payer, which is typically discounted from providers' charges and excludes patient out-of-pocket expenditures. For the Commercial population, the average amount paid was further broken-out as the average health-plan payment, average patient out-of-pocket payments, and average third-party payments. Out-of-pocket payments included the amount paid by patients to meet deductible requirements, patient coinsurance, and co-payments. For the commercial data, third-party payments represent payments made by someone other than the beneficiary or insurer such as a union or employer. Third-party payments accounted for less than one percent of the average payments in the Commercial data. Because out-of-pocket fees are typically not required of Medicaid beneficiaries (this study showed <1% of total payments were classified as out-of-pocket) and Medicaid does not typically recover third-party payments, we report only charges and allowed payments for Medicaid. Cases having total maternity-related charges of less than a dollar or greater than $85,000 were considered outliers and excluded from the analysis. For the newborn costs analyses, cases having total newborn care charges of less than dollar or greater than $500,000 were considered outliers and excluded from the analysis. The outlier threshold was set higher for the newborn costs analysis because newborns admitted into the neonatal intensive care unit were concentrated at the higher end of the cost distribution and would have been disproportionately excluded from the analysis.

LIMITATIONS

This study was based on convenience samples of the commercially insured and Medicaid populations. While *MarketScan* Commercial provides a robust population of individuals from all states, it represents primarily individuals with insurance from large, self-insured employers with greater concentrations of beneficiaries in the South and North Central regions of the United States. Population weights based on the MEPS national estimates were applied to generalize these estimates to the national population of individuals with employer-sponsored insurance. *MarketScan* Medicaid represented 7 states and 5 Medicaid managed care plans for the 2009-2011 data period. Truven cannot disclose the identities of these states. Because of the small number of states and because state Medicaid populations and benefits vary widely, no weighting was applied to generalize the Medicaid results to a national population.

The study period was selected based on a typical gestation period. It is possible, particularly for the Medicaid population, that not all women received nine months of prenatal care. The continuous enrollment inclusion criteria are set in place to capture all services in the claims data; however, this approach biases the study against women who were not insured until the second month of pregnancy or beyond.

Several components of this study did not come to fruition due to a few data limitations. First, labor induction costs are not presented because the inpatient birth claim does not adequately distinguish labor inductions. While such procedure codes are available, they are not reimbursed separately from the birth and therefore under-coded. After consulting with medical experts and referring to the literature on this topic, the rate of labor inductions identified in this study was considered too low to report.

Another issue to consider deals with the pregnancy-related pharmacy costs. Two types of pharmacy costs were calculated in this study. One set of costs aggregates and calculates the average for all pharmacy expenditures dispensed to women over the entire maternal period (prenatal and postpartum). The second set of costs only includes medications used by pregnant women in the nine-month prenatal period identified using the Medical Episode Grouper (MEG) for

women with a live birth in 2010. It should be noted that using the MEG logic, the majority of drugs are categorized as pregnancy-related, meaning that there is a great deal of overlap in the list of drugs used to calculate maternal-related and pregnancy-related pharmacy costs. We believe pregnancy-related pharmacy costs are overestimated. Without a diagnosis on a drug claim, there is no systematic way to determine if a drug was truly pregnancy-related. These results should be interpreted with caution.

Average total maternity care costs were estimated by adding average maternal and newborn costs. The total maternity cost estimates, however, need to be interpreted with caution for several reasons. First, mothers and newborns were identified and analyzed independently. This study includes linked mothers and newborns, unlinked mothers, and unlinked newborns. This strategy was selected in order to make maximum use of the data and this made the analyses of Medicaid costs possible. It is probable that linked mothers and newborns are selectively different from unlinked mothers and newborns. Second, the newborn costs include three months worth of newborn care. In addition, it could be argued that newborn care should not be considered as maternity care. Third, maternal and newborn costs are dependent phenomena and could be highly correlated. While average maternity costs at the highest possible level are presented in this report, further analyses could not be carried out without exploring the potential dependence and correlations issues in this population.

Finally, these results cannot be generalized to women with policies in the individual market and to women who give birth in freestanding birth centers or at home.

MATERNAL COST ANALYSES

Because costs associated with pregnancy were calculated for each individual phase and were then combined, this section lays out the overall maternal costs first and then drills down to the results for each phase. This section includes a discussion of the following:

- Average total maternal costs by childbirth type in Commercial and Medicaid;
- A breakdown of average total maternal costs according to payer and type of service payments by childbirth type in Commercial and Medicaid;
- A breakdown of average total costs according to phase of care and type of service payments within each phase by childbirth type in Commercial and Medicaid; and
- Average total maternal costs for selected U.S. states by childbirth type in Commercial.

In 2010, 67,977 women in the Commercial databases and 7,253 women in Medicaid met the population selection and exclusions criteria.

AVERAGE TOTAL MATERNAL COSTS

Average total maternal charges were approximately 30% lower for vaginal childbirths when compared to cesarean childbirths for both Commercial and Medicaid payers. Table 6 also shows that in Commercial, total average payments for vaginal childbirths were $12,520 and for cesarean childbirths were $16,673. In Medicaid, average payments for vaginal childbirths were $ 6,117 and for cesarean childbirths were $7,983. Average payments for vaginal childbirths were approximately 25% lower when compared to average payments for cesarean childbirths in both Commercial fee-for-service plans and Medicaid. For both types of birth, Commercial insurers paid about 100% more than Medicaid.

Table 6: Average Total Maternal Health Care Charges and Payments among Commercial and Medicaid Beneficiaries, 2010

	Total	Vaginal Childbirth	Cesarean Childbirth
Commercial			
Provider Charges	$24,921	$22,734	$32,062
Allowed Paid Amount	$13,494	$12,520	$16,673
Medicaid			
Provider Charges	$24,227	$21,247	$31,259
Allowed Paid Amount	$6,673	$6,117	$7,983

Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Maternal costs include the 9-month prenatal, childbirth, and 3-month postpartum period.

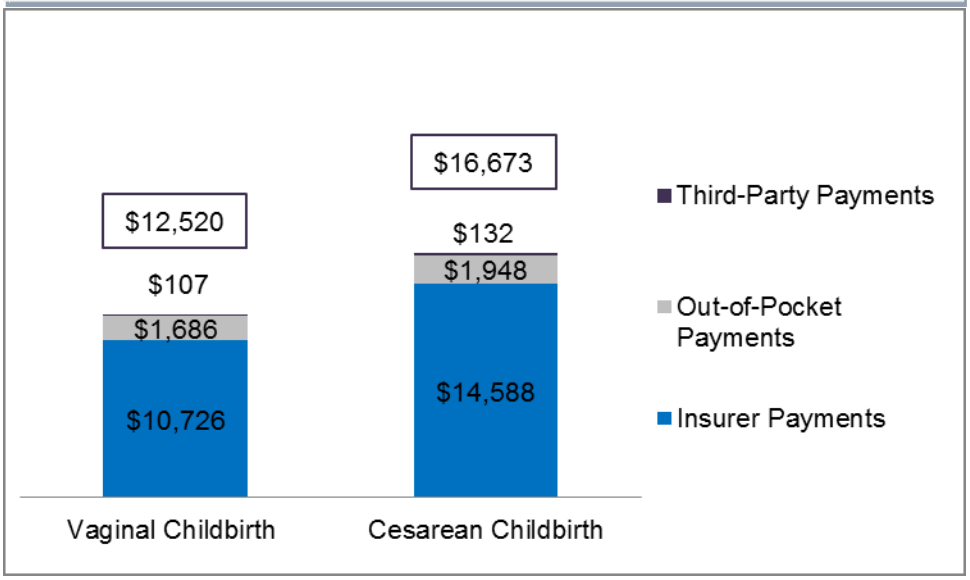
SOURCE OF PAYMENT AND TYPE OF SERVICE ANALYSES

Commercial

Figure 1 shows the breakdown of average allowed payments for all maternal care in Commercial. Although the average payments were approximately $4,100 higher for cesarean when compared to vaginal childbirths, over 86% of the total

average allowed payment consists of the average insurer or third party administrator payments for vaginal and cesarean childbirths. The remaining portions of the average payments were primarily patient out-of-pocket costs for both vaginal and cesarean childbirths (13% and 12%, respectively). Third-party payments (i.e., payments made by someone other than the beneficiary or insurer such as a union or employer) account for less than one percent of the average payments.

Figure 1: Average Total Maternal Health Care Payments by Payment Source among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010

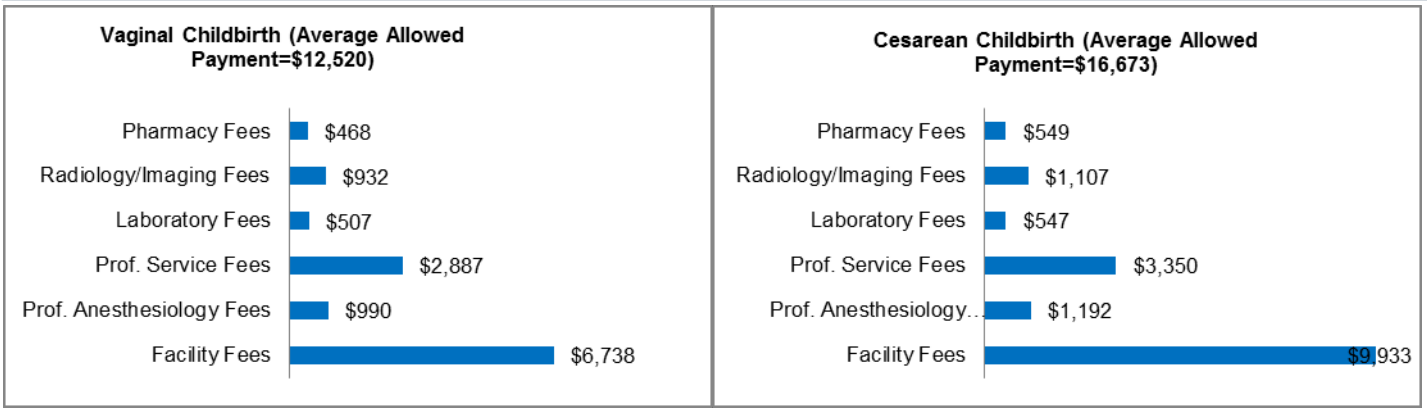


Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Maternal costs include the 9-month prenatal, childbirth, and 3-month postpartum period. Due to rounding, the sum of average payments across payers may not add up to exactly to the total average allowed payment.

Next, Figure 2 shows the proportion of the average allowed payments for maternal care distributed to cover facility fees, professional anesthesiology service fees, other professional service fees, laboratory fees, radiology/imaging fees, and pharmacy fees. A majority of average allowed payments consisted of facility fees, but a higher proportion of the average payments for cesarean childbirths covered facility fees when compared to vaginal childbirths (60% and 54%, respectively). Approximately, one-fifth of average payments for both types of childbirths consisted of professional services (not recorded as facility claims) such as office or other outpatient visits, surgical procedures, hydration, therapeutic, prophylactic, diagnostic injections and infusions, etc. Professional anesthesiology fees, laboratory fees, radiology/imaging fees, and pharmaceutical fees all individually accounted for three to eight percent of the total average allowed payments.

For both vaginal and cesarean childbirths, average payments for pharmacy (for combined maternity and non-maternal related prescriptions) represented less than five percent of total average payments ($468 and $549, respectively). Maternity-related pharmacy costs represented an even smaller portion of total average payments. The average allowed payments for maternity-related pharmacy cost were $169 for vaginal childbirths and $189 for cesarean childbirths (see Table 22 in Appendix B).

Figure 2: Average Total Maternal Health Care Payments by Type of Service among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010

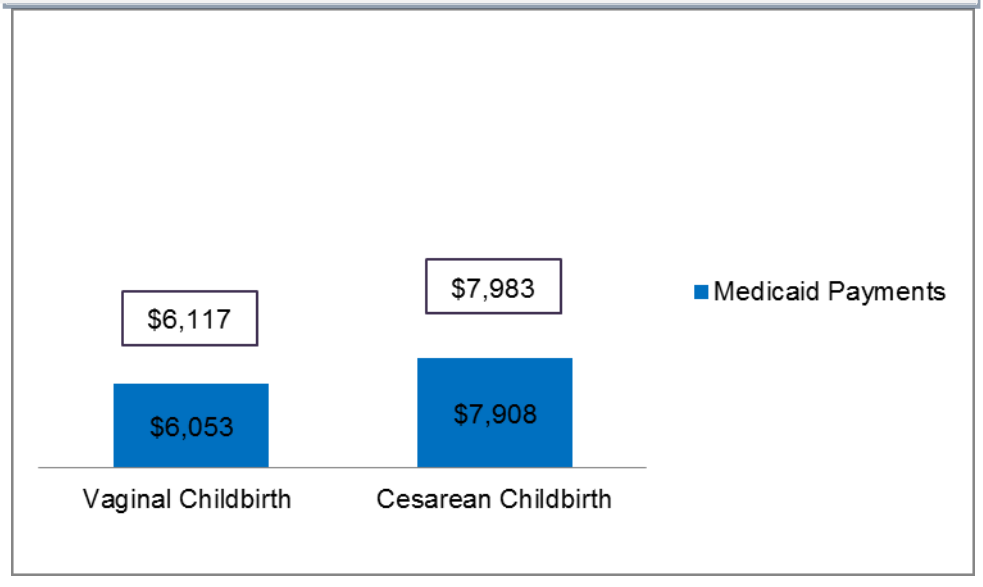


Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Maternal costs include the 9-month prenatal, childbirth, and 3-month postpartum period. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Medicaid

Average maternal payments were approximately $1,800 higher for cesarean childbirths when compared to vaginal childbirths in Medicaid. Figure 3 also shows that Medicaid covered almost the entire average total allowed payment. This was the case for both vaginal and cesarean childbirths. As stated in the data and methods section, out-of-pocket payments represented less than one percent and are too small to show in the graphs below. This accounts for the difference between average total allowed payments and Medicaid payments.

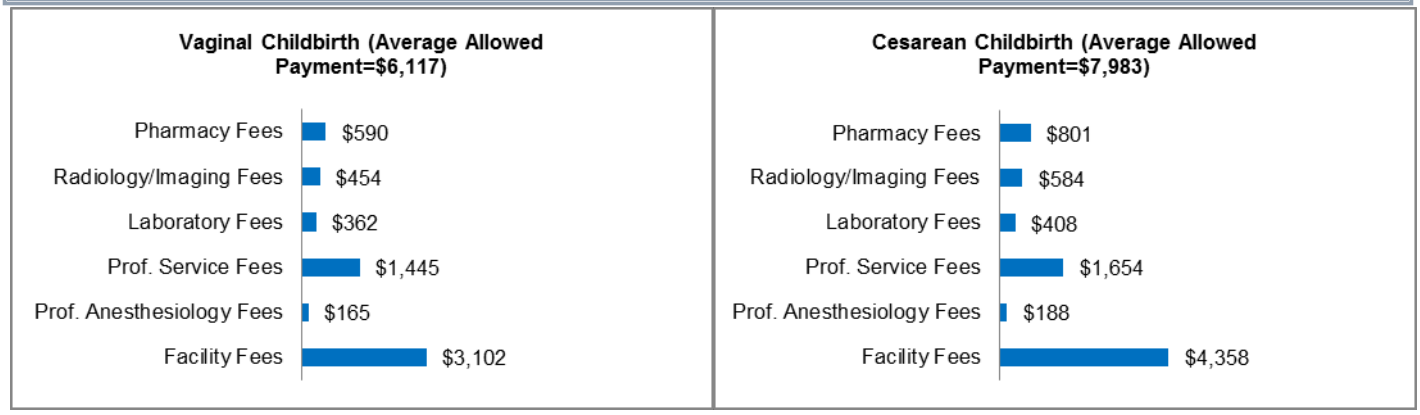
Figure 3: Average Total Maternal Health Care Payments by Payment Source among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Maternal costs include the 9-month prenatal, childbirth, and 3-month postpartum period. Due to rounding, the sum of average payments across payers may not add up to exactly the total average allowed payment.

Figure 4 shows the proportion of the average allowed payments for maternal care covering facility fees, professional anesthesiology service fees, professional service fees, laboratory fees, radiology/imaging fees, and pharmacy fees. The results presented here mirror the results observed in the Commercial data. More than half of average allowed payments consisted of facility fees with 55% of the average payments for cesarean childbirths covering facility fees compared to 51% for vaginal childbirths. The next largest category of average payments goes towards other professional fees that consisted of office or other outpatient visits, prenatal at-risk-assessments, surgical procedures, hydration, therapeutic, prophylactic, diagnostic injections and infusions, etc. Laboratory fees, radiology/imaging fee, and pharmaceutical fees all individually account for two to ten percent of the total average payments.

Figure 4: Average Total Maternal Health Care Payments by Type of Service among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Maternal costs include the 9-month prenatal, childbirth, and 3-month postpartum period. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

For both vaginal and cesarean childbirths, average payments for pharmacy (for combined maternity and non-maternity related prescriptions) represented 10% of total average payments ($590 and $801, respectively). Here too, maternity-related pharmacy costs represent an even smaller portion of total average payments. The average allowed payments for maternity-related pharmacy cost were $178 for vaginal childbirths and $244 for cesarean childbirths (see Table 48 in Appendix B).

PHASE OF CARE ANALYSES

Thusfar, this study showed that costs are on average higher for cesarean childbirths when compared to vaginal childbirths across the two payers. The insurer or Medicaid paid large portions of the total average payments resulting in out-of-pocket-costs being minimal. In addition, more than three-quarters of total average payments covered facility fees or professional service fees and this finding was consistent across childbirth type and held for both Commercial and Medicaid.

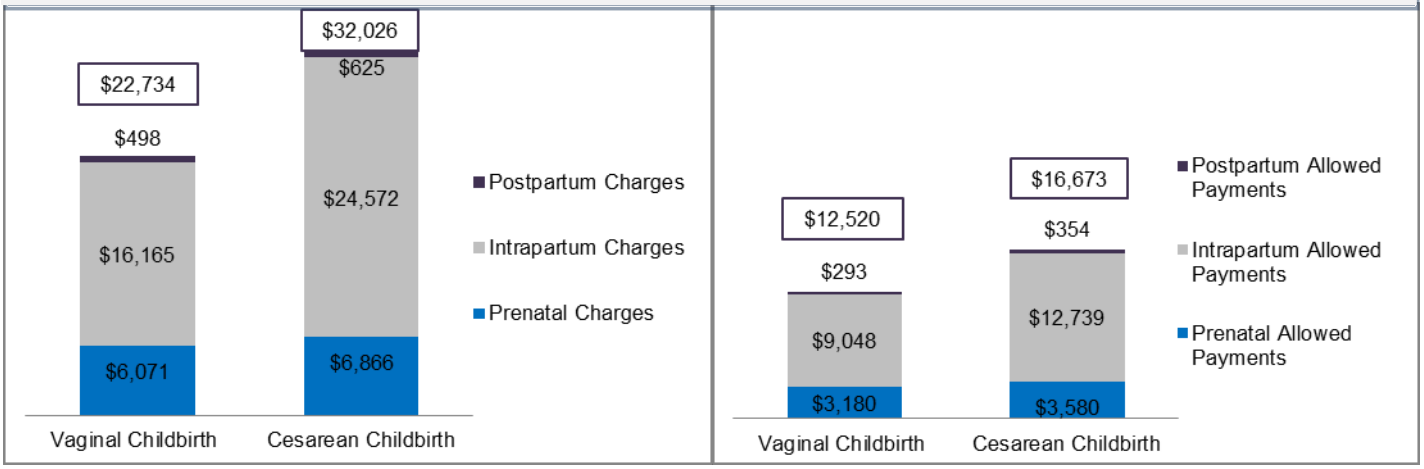
In this section, total average maternal costs are examined according to phase of care (prenatal, intrapartum and post-partum) and type of service payments within each phase by childbirth type in Commercial and Medicaid. Since this section only discusses the highlights of the analyses, Appendices A and B show the full set of results in table format.

Commercial

Figure 5 illustrates that when total average charges and allowed payments are examined by phase of care, over 70% of both costs cover intrapartum care. Both the intrapartum and prenatal average costs make up 98% of the total average

costs for charges and payments. These findings were consistent for vaginal and cesarean childbirths. Average allowed payments were between 10% and 30% lower for vaginal childbirths when compared to cesarean childbirths.

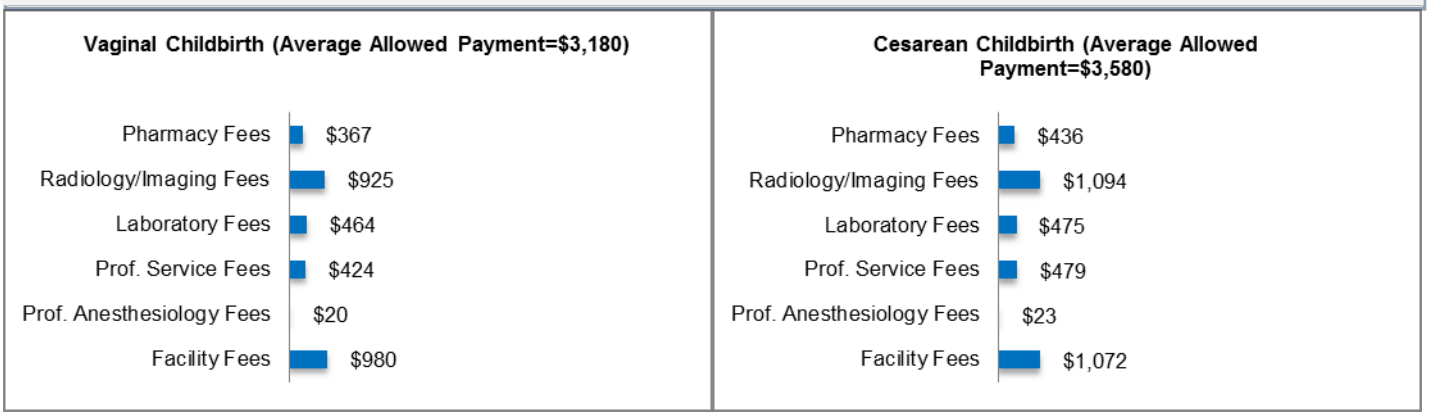
Figure 5: Average Total Maternal Health Care Charges and Payments by Phase of Care among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Due to rounding, the sum of average charges and allowed payments may not add up to exactly to total average charges or allowed payments, respectively.

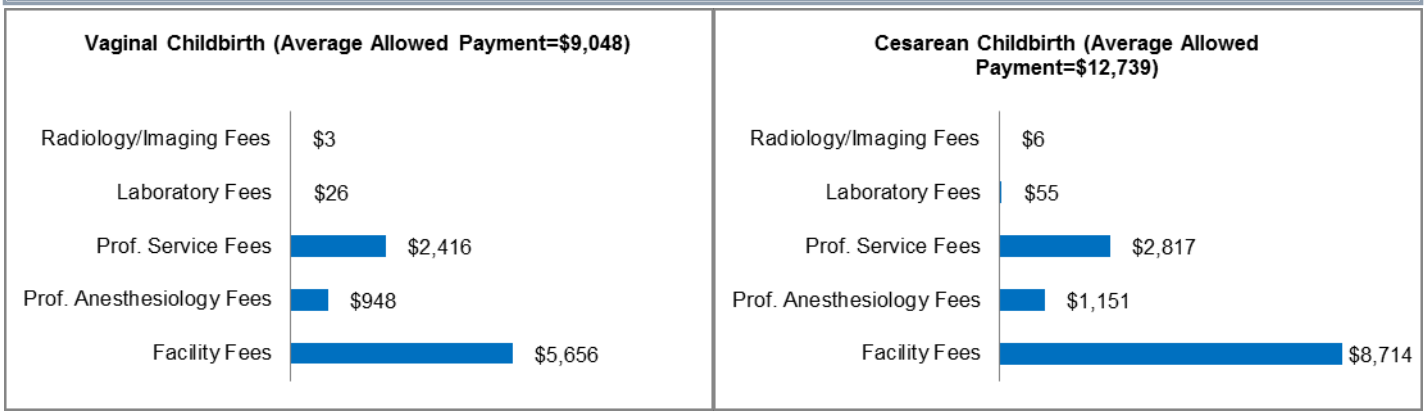
Figures 6 and 7 below show the proportion of the average allowed maternal payment attributed to each service for the prenatal and intrapartum periods. Approximately, a third of prenatal average payments covered facility fees or radiology/imaging service fees. Overall, the prenatal average payments and the service proportions for prenatal costs look very similar for both types of childbirths. Figure 7 shows that average payments for intrapartum care are restricted to facility fees, professional anesthesiology fees, and professional service fees. A higher proportion of average payments for cesarean childbirths covered facility fees, while a higher proportion of average payments for vaginal childbirths covered professional services fees.

Figure 6: Average Maternal Prenatal Health Care Payments by Type of Service among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Due to rounding, the sum of average allowed payments across categories may not add up to exactly the total average allowed payment.

Figure 7: Average Maternal Intrapartum Health Care Payments by Type of Service among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010

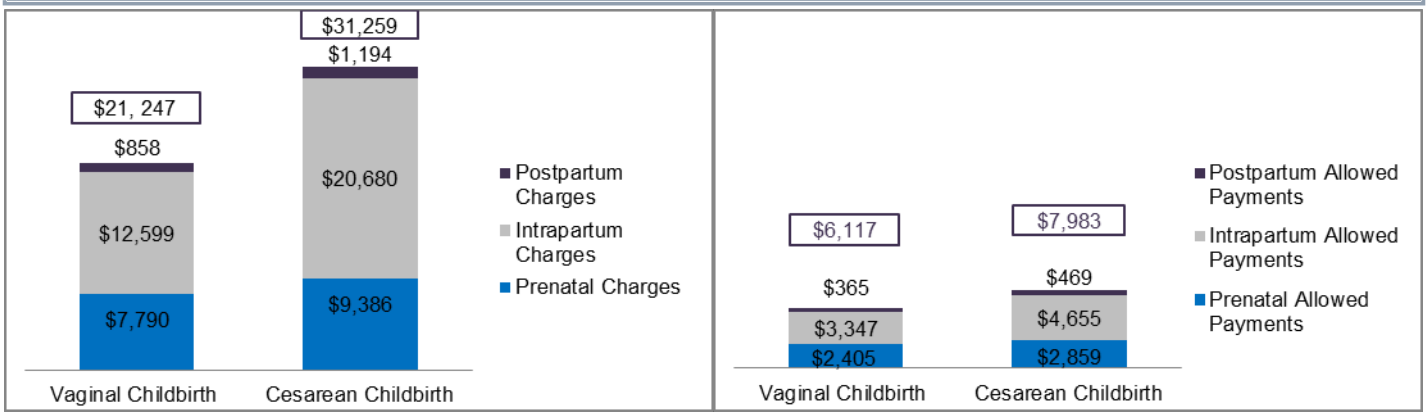


Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Due to rounding, the sum of average allowed payments across categories may not add up to exactly the total average allowed payment.

Medicaid

Figure 8 illustrates that when total average maternal charges and allowed payments are examined by phase of care, 60% or more of the charges and 55% or more of the payments were for intrapartum care (depending on the childbirth type) in Medicaid. Both intrapartum and prenatal average costs made up over 90% of the total average costs for charges and payments. These findings were consistent for vaginal and cesarean childbirths. Average allowed payments were between 20% and 30% lower for vaginal childbirths when compared to cesarean childbirths.

Figure 8: Average Total Maternal Health Care Charges and Payments by Phase of Care among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010

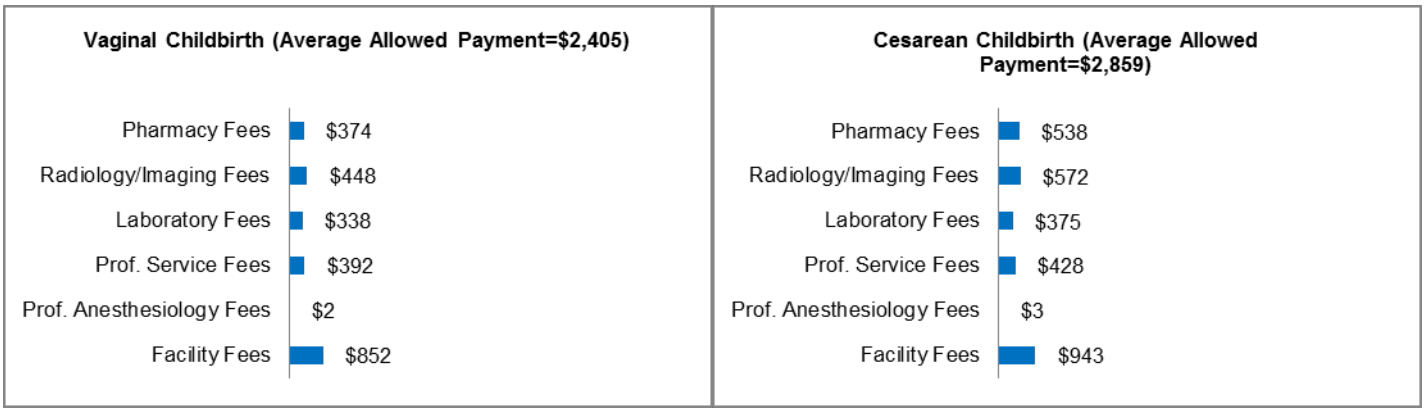


Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Due to rounding, the sum of average charges and allowed payments may not add up to exactly to total average charges or allowed payments, respectively.

Figures 9 and 10 below show the proportion of the average allowed maternal payment attributed to each service for the prenatal and intrapartum periods of a pregnancy. Overall, the prenatal average payments and the service proportions for

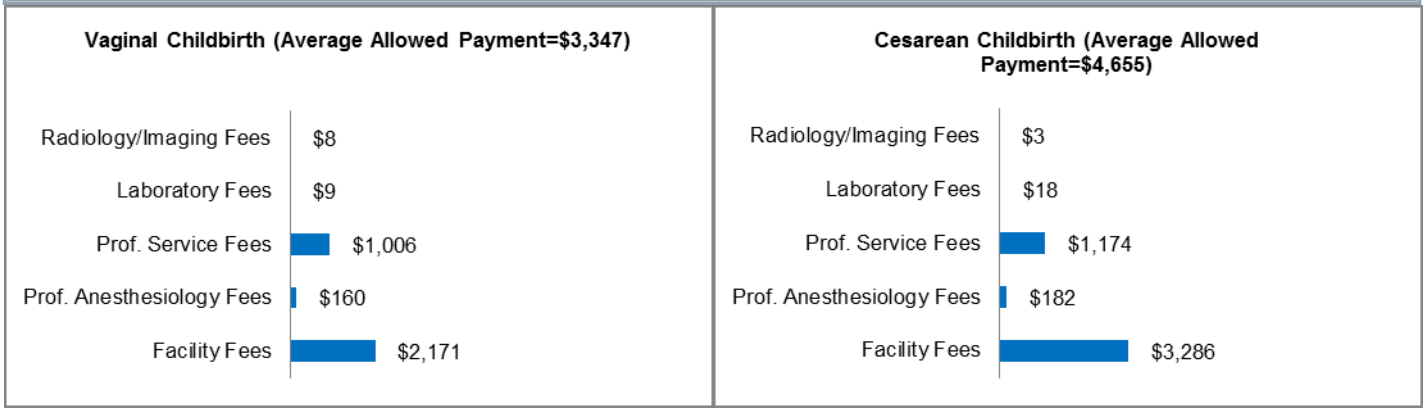
prenatal costs look very similar for both types of childbirth. Approximately, a third of prenatal average payments covered facility fees. The next largest distribution of average payments covered radiology/imaging fees followed by pharmacy fees, professional services fees, and laboratory fees. Figure 10 shows that average payments for the intrapartum period are restricted to facility fees and professional service fees. A higher proportion of average payments for cesarean childbirths covered facility fees, while a higher proportion of average payments for vaginal childbirths covered professional services fees.

Figure 9: Average Maternal Prenatal Health Care Payments by Type of Service among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Figure 10: Average Maternal Intrapartum Health Care Payments by Type of Service among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

AVERAGE TOTAL MATERNAL COSTS FOR SELECTED STATES

Table 7 shows average total maternal health care costs for selected states, in comparison with corresponding national averages, using the commercial data. Results for Medicaid were not provided because we cannot release the identity of the contributing states. We found a large spread across five selected states in average total maternal care costs for

women with employer-provided Commercial insurance in 2010 ranging from Louisiana, which had maternal payments of $10,318 for vaginal births and $13,943 for cesarean births to Massachusetts, which had maternal payments of $16,888 for vaginal births and $20,620 for cesarean births (Table 2). Service cost breakdowns for all five states are provided in Tables 24 through 33 in Appendix B.

Table 7: Average Total Maternal-Newborn Health Care Charges and Payments at National Level and in Selected States among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010

	Vaginal Childbirth	Cesarean Childbirth
National		
Provider Charges	$22,734	$32,062
Allowed Paid Amount	$12,520	$16,673
California		
Provider Charges	$29,093	$43,173
Allowed Paid Amount	$15,259	$21,307
Illinois		
Provider Charges	$22,262	$31,499
Allowed Paid Amount	$11,692	$15,602
Louisiana		
Provider Charges	$20,352	$28,561
Allowed Paid Amount	$10,318	$13,943
Massachusetts		
Provider Charges	$27,496	$33,140
Allowed Paid Amount	$16,888	$20,620
Minnesota		
Provider Charges	$18,725	$27,279
Allowed Paid Amount	$12,130	$17,109

Note: National Commercial results are weighted to reflect the national employer-sponsored insurance population. Commercial results for select states are not weighted.

NEWBORN CARE COST ANALYSES

Newborn care costs capture the cost of care from birth to care provided through the first three months of life following the hospital discharge. This section includes a discussion of the following:

1. Total average newborn care costs by childbirth type in Commercial and Medicaid;
2. A breakdown of total average newborn costs according to payer and type of service payments by childbirth type in Commercial and Medicaid; and
3. Total average newborn care costs for babies admitted into the intensive care unit by childbirth type in Commercial and Medicaid.

In 2010, 44,621 newborns in the Commercial databases and 39,991 newborns in Medicaid met the population selection and exclusions criteria.

TOTAL AVERAGE NEWBORN CARE COSTS

Total average charges were over 50% lower for newborns from vaginal childbirths when compared to newborns from cesarean childbirths in both systems of care. Table 8 shows that in Commercial, total average payments were $11,193 for newborns from cesarean childbirths and $5,809 for newborns from vaginal childbirths. In Medicaid, average payments were $5,607 for newborns from cesarean childbirths and $3,014 for newborns from vaginal childbirths. Average payments for vaginal delivered newborns were approximately 48% and 46% lower when compared to average payments for cesarean delivered newborns in both Commercial fee-for-service plans and Medicaid, respectively.

Table 8: Average Total Newborn Health Care Charges and Payments Covering Care at Birth and In the First Three Months of Life among Commercial and Medicaid Beneficiaries Following Vaginal and Cesarean Births, 2010

	Total	Vaginal Childbirth	Cesarean Childbirth
Commercial			
Provider Charges	$12,419	$9,359	$19,063
Allowed Paid Amount	$7,507	$5,809	$11,193
Medicaid			
Provider Charges	$11,254	$8,553	$19,114
Allowed Paid Amount	$3,677	$3,014	$5,607

Note: Commercial results are weighted to reflect the national employer-sponsored insurance population.

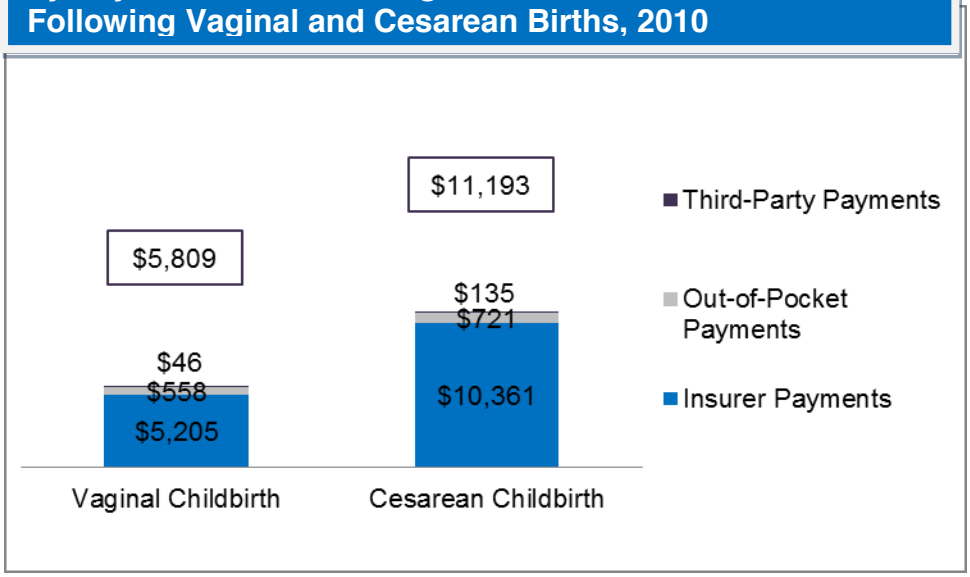
SOURCE OF PAYMENT, TYPE OF SERVICE, AND NICU ANALYSES

Commercial

Figure 11 shows the breakdown of average allowed newborn payments in Commercial for newborn care. Although the average payments were approximately $5,300 higher for newborns from cesarean childbirths when compared to newborns from vaginal childbirths, approximately 90% of the total average allowed payment consists of the average

insurer or third party administrator payments for both vaginal and cesarean childbirths. Remaining portions of the average payments are primarily patient out-of-pocket costs for both vaginal and cesarean childbirths (10% and 6%, respectively).

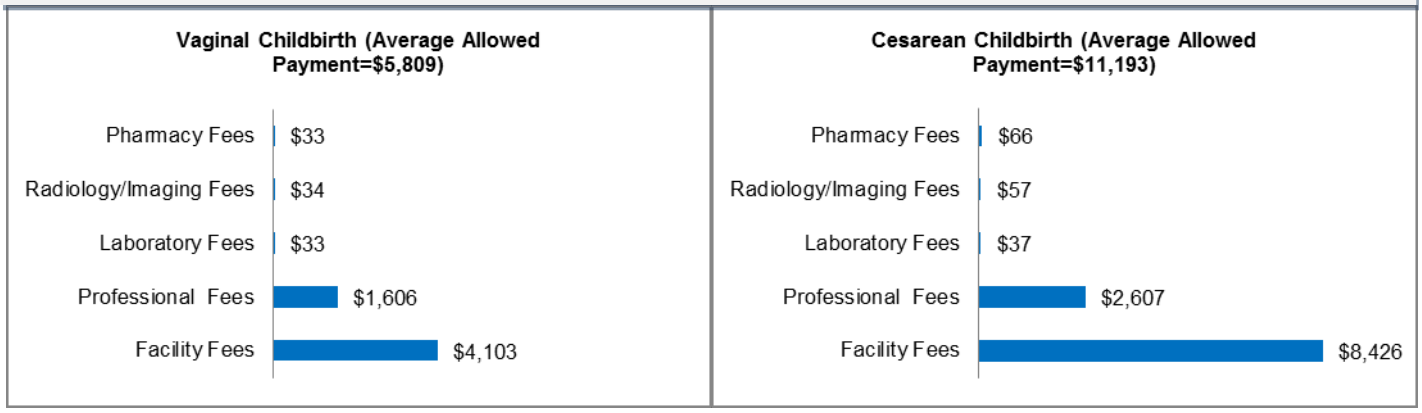
Figure 11: Average Total Newborn Health Care Payments Covering Care at Birth and In the First Three Months of Life by Payment Source among Commercial Beneficiaries Following Vaginal and Cesarean Births, 2010



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Due to rounding, the sum of average payments across payers may not add up to exactly to the total average allowed payment.

Figure 12 shows that a majority of the total average newborn payments were facility fees. A slightly higher proportion of the average payments calculated for newborns from cesarean childbirths covered facility fees when compared to newborns from vaginal childbirths (75% and 71%, respectively). Approximately, a quarter of average payments for both types of childbirths were for professional services, which consisted of office or other outpatient visits, vaccines, immunizations, circumcisions, etc.

Figure 12: Average Total Newborn Health Care Payments Covering Care at Birth and In the First Three Months of Life by Type of Service among Commercial Beneficiaries Following Vaginal and Cesarean Births, 2010



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Small proportions of newborns delivered in 2010 had an admission into an intensive care unit around the time of childbirth or within the first three months of being born. Approximately, six percent (1,917) of newborns from vaginal childbirths and 13% (1,859) of newborns from cesarean childbirths entered an intensive care unit one or more times. Table 9 shows that newborn costs for this small group of newborns were significantly higher than average commercial costs for all newborns shown in Table 8. Among newborns with one or more admission to the intensive care unit, total average charges and payments for all care rendered during the admission were approximately a third less for newborns from vaginal childbirths compared to newborns from cesarean childbirths. For example, total average allowed payments for newborns that required an intensive care admission were $32,595 for newborns from vaginal childbirths and $47,429 for newborns from cesarean childbirths. The insurer paid approximately 95% of the total average payments and out-of-pockets payment were less than five percent for both childbirth types.

Table 9: Average Total Newborn Health Care Charges and Payments Covering Care In the First Three Months of Life among Commercial Beneficiaries with Intensive Care Unit Stays Following Vaginal or Cesarean Births, 2010

Cost Breakdown	Vaginal Childbirth	Cesarean Childbirth
Provider Charges	$54,879	$82,639
Allowed Paid Amount	$32,595	$47,429
Insurer Payments	$30,875	$45,496
Out-of-Pocket Payments	$1,241	$1,351
Third-Party Payments	$468	$735

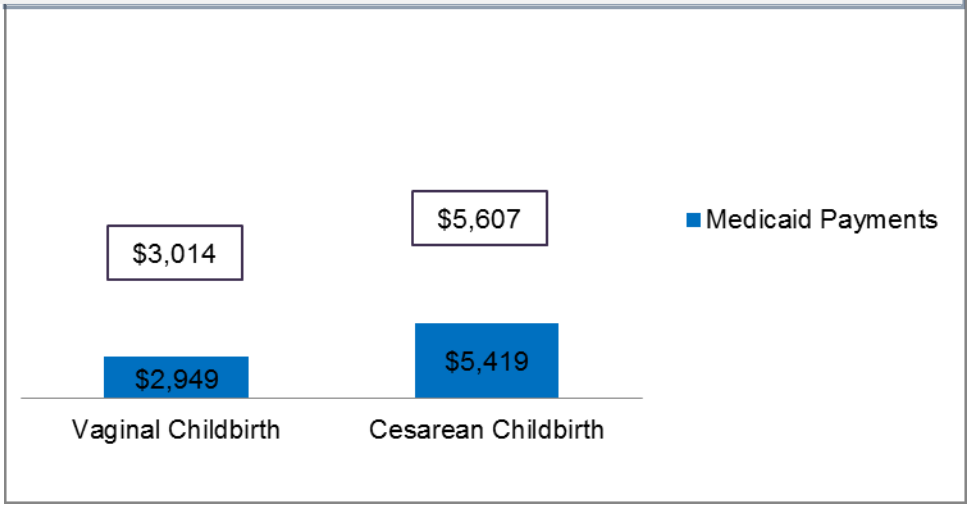
Note: Commercial results are weighted to reflect the national employer-sponsored insurance population.

Appendix B (Table 39) lists the types of health conditions diagnosed and treated during the intensive care admission for vaginal and cesarean delivered newborns.

Medicaid

Figure 13 shows that on average, Medicaid payments were approximately $2,500 higher for newborns from cesarean childbirths when compared to newborns from vaginal childbirths. Similar to the observations made in the maternal cost analyses, Medicaid covered almost the entire total average payment for newborn care. This was the case for both vaginal and cesarean childbirths.

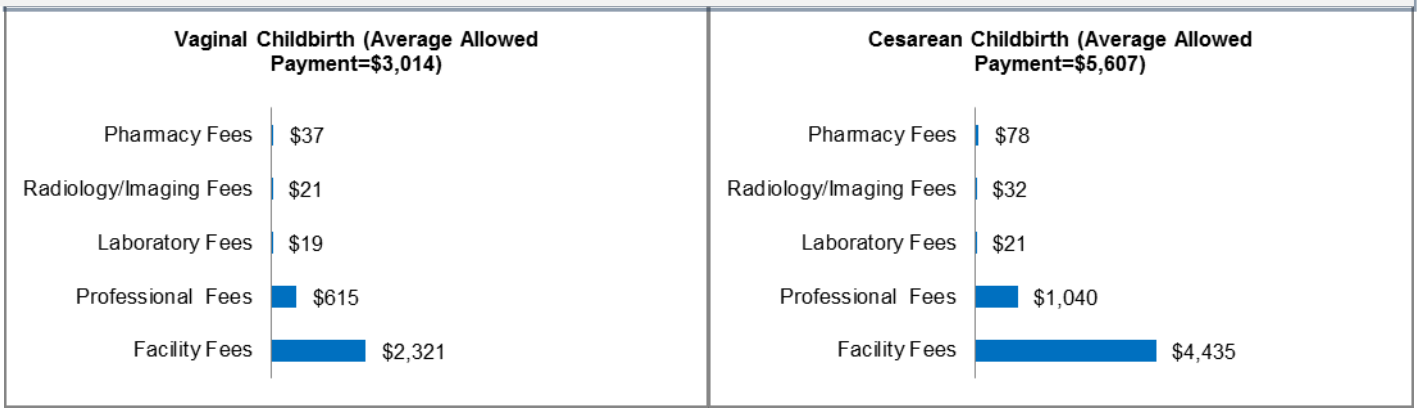
Figure 13: Average Total Newborn Health Care Payments Covering Care at Birth In the First Three Months of Life by Payment Source among Medicaid Beneficiaries Following Vaginal and Cesarean Births, 2010



Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Due to rounding, the sum of average payments across payers may not add up to exactly the total average allowed payment.

Figure 14 is similar to Figure 12, which shows the proportion of the total average allowed payments for newborn care that covered facility fees, professional service fees, laboratory fees, radiology/imaging fees, and pharmacy fees. Here too, a majority of the total average payments were facility fees with a slightly higher proportion of the average payments calculated for newborns from cesarean childbirths covered facility fees when compared to newborns from vaginal childbirths (79% and 77%, respectively). Approximately, a fifth of average payments for both types of childbirths were professional services such as office or other outpatient visits, vaccines, immunizations, circumcisions, etc.

Figure 14: Average Total Newborn Health Care Payments Covering Care at Birth and In the First Three Months of Life by Type of Service among Medicaid Beneficiaries Following Vaginal and Cesarean Births, 2010



Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

In Medicaid, six percent (1,906) of newborns from vaginal childbirths and 14% (1,479) of newborns from cesarean childbirths entered an intensive care unit one or more times during the observation period. Table 10 shows that newborn costs for this small group of newborns were significantly higher than average total costs for all newborns covered by Medicaid, shown in Table 6. Among newborns with one or more admission to the intensive care unit, total average charges and payments for all care rendered during the admission were approximately a third less for newborns from vaginal childbirths compared to newborns from cesarean childbirths. For example, total average allowed payments for newborns that required an intensive care admission were $14,517 for newborns from vaginal childbirths and $20,934 for newborns from cesarean childbirths. Medicaid paid approximately 95% of the total average payments.

Table 10: Average Total Newborn Health Care Charges and Payments Covering Care at Birth and In the First Three Months of Life among Medicaid Beneficiaries with Intensive Care Unit Stays Following Vaginal or Cesarean Births, 2010

Cost Breakdown	Vaginal Childbirth	Cesarean Childbirth
Provider Charges	$58,076	$86,409
Allowed Paid Amount	$14,517	$20,934
Medicaid Payments	$13,875	$19,971

Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population.

Appendix C (Table 55) lists the types of health conditions diagnosed and treated during the intensive care admission for vaginal and cesarean delivered newborns.

TOTAL MATERNITY CARE COST ANALYSES

TOTAL AVERAGE MATERNAL-NEWBORN CARE COSTS

The average total maternal and newborn charges and costs (from the preceding Table 6 and Table 8) were summed to create estimates of the total maternity care charges and costs inclusive of maternal and newborn care. Table 11 shows average total maternity charges and costs estimates for Commercial and Medicaid beneficiaries overall and by childbirth method. Average total maternity charges were approximately 40% lower for vaginal childbirths when compared to cesarean childbirths for both Commercial and Medicaid beneficiaries. Among Commercial beneficiaries, average total maternity care charges were $32,093 for vaginal births and $51,125 for cesarean births. Average total maternity care Commercial payments for vaginal and cesarean childbirths were $18,329 and $27,866, respectively. Average charges to Medicaid were $29,800 for vaginal births and $50,373 for cesarean births. Average total Medicaid maternity payments for vaginal and cesarean childbirths were $ 9,131 and $13,590, respectively. Both Commercial and Medicaid payers paid approximately 100% more for cesarean than vaginal births. For both types of birth, Commercial payers paid approximately 100% more than Medicaid.

Table 11: Average Total Maternal-Newborn Health Care Charges and Payments for Vaginal or Cesarean Births among Commercial and Medicaid Beneficiaries, 2010

	Total	Vaginal Childbirth	Cesarean Childbirth
Commercial			
Provider Charges	$37,340	$32,093	$51,125
Allowed Paid Amount	$21,001	$18,329	$27,866
Medicaid			
Provider Charges	$35,481	$29,800	$50,373
Allowed Paid Amount	$10,350	$9,131	$13,590

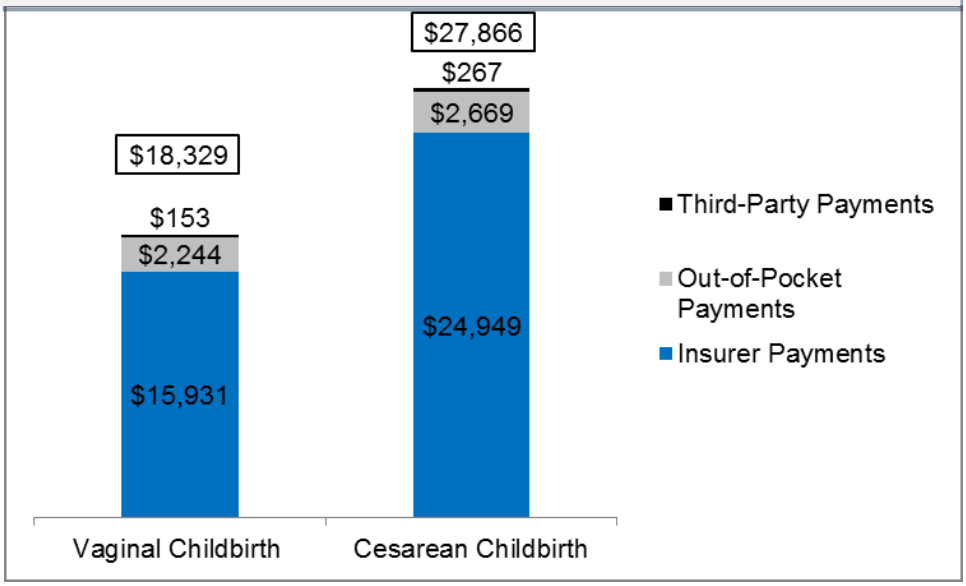
Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Costs include the prenatal, childbirth, and 3-month postpartum period and newborn care from birth through the first three months of life.

SOURCE OF PAYMENT ANALYSES

The study examined the source of payments, which were the primary payer (employer-provided Commercial insurance or Medicaid), a secondary insurer such as a union, and out-of-pocket costs (Figures 15 and 16). Among total maternal-newborn payments for beneficiaries with Commercial insurance and vaginal births, on average the primary insurer paid the largest proportion of costs ($15,931 or 87%), out-of-pocket costs averaged $2,244 (12%), and secondary insurers covered a small portion ($153 or 1%). Among total maternal-newborn payments for beneficiaries with Commercial insurance and cesarean births, on average the primary insurer paid $24,949 (90%), out-of-pocket costs were $2,669 (10%), and secondary insurers paid $267 (1%) (numbers exceed 100% due to rounding).

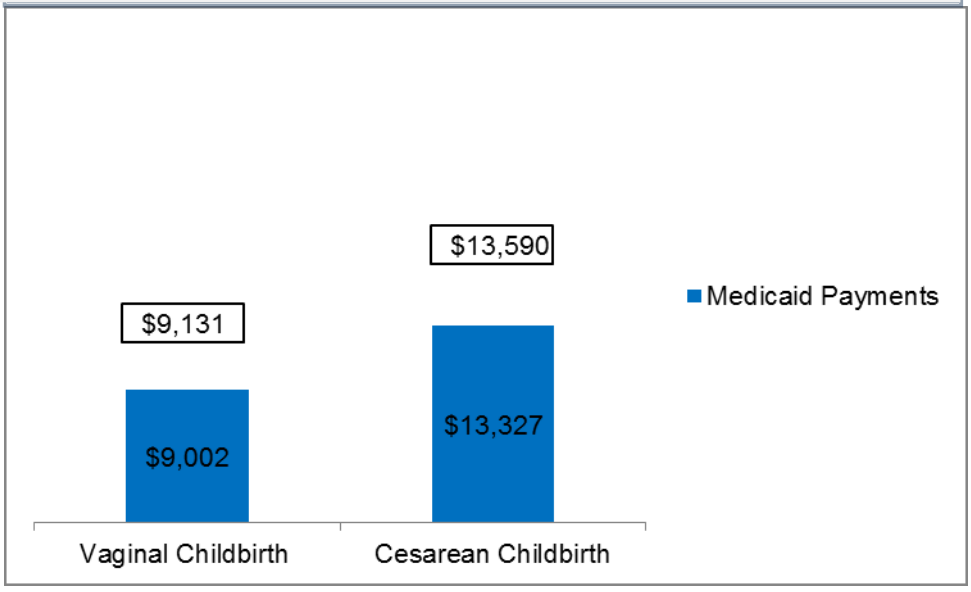
For both vaginal and cesarean births covered by Medicaid (Figure 16), Medicaid paid nearly all costs for vaginal ($9,002 or 99%) and cesarean ($13,327 or 98%) births.

Figure 15: Average Total Maternal-Newborn Health Care Payments by Payment Source among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Costs include the prenatal, childbirth, and 3-month postpartum period and newborn care from birth through the first three months of life.

Figure 16: Average Total Maternal-Newborn Health Care Payments by Payment Source among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010

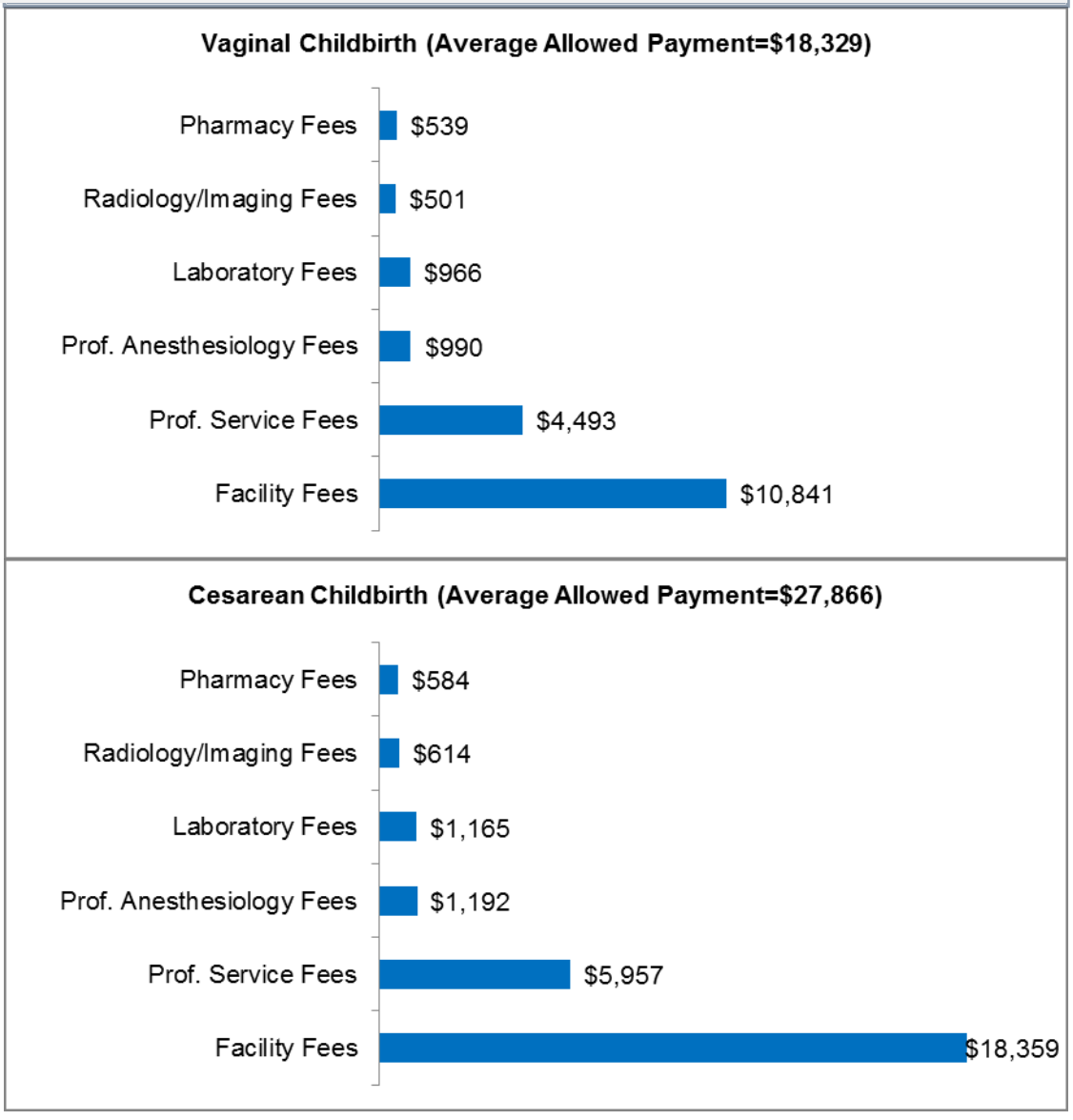


Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Costs include the prenatal, childbirth, and 3-month postpartum period and newborn care from birth through the first three months of life.

TYPE OF SERVICE ANALYSES

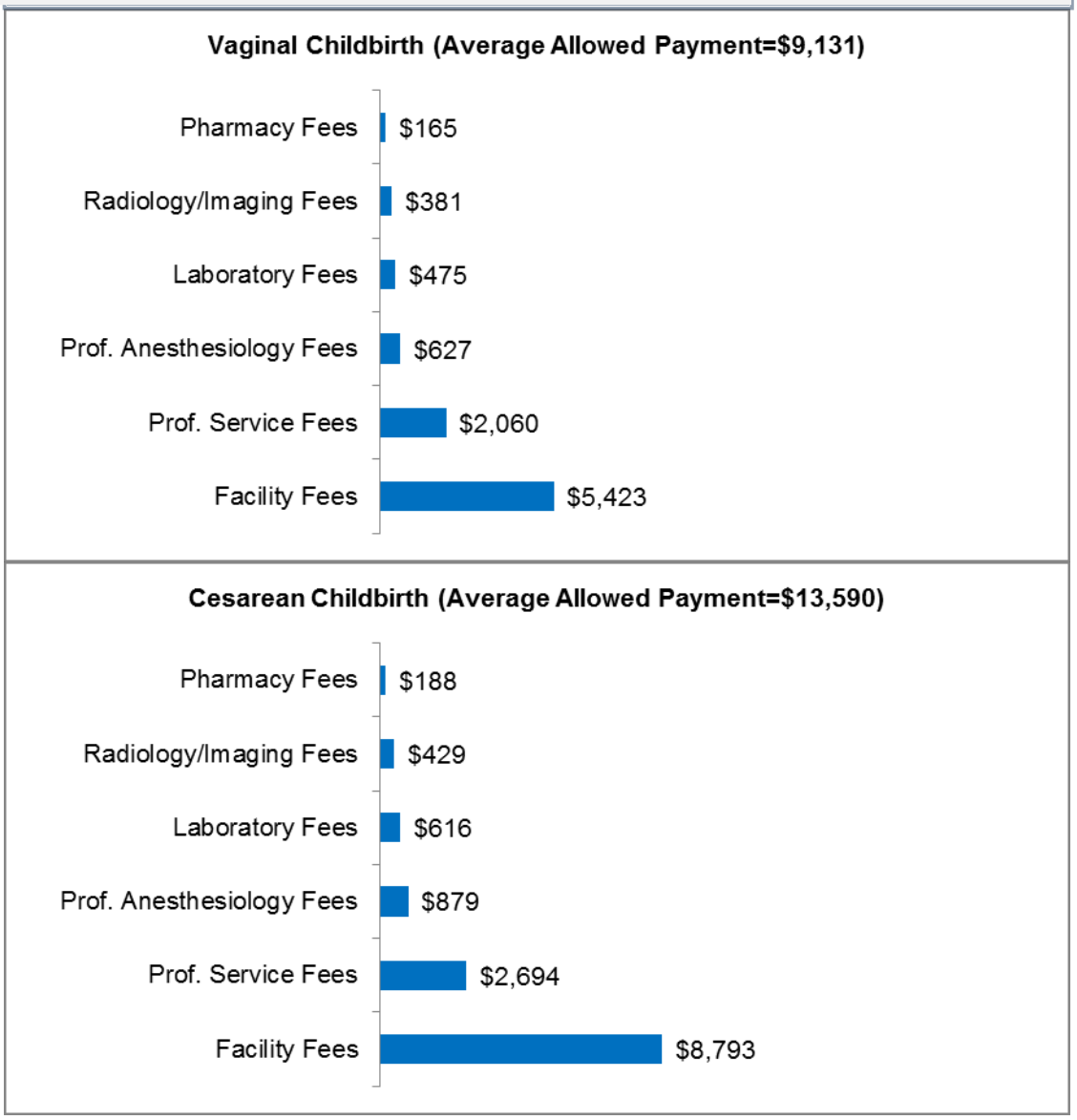
Figures 17 and 18 present total maternal and newborn costs by type of service and mode of birth for Commercial and Medicaid populations, respectively. In all cases, facility fees predominated (from 59% to 66% of all costs, followed by professional services fees (from 20% to 25%), with smaller proportions going to radiology/imaging, anesthesiology, pharmacy, and laboratory.

Figure 17: Average Total Maternal-Newborn Health Care Payments by Type of Service among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Costs include payments for maternal prenatal, childbirth, and postpartum care and newborn care from birth through three months. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Figure 18. Average Total Maternal-Newborn Health Care Payments by Type of Service among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Costs include payments for maternal prenatal, childbirth, and 3-month postpartum care, and newborn care from birth through three months. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Tables 12 and 13 present the allocation of all maternal-newborn payments by type of service. Among total average Commercial payments for maternal-newborn care with vaginal births ($18,329), 59% went to facilities and 25% to maternity care providers, followed in descending order by payments for anesthesiology, radiology/imaging, laboratory, and pharmacy services. Among total average Commercial payments for maternal-newborn care with cesarean births ($27,866), 66% went to facilities and 21% to maternity care providers, followed in descending order by payments for anesthesiology, radiology/imaging, pharmacy, and laboratory services. Among total average Medicaid payments for maternal-newborn care with vaginal births ($9,131), 59% went to facilities and 23% to maternity care providers, while among total Medicaid payments for cesarean births ($13,590), 65% went to facilities and 20% to maternity care providers.

For both types of birth, remaining Medicaid payments covered in descending order pharmacy, radiology/imaging, laboratory, and anesthesia services.

Table 12: Average Total Maternal-Newborn Health Care Charges and Payments by Type of Service among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010

	Total	Vaginal Childbirth	Cesarean Childbirth
Commercial			
Grand Total: Prenatal+Intrapartum+Postpartum+First Three Months of Newborn Care			
Total Costs			
Provider Charges	$37,341	$32,093	$51,126
Allowed Paid Amount	$21,001	$18,329	$27,866
Facility Fees			
Provider Charges	$23,840	$19,664	$34,706
Allowed Paid Amount	$12,953	$10,841	$18,359
Professional Anesthesiology Fees[2]			
Provider Charges	$1,683	$1,607	$1,931
Allowed Paid Amount	$1,037	$990	$1,192
Professional Service Fees			
Provider Charges	$7,636	$6,807	$9,792
Allowed Paid Amount	$4,917	$4,493	$5,957
Laboratory Fees			
Provider Charges	$1,426	$1,396	$1,521
Allowed Paid Amount	$550	$539	$584
Radiology/Imaging Fees			
Provider Charges	$1,995	$1,892	$2,312
Allowed Paid Amount	$1,015	$966	$1,165
Pharmacy Fees			
Provider Charges	$765	$730	$869
Allowed Paid Amount	$531	$501	$614

Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Costs include payments for maternal prenatal, childbirth, and postpartum care and newborn care from birth through three months. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 13: Average Total Maternal-Newborn Health Care Charges and Payments by Type of Service among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010

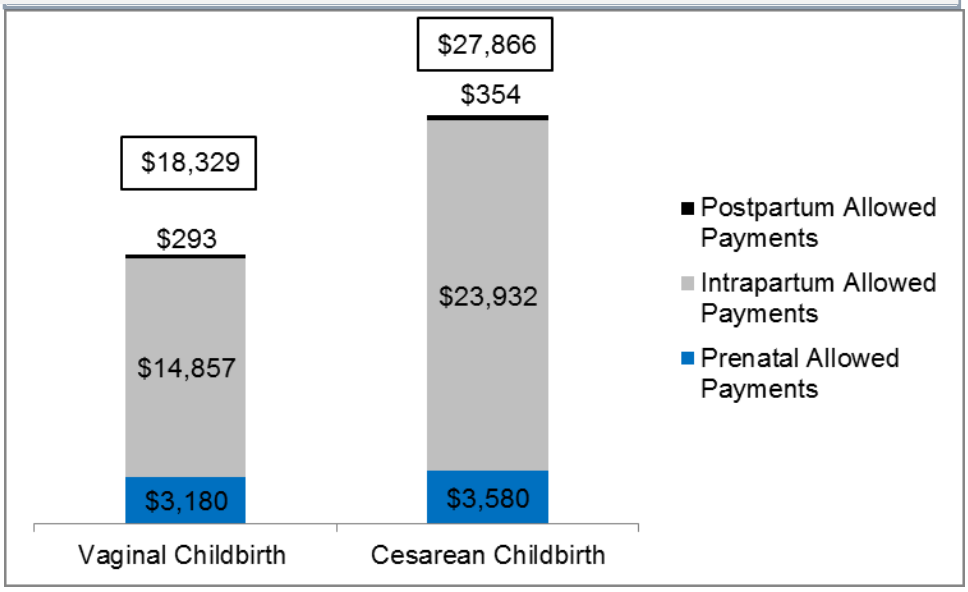
	Total	Vaginal Childbirth	Cesarean Childbirth
Medicaid			
Grand Total: Prenatal+Intrapartum+Postpartum+First Three Months of Newborn Care			
Total Costs			
Provider Charges	$35,481	$29,800	$50,374
Allowed Paid Amount	$10,350	$9,131	$13,590
Facility Fees			
Provider Charges	$22,704	$18,376	$34,095
Allowed Paid Amount	$6,338	$5,423	$8,793
Professional Anesthesiology Fees			
Provider Charges	$1,015	$876	$1,343
Allowed Paid Amount	$172	$165	$188
Professional Service Fees			
Provider Charges	$6,504	$5,656	$8,792
Allowed Paid Amount	$2,231	$2,060	$2,694
Laboratory Fees			
Provider Charges	$2,145	$2,049	$2,371
Allowed Paid Amount	$395	$381	$429
Radiology/Imaging Fees			
Provider Charges	$2,083	$1,902	$2,519
Allowed Paid Amount	$517	$475	$616
Pharmacy Fees			
Provider Charges	$1,056	$950	$1,316
Allowed Paid Amount	$700	$627	$879

Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Costs include payments for maternal prenatal, childbirth, and 3-month postpartum care, and newborn care from birth through three months. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

PHASE OF CARE ANALYSES

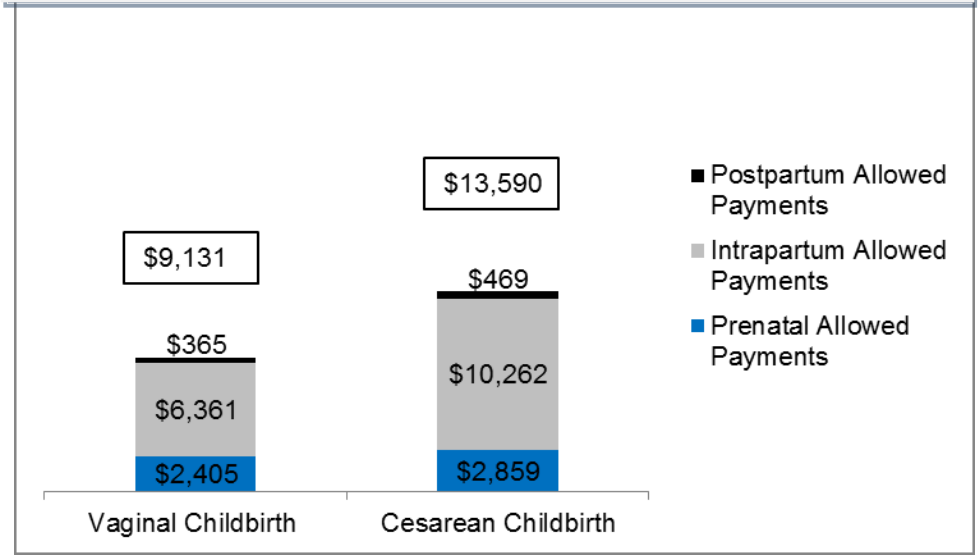
When examined by phase of care — prenatal, the intrapartum hospital stay for both women and newborns, and the postpartum and newborn care provided after birth hospitalization discharge, 2010 payments were heavily concentrated in the intrapartum hospital stay (Figures 19 and 20). Our figures slightly overestimate payments for the intrapartum phase and slightly underestimate payments for care after discharge as modest newborn payments for care after discharge are included in the intrapartum phase. Commercially insured intrapartum care involved 81% of maternal-newborn payments in vaginal births and 86% of maternal-newborn payments in cesarean births. In Medicaid, intrapartum payments were 70% of payments for vaginal births and 76% of payments for cesarean births.

Figure 19: Average Total Maternal-Newborn Health Care Payments by Phase of Care among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Costs include payments for maternal prenatal, childbirth, and postpartum care and newborn care from birth through three months. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Figure 20: Average Total Maternal-Newborn Health Care Payments by Phase of Care among Medicaid Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Because the Medicaid database is comprised of a small convenience sample of 7 states and 5 Medicaid managed care plans, the results are not weighted to the national Medicaid population. Costs include payments for maternal prenatal, childbirth, and 3-month postpartum care, and newborn care from birth through three months.

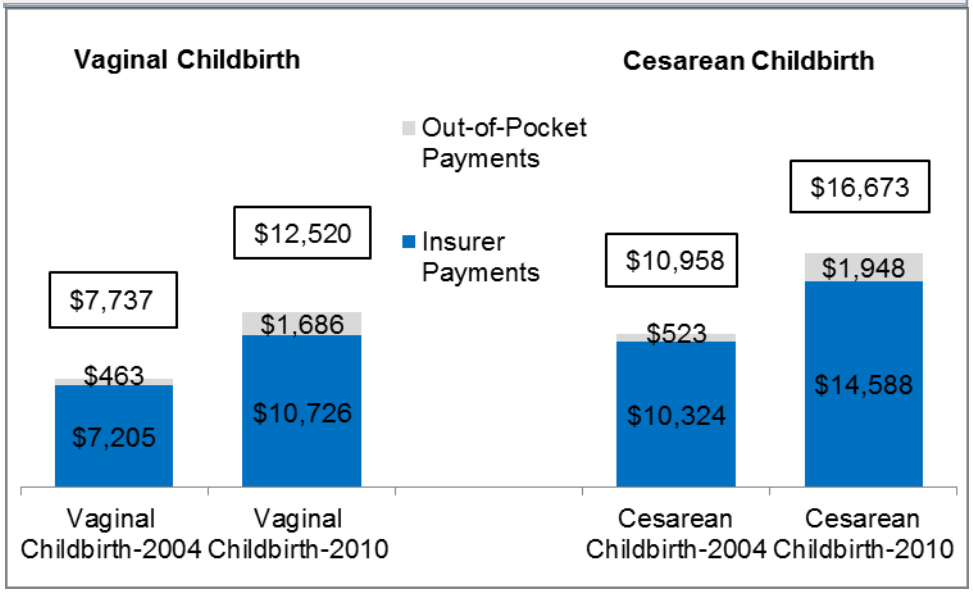
APPENDIX A: MATERNAL COST IN COMMERCIAL DATA FOR 2004 AND 2010

We have included a comparison of key results from the 2007 study, *The Healthcare Cost of Having a Baby*. Please note that while the underlying methodology used in the 2007 study is consistent with the approach taken in this 2012 analysis, the *MarketScan* data set used in the current analysis reflects a significantly larger population than that underlying the 2007 study. In addition, the original study did not examine newborn care costs or costs among Medicaid beneficiaries. This comparison is therefore of interest for directional guidance, but we did not attempt to modify the study data used in the current study to provide a rigorous comparison to the 2007 work. Note that the 2007 study reflects 2004 *MarketScan* data and this study uses data from the 2010 calendar year.

Average Total Maternal Costs Comparisons

For women with a live birth in 2004 and 2010, average charges increased by 58% from $14,352 to $22,734 for vaginal childbirths and by 51% from $21,213 to $32,062 for cesarean childbirths. Figure 21 shows the average allowed payments (i.e., actual insurer payments) and average out-of-pockets payments by childbirth type. Average allowed payments for maternal care increased by 49% for vaginal childbirths and 41% for cesarean childbirths. Although average insurer payments account for a majority of total average payments, the portion of the average total maternal payment covered by the insurer decreased slightly from 93% to 84% for both types of childbirths during this observation period. Although the dollar amount is relatively small when compared to insurer payments, out-of-pocket payments for women with both vaginal and cesarean births increased nearly fourfold over the six-year period. Data were not adjusted for inflation.

Figure 21: Average Total Maternal Health Care Payments by Payment Source among Commercial Beneficiaries with Vaginal and Cesarean Births, 2004 and 2010

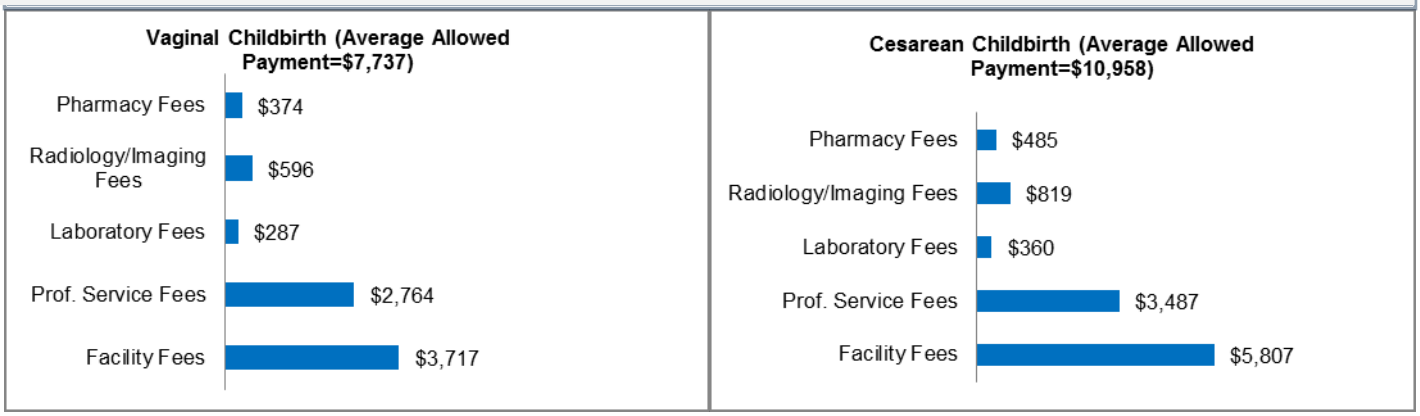


Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Costs include payments for maternal prenatal, childbirth, and postpartum care. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Figures 22 and 23 show the proportion of the average allowed payments covering facility fees, professional anesthesiology service fees, other professional service fees, laboratory fees, radiology/imaging fees, and pharmacy fees for women with a live birth in 2004 and 2010. Note that analyses of 2004 data combined professional anesthesiology

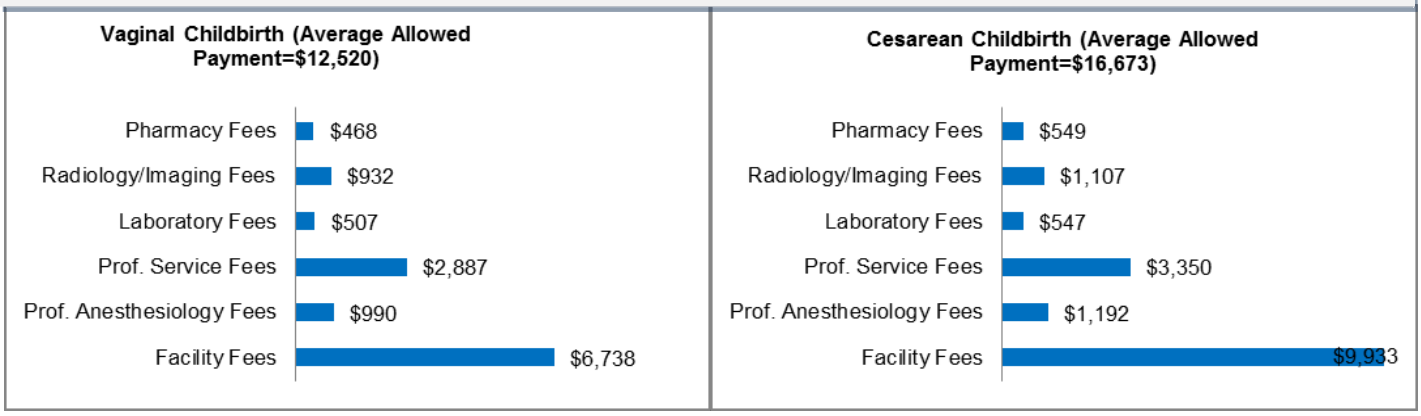
and professional service fees into a combined professional service fees category. More than 80% of total average allowed payments covered facility fees and professional services fees. Overall, the maternal medical care profile looks similar for women with live births across both periods with one exception. For both vaginal and cesarean childbirths, the share of average allowed payments covering facility fees has increased considerably while the share of average allowed payments covering professional services decreased slightly. In this comparison, no adjustments were made for inflation.

Figure 22: Average Total Maternal Health Care Payments by Type of Service among Commercial Beneficiaries with Vaginal and Cesarean Births, 2004



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Maternal costs include the 9-month prenatal, childbirth, and 3-month postpartum period. Due to rounding, the sum of average payments across payers may not add up to exactly to the total average allowed payment.

Figure 23: Average Total Maternal Health Care Payments by Type of Service among Commercial Beneficiaries with Vaginal and Cesarean Births, 2010



Note: Commercial results are weighted to reflect the national employer-sponsored insurance population. Maternal costs include the 9-month prenatal, childbirth, and 3-month postpartum period. Due to rounding, the sum of average payments across payers may not add up to exactly to the total average allowed payment.

APPENDIX B: COMMERCIAL COST

Table 14: Nationally Weighted Live Birth Numbers, Proportions, and Mean Prenatal Health Care Costs by Type of Service for Vaginal and Cesarean Childbirths by Payer, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Live Births	51,936			16,041			67,977		
Percent	76%			24%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	6,071	6,404		6,866	6,794		6,257	6,506	
Allowed Paid Amount	3,180	3,601		3,580	3,879		3,274	3,672	
Insurer Payments	2,559	3,304		2,910	3,569		2,641	3,371	
Out-of-Pocket Payments	604	622		653	645		616	628	
Third-Party Payments	19	264		18	242		19	259	
Facility Fees									
Provider Charges	1,721	3,885	28.3%	1,905	3,865	27.7%	1,764	3,881	28.2%
Allowed Paid Amount	980	2,261	30.8%	1,072	2,317	30.0%	1,002	2,275	30.6%
Insurer Payments	812	2,031	31.7%	898	2,103	30.9%	832	2,048	31.5%
Out-of-Pocket Payments	155	358	25.7%	164	349	25.0%	157	356	25.5%
Third-Party Payments	8	171	43.9%	7	144	38.8%	8	165	42.8%
Professional Anesthesiology Fees									
Provider Charges	32	244	0.5%	37	270	0.5%	33	250	0.5%
Allowed Paid Amount	20	147	0.6%	23	170	0.6%	21	153	0.6%
Insurer Payments	17	133	0.7%	20	157	0.7%	18	139	0.7%
Out-of-Pocket Payments	2	29	0.4%	3	29	0.4%	2	29	0.4%
Third-Party Payments	0	13	0.9%	0	6	0.5%	0	12	0.8%
Professional Service Fees									
Provider Charges	727	1,608	12.0%	829	1,494	12.1%	751	1,583	12.0%
Allowed Paid Amount	424	988	13.3%	479	909	13.4%	437	970	13.3%
Insurer Payments	350	919	13.7%	396	837	13.6%	361	900	13.7%
Out-of-Pocket Payments	69	153	11.5%	77	151	11.7%	71	153	11.5%
Third-Party Payments	3	82	16.9%	3	51	15.4%	3	76	16.5%
Laboratory Fees									
Provider Charges	1,233	1,205	20.3%	1,291	1,231	18.8%	1,247	1,212	19.9%
Allowed Paid Amount	464	572	14.6%	475	572	13.3%	467	572	14.3%
Insurer Payments	352	515	13.8%	366	515	12.6%	356	515	13.5%
Out-of-Pocket Payments	115	177	19.0%	113	178	17.3%	115	177	18.6%
Third-Party Payments	2	32	9.1%	1	24	7.7%	2	30	8.8%
Radiology/Imaging Fees									
Provider Charges	1,811	2,084	29.8%	2,167	2,557	31.6%	1,894	2,209	30.3%
Allowed Paid Amount	925	1,022	29.1%	1,094	1,270	30.6%	965	1,088	29.5%
Insurer Payments	756	946	29.6%	906	1,185	31.1%	791	1,010	30.0%
Out-of-Pocket Payments	169	250	27.9%	187	273	28.6%	173	256	28.1%
Third-Party Payments	5	84	26.3%	6	114	35.5%	5	92	28.4%
Pharmacy Fees									
Provider Charges	548	1,446	9.0%	637	1,546	9.3%	569	1,470	9.1%
Allowed Paid Amount	367	1,090	11.5%	436	1,169	12.2%	384	1,110	11.7%
Insurer Payments	271	1,015	10.6%	323	1,075	11.1%	283	1,030	10.7%
Out-of-Pocket Payments	94	145	15.5%	110	160	16.9%	98	148	15.9%
Third-Party Payments	1	49	2.8%	0	13	2.2%	1	44	2.7%

Note: Prenatal costs do not include intrapartum or postpartum care costs. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 15: Nationally Weighted First, Second, and Third Quartiles for Prenatal Health Care Costs by Type of Service for Vaginal & Cesarean Childbirths by Payer, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	11,212	14,531	19,381	17,308	21,988	29,436	12,005	16,012	22,012
Allowed Paid Amount	6,850	8,402	10,495	9,472	11,585	14,502	7,220	9,058	11,501
Insurer Payments	5,746	7,296	9,411	8,255	10,300	13,135	6,110	7,930	10,374
Out-of-Pocket Payments	396	941	1,476	477	1,138	1,803	415	981	1,538
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	6,790	9,493	13,442	11,337	15,363	21,831	7,379	10,591	15,537
Allowed Paid Amount	3,850	5,043	6,695	5,886	7,691	10,075	4,123	5,543	7,574
Insurer Payments	3,219	4,380	5,967	5,059	6,818	9,172	3,460	4,834	6,822
Out-of-Pocket Payments	246	542	903	250	706	1,170	250	573	964
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	602	1,352	2,124	1,100	1,500	2,255	836	1,400	2,166
Allowed Paid Amount	410	891	1,300	686	951	1,386	540	900	1,320
Insurer Payments	263	770	1,167	594	848	1,265	410	792	1,191
Out-of-Pocket Payments	0	24	150	0	72	157	0	46	152
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	2,750	3,250	4,070	3,500	4,325	5,632	2,800	3,459	4,490
Allowed Paid Amount	1,967	2,317	2,827	2,208	2,661	3,279	2,014	2,400	2,952
Insurer Payments	1,620	2,062	2,560	1,853	2,357	2,950	1,667	2,127	2,670
Out-of-Pocket Payments	0	213	430	0	236	467	0	218	439
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	0	0	19	0	0	190	0	0	49
Allowed Paid Amount	0	0	5	0	0	85	0	0	21
Insurer Payments	0	0	0	0	0	69	0	0	14
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology/Imaging Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Insurer Payments	0	0	0	0	0	0	0	0	0
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges									
Allowed Paid Amount									
Insurer Payments									
Out-of-Pocket Payments									
Third-Party Payments									

Table 16: Nationally Weighted Live Birth Numbers, Proportions, and Mean Intrapartum Health Care Costs by Type of Service for Vaginal and Cesarean Childbirths by Payer, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Live Births	51,936			16,041			67,977		
Percent	76%			24%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	16,165	7,824		24,572	10,899		18,136	9,349	
Allowed Paid Amount	9,048	3,549		12,739	5,164		9,913	4,282	
Insurer Payments	7,921	3,545		11,375	5,153		8,730	4,241	
Out-of-Pocket Payments	1,038	835		1,246	981		1,087	876	
Third-Party Payments	87	838		113	1,151		93	921	
Facility Fees									
Provider Charges	11,063	6,836	68.4%	17,807	9,897	72.5%	12,644	8,180	69.7%
Allowed Paid Amount	5,656	2,991	62.5%	8,714	4,690	68.4%	6,373	3,699	64.3%
Insurer Payments	4,945	2,899	62.4%	7,815	4,608	68.7%	5,618	3,590	64.3%
Out-of-Pocket Payments	643	596	61.9%	806	728	64.7%	681	633	62.7%
Third-Party Payments	64	671	74.0%	87	939	77.2%	69	743	75.0%
Professional Anesthesiology Fees									
Provider Charges	1,539	1,464	9.5%	1,864	1,421	7.6%	1,615	1,461	8.9%
Allowed Paid Amount	948	862	10.5%	1,151	859	9.0%	995	865	10.0%
Insurer Payments	838	809	10.6%	1,026	826	9.0%	882	817	10.1%
Out-of-Pocket Payments	105	184	10.1%	119	186	9.6%	109	185	10.0%
Third-Party Payments	5	82	6.3%	5	75	4.3%	5	81	5.7%
Professional Service Fees									
Provider Charges	3,508	1,765	21.7%	4,782	2,427	19.5%	3,807	2,014	21.0%
Allowed Paid Amount	2,416	1,073	26.7%	2,817	1,240	22.1%	2,510	1,127	25.3%
Insurer Payments	2,114	1,057	26.7%	2,484	1,216	21.8%	2,201	1,107	25.2%
Out-of-Pocket Payments	286	368	27.6%	314	400	25.2%	293	376	26.9%
Third-Party Payments	17	189	19.5%	21	237	18.2%	18	201	19.1%
Laboratory Fees									
Provider Charges	52	128	0.3%	111	191	0.5%	66	147	0.4%
Allowed Paid Amount	26	68	0.3%	55	104	0.4%	33	79	0.3%
Insurer Payments	23	69	0.3%	48	98	0.4%	29	78	0.3%
Out-of-Pocket Payments	3	16	0.3%	6	23	0.5%	4	18	0.4%
Third-Party Payments	0	5	0.2%	0	6	0.2%	0	5	0.2%
Radiology /Imaging Fees									
Provider Charges	6	66	0.0%	14	104	0.1%	8	77	0.0%
Allowed Paid Amount	3	29	0.0%	6	42	0.0%	3	32	0.0%
Insurer Payments	2	23	0.0%	5	38	0.0%	3	27	0.0%
Out-of-Pocket Payments	0	6	0.0%	1	8	0.1%	0	6	0.0%
Third-Party Payments	-	0	0.0%	0	2	0.0%	0	1	0.0%
Pharmacy Fees									
Provider Charges	-	-	0.0%	-	-	0.0%	-	-	0.0%
Allowed Paid Amount	-	-	0.0%	-	-	0.0%	-	-	0.0%
Insurer Payments	-	-	0.0%	-	-	0.0%	-	-	0.0%
Out-of-Pocket Payments	-	-	0.0%	-	-	0.0%	-	-	0.0%
Third-Party Payments	-	-	0.0%	-	-	0.0%	-	-	0.0%

Note: Intrapartum costs do not include prenatal or postpartum care costs. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 17: Nationally Weighted First, Second, and Third Quartiles for Intrapartum Health Care Costs by Type of Service for Vaginal and Cesarean Childbirths by Payer, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	11,212	14,531	19,381	17,308	21,988	29,436	12,005	16,012	22,012
Allowed Paid Amount	6,850	8,402	10,495	9,472	11,585	14,502	7,220	9,058	11,501
Insurer Payments	5,746	7,296	9,411	8,255	10,300	13,135	6,110	7,930	10,374
Out-of-Pocket Payments	396	941	1,476	477	1,138	1,803	415	981	1,538
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	6,790	9,493	13,442	11,337	15,363	21,831	7,379	10,591	15,537
Allowed Paid Amount	3,850	5,043	6,695	5,886	7,691	10,075	4,123	5,543	7,574
Insurer Payments	3,219	4,380	5,967	5,059	6,818	9,172	3,460	4,834	6,822
Out-of-Pocket Payments	246	542	903	250	706	1,170	250	573	964
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	602	1,352	2,124	1,100	1,500	2,255	836	1,400	2,166
Allowed Paid Amount	410	891	1,300	686	951	1,386	540	900	1,320
Insurer Payments	263	770	1,167	594	848	1,265	410	792	1,191
Out-of-Pocket Payments	0	24	150	0	72	157	0	46	152
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	2,750	3,250	4,070	3,500	4,325	5,632	2,800	3,459	4,490
Allowed Paid Amount	1,967	2,317	2,827	2,208	2,661	3,279	2,014	2,400	2,952
Insurer Payments	1,620	2,062	2,560	1,853	2,357	2,950	1,667	2,127	2,670
Out-of-Pocket Payments	0	213	430	0	236	467	0	218	439
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	0	0	19	0	0	190	0	0	49
Allowed Paid Amount	0	0	5	0	0	85	0	0	21
Insurer Payments	0	0	0	0	0	69	0	0	14
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology/Imaging Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Insurer Payments	0	0	0	0	0	0	0	0	0
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges									
Allowed Paid Amount									
Insurer Payments									
Out-of-Pocket Payments									
Third-Party Payments									

Table 18: Nationally Weighted Live Birth Numbers, Proportions, and Mean Postpartum Costs by Type of Service for Vaginal and Cesarean Childbirths, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Live Births	51,936			16,041			67,977		
Percent	76%			24%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	498	2,195		625	2,624		528	2,304	
Allowed Paid Amount	293	1,200		354	1,404		307	1,251	
Insurer Payments	246	1,136		303	1,348		260	1,189	
Out-of-Pocket Payments	44	108		49	120		45	111	
Third-Party Payments	1	55		1	91		1	66	
Facility Fees									
Provider Charges	198	1,783	39.8%	291	2,179	46.5%	220	1,884	41.6%
Allowed Paid Amount	101	948	34.6%	146	1,112	41.3%	112	989	36.4%
Insurer Payments	93	906	37.8%	137	1,075	45.2%	103	948	39.8%
Out-of-Pocket Payments	7	69	15.9%	8	75	16.7%	7	71	16.1%
Third-Party Payments	1	42	40.8%	1	89	74.1%	1	57	49.6%
Professional Anesthesiology Fees									
Provider Charges	36	267	7.3%	30	223	4.9%	35	258	6.6%
Allowed Paid Amount	22	170	7.6%	18	137	5.1%	21	163	6.9%
Insurer Payments	20	158	8.3%	17	130	5.6%	20	152	7.5%
Out-of-Pocket Payments	2	27	4.1%	1	21	2.5%	2	25	3.7%
Third-Party Payments	0	6	5.4%	0	3	1.4%	0	5	4.5%
Professional Service Fees									
Provider Charges	76	374	15.3%	90	399	14.4%	80	380	15.1%
Allowed Paid Amount	47	227	16.1%	53	237	15.0%	48	230	15.8%
Insurer Payments	41	206	16.8%	47	216	15.5%	43	208	16.4%
Out-of-Pocket Payments	5	40	11.9%	6	55	12.1%	5	44	12.0%
Third-Party Payments	0	17	26.2%	0	5	10.5%	0	15	21.8%
Laboratory Fees									
Provider Charges	39	129	7.9%	42	142	6.7%	40	132	7.6%
Allowed Paid Amount	16	59	5.6%	17	64	4.7%	16	60	5.3%
Insurer Payments	14	57	5.8%	15	63	4.9%	15	58	5.6%
Out-of-Pocket Payments	2	11	4.3%	2	11	3.7%	2	11	4.2%
Third-Party Payments	0	18	10.8%	0	3	4.2%	0	16	9.0%
Radiology/Imaging Fees									
Provider Charges	10	180	2.0%	16	239	2.6%	12	195	2.2%
Allowed Paid Amount	4	93	1.5%	8	131	2.2%	5	104	1.7%
Insurer Payments	4	90	1.7%	7	130	2.4%	5	100	1.9%
Out-of-Pocket Payments	0	9	0.7%	0	7	0.5%	0	8	0.7%
Third-Party Payments	0	3	2.3%	-	1	0.0%	0	3	1.5%
Pharmacy Fees									
Provider Charges	138	494	27.7%	155	472	24.8%	142	489	26.9%
Allowed Paid Amount	101	339	34.6%	112	405	31.7%	104	356	33.8%
Insurer Payments	73	317	29.6%	80	382	26.4%	75	333	28.7%
Out-of-Pocket Payments	28	45	63.0%	32	53	64.5%	28	47	63.4%
Third-Party Payments	0	16	13.8%	0	7	9.8%	0	15	12.8%

*Note: Postpartum costs do not include prenatal or intrapartum care costs. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 19: Nationally Weighted First, Second, and Third Quartiles for Postpartum Costs by Type of Service for Vaginal and Cesarean Childbirths, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	25	117	303	36	135	338	28	121	311
Allowed Paid Amount	13	74	195	20	82	213	15	76	199
Insurer Payments	0	45	142	3	50	157	0	46	145
Out-of-Pocket Payments	1	18	48	4	20	53	2	18	50
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Insurer Payments	0	0	0	0	0	0	0	0	0
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Insurer Payments	0	0	0	0	0	0	0	0	0
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Insurer Payments	0	0	0	0	0	0	0	0	0
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	0	0	30	0	0	34	0	0	32
Allowed Paid Amount	0	0	8	0	0	9	0	0	8
Insurer Payments	0	0	5	0	0	6	0	0	5
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology/Imaging Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Insurer Payments	0	0	0	0	0	0	0	0	0
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	0	50	141	8	61	160	0	53	145
Allowed Paid Amount	0	34	101	5	39	113	0	35	104
Insurer Payments	0	13	61	0	15	67	0	13	62
Out-of-Pocket Payments	0	12	37	1	15	41	0	13	38
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 20: Nationally Weighted Live Birth Numbers, Proportions, and Mean Total Maternal Health Care Costs by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Live Births	51,936			16,041			67,977		
Percent	76%			24%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	22,734	11,425		32,062	14,029		24,921	12,716	
Allowed Paid Amount	12,520	5,636		16,673	7,076		13,494	6,257	
Insurer Payments	10,726	5,525		14,588	6,983		11,631	6,122	
Out-of-Pocket Payments	1,686	1,142		1,948	1,272		1,747	1,179	
Third-Party Payments	107	991		132	1,292		113	1,069	
Facility Fees									
Provider Charges	12,982	8,458	57.1%	20,003	11,101	62.4%	14,628	9,618	58.7%
Allowed Paid Amount	6,738	4,057	53.8%	9,933	5,548	59.6%	7,487	4,653	55.5%
Insurer Payments	5,850	3,879	54.5%	8,851	5,415	60.7%	6,554	4,473	56.3%
Out-of-Pocket Payments	805	718	47.7%	978	825	50.2%	846	748	48.4%
Third-Party Payments	73	740	68.3%	95	996	71.9%	78	807	69.3%
Professional Anesthesiology Fees									
Provider Charges	1,607	1,506	7.1%	1,931	1,463	6.0%	1,683	1,502	6.8%
Allowed Paid Amount	990	890	7.9%	1,192	886	7.1%	1,037	893	7.7%
Insurer Payments	875	837	8.2%	1,063	852	7.3%	919	844	7.9%
Out-of-Pocket Payments	109	188	6.5%	123	190	6.3%	113	189	6.4%
Third-Party Payments	6	84	5.3%	5	76	3.7%	6	82	4.9%
Professional Service Fees									
Provider Charges	4,311	2,426	19.0%	5,701	2,919	17.8%	4,637	2,617	18.6%
Allowed Paid Amount	2,887	1,431	23.1%	3,350	1,531	20.1%	2,996	1,468	22.2%
Insurer Payments	2,505	1,403	23.4%	2,927	1,504	20.1%	2,604	1,438	22.4%
Out-of-Pocket Payments	361	409	21.4%	396	440	20.3%	369	417	21.1%
Third-Party Payments	20	224	19.1%	23	253	17.7%	21	231	18.7%
Laboratory Fees									
Provider Charges	1,325	1,245	5.8%	1,444	1,285	4.5%	1,353	1,256	5.4%
Allowed Paid Amount	507	589	4.0%	547	595	3.3%	516	591	3.8%
Insurer Payments	390	532	3.6%	430	539	2.9%	399	534	3.4%
Out-of-Pocket Payments	120	180	7.1%	121	181	6.2%	121	180	6.9%
Third-Party Payments	2	38	1.9%	2	27	1.3%	2	35	1.7%
Radiology /Imaging Fees									
Provider Charges	1,827	2,098	8.0%	2,197	2,578	6.9%	1,914	2,225	7.7%
Allowed Paid Amount	932	1,029	7.4%	1,107	1,279	6.6%	973	1,095	7.2%
Insurer Payments	763	953	7.1%	918	1,195	6.3%	799	1,017	6.9%
Out-of-Pocket Payments	169	251	10.0%	188	273	9.6%	174	256	9.9%
Third-Party Payments	5	85	4.7%	7	115	4.9%	5	93	4.8%
Pharmacy Fees									
Provider Charges	686	1,673	3.0%	792	1,741	2.5%	711	1,690	2.9%
Allowed Paid Amount	468	1,274	3.7%	549	1,345	3.3%	487	1,291	3.6%
Insurer Payments	344	1,185	3.2%	403	1,239	2.8%	358	1,198	3.1%
Out-of-Pocket Payments	121	168	7.2%	142	184	7.3%	126	172	7.2%
Third-Party Payments	1	64	0.7%	1	16	0.4%	1	57	0.6%

Note: Maternal costs include the 9-month prenatal, intrapartum, and 3-month pospartum periods. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 21: Nationally Weighted First, Second, and Third Quartiles for Total Maternal Health Care Costs by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	15,227	19,989	27,395	22,141	28,638	39,107	16,261	21,840	30,454
Allowed Paid Amount	8,953	11,216	14,480	12,043	14,909	19,339	9,448	12,023	15,760
Insurer Payments	7,312	9,498	12,707	10,140	12,931	17,270	7,761	10,259	13,843
Out-of-Pocket Payments	864	1,572	2,306	1,055	1,847	2,661	904	1,629	2,395
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	7,623	10,818	15,822	12,469	17,167	24,904	8,322	12,091	18,082
Allowed Paid Amount	4,323	5,749	7,903	6,509	8,561	11,551	4,637	6,333	8,855
Insurer Payments	3,574	4,948	7,014	5,531	7,575	10,522	3,847	5,465	7,899
Out-of-Pocket Payments	300	666	1,106	383	854	1,387	313	703	1,177
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	686	1,404	2,200	1,105	1,560	2,360	880	1,440	2,244
Allowed Paid Amount	467	900	1,351	697	988	1,443	572	920	1,370
Insurer Payments	328	796	1,203	604	873	1,314	442	810	1,235
Out-of-Pocket Payments	0	40	154	0	76	162	0	55	156
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	3,135	3,836	4,971	3,994	5,088	6,719	3,257	4,079	5,429
Allowed Paid Amount	2,231	2,662	3,305	2,536	3,063	3,844	2,284	2,750	3,429
Insurer Payments	1,864	2,332	2,948	2,151	2,710	3,432	1,919	2,416	3,069
Out-of-Pocket Payments	39	275	518	54	302	570	40	281	529
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	515	1,026	1,773	594	1,132	1,926	532	1,048	1,809
Allowed Paid Amount	152	321	673	174	361	738	157	330	689
Insurer Payments	73	215	514	99	256	579	79	225	528
Out-of-Pocket Payments	1	54	163	3	55	160	2	55	162
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology /Imaging Fees									
Provider Charges	661	1,197	2,217	750	1,389	2,642	683	1,236	2,303
Allowed Paid Amount	371	648	1,122	418	732	1,313	381	666	1,165
Insurer Payments	242	507	943	285	578	1,101	251	523	977
Out-of-Pocket Payments	0	75	240	0	88	269	0	78	246
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	80	273	660	105	334	775	86	287	685
Allowed Paid Amount	55	191	465	70	231	538	58	200	480
Insurer Payments	17	94	291	23	117	338	18	100	303
Out-of-Pocket Payments	20	70	161	28	83	190	22	73	168
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 22: Nationally Weighted Prenatal and Postpartum Pharmacy Costs for Vaginal and Cesarean Childbirths, 2010 Commercial

Prenatal						
	Vaginal Delivery		Cesarean Delivery		Total	
Number of Live Births	51,936		16,041		67,977	
Percent	76%		24%		100%	
Cost Breakdown	Mean	SD	Mean	SD	Mean	SD
Maternity-Related Pharmacy Costs						
Provider Charges	292	1147	323	1139	299	1145
Allowed Paid Amount	169	859	189	841	173	855
Insurer Payments	131	816	144	786	134	809
Out-of-Pocket Payments	37	84	42	88	38	85
Third-Party Payments	0	46	0	9	0	41
Postpartum						
	Vaginal Delivery		Cesarean Delivery		Total	
Number of Live Births	51,936		16,041		67,977	
Percent	76%		24%		100%	
Cost Breakdown	Mean	SD	Mean	SD	Mean	SD
Maternity-Related Pharmacy Costs						
Provider Charges	57	254	67	238	59	250
Allowed Paid Amount	35	199	40	183	36	196
Insurer Payments	25	191	26	172	25	186
Out-of-Pocket Payments	11	23	14	28	11	24
Third-Party Payments	0	15	0	1	0	13

Note: Prenatal costs incluede the 9-month stage of prenatal care. Postpartum costs include the 3-month postpartum stage of care only.

Table 23: Nationally Weighted First, Second, and Third Quartiles for Prenatal and Postpartum Pharmacy Costs for Vaginal and Cesarean Childbirths, 2010 Commercial

Prenatal									
	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Maternity-Related Pharmacy Costs									
Provider Charges	0	43	188	0	54	225	0	46	197
Allowed Paid Amount	0	25	111	0	32	129	0	27	116
Insurer Payments	0	4	55	0	8	68	0	5	58
Out-of-Pocket Payments	0	11	42	0	15	48	0	12	43
Third-Party Payments	0	0	0	0	0	0	0	0	0
Postpartum									
	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Maternity-Related Pharmacy Costs									
Provider Charges	0	5	42	0	14	58	0	7	46
Allowed Paid Amount	0	4	24	0	8	31	0	5	25
Insurer Payments	0	0	7	0	0	12	0	0	9
Out-of-Pocket Payments	0	1	12	0	5	16	0	3	13
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 24: Live Birth Numbers, Proportions, and Mean Total Maternal Health Care Costs in California by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Delivery			Cesarean Delivery			Total		
California									
Number of Live Births	4,050			1,258			5,308		
Percent	76%			24%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Provider Charges	29,093	12,860		43,173	15,607		32,430	14,823	
Allowed Paid Amount	15,259	6,823		21,307	9,494		16,692	7,968	
Insurer Payments	13,037	6,640		18,588	9,319		14,353	7,731	
Out-of-Pocket Payments	2,054	1,246		2,510	1,367		2,162	1,290	
Third-Party Payments	190	1,528		226	1,877		198	1,617	
Facility Fees									
Provider Charges	20,016	10,764	69%	31,939	13,667	74%	22,842	12,583	70%
Allowed Paid Amount	9,769	5,797	64%	15,157	8,570	71%	11,046	6,949	66%
Insurer Payments	8,513	5,526	65%	13,542	8,380	73%	9,705	6,671	68%
Out-of-Pocket Payments	1,104	893	54%	1,429	1,040	57%	1,181	940	55%
Third-Party Payments	152	1,271	80%	185	1,606	82%	160	1,358	80%
Professional Anesthesiology Fees									
Provider Charges	1,361	1,203	5%	1,621	1,144	4%	1,423	1,195	4%
Allowed Paid Amount	881	839	6%	979	758	5%	904	821	5%
Insurer Payments	792	786	6%	872	729	5%	811	774	6%
Out-of-Pocket Payments	83	146	4%	104	146	4%	88	146	4%
Third-Party Payments	7	79	4%	3	37	1%	6	71	3%
Professional Service Fees									
Provider Charges	3,968	2,181	14%	5,362	2,570	12%	4,298	2,355	13%
Allowed Paid Amount	2,715	1,370	18%	3,104	1,498	15%	2,807	1,411	17%
Insurer Payments	2,279	1,277	17%	2,603	1,399	14%	2,356	1,314	16%
Out-of-Pocket Payments	395	400	19%	437	391	17%	405	398	19%
Third-Party Payments	23	220	12%	29	275	13%	24	234	12%
Laboratory Fees									
Provider Charges	1,263	1,109	4%	1,302	992	3%	1,273	1,082	4%
Allowed Paid Amount	580	648	4%	575	587	3%	579	634	3%
Insurer Payments	422	559	3%	409	470	2%	419	539	3%
Out-of-Pocket Payments	172	200	8%	182	220	7%	174	205	8%
Third-Party Payments	2	38	1%	2	24	1%	2	35	1%
Radiology/Imaging Fees									
Provider Charges	1,941	1,823	7%	2,327	2,628	5%	2,033	2,049	6%
Allowed Paid Amount	945	1,007	6%	1,083	1,265	5%	978	1,075	6%
Insurer Payments	760	894	6%	860	1,122	5%	784	953	5%
Out-of-Pocket Payments	208	263	10%	256	288	10%	219	270	10%
Third-Party Payments	6	89	3%	7	122	3%	6	97	3%
Pharmacy Fees									
Provider Charges	555	1,550	2%	625	1,408	1%	572	1,517	2%
Allowed Paid Amount	368	1,110	2%	412	1,052	2%	378	1,096	2%
Insurer Payments	271	1,053	2%	304	967	2%	279	1,034	2%
Out-of-Pocket Payments	94	130	5%	102	147	4%	96	134	4%
Third-Party Payments	0.01	1	0%	-	-	0%	0.01	1	0%

Note: Maternal costs include the 9-month prenatal, intrapartum, and 3-month postpartum periods. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 25: First, Second, and Third Quartiles for Maternal Health Care Costs in California by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
California									
Total Costs									
Provider Charges	20,000	26,325	35,757	31,470	41,070	53,118	21,565	29,512	40,374
Allowed Paid Amount	10,784	13,878	18,126	14,271	19,295	26,032	11,383	14,955	19,942
Insurer Payments	8,832	11,771	15,954	12,004	16,542	22,999	9,384	12,603	17,422
Out-of-Pocket Payments	1,220	1,901	2,856	1,579	2,413	3,465	1,291	2,004	3,026
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	12,456	17,563	25,138	22,157	29,968	40,188	13,835	20,033	29,309
Allowed Paid Amount	6,105	8,519	11,676	9,350	12,894	19,035	6,601	9,469	13,424
Insurer Payments	5,146	7,381	10,300	7,862	11,348	17,131	5,579	8,132	11,831
Out-of-Pocket Payments	466	957	1,572	720	1,325	2,030	505	1,019	1,714
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	0	1,273	2,000	1,080	1,317	1,980	780	1,275	1,999
Allowed Paid Amount	235	809	1,224	585	784	1,176	468	798	1,213
Insurer Payments	0	710	1,102	502	689	1,056	352	701	1,095
Out-of-Pocket Payments	0	0	122	0	72	140	0	33	127
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	2,953	3,649	4,735	4,045	5,024	6,557	3,087	3,953	5,250
Allowed Paid Amount	2,139	2,447	3,039	2,384	2,811	3,485	2,183	2,521	3,165
Insurer Payments	1,743	2,101	2,619	1,952	2,394	3,006	1,791	2,158	2,723
Out-of-Pocket Payments	95	314	541	155	382	608	103	329	558
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	563	1,007	1,660	620	1,102	1,764	575	1,028	1,686
Allowed Paid Amount	171	362	803	192	379	808	176	365	804
Insurer Payments	70	226	596	92	244	574	76	229	590
Out-of-Pocket Payments	30	107	237	39	114	234	32	109	236
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology /Imaging Fees									
Provider Charges	788	1,455	2,505	805	1,617	2,898	790	1,483	2,591
Allowed Paid Amount	350	691	1,204	364	730	1,359	353	705	1,233
Insurer Payments	219	540	999	236	549	1,078	225	543	1,018
Out-of-Pocket Payments	25	126	294	45	169	372	30	138	310
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	50	194	547	63	254	605	52	204	563
Allowed Paid Amount	30	123	390	34	135	425	30	127	400
Insurer Payments	9	65	234	11	74	248	10	67	239
Out-of-Pocket Payments	10	43	127	10	46	144	10	45	130
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 26: Live Birth Numbers, Proportions, and Mean Total Maternal Health Care Costs in Illinois by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Delivery			Cesarean Delivery			Total		
Illinois									
Number of Live Births	2,348			680			3,028		
Percent	78%			0			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Provider Charges	22,262	10,578		31,499	11,709		24,336	11,505	
Allowed Paid Amount	11,692	4,714		15,602	5,970		12,570	5,281	
Insurer Payments	9,531	4,503		13,180	5,735		10,351	5,042	
Out-of-Pocket Payments	1,983	1,086		2,190	1,054		2,030	1,082	
Third-Party Payments	163	1,323		209	1,876		173	1,465	
Facility Fees									
Provider Charges	12,199	7,224	55%	19,059	8,839	61%	13,740	8,135	56%
Allowed Paid Amount	5,598	3,291	48%	8,376	4,516	54%	6,221	3,784	49%
Insurer Payments	4,618	2,937	48%	7,208	4,011	55%	5,199	3,386	50%
Out-of-Pocket Payments	859	713	43%	995	785	45%	889	732	44%
Third-Party Payments	118	1,052	72%	150	1,421	72%	125	1,145	72%
Professional Anesthesiology Fees									
Provider Charges	1,449	1,145	7%	1,885	1,201	6%	1,547	1,172	6%
Allowed Paid Amount	888	648	8%	1,081	738	7%	931	674	7%
Insurer Payments	745	590	8%	928	692	7%	786	619	8%
Out-of-Pocket Payments	130	168	7%	138	165	6%	132	167	6%
Third-Party Payments	11	126	7%	15	234	7%	12	157	7%
Professional Service Fees									
Provider Charges	4,693	2,159	21%	6,482	2,724	21%	5,095	2,416	21%
Allowed Paid Amount	3,203	1,084	27%	4,006	1,505	26%	3,383	1,238	27%
Insurer Payments	2,671	1,103	28%	3,409	1,554	26%	2,837	1,257	27%
Out-of-Pocket Payments	503	416	25%	561	466	26%	516	428	25%
Third-Party Payments	24	239	15%	32	315	15%	26	258	15%
Laboratory Fees									
Provider Charges	1,297	1,541	6%	1,345	1,327	4%	1,308	1,496	5%
Allowed Paid Amount	524	876	4%	556	820	4%	531	864	4%
Insurer Payments	401	784	4%	446	786	3%	411	784	4%
Out-of-Pocket Payments	120	202	6%	113	164	5%	119	194	6%
Third-Party Payments	4	44	2%	4	32	2%	4	41	2%
Radiology/Imaging Fees									
Provider Charges	1,999	2,236	9%	2,064	1,848	7%	2,013	2,155	8%
Allowed Paid Amount	998	943	9%	1,053	888	7%	1,010	931	8%
Insurer Payments	746	854	8%	800	793	6%	758	841	7%
Out-of-Pocket Payments	244	273	12%	242	278	11%	243	274	12%
Third-Party Payments	7	80	4%	9	93	4%	7	83	4%
Pharmacy Fees									
Provider Charges	629	1,548	3%	664	1,183	2%	636	1,474	3%
Allowed Paid Amount	486	1,315	4%	531	1,041	3%	496	1,259	4%
Insurer Payments	355	1,159	4%	389	893	3%	362	1,105	4%
Out-of-Pocket Payments	127	237	6%	140	201	6%	130	229	6%
Third-Party Payments	-	-	0%	-	-	0%	-	-	0%

Note: Maternal costs include the 9-month prenatal, intrapartum, and 3-month postpartum periods. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 27: First, Second, and Third Quartiles for Maternal Health Care Costs in Illinois by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Illinois									
Total Costs									
Provider Charges	15,678	20,426	26,732	23,945	29,169	36,509	16,919	22,293	29,304
Allowed Paid Amount	8,632	10,673	13,497	11,747	14,198	17,388	9,107	11,461	14,536
Insurer Payments	6,761	8,697	11,276	9,553	12,001	14,981	7,153	9,348	12,270
Out-of-Pocket Payments	1,298	1,828	2,467	1,544	2,113	2,718	1,335	1,899	2,526
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	7,618	10,763	15,133	13,528	17,337	22,382	8,402	12,309	17,148
Allowed Paid Amount	3,338	4,921	6,819	5,534	7,368	9,831	3,645	5,459	7,573
Insurer Payments	2,662	4,042	5,780	4,630	6,242	8,518	2,937	4,494	6,471
Out-of-Pocket Payments	423	688	1,121	521	880	1,385	447	731	1,171
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	864	1,500	2,000	1,263	1,600	2,267	1,008	1,500	2,000
Allowed Paid Amount	740	825	1,008	707	880	1,331	720	825	1,139
Insurer Payments	492	743	919	594	756	1,166	553	743	958
Out-of-Pocket Payments	0	83	165	10	98	178	0	83	172
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	3,625	4,480	5,525	4,858	6,063	7,415	3,787	4,741	6,001
Allowed Paid Amount	2,831	3,220	3,567	3,453	3,913	4,406	2,946	3,312	3,808
Insurer Payments	2,228	2,688	3,115	2,766	3,313	3,897	2,328	2,784	3,304
Out-of-Pocket Payments	260	438	660	281	489	762	264	449	683
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	469	919	1,578	587	1,010	1,656	500	942	1,602
Allowed Paid Amount	161	308	573	209	336	633	171	313	589
Insurer Payments	80	203	424	120	245	481	87	214	434
Out-of-Pocket Payments	18	64	150	20	61	136	18	62	147
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology /Imaging Fees									
Provider Charges	837	1,399	2,436	971	1,576	2,545	862	1,447	2,453
Allowed Paid Amount	485	760	1,216	535	844	1,302	496	778	1,242
Insurer Payments	275	541	937	352	606	1,067	291	553	955
Out-of-Pocket Payments	45	170	355	48	165	357	45	168	357
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	69	264	606	96	285	713	74	270	625
Allowed Paid Amount	46	205	488	68	214	577	51	209	508
Insurer Payments	14	105	311	24	126	381	17	110	326
Out-of-Pocket Payments	15	70	165	21	77	180	18	71	168
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 28: Live Birth Numbers, Proportions, and Mean Total Maternal Health Care Costs in Louisiana by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Delivery			Cesarean Delivery			Total		
Louisiana									
Number of Live Births	447			223			670		
Percent	67%			33%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Provider Charges	20,352	9,591		28,561	13,205		23,084	11,583	
Allowed Paid Amount	10,318	4,642		13,943	7,167		11,524	5,859	
Insurer Payments	8,280	4,495		11,697	7,192		9,418	5,765	
Out-of-Pocket Payments	1,867	1,053		2,115	1,131		1,950	1,085	
Third-Party Payments	165	1,050		141	1,233		157	1,114	
Facility Fees									
Provider Charges	12,047	7,258	59%	17,627	10,547	62%	13,904	8,885	60%
Allowed Paid Amount	5,365	3,486	52%	7,711	5,334	55%	6,145	4,332	53%
Insurer Payments	4,329	3,227	52%	6,536	5,313	56%	5,064	4,170	54%
Out-of-Pocket Payments	899	705	48%	1,077	750	51%	958	725	49%
Third-Party Payments	120	776	72%	105	1,177	75%	115	928	73%
Professional Anesthesiology Fees									
Provider Charges	1,548	1,480	8%	1,912	1,347	7%	1,669	1,446	7%
Allowed Paid Amount	860	717	8%	1,034	872	7%	918	776	8%
Insurer Payments	701	659	8%	871	843	7%	757	729	8%
Out-of-Pocket Payments	149	218	8%	157	218	7%	152	218	8%
Third-Party Payments	7	60	4%	1	14	1%	5	50	3%
Professional Service Fees									
Provider Charges	3,442	2,718	17%	4,817	1,890	17%	3,900	2,555	17%
Allowed Paid Amount	2,322	901	23%	2,925	1,052	21%	2,522	995	22%
Insurer Payments	1,890	895	23%	2,481	1,095	21%	2,087	1,004	22%
Out-of-Pocket Payments	405	411	22%	415	369	20%	408	397	21%
Third-Party Payments	30	231	18%	29	216	21%	30	226	19%
Laboratory Fees									
Provider Charges	1,109	1,107	5%	1,338	1,252	5%	1,185	1,162	5%
Allowed Paid Amount	416	506	4%	500	576	4%	444	531	4%
Insurer Payments	318	459	4%	413	521	4%	350	483	4%
Out-of-Pocket Payments	104	182	6%	88	139	4%	99	169	5%
Third-Party Payments	2	20	1%	3	26	2%	2	22	1%
Radiology/Imaging Fees									
Provider Charges	1,349	1,382	7%	1,836	2,077	6%	1,511	1,661	7%
Allowed Paid Amount	736	790	7%	982	1,103	7%	818	913	7%
Insurer Payments	608	764	7%	826	1,006	7%	681	857	7%
Out-of-Pocket Payments	126	187	7%	159	256	8%	137	213	7%
Third-Party Payments	7	80	4%	2	23	2%	6	67	4%
Pharmacy Fees									
Provider Charges	857	1,854	4%	1,030	1,975	4%	914	1,895	4%
Allowed Paid Amount	620	1,569	6%	792	1,763	6%	678	1,637	6%
Insurer Payments	434	1,447	5%	571	1,675	5%	480	1,527	5%
Out-of-Pocket Payments	184	211	10%	220	192	10%	196	205	10%
Third-Party Payments	-	-	0%	-	-	0%	-	-	0%

Note: Maternal costs include the 9-month prenatal, intrapartum, and 3-month postpartum periods. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 29: First, Second, and Third Quartiles for Maternal Health Care Costs in Louisiana by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Louisiana									
Total Costs									
Provider Charges	14,103	17,533	23,865	20,443	25,122	33,480	15,449	20,176	26,768
Allowed Paid Amount	7,648	9,523	11,370	10,078	12,893	15,814	8,351	10,310	13,318
Insurer Payments	5,763	7,646	9,412	7,909	10,409	13,252	6,353	8,264	10,933
Out-of-Pocket Payments	1,094	1,787	2,489	1,242	2,013	2,821	1,161	1,868	2,604
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	7,796	10,108	13,815	11,095	14,769	20,708	8,520	11,541	16,293
Allowed Paid Amount	3,394	4,613	6,582	5,088	6,738	9,181	3,818	5,348	7,332
Insurer Payments	2,558	3,826	5,229	4,055	5,772	7,715	2,979	4,262	6,080
Out-of-Pocket Payments	395	723	1,242	500	902	1,524	426	789	1,331
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	880	1,350	1,955	1,050	1,470	2,560	970	1,350	2,200
Allowed Paid Amount	461	750	1,120	576	750	1,203	530	750	1,150
Insurer Payments	324	595	896	472	658	1,008	391	617	960
Out-of-Pocket Payments	0	93	187	0	107	186	0	97	186
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	2,700	3,204	3,935	3,750	4,392	5,614	2,935	3,551	4,497
Allowed Paid Amount	2,035	2,267	2,654	2,316	2,797	3,480	2,066	2,384	2,920
Insurer Payments	1,564	1,936	2,247	1,916	2,373	3,013	1,646	2,035	2,483
Out-of-Pocket Payments	89	322	556	90	389	618	90	339	586
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	380	802	1,578	462	1,025	2,045	406	873	1,670
Allowed Paid Amount	107	267	527	131	339	641	114	275	572
Insurer Payments	55	165	419	70	205	563	60	178	474
Out-of-Pocket Payments	2	29	121	0	23	130	2	26	125
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology /Imaging Fees									
Provider Charges	625	934	1,555	750	1,225	2,055	645	1,014	1,739
Allowed Paid Amount	338	522	854	420	639	1,094	364	559	927
Insurer Payments	225	415	705	309	540	967	255	447	786
Out-of-Pocket Payments	0	56	185	0	64	222	0	59	195
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	146	379	801	228	548	1,034	174	421	916
Allowed Paid Amount	97	289	589	189	386	723	123	322	658
Insurer Payments	34	132	337	66	179	456	43	150	373
Out-of-Pocket Payments	47	124	239	91	166	310	57	139	265
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 30: Live Birth Numbers, Proportions, and Mean Total Maternal Health Care Costs in Massachusetts by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Delivery			Cesarean Delivery			Total		
Massachusetts									
Number of Live Births	1,223			185			1,408		
Percent	87%			13%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Provider Charges	27,496	11,165.6		33,140	13,431		28,238	11,641	
Allowed Paid Amount	16,888	6,040		20,620	7,291		17,379	6,343	
Insurer Payments	15,880	6,283		19,359	7,342		16,337	6,536	
Out-of-Pocket Payments	989	1,143		1,287	1,221		1,028	1,157	
Third-Party Payments	37	694		-	-		32	647	
Facility Fees									
Provider Charges	13,972	8,204	51%	18,435	10,202	56%	14,558	8,622	52%
Allowed Paid Amount	8,854	3,932	52%	12,295	5,136	60%	9,306	4,270	54%
Insurer Payments	8,379	3,973	53%	11,657	5,064	60%	8,810	4,276	54%
Out-of-Pocket Payments	466	630	47%	661	695	51%	491	642	48%
Third-Party Payments	26	558	70%	-	-	0%	23	520	70%
Professional Anesthesiology Fees									
Provider Charges	2,200	1,623	8%	2,365	1,596	7%	2,221	1,620	8%
Allowed Paid Amount	1,373	912	8%	1,432	1,067	7%	1,381	934	8%
Insurer Payments	1,302	879	8%	1,342	1,025	7%	1,308	899	8%
Out-of-Pocket Payments	65	163	7%	91	208	7%	69	170	7%
Third-Party Payments	6	143	15%	-	-	0%	5	133	15%
Professional Service Fees									
Provider Charges	5,794	2,044	21%	6,613	1,898	20%	5,902	2,043	21%
Allowed Paid Amount	3,969	1,483	24%	4,070	1,318	20%	3,983	1,463	23%
Insurer Payments	3,766	1,563	24%	3,832	1,373	20%	3,775	1,539	23%
Out-of-Pocket Payments	200	329	20%	238	316	19%	205	328	20%
Third-Party Payments	4	84	9%	-	-	0%	3	78	9%
Laboratory Fees									
Provider Charges	1,830	1,582	7%	1,796	1,589	5%	1,826	1,582	6%
Allowed Paid Amount	800	809	5%	785	814	4%	798	810	5%
Insurer Payments	733	775	5%	716	777	4%	731	775	4%
Out-of-Pocket Payments	68	162	7%	70	145	5%	68	160	7%
Third-Party Payments	0	0	0%	-	-	0%	0	0	0%
Radiology/Imaging Fees									
Provider Charges	3,024	2,528	11%	3,381	4,318	10%	3,071	2,829	11%
Allowed Paid Amount	1,433	1,219	8%	1,648	2,076	8%	1,461	1,364	8%
Insurer Payments	1,325	1,174	8%	1,513	1,976	8%	1,350	1,308	8%
Out-of-Pocket Payments	106	237	11%	137	307	11%	110	248	11%
Third-Party Payments	2	32	5%	-	-	0%	2	30	5%
Pharmacy Fees									
Provider Charges	677	1,787	2%	562	1,498	2%	662	1,751	2%
Allowed Paid Amount	459	1,412	3%	396	1,211	2%	451	1,387	3%
Insurer Payments	375	1,363	2%	304	1,140	2%	365	1,335	2%
Out-of-Pocket Payments	84	117	8%	92	135	7%	85	119	8%
Third-Party Payments	-	-	0%	-	-	0%	-	-	0%

Note: Maternal costs include the 9-month prenatal, intrapartum, and 3-month postpartum periods. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 31: First, Second, and Third Quartiles for Maternal Health Care Costs in Massachusetts by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Massachusetts									
Total Costs									
Provider Charges	19,802	25,447	33,230	23,246	29,394	41,980	20,146	25,886	34,004
Allowed Paid Amount	12,951	15,913	19,256	15,890	18,839	23,585	13,275	16,296	19,669
Insurer Payments	11,736	15,065	18,543	14,492	17,590	22,038	12,141	15,394	18,910
Out-of-Pocket Payments	61	390	1,781	129	1,139	2,030	67	435	1,823
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	7,796	12,866	17,886	10,396	16,205	24,310	8,176	13,111	18,560
Allowed Paid Amount	6,611	8,413	9,810	9,361	11,407	13,949	6,759	8,478	10,480
Insurer Payments	5,994	8,025	9,511	8,540	11,232	13,759	6,178	8,332	10,053
Out-of-Pocket Payments	0	150	788	0	485	1,120	0	200	850
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	1,300	2,250	2,912	1,500	1,785	2,875	1,400	2,200	2,903
Allowed Paid Amount	805	1,438	1,977	803	1,204	1,610	804	1,405	1,896
Insurer Payments	739	1,333	1,883	759	1,125	1,552	748	1,294	1,812
Out-of-Pocket Payments	0	0	77	0	0	104	0	0	83
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	4,680	5,788	6,925	5,287	6,462	7,880	4,748	5,917	7,004
Allowed Paid Amount	3,085	3,842	4,868	3,219	3,884	5,079	3,102	3,848	4,884
Insurer Payments	2,809	3,629	4,762	2,889	3,652	4,728	2,817	3,641	4,755
Out-of-Pocket Payments	0	14	365	0	33	403	0	15	376
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	787	1,531	2,459	787	1,446	2,405	787	1,520	2,456
Allowed Paid Amount	287	572	1,056	288	549	1,092	288	565	1,069
Insurer Payments	237	524	974	242	478	1,006	238	518	975
Out-of-Pocket Payments	0	0	46	0	0	60	0	0	48
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology /Imaging Fees									
Provider Charges	1,400	2,351	3,799	1,200	2,114	3,485	1,382	2,322	3,763
Allowed Paid Amount	701	1,074	1,762	638	995	1,734	691	1,067	1,761
Insurer Payments	605	1,020	1,660	515	929	1,526	596	1,002	1,641
Out-of-Pocket Payments	0	0	109	0	0	171	0	0	115
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	55	187	539	27	150	551	51	184	539
Allowed Paid Amount	34	121	344	20	92	320	33	119	341
Insurer Payments	8	61	220	2	53	217	7	59	219
Out-of-Pocket Payments	16	47	109	10	40	120	15	46	110
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 32: Live Birth Numbers, Proportions, and Mean Total Maternal Health Care Costs in Minnesota by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Delivery			Cesarean Delivery			Total		
Minnesota									
Number of Live Births	634			146			780		
Percent	81%			19%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Provider Charges	18,725	8,496		27,279	11,559		20,326	9,730	
Allowed Paid Amount	12,130	4,891		17,109	5,035		13,062	5,285	
Insurer Payments	10,094	4,895		15,143	5,104		11,039	5,311	
Out-of-Pocket Payments	1,971	1,105		1,921	1,121		1,962	1,108	
Third-Party Payments	82	781		59	637		78	756	
Facility Fees									
Provider Charges	10,874	6,285	58%	17,497	9,366	64%	12,114	7,423	60%
Allowed Paid Amount	6,218	2,839	51%	10,307	4,140	60%	6,984	3,505	53%
Insurer Payments	5,239	2,753	52%	9,189	4,094	61%	5,978	3,414	54%
Out-of-Pocket Payments	937	683	48%	1,056	722	55%	959	692	49%
Third-Party Payments	52	490	63%	56	636	95%	53	520	68%
Professional Anesthesiology Fees									
Provider Charges	790	626	4%	1,415	970	5%	907	743	4%
Allowed Paid Amount	577	478	5%	982	671	6%	653	542	5%
Insurer Payments	479	433	5%	861	630	6%	551	498	5%
Out-of-Pocket Payments	99	172	5%	122	196	6%	103	176	5%
Third-Party Payments	1	34	2%	-	-	0%	1	31	1%
Professional Service Fees									
Provider Charges	4,370	1,562	23%	5,174	1,369	19%	4,521	1,559	22%
Allowed Paid Amount	3,570	1,216	29%	3,937	1,259	23%	3,638	1,231	28%
Insurer Payments	2,985	1,220	30%	3,538	1,170	23%	3,089	1,229	28%
Out-of-Pocket Payments	560	529	28%	402	447	21%	530	518	27%
Third-Party Payments	25	272	31%	2	26	4%	21	246	27%
Laboratory Fees									
Provider Charges	815	848	4%	902	700	3%	831	823	4%
Allowed Paid Amount	483	571	4%	521	462	3%	490	552	4%
Insurer Payments	379	551	4%	435	448	3%	390	534	4%
Out-of-Pocket Payments	104	167	5%	93	161	5%	102	166	5%
Third-Party Payments	2	38	3%	1	11	2%	2	34	3%
Radiology/Imaging Fees									
Provider Charges	1,197	1,244	6%	1,587	2,984	6%	1,270	1,714	6%
Allowed Paid Amount	882	901	7%	1,069	1,348	6%	917	1,001	7%
Insurer Payments	693	845	7%	901	1,157	6%	732	915	7%
Out-of-Pocket Payments	192	303	10%	176	366	9%	189	316	10%
Third-Party Payments	1	19	1%	0	1	0%	1	17	1%
Pharmacy Fees									
Provider Charges	679	2,609	4%	705	1,939	3%	684	2,497	3%
Allowed Paid Amount	400	2,029	3%	293	648	2%	380	1,850	3%
Insurer Payments	319	1,939	3%	219	573	1%	300	1,766	3%
Out-of-Pocket Payments	80	154	4%	73	107	4%	79	146	4%
Third-Party Payments	-	-	0%	-	-	0%	-	-	0%

Note: Maternal costs include the 9-month prenatal, intrapartum, and 3-month postpartum periods. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 33: First, Second, and Third Quartiles for Maternal Health Care Costs in Minnesota by Type of Service for Vaginal and Cesarean Deliveries, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Minnesota									
Total Costs									
Provider Charges	14,117	16,884	21,215	20,134	24,120	33,352	14,817	18,014	23,397
Allowed Paid Amount	9,574	11,123	13,361	13,702	17,010	19,150	9,897	11,730	15,025
Insurer Payments	7,621	9,113	11,512	11,846	15,069	17,275	7,849	9,707	13,153
Out-of-Pocket Payments	1,221	1,853	2,544	1,039	1,801	2,535	1,173	1,846	2,541
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	7,161	9,618	12,862	11,465	15,028	22,142	7,519	10,320	14,287
Allowed Paid Amount	4,549	5,321	7,186	7,594	9,668	11,385	4,686	5,782	8,511
Insurer Payments	3,817	4,509	6,051	6,772	8,557	10,814	3,943	4,881	7,397
Out-of-Pocket Payments	488	813	1,178	474	929	1,521	487	833	1,225
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	0	1,082	1,190	845	1,500	2,052	0	1,082	1,190
Allowed Paid Amount	0	730	900	493	1,037	1,387	0	741	976
Insurer Payments	0	538	793	390	941	1,213	0	609	867
Out-of-Pocket Payments	0	50	118	0	62	142	0	51	129
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	3,826	4,342	4,835	4,440	5,066	5,711	3,899	4,434	5,053
Allowed Paid Amount	3,003	3,478	4,118	3,161	3,864	4,747	3,025	3,520	4,220
Insurer Payments	2,410	2,990	3,516	2,817	3,301	4,210	2,463	3,045	3,675
Out-of-Pocket Payments	245	461	758	60	268	578	160	436	747
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	379	628	1,026	476	760	1,204	393	656	1,060
Allowed Paid Amount	208	345	578	220	352	650	210	347	602
Insurer Payments	92	252	457	159	284	565	102	260	470
Out-of-Pocket Payments	0	34	143	2	35	105	0	34	138
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology /Imaging Fees									
Provider Charges	509	876	1,433	647	1,033	1,822	517	906	1,470
Allowed Paid Amount	380	655	1,123	377	774	1,291	380	682	1,146
Insurer Payments	224	493	877	275	617	1,089	234	511	916
Out-of-Pocket Payments	0	72	269	0	61	219	0	70	263
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	38	142	424	42	130	472	39	139	437
Allowed Paid Amount	22	91	246	20	73	267	22	88	253
Insurer Payments	1	41	133	0	39	177	0	41	135
Out-of-Pocket Payments	7	36	96	11	32	92	8	34	95
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 34: Nationally Weighted Live Birth Numbers, Proportions, and Mean Newborn Care Costs Covering Care at Birth and In the First Three Months of Life Following Vaginal and Cesarean Births, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Newborns	30,453			14,168			44,621		
Percent	68%			32%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	9,359	25,835		19,063	47,867		12,419	34,640	
Allowed Paid Amount	5,809	16,708		11,193	28,749		7,507	21,401	
Insurer Payments	5,205	16,413		10,361	28,252		6,831	21,021	
Out-of-Pocket Payments	558	649		721	901		609	741	
Third-Party Payments	46	1,402		135	3,227		74	2,152	
Facility Fees									
Provider Charges	6,682	21,527	71%	14,703	40,229	77%	9,211	29,010	74%
Allowed Paid Amount	4,103	13,983	71%	8,426	23,836	75%	5,466	17,807	73%
Insurer Payments	3,732	13,837	72%	7,924	23,583	76%	5,054	17,614	74%
Out-of-Pocket Payments	330	335	59%	408	397	57%	355	356	58%
Third-Party Payments	39	1,350	85%	116	3,032	86%	63	2,037	86%
Professional Fees									
Provider Charges	2,496	5,052	27%	4,091	8,989	21%	2,999	6,596	24%
Allowed Paid Amount	1,606	3,245	28%	2,607	5,970	23%	1,922	4,320	26%
Insurer Payments	1,394	3,062	27%	2,306	5,713	22%	1,682	4,110	25%
Out-of-Pocket Payments	206	294	37%	285	574	39%	231	406	38%
Third-Party Payments	7	223	14%	18	423	13%	10	301	14%
Laboratory Fees									
Provider Charges	72	335	0.8%	77	397	0%	73	356	1%
Allowed Paid Amount	33	158	0.6%	37	198	0%	34	172	0%
Insurer Payments	24	145	0.5%	28	185	0%	26	158	0%
Out-of-Pocket Payments	8	34	1.5%	8	37	1%	8	35	1%
Third-Party Payments	0	5	0.1%	0	4	0%	0	5	0%
Radiology/Imaging Fees									
Provider Charges	65	331	0.7%	115	437	0.6%	81	369	0.6%
Allowed Paid Amount	34	233	0.6%	57	219	0.5%	42	229	0.6%
Insurer Payments	29	223	0.6%	48	199	0.5%	35	216	0.5%
Out-of-Pocket Payments	5	32	0.9%	9	47	1.3%	6	37	1.1%
Third-Party Payments	0	5	0.2%	0	13	0.2%	0	8	0.2%
Pharmacy Fees									
Provider Charges	44	400	0.5%	77	459	0.4%	55	420	0.4%
Allowed Paid Amount	33	252	0.6%	66	413	0.6%	43	312	0.6%
Insurer Payments	25	237	0.5%	55	398	0.5%	34	298	0.5%
Out-of-Pocket Payments	8	30	1.4%	11	31	1.5%	9	31	1.5%
Third-Party Payments	0	12	0.3%	0	36	0.3%	0	22	0.4%

Note: The number of newborns may differ from the live birth numbers shown in the maternal costs tables because newborns were identified using a different criteria and did not depend on a linked mothers and newborns. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 35: Nationally Weighted First, Second, and Third Quartiles for Newborn Care Costs Covering Care at Birth and In the First Three Months of Life Following Vaginal and Cesarean Births, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	3,231	4,437	6,662	4,381	6,317	11,299	3,494	4,925	7,843
Allowed Paid Amount	2,150	2,762	3,833	2,720	3,660	5,957	2,281	2,994	4,413
Insurer Payments	1,723	2,335	3,319	2,242	3,125	5,190	1,852	2,541	3,817
Out-of-Pocket Payments	170	396	709	205	507	939	180	425	772
Third-Party Payments	0	0	0	0	0	0	0	0	0
Facility Fees									
Provider Charges	1,707	2,610	4,368	2,581	4,068	8,175	1,890	2,986	5,285
Allowed Paid Amount	1,107	1,613	2,406	1,524	2,281	4,189	1,200	1,775	2,870
Insurer Payments	873	1,352	2,162	1,254	1,968	3,675	960	1,511	2,530
Out-of-Pocket Payments	0	199	424	0	242	542	0	209	460
Third-Party Payments	0	0	0	0	0	0	0	0	0
Professional Fees									
Provider Charges	1,239	1,658	2,280	1,475	2,024	2,974	1,300	1,759	2,479
Allowed Paid Amount	834	1,081	1,441	961	1,267	1,846	866	1,131	1,553
Insurer Payments	687	917	1,242	785	1,075	1,598	714	960	1,334
Out-of-Pocket Payments	54	124	264	60	154	340	59	132	287
Third-Party Payments	0	0	0	0	0	0	0	0	0
Laboratory Fees									
Provider Charges	0	0	49	0	0	43	0	0	47
Allowed Paid Amount	0	0	17	0	0	15	0	0	16
Insurer Payments	0	0	8	0	0	7	0	0	8
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Radiology/Imaging Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Insurer Payments	0	0	0	0	0	0	0	0	0
Out-of-Pocket Payments	0	0	0	0	0	0	0	0	0
Third-Party Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	0	0	15	0	0	22	0	0	18
Allowed Paid Amount	0	0	10	0	0	16	0	0	12
Insurer Payments	0	0	0	0	0	2	0	0	0
Out-of-Pocket Payments	0	0	5	0	0	8	0	0	6
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 36: Top 50 Diagnoses for Newborns by Childbirth Type, 2010 Commercial

Vaginal Childbirth		Cesarean Childbirth	
Diagnoses	Number	Diagnoses	Number
OTH85-Encounter for Preventive Health Services	30,026	OTH85-Encounter for Preventive Health Services	13,961
PED86-Live Newborns	29,816	PED86-Live Newborns	13,638
HEM11-Hemolytic Disease of the Newborn	8,360	OTH87-Encounter Related to Other Treatment	4,237
OTH87-Encounter Related to Other Treatment	8,341	PED85-Other Neonatal Conditions	3,894
PED85-Other Neonatal Conditions	7,565	PED84-Other Maternal Conditions Affecting Newborn	3,571
OTH92-General Signs, Symptoms, and Ill-Defined Conditions	5,414	HEM11-Hemolytic Disease of the Newborn	2,969
NUT81-Other Nutritional and Metabolic Disorders	3,904	OTH92-General Signs, Symptoms, and Ill-Defined Conditions	2,453
ENT82-Other Ear, Nose, and Throat Infections	3,246	NUT81-Other Nutritional and Metabolic Disorders	2,031
SKN82-Other Inflammations and Infections of Skin and Subcutaneous Tissu	2,992	PED20-Hyaline Membrane Disease/Respiratory Distress Syndrome	1,821
GIS20-Hernia, Hiatal or Reflux Esophagitis	2,759	ENT82-Other Ear, Nose, and Throat Infections	1,696
GIS87-Other Gastrointestinal or Abdominal Symptoms	2,126	GIS20-Hernia, Hiatal or Reflux Esophagitis	1,586
PED84-Other Maternal Conditions Affecting Newborn	1,923	SKN82-Other Inflammations and Infections of Skin and Subcutaneous Tissu	1,433
ENT81-Other Ear, Nose and Throat Disorders	1,914	PED27-Prematurity: Low Birthweight	1,403
PED20-Hyaline Membrane Disease/Respiratory Distress Syndrome	1,710	GIS87-Other Gastrointestinal or Abdominal Symptoms	1,154
PED27-Prematurity: Low Birthweight	1,562	ENT81-Other Ear, Nose and Throat Disorders	989
PED25-Postmaturity	1,542	PED25-Postmaturity	882
PED16-Bacterial and Fungal Infections of the Newborn	1,247	RES86-Other Respiratory Symptoms	771
MGS81-Other Disorders of Male Genital System	1,141	MGS81-Other Disorders of Male Genital System	620
RES86-Other Respiratory Symptoms	973	PED16-Bacterial and Fungal Infections of the Newborn	563
GIS16-Functional Digestive Disorders	906	RES24-Rhino, Adeno, and Corona Virus Infections	538
RES24-Rhino, Adeno, and Corona Virus Infections	904	GIS16-Functional Digestive Disorders	496
EYE02-Conjunctivitis: Bacterial	887	MUS80-Anomaly: Musculoskeletal System	491
OTH84-Encounter for Other Administrative Reasons	784	CVS84-Other Cardiovascular Symptoms	452
INF03-Candida (Monilial) Infections	780	EYE02-Conjunctivitis: Bacterial	432
CVS84-Other Cardiovascular Symptoms	727	OTH84-Encounter for Other Administrative Reasons	399
ENT18-Otitis Media	660	MUS83-Other Arthropathies, Bone and Joint Disorders	365
PED22-Meconium Aspiration Syndrome	646	PED02-Anomaly: Atrial Septal Defect	363
EYE06-Dacryostenosis or Dacryocystitis	628	INF03-Candida (Monilial) Infections	362
EYE82-Other Eye Disorders	612	ENT18-Otitis Media	359
INF85-Other Viral Infections	545	EYE82-Other Eye Disorders	334
MUS80-Anomaly: Musculoskeletal System	545	RES83-Other Disorders of Respiratory System	333
GIS85-Other Gastrointestinal Disorders	515	EYE06-Dacryostenosis or Dacryocystitis	296
OTH80-Abnormal Lab, X-ray and Clinical Findings	455	GIS85-Other Gastrointestinal Disorders	292
PED02-Anomaly: Atrial Septal Defect	430	PED19-Full Term Infant with Abnormal Birth Weight	290
MUS83-Other Arthropathies, Bone and Joint Disorders	412	INF85-Other Viral Infections	272
RES23-Respiratory Syncytial Virus Infections	404	RES23-Respiratory Syncytial Virus Infections	258
OTH88-Factors Influencing Health Status	395	GUS83-Other Disorders of Kidney or Ureter	226
PED19-Full Term Infant with Abnormal Birth Weight	393	OTH80-Abnormal Lab, X-ray and Clinical Findings	225
GUS83-Other Disorders of Kidney or Ureter	385	OTH88-Factors Influencing Health Status	225
GIS81-Gastroenteritis	370	GIS81-Gastroenteritis	205
MUS86-Other Spinal and Back Disorders: Cervical	356	CVS03-Anomaly: Patent Ductus Arteriosus	204
RES83-Other Disorders of Respiratory System	349	EYE31-Prematurity: Retinopathy	199
GIS19-Hernia, External	286	GIS19-Hernia, External	190
PED21-Injury: To Newborn During Delivery	233	PED22-Meconium Aspiration Syndrome	176
TRA81-Injury: Other	218	MUS86-Other Spinal and Back Disorders: Cervical	160
PED06-Anomaly: Defects of Kidney	213	PED28-Prematurity: Very Low Birthweight	145
SKN05-Infections of Skin and Subcutaneous Tissue	209	CVS06-Arrhythmias	128
GIS84-Other Diseases of Esophagus, Stomach, and Duodenum	198	PED06-Anomaly: Defects of Kidney	128
PED15-Anomaly: Ventricular Septal Defects	198	PED15-Anomaly: Ventricular Septal Defects	127
SKN10-Pilonidal Cyst	197	SKN10-Pilonidal Cyst	116

Table 37: Nationally Weighted Live Birth Numbers, Proportions, and Mean Newborn s Care Costs Covering Birth and Three Months Post Birth for Hospitalizations that included Neonatal Intensive Care Unit Stays, 2010 Commercial

	Vaginal Delivery		Cesarean Delivery		Total	
Number of Newborns	1,917		1,859		3,776	
Percent	51%		49%		100%	
Number of NICU Admissions	2,024		2,009		4,033	
Cost Breakdown	Mean	SD	Mean	SD	Mean	SD
Provider Charges	54,879	72,118	82,639	97,904	68,496	86,857
Allowed Paid Amount	32,595	47,417	47,429	59,604	39,871	54,251
Insurer Payments	30,875	47,162	45,496	59,214	38,047	53,912
Out-of-Pocket Payments	1,241	1,327	1,351	1,666	1,295	1,504
Third-Party Payments	468	5,357	735	8,452	599	7,048

Note: The number of newborns may differ from the live birth numbers shown in the maternity costs tables because newborns were identified using a different criteria and did not depend on a linked mothers and infants.

Table 38: Nationally Weighted First, Second, and Third Quartiles for Newborns Care Costs Covering Birth and Three Months Post Birth for Hospitalizations that included Neonatal Intensive Care Unit Stays, 2010 Commercial

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	13,604	27,965	64,382	19,269	44,607	103,947	15,913	34,830	81,117
Allowed Paid Amount	7,931	16,312	37,292	11,381	25,437	57,684	9,271	20,136	45,840
Insurer Payments	6,732	14,619	34,594	9,843	23,567	54,760	7,813	18,225	43,427
Out-of-Pocket Payments	250	1,021	1,762	352	1,150	1,915	300	1,077	1,817
Third-Party Payments	0	0	0	0	0	0	0	0	0

Table 39: Top 50 Diagnoses among Newborns Admitted to the Neonatal Intensive Care Unit by Type of Delivery, 2010 Commercial

Vaginal Childbirth		Cesarean Childbirth	
Diagnoses	Number	Diagnoses	Number
PED86-Live Newborns	1,338	PED86-Live Newborns	1,380
PED20-Hyaline Membrane Disease/Respiratory Distress Syndrom	834	PED20-Hyaline Membrane Disease/Respiratory Distress Syndrome	1,057
PED27-Prematurity: Low Birthweight	573	PED27-Prematurity: Low Birthweight	732
OTH87-Encounter Related to Other Treatment	518	PED84-Other Maternal Conditions Affecting Newborn	596
PED85-Other Neonatal Conditions	445	OTH87-Encounter Related to Other Treatment	574
PED84-Other Maternal Conditions Affecting Newborn	348	PED85-Other Neonatal Conditions	467
RES86-Other Respiratory Symptoms	230	RES86-Other Respiratory Symptoms	264
HEM11-Hemolytic Disease of the Newborn	210	RES83-Other Disorders of Respiratory System	168
PED16-Bacterial and Fungal Infections of the Newborn	175	HEM11-Hemolytic Disease of the Newborn	146
OTH92-General Signs, Symptoms, and Ill-Defined Conditions	146	PED02-Anomaly: Atrial Septal Defect	134
RES83-Other Disorders of Respiratory System	130	OTH92-General Signs, Symptoms, and Ill-Defined Conditions	127
OTH85-Encounter for Preventive Health Services	108	OTH85-Encounter for Preventive Health Services	126
PED02-Anomaly: Atrial Septal Defect	100	CVS03-Anomaly: Patent Ductus Arteriosus	120
GIS87-Other Gastrointestinal or Abdominal Symptoms	92	EYE31-Prematurity: Retinopathy	118
CVS84-Other Cardiovascular Symptoms	80	PED16-Bacterial and Fungal Infections of the Newborn	115
PED22-Meconium Aspiration Syndrome	55	PED28-Prematurity: Very Low Birthweight	109
CVS03-Anomaly: Patent Ductus Arteriosus	51	GIS87-Other Gastrointestinal or Abdominal Symptoms	99
ENT81-Other Ear, Nose and Throat Disorders	47	CVS84-Other Cardiovascular Symptoms	89
PED25-Postmaturity	47	PED19-Full Term Infant with Abnormal Birth Weight	77
PED19-Full Term Infant with Abnormal Birth Weight	46	ENT81-Other Ear, Nose and Throat Disorders	54
MGS81-Other Disorders of Male Genital System	43	PED22-Meconium Aspiration Syndrome	50
GIS85-Other Gastrointestinal Disorders	39	GIS20-Hernia, Hiatal or Reflux Esophagitis	47
EYE31-Prematurity: Retinopathy	37	GIS85-Other Gastrointestinal Disorders	42
CVS06-Arrhythmias	36	MGS81-Other Disorders of Male Genital System	41
INF82-Other Bacterial Infections	35	OTH80-Abnormal Lab, X-ray and Clinical Findings	41
NEU04-Cerebrovascular Disease	35	CVS83-Other Cardiac Conditions	40
OTH80-Abnormal Lab, X-ray and Clinical Findings	35	CVS06-Arrhythmias	37
PED21-Injury: To Newborn During Delivery	35	MUS80-Anomaly: Musculoskeletal System	37
PED28-Prematurity: Very Low Birthweight	32	NUT81-Other Nutritional and Metabolic Disorders	37
GIS20-Hernia, Hiatal or Reflux Esophagitis	31	PED80-Anomaly: Other Circulatory System	37
PED15-Anomaly: Ventricular Septal Defects	31	GUS83-Other Disorders of Kidney or Ureter	36
GUS83-Other Disorders of Kidney or Ureter	27	PED26-Prematurity: Extremely Low Birthweight	34
MUS80-Anomaly: Musculoskeletal System	26	END08-Hypoglycemia	33
PED10-Anomaly: Other Congenital Heart Disease	26	PED25-Postmaturity	32
GEN80-Other Chromosomal Anomalies	25	NEU80-Other CNS Inflammation, Infection, or Disorder	31
NEU80-Other CNS Inflammation, Infection, or Disorder	25	PED15-Anomaly: Ventricular Septal Defects	28
END08-Hypoglycemia	24	GEN80-Other Chromosomal Anomalies	26
RES23-Respiratory Syncytial Virus Infections	24	GIS16-Functional Digestive Disorders	24
CVS83-Other Cardiac Conditions	23	OTH84-Encounter for Other Administrative Reasons	23
NUT81-Other Nutritional and Metabolic Disorders	22	NEU04-Cerebrovascular Disease	22
PED80-Anomaly: Other Circulatory System	22	PED10-Anomaly: Other Congenital Heart Disease	22
OTH81-Complications of Surgical and Medical Care	21	PED31-Toxoplasmosis: Congenital	21
GIS16-Functional Digestive Disorders	20	PED83-Anomaly: Other Nervous System	20
RES24-Rhino, Adeno, and Corona Virus Infections	20	OTH88-Factors Influencing Health Status	19
MUS83-Other Arthropathies, Bone and Joint Disorders	19	PED06-Anomaly: Defects of Kidney	19
RES15-Pneumonia: Bacterial	19	PED21-Injury: To Newborn During Delivery	19
PED04-Anomaly: Coarctation of the Aorta	16	PED81-Anomaly: Other Digestive or Hepatobiliary System	18
PED31-Toxoplasmosis: Congenital	16	RES23-Respiratory Syncytial Virus Infections	18
GIS84-Other Diseases of Esophagus, Stomach, and Duodenum	14	GEN01-Down's Syndrome	17
NUT80-Other Electrolyte Disorders	14	OTH81-Complications of Surgical and Medical Care	16

APPENDIX C: MEDICAID COST

Table 40: Live Birth Numbers, Proportions, and Mean Prenatal Health Care Costs by Type of Service for Vaginal and Cesarean Childbirths by Payer, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Live Births	5,094			2,159			7,253		
Percent	70%			30%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	7,790	7,497		9,386	8,891		8,265	7,970	
Allowed Paid Amount	2,405	2,450		2,859	2,779		2,540	2,561	
Medicaid Payments	2,389	2,448		2,840	2,776		2,523	2,558	
Facility Fees									
Provider Charges	2,663	4,355	34.2%	3,110	4,998	33.1%	2,796	4,561	33.8%
Allowed Paid Amount	852	1,427	35.4%	943	1,455	33.0%	879	1,436	34.6%
Medicaid Payments	846	1,423	35.4%	933	1,447	32.9%	872	1,431	34.6%
Professional Anesthesiology Fees									
Provider Charges	16	145	0.2%	19	164	0.2%	17	151	0.2%
Allowed Paid Amount	2	24	0.1%	3	23	0.1%	2	24	0.1%
Medicaid Payments	2	24	0.1%	3	23	0.1%	2	24	0.1%
Professional Service Fees									
Provider Charges	949	1,471	12.2%	1,101	1,377	11.7%	995	1,446	12.0%
Allowed Paid Amount	392	620	16.3%	428	537	15.0%	403	596	15.8%
Medicaid Payments	390	620	16.3%	427	537	15.0%	401	596	15.9%
Laboratory Fees									
Provider Charges	1,814	1,509	23.3%	2,054	1,746	21.9%	1,886	1,587	22.8%
Allowed Paid Amount	338	302	14.0%	375	354	13.1%	349	319	13.7%
Medicaid Payments	337	302	14.1%	374	355	13.2%	348	319	13.8%
Radiology/Imaging Fees									
Provider Charges	1,765	2,094	22.7%	2,287	2,781	24.4%	1,920	2,332	23.2%
Allowed Paid Amount	448	477	18.6%	572	632	20.0%	485	531	19.1%
Medicaid Payments	445	475	18.6%	570	632	20.1%	482	529	19.1%
Pharmacy Fees									
Provider Charges	584	1,590	7.5%	815	1,874	8.7%	652	1,683	7.9%
Allowed Paid Amount	374	1,136	15.5%	538	1,382	18.8%	423	1,216	16.6%
Medicaid Payments	369	1,132	15.4%	533	1,378	18.8%	418	1,213	16.6%

Note: Prenatal costs do not include intrapartum or postpartum care costs. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 41: First, Second, and Third Quartiles for Prenatal Health Care Expenditures for Vaginal and Cesarean Childbirths by Payer, 2010, Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	3,166	5,415	9,565	3,766	6,686	11,495	3,340	5,771	10,233
Allowed Paid Amount	968	1,689	3,001	1,139	2,062	3,541	1,018	1,790	3,158
Medicaid Payments	954	1,681	2,984	1,123	2,050	3,528	1,002	1,778	3,141
Facility Fees									
Provider Charges	259	1,174	3,054	389	1,486	3,558	297	1,252	3,211
Allowed Paid Amount	54	335	1,029	94	405	1,193	67	357	1,079
Medicaid Payments	51	332	1,024	87	398	1,185	63	353	1,072
Professional Anesthesiology Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Medicaid Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	95	481	1,294	153	668	1,573	114	522	1,369
Allowed Paid Amount	37	168	537	56	221	645	42	181	569
Medicaid Payments	37	166	535	55	219	645	41	180	569
Laboratory Fees									
Provider Charges	800	1,464	2,360	930	1,611	2,639	841	1,505	2,456
Allowed Paid Amount	135	254	441	150	280	468	139	262	449
Medicaid Payments	133	253	440	149	279	465	137	261	448
Radiology/Imaging Fees									
Provider Charges	634	1,208	2,145	716	1,468	2,802	658	1,270	2,347
Allowed Paid Amount	183	317	535	205	372	706	189	331	579
Medicaid Payments	181	316	534	204	371	701	187	330	577
Pharmacy Fees									
Provider Charges	76	215	508	97	287	755	81	234	569
Allowed Paid Amount	51	144	336	67	188	448	55	156	368
Medicaid Payments	50	141	330	63	182	445	52	153	364

Table 42: Live Birth Numbers, Proportions, and Mean Intrapartum Health Care Expenditures for Vaginal and Cesarean Childbirths by Payer, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Live Births	5,094			2,159			7,253		
Percent	70%			30%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	12,599	5,301		20,680	7,582		15,004	7,106	
Allowed Paid Amount	3,347	1,304		4,655	2,090		3,736	1,689	
Medicaid Payments	3,303	1,337		4,604	2,107		3,690	1,712	
Facility Fees									
Provider Charges	9,085	4,600	72.1%	15,761	7,146	76.2%	11,073	6,275	73.8%
Allowed Paid Amount	2,171	1,111	64.9%	3,286	1,889	70.6%	2,503	1,480	67.0%
Medicaid Payments	2,140	1,107	64.8%	3,246	1,876	70.5%	2,469	1,471	66.9%
Professional Anesthesiology Fees									
Provider Charges	842	881	6.7%	1,309	960	6.3%	981	930	6.5%
Allowed Paid Amount	160	173	4.8%	182	166	3.9%	167	172	4.5%
Medicaid Payments	158	171	4.8%	179	163	3.9%	164	169	4.4%
Professional Service Fees									
Provider Charges	2,620	1,354	20.8%	3,540	2,031	17.1%	2,894	1,641	19.3%
Allowed Paid Amount	1,006	444	30.1%	1,174	522	25.2%	1,056	475	28.3%
Medicaid Payments	996	444	30.2%	1,167	524	25.3%	1,047	476	28.4%
Laboratory Fees									
Provider Charges	52	117	0.4%	115	177	0.6%	71	140	0.5%
Allowed Paid Amount	9	22	0.3%	18	30	0.4%	12	25	0.3%
Medicaid Payments	9	21	0.3%	18	30	0.4%	12	24	0.3%
Radiology/Imaging Fees									
Provider Charges	8	66	0.1%	17	95	0.1%	11	76	0.1%
Allowed Paid Amount	1	11	0.0%	3	15	0.1%	2	13	0.0%
Medicaid Payments	1	11	0.0%	3	15	0.1%	2	13	0.1%
Pharmacy Fees									
Provider Charges									
Allowed Paid Amount									
Medicaid Payments									

Note: Intrapartum costs do not include prenatal or postpartum care costs. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 43: First, Second, and Third Quartiles for Intrapartum Health Care Expenditures for Vaginal and Cesarean Childbirths by Payer, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	9,221	11,487	15,062	15,690	19,079	24,132	10,193	13,541	18,156
Allowed Paid Amount	2,425	3,119	4,036	3,273	4,240	5,958	2,645	3,403	4,466
Medicaid Payments	2,405	3,090	4,016	3,250	4,205	5,903	2,608	3,373	4,441
Facility Fees									
Provider Charges	6,301	8,144	10,940	11,154	14,236	18,441	7,040	9,604	13,508
Allowed Paid Amount	1,408	1,966	2,621	2,132	2,889	4,298	1,560	2,249	3,136
Medicaid Payments	1,408	1,955	2,594	2,132	2,826	4,281	1,499	2,248	3,082
Professional Anesthesiology Fees									
Provider Charges	-	700	1,250	825	1,102	1,540	404	825	1,342
Allowed Paid Amount	-	166	175	85	141	232	42	156	203
Medicaid Payments	-	161	174	83	139	232	42	149	200
Professional Service Fees									
Provider Charges	1,800	2,650	3,277	2,406	3,227	4,187	1,963	2,795	3,588
Allowed Paid Amount	605	1,183	1,200	727	1,238	1,346	660	1,183	1,260
Medicaid Payments	605	1,183	1,200	727	1,238	1,346	653	1,183	1,256
Laboratory Fees									
Provider Charges	0	0	0	0	0	258	0	0	57
Allowed Paid Amount	0	0	0	0	0	48	0	0	3
Medicaid Payments	0	0	0	0	0	48	0	0	3
Radiology/Imaging Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Medicaid Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges									
Allowed Paid Amount									
Medicaid Payments									

Table 44: Live Birth Numbers, Proportions, and Mean Postpartum Health Care Expenditures for Vaginal and Cesarean Childbirths by Payer, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Live Births	5,094			2,159			7,253		
Percent	70%			30%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	858	2,459		1,194	3,058		958	2,656	
Allowed Paid Amount	365	688		469	934		396	771	
Medicaid Payments	361	685		464	927		392	766	
Facility Fees									
Provider Charges	311	1,897	36.3%	528	2,327	44.3%	376	2,037	39.2%
Allowed Paid Amount	79	414	21.6%	128	547	27.4%	94	458	23.6%
Medicaid Payments	78	412	21.6%	126	541	27.1%	92	455	23.5%
Professional Anesthesiology Fees									
Provider Charges	18	150	2.1%	15	141	1.3%	18	147	1.8%
Allowed Paid Amount	3	26	0.8%	3	28	0.6%	3	27	0.7%
Medicaid Payments	3	26	0.8%	3	28	0.6%	3	26	0.7%
Professional Service Fees									
Provider Charges	116	330	13.5%	137	452	11.5%	122	371	12.8%
Allowed Paid Amount	47	117	12.9%	52	130	11.0%	48	121	12.2%
Medicaid Payments	47	117	12.9%	51	130	11.1%	48	121	12.3%
Laboratory Fees									
Provider Charges	75	184	8.7%	88	252	7.3%	79	207	8.2%
Allowed Paid Amount	15	58	4.1%	15	41	3.2%	15	53	3.8%
Medicaid Payments	15	58	4.1%	15	40	3.2%	15	53	3.8%
Radiology /Imaging Fees									
Provider Charges	25	257	3.0%	47	415	4.0%	32	313	3.3%
Allowed Paid Amount	5	66	1.3%	9	98	1.9%	6	77	1.5%
Medicaid Payments	5	66	1.3%	9	98	1.9%	6	77	1.5%
Pharmacy Fees									
Provider Charges	312	592	36.4%	378	827	31.6%	332	672	34.6%
Allowed Paid Amount	217	416	59.4%	263	616	56.0%	230	485	58.2%
Medicaid Payments	214	415	59.4%	260	614	56.0%	228	483	58.2%

Note: Postpartum costs do not include prenatal or intrapartum care costs. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 45: First, Second, and Third Quartiles for Maternal Health Care Expenditures for Vaginal and Cesarean Childbirths by Payer, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	82	277	789	105	334	923	89	293	818
Allowed Paid Amount	46	149	396	65	183	472	51	159	420
Medicaid Payments	46	147	391	63	183	469	50	157	413
Facility Fees									
Provider Charges	0	0	0	0	0	76	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Medicaid Payments	0	0	0	0	0	0	0	0	0
Professional Anesthesiology Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Medicaid Payments	0	0	0	0	0	0	0	0	0
Professional Service Fees									
Provider Charges	0	0	95	0	0	129	0	0	105
Allowed Paid Amount	0	0	60	0	0	60	0	0	60
Medicaid Payments	0	0	59	0	0	60	0	0	60
Laboratory Fees									
Provider Charges	0	0	73	0	0	78	0	0	74
Allowed Paid Amount	0	0	11	0	0	11	0	0	11
Medicaid Payments	0	0	11	0	0	11	0	0	11
Radiology/Imaging Fees									
Provider Charges	0	0	0	0	0	0	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Medicaid Payments	0	0	0	0	0	0	0	0	0
Pharmacy Fees									
Provider Charges	21	101	325	32	126	401	24	109	352
Allowed Paid Amount	14	68	213	23	82	244	16	73	221
Medicaid Payments	13	67	210	21	81	238	15	71	219

Table 46: Live Birth Numbers, Proportions, and Mean Maternal Health Care Costs by Type of Service for Vaginal and Cesarean Childbirths by Payer, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
Number of Live Births	5,094			2,159			7,253		
Percent	70%			30%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	21,247	10,198		31,259	13,282		24,227	12,104	
Allowed Paid Amount	6,117	3,092		7,983	3,949		6,673	3,476	
Medicaid Payments	6,053	3,127		7,908	3,972		6,605	3,504	
Facility Fees									
Provider Charges	12,059	6,938	56.8%	19,399	9,639	62.1%	14,244	8,528	58.8%
Allowed Paid Amount	3,102	1,955	50.7%	4,358	2,577	54.6%	3,476	2,234	52.1%
Medicaid Payments	3,064	1,955	50.6%	4,305	2,568	54.4%	3,433	2,229	52.0%
Professional Anesthesiology Fees									
Provider Charges	876	906	4.1%	1,343	984	4.3%	1,015	954	4.2%
Allowed Paid Amount	165	178	2.7%	188	172	2.4%	172	177	2.6%
Medicaid Payments	163	176	2.7%	185	169	2.3%	169	174	2.6%
Professional Service Fees									
Provider Charges	3,686	1,917	17.3%	4,778	2,503	15.3%	4,011	2,166	16.6%
Allowed Paid Amount	1,445	759	23.6%	1,654	784	20.7%	1,507	773	22.6%
Medicaid Payments	1,433	765	23.7%	1,645	789	20.8%	1,496	778	22.6%
Laboratory Fees									
Provider Charges	1,941	1,556	9.1%	2,257	1,809	7.2%	2,036	1,641	8.4%
Allowed Paid Amount	362	313	5.9%	408	364	5.1%	375	330	5.6%
Medicaid Payments	360	313	6.0%	406	364	5.1%	374	330	5.7%
Radiology/Imaging Fees									
Provider Charges	1,799	2,114	8.5%	2,352	2,833	7.5%	1,963	2,364	8.1%
Allowed Paid Amount	454	483	7.4%	584	644	7.3%	493	539	7.4%
Medicaid Payments	451	481	7.5%	582	644	7.4%	490	538	7.4%
Pharmacy Fees									
Provider Charges	896	1,940	4.2%	1,192	2,493	3.8%	984	2,124	4.1%
Allowed Paid Amount	590	1,374	9.6%	801	1,835	10.0%	653	1,528	9.8%
Medicaid Payments	583	1,368	9.6%	793	1,827	10.0%	646	1,522	9.8%

Table 47: First, Second, and Third Quartiles for Maternal Health Care Expenditures for Vaginal and Cesarean Childbirths by Payer, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	14,485	18,855	25,089	22,046	27,582	36,842	16,084	21,376	28,856
Allowed Paid Amount	4,167	5,397	7,202	5,357	7,161	9,619	4,443	5,845	7,959
Medicaid Payments	4,130	5,365	7,166	5,326	7,121	9,548	4,407	5,817	7,908
Facility Fees									
Provider Charges	7,736	10,368	14,453	13,086	16,712	23,127	8,570	12,247	17,154
Allowed Paid Amount	1,834	2,592	3,707	2,550	3,847	5,463	2,050	2,837	4,301
Medicaid Payments	1,803	2,571	3,682	2,525	3,818	5,429	2,034	2,816	4,274
Professional Anesthesiology Fees									
Provider Charges	-	700	1,250	840	1,120	1,603	455	852	1,390
Allowed Paid Amount	-	166	186	85	142	236	45	161	215
Medicaid Payments	-	166	181	85	142	234	42	159	212
Professional Service Fees									
Provider Charges	2,768	3,463	4,305	3,381	4,301	5,509	2,923	3,682	4,694
Allowed Paid Amount	1,176	1,318	1,719	1,244	1,475	2,021	1,183	1,369	1,807
Medicaid Payments	1,151	1,313	1,710	1,238	1,470	2,016	1,183	1,362	1,798
Laboratory Fees									
Provider Charges	894	1,572	2,516	1,072	1,797	2,880	946	1,644	2,636
Allowed Paid Amount	153	274	469	176	310	506	160	287	480
Medicaid Payments	151	274	468	174	309	501	158	285	479
Radiology/Imaging Fees									
Provider Charges	650	1,240	2,191	745	1,504	2,859	664	1,299	2,411
Allowed Paid Amount	185	321	543	208	379	712	192	336	590
Medicaid Payments	183	320	541	208	378	711	189	334	586
Pharmacy Fees									
Provider Charges	159	398	945	194	517	1,196	170	425	1,013
Allowed Paid Amount	106	260	655	136	320	794	114	275	699
Medicaid Payments	103	255	647	131	315	792	110	271	689

Table 48: Live Birth Numbers, Proportions, and Mean Prenatal and Postpartum Pharmacy Costs for Vaginal and Cesarean Childbirths, 2010

Prenatal						
	Vaginal Childbirth			Cesarean Childbirth		
Number of Live Births	5,094		2,159		7,253	
Percent	70%		30%		100%	
Cost Breakdown	Mean	SD	Mean	SD	Mean	SD
Maternity-Related Pharmacy Costs						
Provider Charges	317	1,188	421	1,072	348	1,156
Allowed Paid Amount	178	854	244	757	197	827
Medicaid Payments	175	853	241	756	195	826

*Note: Costs include the 9-month prenatal stage of care only

Postpartum						
	Vaginal Childbirth			Cesarean Childbirth		
Number of Live Births	5,094		2,159		7,253	
Percent	70%		30%		100%	
Cost Breakdown	Mean	SD	Mean	SD	Mean	SD
Maternity-Related Pharmacy Costs						
Provider Charges	101	278	137	410	112	323
Allowed Paid Amount	56	172	78	307	63	221
Medicaid Payments	55	170	77	307	62	220

*Note: Costs include the 3-month postpartum stage of care only

Table 49: First, Second, and Third Quartiles for Prenatal and Postpartum Pharmacy Costs for Vaginal and Cesarean Childbirths, 2010 Medicaid

Prenatal									
	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Maternity-Related Pharmacy Costs									
Provider Charges	32	100	250	43	134	344	35	109	279
Allowed Paid Amount	22	62	147	30	83	198	24	68	160
Medicaid Payments	20	61	145	29	80	192	22	66	157
Postpartum									
	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Maternity-Related Pharmacy Costs									
Provider Charges	0	25	90	4	38	123	0	28	98
Allowed Paid Amount	0	16	50	4	26	69	0	18	56
Medicaid Payments	0	15	49	2	24	68	0	16	54

Table 50: Live Birth Numbers, Proportions, and Mean Newborn Care Costs Covering Care at Birth and In the First Three Months of Life Following Vaginal and Cesarean Births, 2010 Medicaid

	Vaginal Delivery			Cesarean Delivery			Total		
Number of Newborns	29,764			10,227			39,991		
Percent	74%			26%			100%		
Cost Breakdown	Mean	SD	% of Total	Mean	SD	% of Total	Mean	SD	% of Total
Total Costs									
Provider Charges	8,553	26,546		19,114	51,618		11,254	35,029	
Allowed Paid Amount	3,014	7,475		5,607	13,642		3,677	9,511	
Medicaid Payments	2,949	7,043		5,419	12,892		3,580	8,977	
Facility Fees									
Provider Charges	6,317	21,077	74%	14,696	41,842	77%	8,460	28,137	75%
Allowed Paid Amount	2,321	6,408	77%	4,435	11,709	79%	2,861	8,153	78%
Medicaid Payments	2,262	5,931	77%	4,258	10,852	79%	2,773	7,553	77%
Professional Fees									
Provider Charges	1,970	5,866	23%	4,014	10,924	21%	2,493	7,545	22%
Allowed Paid Amount	615	1,264	20%	1,040	2,231	19%	724	1,580	20%
Medicaid Payments	609	1,246	21%	1,029	2,223	19%	717	1,566	20%
Laboratory									
Provider Charges	108	326	1.3%	113	344	0.6%	109	331	1.0%
Allowed Paid Amount	19	63	0.6%	21	71	0.4%	20	65	0.5%
Medicaid Payments	19	62	0.7%	21	71	0.4%	20	65	0.6%
Radiology and Imaging									
Provider Charges	103	407	1.2%	168	563	0.9%	120	453	1.1%
Allowed Paid Amount	21	102	0.7%	32	113	0.6%	24	105	0.7%
Medicaid Payments	21	102	0.7%	32	112	0.6%	24	105	0.7%
Pharmacy									
Provider Charges	54	445	0.6%	124	954	0.6%	72	617	0.6%
Allowed Paid Amount	37	254	1.2%	78	486	1.4%	48	330	1.3%
Medicaid Payments	37	253	1.3%	78	486	1.4%	48	329	1.3%

Note: The number of newborns may differ from the live birth numbers shown in the maternal costs tables because newborns were identified using a different criteria and did not depend on a linked mothers and newborns. Due to rounding, the sum of average payments across categories may not add up to exactly the total average allowed payment.

Table 51: First, Second, and Third Quartiles for Newborn Care Costs Covering Care at Birth and In the First Three Months of Life Following Vaginal and Cesarean Births, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Total Costs									
Provider Charges	2,523	3,404	5,067	3,262	4,528	7,807	2,661	3,657	5,653
Allowed Paid Amount	1,209	1,657	2,374	1,375	2,022	3,547	1,248	1,729	2,629
Medicaid Payments	1,189	1,638	2,347	1,349	1,989	3,477	1,226	1,708	2,596
Facility Fees									
Provider Charges	1,683	2,340	3,475	2,274	3,197	5,391	1,796	2,519	3,890
Allowed Paid Amount	820	1,138	1,826	936	1,463	2,808	856	1,209	2,037
Medicaid Payments	803	1,121	1,807	936	1,420	2,729	838	1,180	2,027
Professional Fees									
Provider Charges	545	903	1,483	657	1,150	2,067	566	957	1,605
Allowed Paid Amount	243	381	586	277	465	784	250	398	625
Medicaid Payments	237	378	583	269	459	777	244	394	621
Laboratory									
Provider Charges	0	0	60	0	0	52	0	0	57
Allowed Paid Amount	0	0	13	0	0	12	0	0	13
Medicaid Payments	0	0	13	0	0	12	0	0	13
Radiology and Imaging									
Provider Charges	0	0	0	0	0	32	0	0	0
Allowed Paid Amount	0	0	0	0	0	0	0	0	0
Medicaid Payments	0	0	0	0	0	0	0	0	0
Pharmacy									
Provider Charges	0	0	30	0	0	39	0	0	32
Allowed Paid Amount	0	0	19	0	0	26	0	0	21
Medicaid Payments	0	0	19	0	0	26	0	0	21

Table 52: Top 50 Diagnoses among Newborns by Type of Delivery, 2010 Medicaid

Vaginal Delivery		Cesarean Delivery	
Diagnoses	Number	Diagnoses	Number
OTH85-Encounter for Preventive Health Services	30,026	OTH85-Encounter for Preventive Health Services	13,961
PED86-Live Newborns	29,816	PED86-Live Newborns	13,638
HEM11-Hemolytic Disease of the Newborn	8,360	OTH87-Encounter Related to Other Treatment	4,237
OTH87-Encounter Related to Other Treatment	8,341	PED85-Other Neonatal Conditions	3,894
PED85-Other Neonatal Conditions	7,565	PED84-Other Maternal Conditions Affecting Newborn	3,571
OTH92-General Signs, Symptoms, and Ill-Defined Conditions	5,414	HEM11-Hemolytic Disease of the Newborn	2,969
NUT81-Other Nutritional and Metabolic Disorders	3,904	OTH92-General Signs, Symptoms, and Ill-Defined Conditions	2,453
ENT82-Other Ear, Nose, and Throat Infections	3,246	NUT81-Other Nutritional and Metabolic Disorders	2,031
SKN82-Other Inflammations and Infections of Skin and Subcutaneous Tissu	2,992	PED20-Hyaline Membrane Disease/Respiratory Distress Syndrome	1,821
GIS20-Hernia, Hiatal or Reflux Esophagitis	2,759	ENT82-Other Ear, Nose, and Throat Infections	1,696
GIS87-Other Gastrointestinal or Abdominal Symptoms	2,126	GIS20-Hernia, Hiatal or Reflux Esophagitis	1,586
PED84-Other Maternal Conditions Affecting Newborn	1,923	SKN82-Other Inflammations and Infections of Skin and Subcutaneous Tiss	1,433
ENT81-Other Ear, Nose and Throat Disorders	1,914	PED27-Prematurity: Low Birthweight	1,403
PED20-Hyaline Membrane Disease/Respiratory Distress Syndrome	1,710	GIS87-Other Gastrointestinal or Abdominal Symptoms	1,154
PED27-Prematurity: Low Birthweight	1,562	ENT81-Other Ear, Nose and Throat Disorders	989
PED25-Postmaturity	1,542	PED25-Postmaturity	882
PED16-Bacterial and Fungal Infections of the Newborn	1,247	RES86-Other Respiratory Symptoms	771
MGS81-Other Disorders of Male Genital System	1,141	MGS81-Other Disorders of Male Genital System	620
RES86-Other Respiratory Symptoms	973	PED16-Bacterial and Fungal Infections of the Newborn	563
GIS16-Functional Digestive Disorders	906	RES24-Rhino, Adeno, and Corona Virus Infections	538
RES24-Rhino, Adeno, and Corona Virus Infections	904	GIS16-Functional Digestive Disorders	496
EYE02-Conjunctivitis: Bacterial	887	MUS80-Anomaly: Musculoskeletal System	491
OTH84-Encounter for Other Administrative Reasons	784	CVS84-Other Cardiovascular Symptoms	452
INF03-Candida (Monilial) Infections	780	EYE02-Conjunctivitis: Bacterial	432
CVS84-Other Cardiovascular Symptoms	727	OTH84-Encounter for Other Administrative Reasons	399
ENT18-Otitis Media	660	MUS83-Other Arthropathies, Bone and Joint Disorders	365
PED22-Meconium Aspiration Syndrome	646	PED02-Anomaly: Atrial Septal Defect	363
EYE06-Dacryostenosis or Dacryocystitis	628	INF03-Candida (Monilial) Infections	362
EYE82-Other Eye Disorders	612	ENT18-Otitis Media	359
INF85-Other Viral Infections	545	EYE82-Other Eye Disorders	334
MUS80-Anomaly: Musculoskeletal System	545	RES83-Other Disorders of Respiratory System	333
GIS85-Other Gastrointestinal Disorders	515	EYE06-Dacryostenosis or Dacryocystitis	296
OTH80-Abnormal Lab, X-ray and Clinical Findings	455	GIS85-Other Gastrointestinal Disorders	292
PED02-Anomaly: Atrial Septal Defect	430	PED19-Full Term Infant with Abnormal Birth Weight	290
MUS83-Other Arthropathies, Bone and Joint Disorders	412	INF85-Other Viral Infections	272
RES23-Respiratory Syncytial Virus Infections	404	RES23-Respiratory Syncytial Virus Infections	258
OTH88-Factors Influencing Health Status	395	GUS83-Other Disorders of Kidney or Ureter	226
PED19-Full Term Infant with Abnormal Birth Weight	393	OTH80-Abnormal Lab, X-ray and Clinical Findings	225
GUS83-Other Disorders of Kidney or Ureter	385	OTH88-Factors Influencing Health Status	225
GIS81-Gastroenteritis	370	GIS81-Gastroenteritis	205
MUS86-Other Spinal and Back Disorders: Cervical	356	CVS03-Anomaly: Patent Ductus Arteriosus	204
RES83-Other Disorders of Respiratory System	349	EYE31-Prematurity: Retinopathy	199
GIS19-Hernia, External	286	GIS19-Hernia, External	190
PED21-Injury: To Newborn During Delivery	233	PED22-Meconium Aspiration Syndrome	176
TRA81-Injury: Other	218	MUS86-Other Spinal and Back Disorders: Cervical	160
PED06-Anomaly: Defects of Kidney	213	PED28-Prematurity: Very Low Birthweight	145
SKN05-Infections of Skin and Subcutaneous Tissue	209	CVS06-Arrhythmias	128
GIS84-Other Diseases of Esophagus, Stomach, and Duodenum	198	PED06-Anomaly: Defects of Kidney	128
PED15-Anomaly: Ventricular Septal Defects	198	PED15-Anomaly: Ventricular Septal Defects	127
SKN10-Pilonidal Cyst	197	SKN10-Pilonidal Cyst	116

Table 53: Live Birth Numbers, Proportions, and Mean Newborn s Care Costs Covering Birth and Three Months Post Birth for Hospitalizations that included Neonatal Intensive Care Unit Stays, 2010 Medicaid

	Vaginal Delivery		Cesarean Delivery		Total	
Number of Newborns	1,906		1,479		3,385	
Percent	56%		44%		100%	
Number of NICU Admissions	2,052		1,591		3,643	
Cost Breakdown	Mean	SD	Mean	SD	Mean	SD
Provider Charges	58,076	77,817	86,409	98,517	70,455	88,575
Allowed Paid Amount	14,517	22,728	20,934	27,179	17,321	24,971
Medicaid Payments	13,875	20,880	19,971	25,417	16,538	23,168

Note: The number of newborns may differ from the live birth numbers shown in the maternity costs tables because newborns were identified using a different criteria and did not depend on a linked mothers and newborns.

Table 54: First, Second, and Third Quartiles for Newborn s Care Costs Covering Birth and Three Months Post Birth for Hospitalizations that included Neonatal Intensive Care Unit Stays, 2010 Medicaid

	Vaginal Childbirth			Cesarean Childbirth			Total		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
Provider Charges	13,821	28,890	65,907	19,452	46,806	112,624	15,275	34,721	84,764
Allowed Paid Amount	2,964	6,760	14,968	4,258	11,455	25,719	3,398	7,947	19,960
Medicaid Payments	2,782	6,522	14,752	3,911	10,768	24,426	3,146	7,618	19,386

Table 55: Top 50 Diagnoses Among Newborns Admitted to the Neonatal Intensive Care Unit by Type of Delivery, 2010 Medicaid

Vaginal Delivery		Cesarean Delivery	
Diagnoses	Number	Diagnoses	Number
PED86-Live Newborns	1,198	PED86-Live Newborns	937
PED20-Hyaline Membrane Disease/Respiratory Distress Syndrom	769	PED20-Hyaline Membrane Disease/Respiratory Distress Syndron	779
PED27-Prematurity: Low Birthweight	579	PED27-Prematurity: Low Birthweight	561
PED85-Other Neonatal Conditions	412	PED84-Other Maternal Conditions Affecting Newborn	418
OTH87-Encounter Related to Other Treatment	407	OTH87-Encounter Related to Other Treatment	375
PED84-Other Maternal Conditions Affecting Newborn	277	PED85-Other Neonatal Conditions	345
RES86-Other Respiratory Symptoms	212	RES86-Other Respiratory Symptoms	202
HEM11-Hemolytic Disease of the Newborn	205	PED02-Anomaly: Atrial Septal Defect	140
OTH92-General Signs, Symptoms, and Ill-Defined Conditions	153	RES83-Other Disorders of Respiratory System	120
PED02-Anomaly: Atrial Septal Defect	150	CVS03-Anomaly: Patent Ductus Arteriosus	115
RES83-Other Disorders of Respiratory System	142	OTH92-General Signs, Symptoms, and Ill-Defined Conditions	109
PED16-Bacterial and Fungal Infections of the Newborn	119	HEM11-Hemolytic Disease of the Newborn	100
GIS87-Other Gastrointestinal or Abdominal Symptoms	106	EYE31-Prematurity: Retinopathy	97
CVS03-Anomaly: Patent Ductus Arteriosus	81	GIS87-Other Gastrointestinal or Abdominal Symptoms	94
CVS84-Other Cardiovascular Symptoms	80	PED28-Prematurity: Very Low Birthweight	91
EYE31-Prematurity: Retinopathy	69	CVS84-Other Cardiovascular Symptoms	76
PED19-Full Term Infant with Abnormal Birth Weight	62	OTH85-Encounter for Preventive Health Services	68
PED28-Prematurity: Very Low Birthweight	55	PED19-Full Term Infant with Abnormal Birth Weight	68
OTH85-Encounter for Preventive Health Services	53	PED16-Bacterial and Fungal Infections of the Newborn	67
GIS85-Other Gastrointestinal Disorders	45	PED25-Postmaturity	55
PED22-Meconium Aspiration Syndrome	42	PED26-Prematurity: Extremely Low Birthweight	51
RES15-Pneumonia: Bacterial	42	PED80-Anomaly: Other Circulatory System	51
NEU80-Other CNS Inflammation, Infection, or Disorder	41	PED22-Meconium Aspiration Syndrome	46
PED25-Postmaturity	41	NEU80-Other CNS Inflammation, Infection, or Disorder	44
PED80-Anomaly: Other Circulatory System	41	GIS85-Other Gastrointestinal Disorders	41
CVS06-Arrhythmias	40	MUS80-Anomaly: Musculoskeletal System	40
ENT81-Other Ear, Nose and Throat Disorders	37	END08-Hypoglycemia	35
GIS16-Functional Digestive Disorders	34	CVS83-Other Cardiac Conditions	33
PED10-Anomaly: Other Congenital Heart Disease	34	CVS06-Arrhythmias	32
PED18-Drug Withdrawal Syndromes in Neonates	33	ENT81-Other Ear, Nose and Throat Disorders	29
RES23-Respiratory Syncytial Virus Infections	33	NUT81-Other Nutritional and Metabolic Disorders	28
GIS20-Hernia, Hiatal or Reflux Esophagitis	32	OTH80-Abnormal Lab, X-ray and Clinical Findings	28
GEN80-Other Chromosomal Anomalies	27	PED10-Anomaly: Other Congenital Heart Disease	28
MUS80-Anomaly: Musculoskeletal System	27	PED09-Anomaly: Neural Tube Defects	26
GYN10-Delivery, Vaginal	25	GIS20-Hernia, Hiatal or Reflux Esophagitis	24
MGS81-Other Disorders of Male Genital System	25	OTH84-Encounter for Other Administrative Reasons	21
PED21-Injury: To Newborn During Delivery	24	EYE82-Other Eye Disorders	20
PED81-Anomaly: Other Digestive or Hepatobiliary System	24	GYN10-Delivery, Vaginal	20
NUT80-Other Electrolyte Disorders	23	PED15-Anomaly: Ventricular Septal Defects	20
CVS83-Other Cardiac Conditions	22	RES15-Pneumonia: Bacterial	20
GUS83-Other Disorders of Kidney or Ureter	22	GIS16-Functional Digestive Disorders	19
NEU04-Cerebrovascular Disease	22	PED21-Injury: To Newborn During Delivery	19
GIS84-Other Diseases of Esophagus, Stomach, and Duodenum	21	GUS83-Other Disorders of Kidney or Ureter	18
NUT81-Other Nutritional and Metabolic Disorders	21	OTH81-Complications of Surgical and Medical Care	18
OTH80-Abnormal Lab, X-ray and Clinical Findings	21	GYN09-Delivery, Cesarean Section	17
PED31-Toxoplasmosis: Congenital	20	MGS81-Other Disorders of Male Genital System	17
PED83-Anomaly: Other Nervous System	20	NEU04-Cerebrovascular Disease	17
NEU11-Injury: Craniocerebral	18	GEN80-Other Chromosomal Anomalies	16
OTH84-Encounter for Other Administrative Reasons	18	PED18-Drug Withdrawal Syndromes in Neonates	16
PED15-Anomaly: Ventricular Septal Defects	18	NUT80-Other Electrolyte Disorders	15

APPENDIX D: COMMERCIAL COMBINED MATERNAL AND NEWBORN COST

Table 56: Nationally Weighted Average Charges and Payments Combining All Phases of Care and for Each Individual Phase of Care by Type of Service for Vaginal and Cesarean Childbirths, 2010 Commercial

	Total	Vaginal Childbirth	Cesarean Childbirth
Commercial			
Grand Total: Prenatal+Intrapartum+Postpartum+First Three Months of Newborn Care			
Total Costs			
Provider Charges	$37,341	$32,093	$51,126
Allowed Paid Amount	$21,001	$18,329	$27,866
Facility Fees			
Provider Charges	$23,840	$19,664	$34,706
Allowed Paid Amount	$12,953	$10,841	$18,359
Professional Anesthesiology Fees			
Provider Charges	$1,683	$1,607	$1,931
Allowed Paid Amount	$1,037	$990	$1,192
Professional Service Fees			
Provider Charges	$7,636	$6,807	$9,792
Allowed Paid Amount	$4,917	$4,493	$5,957
Laboratory Fees			
Provider Charges	$1,426	$1,396	$1,521
Allowed Paid Amount	$550	$539	$584
Radiology/Imaging Fees			
Provider Charges	$1,995	$1,892	$2,312
Allowed Paid Amount	$1,015	$966	$1,165
Pharmacy Fees			
Provider Charges	$765	$730	$869
Allowed Paid Amount	$531	$501	$614
Prenatal Care			
Total Costs			
Provider Charges	$6,257	$6,071	$6,866
Allowed Paid Amount	$3,274	$3,180	$3,580
Facility Fees			
Provider Charges	$1,764	$1,721	$1,905
Allowed Paid Amount	$1,002	$980	$1,072
Professional Anesthesiology Fees			
Provider Charges	$33	$32	$37
Allowed Paid Amount	$21	$20	$23
Professional Service Fees			
Provider Charges	$751	$727	$829
Allowed Paid Amount	$437	$424	$479
Laboratory Fees			
Provider Charges	$1,247	$1,233	$1,291
Allowed Paid Amount	$467	$464	$475
Radiology/Imaging Fees			
Provider Charges	$1,894	$1,811	$2,167
Allowed Paid Amount	$965	$925	$1,094
Pharmacy Fees			
Provider Charges	$569	$548	$637
Allowed Paid Amount	$384	$367	$436

	Total	Vaginal Childbirth	Cesarean Childbirth
Commercial			
Intrapartum Care			
Total Costs			
Provider Charges	$18,136	$16,165	$24,572
Allowed Paid Amount	$9,913	$9,048	$12,739
Facility Fees			
Provider Charges	$12,644	$11,063	$17,807
Allowed Paid Amount	$6,373	$5,656	$8,714
Professional Anesthesiology Fees			
Provider Charges	$1,615	$1,539	$1,864
Allowed Paid Amount	$995	$948	$1,151
Professional Service Fees			
Provider Charges	$3,807	$3,508	$4,782
Allowed Paid Amount	$2,510	$2,416	$2,817
Laboratory Fees			
Provider Charges	$66	$52	$111
Allowed Paid Amount	$33	$26	$55
Radiology/Imaging Fees			
Provider Charges	$8	$6	$14
Allowed Paid Amount	$3	$3	$6
Pharmacy Fees			
Provider Charges			
Allowed Paid Amount			
Postpartum Care			
Total Costs			
Provider Charges	$528	$498	$625
Allowed Paid Amount	$307	$293	$354
Facility Fees			
Provider Charges	$220	$198	$291
Allowed Paid Amount	$112	$101	$146
Professional Anesthesiology Fees			
Provider Charges	$35	$36	$30
Allowed Paid Amount	$21	$22	$18
Professional Service Fees			
Provider Charges	$80	$76	$90
Allowed Paid Amount	$48	$47	$53
Laboratory Fees			
Provider Charges	$40	$39	$42
Allowed Paid Amount	$16	$16	$17
Radiology/Imaging Fees			
Provider Charges	$12	$10	$16
Allowed Paid Amount	$5	$4	$8
Pharmacy Fees			
Provider Charges	$142	$138	$155
Allowed Paid Amount	$104	$101	$112

	Total	Vaginal Childbirth	Cesarean Childbirth
Commercial			
Newborn Care			
Total Costs			
Provider Charges	$12,419	$9,359	$19,063
Allowed Paid Amount	$7,507	$5,809	$11,193
Facility Fees			
Provider Charges	$9,211	$6,682	$14,703
Allowed Paid Amount	$5,466	$4,103	$8,426
Professional Anesthesiology Fees			
Provider Charges			
Allowed Paid Amount			
Professional Service Fees			
Provider Charges	$2,999	$2,496	$4,091
Allowed Paid Amount	$1,922	$1,606	$2,607
Laboratory Fees			
Provider Charges	$73	$72	$77
Allowed Paid Amount	$34	$33	$37
Radiology/Imaging Fees			
Provider Charges	$81	$65	$115
Allowed Paid Amount	$42	$34	$57
Pharmacy Fees			
Provider Charges	$55	$44	$77
Allowed Paid Amount	$43	$33	$66
Intrapartum + Newborn Costs = Estimate of Total Childbirth Hopitalization Costs			
Total Costs			
Provider Charges	$30,555	$25,524	$43,635
Allowed Paid Amount	$17,420	$14,857	$23,931
Facility Fees			
Provider Charges	$21,856	$17,745	$32,510
Allowed Paid Amount	$11,840	$9,759	$17,140
Professional Anesthesiology Fees			
Provider Charges	$1,615	$1,539	$1,864
Allowed Paid Amount	$995	$948	$1,151
Professional Service Fees			
Provider Charges	$6,806	$6,004	$8,873
Allowed Paid Amount	$4,432	$4,022	$5,424
Laboratory Fees			
Provider Charges	$139	$124	$188
Allowed Paid Amount	$67	$59	$92
Radiology/Imaging Fees			
Provider Charges	$89	$71	$129
Allowed Paid Amount	$45	$37	$63
Pharmacy Fees			
Provider Charges	$55	$44	$77
Allowed Paid Amount	$43	$33	$66

Notes: Due to rounding, the sum of average costs across categories or phases of care does not add up to exact total average costs.

APPENDIX E: MEDICAID COMBINED MATERNAL AND NEWBORN COST

Table 57: Average Charges and Payments Combining All Phases of Care and for Each Individual Phase of Care by Type of Service for Vaginal and Cesarean Childbirths, 2010 Medicaid[1]

	Total	Vaginal Childbirth	Cesarean Childbirth
Medicaid			
Grand Total: Prenatal+Intrapartum+Postpartum+First Three Months of Newborn Care			
Total Costs			
Provider Charges	$35,481	$29,800	$50,374
Allowed Paid Amount	$10,350	$9,131	$13,590
Facility Fees			
Provider Charges	$22,704	$18,376	$34,095
Allowed Paid Amount	$6,338	$5,423	$8,793
Professional Anesthesiology Fees			
Provider Charges	$1,015	$876	$1,343
Allowed Paid Amount	$172	$165	$188
Professional Service Fees			
Provider Charges	$6,504	$5,656	$8,792
Allowed Paid Amount	$2,231	$2,060	$2,694
Laboratory Fees			
Provider Charges	$2,145	$2,049	$2,371
Allowed Paid Amount	$395	$381	$429
Radiology/Imaging Fees			
Provider Charges	$2,083	$1,902	$2,519
Allowed Paid Amount	$517	$475	$616
Pharmacy Fees			
Provider Charges	$1,056	$950	$1,316
Allowed Paid Amount	$700	$627	$879
Prenatal Care			
Total Costs			
Provider Charges	$8,265	$7,790	$9,386
Allowed Paid Amount	$2,540	$2,405	$2,859
Facility Fees			
Provider Charges	$2,796	$2,663	$3,110
Allowed Paid Amount	$879	$852	$943
Professional Anesthesiology Fees			
Provider Charges	$17	$16	$19
Allowed Paid Amount	$2	$2	$3
Professional Service Fees			
Provider Charges	$995	$949	$1,101
Allowed Paid Amount	$403	$392	$428
Laboratory Fees			
Provider Charges	$1,886	$1,814	$2,054
Allowed Paid Amount	$349	$338	$375
Radiology/Imaging Fees			
Provider Charges	$1,920	$1,765	$2,287
Allowed Paid Amount	$485	$448	$572
Pharmacy Fees			
Provider Charges	$652	$584	$815
Allowed Paid Amount	$423	$374	$538

	Total	Vaginal Childbirth	Cesarean Childbirth
Medicaid			
Intrapartum Care			
Total Costs			
Provider Charges	$15,004	$12,599	$20,680
Allowed Paid Amount	$3,736	$3,347	$4,655
Facility Fees			
Provider Charges	$11,073	$9,085	$15,761
Allowed Paid Amount	$2,503	$2,171	$3,286
Professional Anesthesiology Fees			
Provider Charges	$981	$842	$1,309
Allowed Paid Amount	$167	$160	$182
Professional Service Fees			
Provider Charges	$2,894	$2,620	$3,540
Allowed Paid Amount	$1,056	$1,006	$1,174
Laboratory Fees			
Provider Charges	$71	$52	$115
Allowed Paid Amount	$12	$9	$18
Radiology/Imaging Fees			
Provider Charges	$11	$8	$17
Allowed Paid Amount	$2	$1	$3
Pharmacy Fees			
Provider Charges			
Allowed Paid Amount			
Postpartum Care			
Total Costs			
Provider Charges	$958	$858	$1,194
Allowed Paid Amount	$396	$365	$469
Facility Fees			
Provider Charges	$376	$311	$528
Allowed Paid Amount	$94	$79	$128
Professional Anesthesiology Fees			
Provider Charges	$18	$18	$15
Allowed Paid Amount	$3	$3	$3
Professional Service Fees			
Provider Charges	$122	$116	$137
Allowed Paid Amount	$48	$47	$52
Laboratory Fees			
Provider Charges	$79	$75	$88
Allowed Paid Amount	$15	$15	$15
Radiology/Imaging Fees			
Provider Charges	$32	$25	$47
Allowed Paid Amount	$6	$5	$9
Pharmacy Fees			
Provider Charges	$332	$312	$378
Allowed Paid Amount	$230	$217	$263

	Total	Vaginal Childbirth	Cesarean Childbirth
Medicaid			
Newborn Care			
Total Costs			
Provider Charges	$11,254	$8,553	$19,114
Allowed Paid Amount	$3,677	$3,014	$5,607
Facility Fees			
Provider Charges	$8,460	$6,317	$14,696
Allowed Paid Amount	$2,861	$2,321	$4,435
Professional Anesthesiology Fees			
Provider Charges			
Allowed Paid Amount			
Professional Service Fees			
Provider Charges	$2,493	$1,970	$4,014
Allowed Paid Amount	$724	$615	$1,040
Laboratory Fees			
Provider Charges	$109	$108	$113
Allowed Paid Amount	$20	$19	$21
Radiology/Imaging Fees			
Provider Charges	$120	$103	$168
Allowed Paid Amount	$24	$21	$32
Pharmacy Fees			
Provider Charges	$72	$54	$124
Allowed Paid Amount	$48	$37	$78
Intrapartum + Newborn Costs = Estimate of Total Childbirth Hospitalization Costs			
Total Costs			
Provider Charges	$26,258	$21,152	$39,794
Allowed Paid Amount	$7,413	$6,361	$10,262
Facility Fees			
Provider Charges	$19,532	$15,403	$30,456
Allowed Paid Amount	$5,365	$4,492	$7,722
Professional Anesthesiology Fees			
Provider Charges	$981	$842	$1,309
Allowed Paid Amount	$167	$160	$182
Professional Service Fees			
Provider Charges	$5,387	$4,591	$7,554
Allowed Paid Amount	$1,780	$1,622	$2,214
Laboratory Fees			
Provider Charges	$180	$160	$229
Allowed Paid Amount	$32	$29	$39
Radiology/Imaging Fees			
Provider Charges	$131	$112	$185
Allowed Paid Amount	$26	$23	$35
Pharmacy Fees			
Provider Charges	$72	$54	$124
Allowed Paid Amount	$48	$37	$78

Notes: Due to rounding, the sum of average costs across categories or phases of care does not add up to exact total average costs.

APPENDIX F: MATERNITY-RELATED SERVICE CODES

Table 58: Maternity-Related Billing Codes

Category	Associated Billing Codes
Pregnancy Diagnosis Code	ICD-9-CM:640.00 – 676.94, V22.0 – V24.2, V72.42
Anesthesia – Obstetric	CPT-4:01958, 01960, 01961, 01967, 01968
Maternity Care and Delivery – Antepartum Services	CPT-4:59000, 59001, 59012, 59015, 59020, 59025, 59030, 59050, 59051, 59070, 59072, 59074, 59076, 59160, 59866, 59871, 59898, 59899
Introduction and Repair*	CPT-4:59200 (and Pregnancy Diagnosis Codes), 59300, 59320, 59325, 59350
Vaginal Delivery – Antepartum and Postpartum Care*	CPT-4:57022, 58605 (and Pregnancy Diagnosis Codes), 59400, 59409, 59410, 59412, 59414, 59425, 59426, 59430
Cesarean Delivery*	CPT-4:58611 (and Pregnancy Diagnosis Codes), 59510, 59514, 59515, 59525
Delivery After Previous Cesarean Section	CPT-4:59610, 59612, 59614, 59618, 59620, 59622
Radiology – Obstetric*	CPT-4:76801, 76802, 76805, 76810 – 76821, 76825 – 76828, 76941. Other CPT-4 not listed above: 70000 – 79999 require Pregnancy Diagnosis Codes
Pathology and Laboratory – Organ or Disease-Oriented Panels*	CPT-4:80055, 85004, 85007, 85009, 85025, 85027, 86592, 86850, 86900, 86901, 87340, 81001 – 81003 (and Pregnancy Diagnosis Codes) , 81025 (and Pregnancy Diagnosis Codes), 82105 (and Pregnancy Diagnosis Codes), 82106, 82677 (and Pregnancy Diagnosis Codes), 82731, 82950 (and Pregnancy Diagnosis Codes), 84163 (and Pregnancy Diagnosis Codes), 84443 (and Pregnancy Diagnosis Codes), 84702 (and Pregnancy Diagnosis Codes), 85018 (and Pregnancy Diagnosis Codes), 85025(and Pregnancy Diagnosis Codes), 86701 (and Pregnancy Diagnosis Codes), 87081 (and Pregnancy Diagnosis Codes), 87086 (and Pregnancy Diagnosis Codes), 88142 (and Pregnancy Diagnosis Codes). Other CPT-4 not listed above: 80000 – 89999 require Pregnancy Diagnosis Codes
In-Utero Procedures*	HCPCS:S0612 (and Pregnancy Diagnosis Codes), S0613 (and Pregnancy Diagnosis Codes), S2400 – S2405, S2409, S2411, S8055
Obstetrical Procedures	CPT-4:72.0 – 74.2, 74.4, 74.99, 75.0 – 75.99
Other Explicit or High Volume Procedures*	CPT-4:0500F, 0501F, 0502F, 0503F. Other CPT-4 not listed above 36415, 99000, and 99212 – 99214 require Pregnancy Diagnosis Codes

Require a combination of pregnancy diagnosis codes and procedures in order to be considered maternity-related services.