

# **Cesarean Deliveries, Outcomes, and Opportunities for Change in California: Toward a Public Agenda for Maternity Care Safety and Quality**

## **A CMQCC White Paper**

Elliott Main, MD, Christine Morton, PhD

David Hopkins, PhD, Giovanna Giuliani, MBA, MPH

Kathryn Melsop, MS and Jeffrey Gould, MD, MPH



December 2011

*Funded by the California HealthCare Foundation, based in Oakland, California.*

## How to cite this paper:

Main EK, Morton CH, Hopkins D, Giuliani G, Melsop K and Gould JB. 2011. Cesarean Deliveries, Outcomes, and Opportunities for Change in California: Toward a Public Agenda for Maternity Care Safety and Quality. Palo Alto, CA: CMQCC. (Available at [www.cmqcc.org](http://www.cmqcc.org))

## Author Affiliations:



Elliott Main, MD, Medical Director

Christine Morton, PhD, Program Manager & Research Sociologist

Kathryn Melsop, MS, Program Manager



David Hopkins, PhD, Senior Advisor

Giovanna Giuliani, MBA, MPH, Senior Manager



Jeffrey Gould, MD, MPH, Principal Investigator, CPQCC/CMQCC

## Acknowledgements:

Thanks are due to many for their advice and critical review of this paper, particularly Suzanne Delbanco, PhD, David Lagrew, MD, Kathleen Pine, Theresa Morris, PhD and Stephanie Teleki, PhD. Our editor, Susan Baird Kanaan, deserves recognition for her superb assistance. Special gratitude to Ann Rose and the Lucile Packard Foundation for Children's Health for financial support for graphic design. Valerie Cape contributed substantially to the entire project, especially in the creation of the bibliography, and has been an invaluable source of practical and moral support. Graphic Design by Visual Art Services.

## For reprint requests, please contact:

California Maternal Quality Care Collaborative CMQCC; Stanford University, MSOB, 1265 Welch Road, MS 5415, Palo Alto, CA 94305 650-725-6108 [www.cmqcc.org](http://www.cmqcc.org)

Copyright © 2011 by CMQCC

All rights reserved. Individuals may photocopy all or parts of white papers for educational, not-for profit uses. These papers may not be reproduced for commercial, for-profit use in any form, by any means (electronic, mechanical, xerographic, or other), or held in any information storage or retrieval system without the written permission of CMQCC.

## Table of Contents

<b>EXECUTIVE SUMMARY .....</b>	<b>5</b>
<b>1. A RISING CESAREAN DELIVERY RATE, WITH WIDE PRACTICE VARIATIONS ...</b>	<b>15</b>
INTRODUCTION.....	15
CESAREAN DELIVERY 101 .....	17
TRENDS IN U.S. AND CALIFORNIA CESAREAN DELIVERY RATES.....	18
<i>Demographic Changes and Increased Cesarean Delivery Rates .....</i>	<i>19</i>
VARIATION IN CESAREAN DELIVERY RATES AMONG REGIONS, HOSPITALS, AND PROVIDERS.....	21
<i>Cesarean Variation among Regions in California: a CMQCC Analysis .....</i>	<i>22</i>
<i>Cesarean Variation among California Hospital Referral Regions (HRRs) and Service Areas (HSAs) .....</i>	<i>23</i>
CESAREAN VARIATION: A LEVER FOR QUALITY IMPROVEMENT .....	25
<b>2. LITTLE EVIDENCE OF BENEFITS; CLEAR COSTS AND RISKS.....</b>	<b>26</b>
THE EFFECTS OF A RISING CESAREAN DELIVERY RATE ON BABIES .....	26
<i>Putative Medical Benefits of Cesarean Delivery for Babies .....</i>	<i>26</i>
<i>Neonatal Morbidity related to Cesarean Delivery .....</i>	<i>27</i>
THE EFFECTS OF A RISING CESAREAN DELIVERY RATE ON WOMEN.....	28
<i>Psychological Costs of Cesarean Delivery for Childbearing Women .....</i>	<i>31</i>
THE ECONOMIC COST OF INCREASED CESAREAN DELIVERY RATES IN CALIFORNIA .....	33
<b>3. MEDICAL FACTORS DRIVING THE RISE IN CESAREAN DELIVERIES .....</b>	<b>37</b>
PRIMARY CESAREAN DELIVERIES AND THEIR INDICATIONS.....	37
REPEAT CESAREANS AND VAGINAL BIRTH AFTER CESAREAN (VBAC).....	40
<i>The Fallacy of Maternal Request Cesareans .....</i>	<i>42</i>
<b>4. EXPANDING THE LENS: SOCIOCULTURAL FACTORS ASSOCIATED WITH THE RISING CESAREAN DELIVERY RATE .....</b>	<b>44</b>
FINDINGS: CLINICIANS' VIEWS OF MATERNAL QUALITY AND SAFETY IN CALIFORNIA.....	45
MEDICO-LEGAL FACTORS AFFECTING CESAREAN DELIVERY RATES.....	47
<i>Education for Childbearing Women.....</i>	<i>47</i>
CLINICIAN ATTITUDES AND PRACTICES.....	48
ECONOMIC FACTORS .....	50

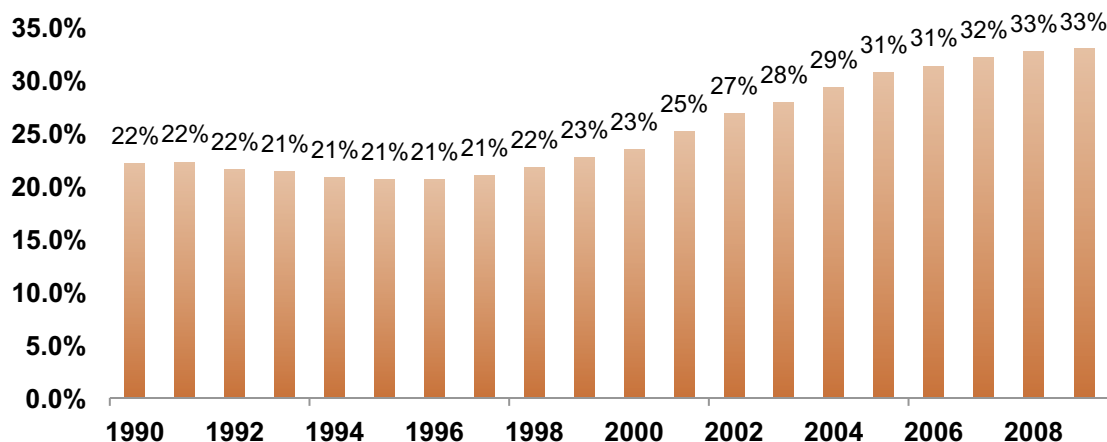
<b>5. STRATEGIES FOR CHANGE: MULTI-FACETED APPROACHES FOR QUALITY IMPROVEMENT, BETTER MEASUREMENT, PUBLIC REPORTING, AND EDUCATION.....</b>	<b>51</b>
<b>QUALITY IMPROVEMENT (QI) .....</b>	<b>51</b>
<i>Clinical Improvement Strategies.....</i>	<i>51</i>
<i>Establishing Targets For U.S. Cesarean Delivery Rates .....</i>	<i>53</i>
<i>Measurement Issues .....</i>	<i>53</i>
<i>Cesarean Delivery Measures with Quality Improvement Potential.....</i>	<i>55</i>
<i>A California Maternal Data Center .....</i>	<i>57</i>
<b>PAYMENT REFORM .....</b>	<b>57</b>
<i>Opportunities for Payment Reform .....</i>	<i>57</i>
Two Maternity Payment Reform Models .....	57
Consumer Economic Incentives .....	61
<b>EDUCATION AND PUBLIC REPORTING .....</b>	<b>62</b>
<i>Education: Collaborative Efforts to Increase Awareness.....</i>	<i>62</i>
<i>Public Reporting: Transparency for Public and Providers .....</i>	<i>63</i>
<b>6. CONCLUSIONS: WHAT CAN AND SHOULD BE DONE? .....</b>	<b>65</b>
<b>CMQCC RECOMMENDATIONS TO REDUCE CESAREAN DELIVERY .....</b>	<b>65</b>
Quality Improvement.....	65
Payment Reform.....	65
Education.....	65
<b>APPENDICES: .....</b>	<b>67</b>
APPENDIX A: CALIFORNIA BIRTHS BY DRG AND PAYER.....	67
APPENDIX B: CMQCC METHODS FOR ANALYSIS OF REGIONAL VARIATIONS .....	68
APPENDIX C: DATA TABLES: NTSV AND OVERALL CESAREAN DELIVERY RATES BY CALIFORNIA RPPC REGIONS, 2007 .....	69
APPENDIX D: CALIFORNIA REGIONAL VARIATION -- BOX AND WHISKERS PLOT .....	71
APPENDIX E: GEOMAPS – THE CALIFORNIA MATERNITY ATLAS PROTOTYPES .....	72
APPENDIX F: KEY INFORMANT INTERVIEWS WITH CALIFORNIA MATERNITY CARE PROVIDERS: METHODS AND SAMPLE.....	69
APPENDIX G: GLOSSARY OF TERMS .....	75
<b>REFERENCES .....</b>	<b>79</b>

## EXECUTIVE SUMMARY

### 1. A RISING CESAREAN DELIVERY RATE, WITH WIDE PRACTICE VARIATIONS

Cesarean delivery rates in both California and the United States as a whole rose by 50 percent between 1998 and 2008, climbing from 22 percent to 33 percent of all births in just a decade. This upward trend, which is seen for every type of woman regardless of race/ethnicity, age, weight, or the gestational age of the pregnancy, shows no signs of reversing. The increasing rates are largely the result of two factors: a significant rise in first-birth cesareans done in the course of labor, and a marked decline in vaginal births after a prior cesarean (VBAC).

**Figure 1: Cesarean Delivery Rates: California, 1990-2009**



Source: CDC/NCHS, National Vital Statistics System

Cesarean deliveries are performed for many reasons. Some, such as those for breech presentation, are supported by strong clinical consensus. However, many cesareans, especially those done in the course of labor, are the result of labor management practices that vary widely and suggest clinician discretion, as discussed below.

In many contexts, cesarean delivery has come to be regarded as the safer option, when in fact it has greater risks and complications than vaginal birth. Higher cesarean delivery rates have brought higher economic costs and greater health complications for mother and baby, with little demonstrable benefit for the large majority of cases. With the marked decline in vaginal births after cesarean, cesarean deliveries have become self-perpetuating; and every subsequent cesarean brings even higher risks. Yet despite the fact that for several decades many editorials in leading obstetric journals and childbirth advocates have called for urgent action to reverse this trend, cesarean delivery rates have continued to rise.

#### Variations in Cesarean Rates among Regions, Hospitals, and Providers

Cesarean delivery rates vary widely among states, regions, hospitals, and providers. In California hospitals with more than 100 births per year, overall cesarean rates vary from 18 percent to well over 50 percent of all births; and rates of cesareans for low-risk first births vary from 9 percent to 51 percent. Several studies have estimated that 90 percent of the variation in cesarean delivery rates can be accounted for by just two indications (i.e., reasons) that occur in cesareans performed in the course of labor: failure to progress, and fetal intolerance of contractions. These

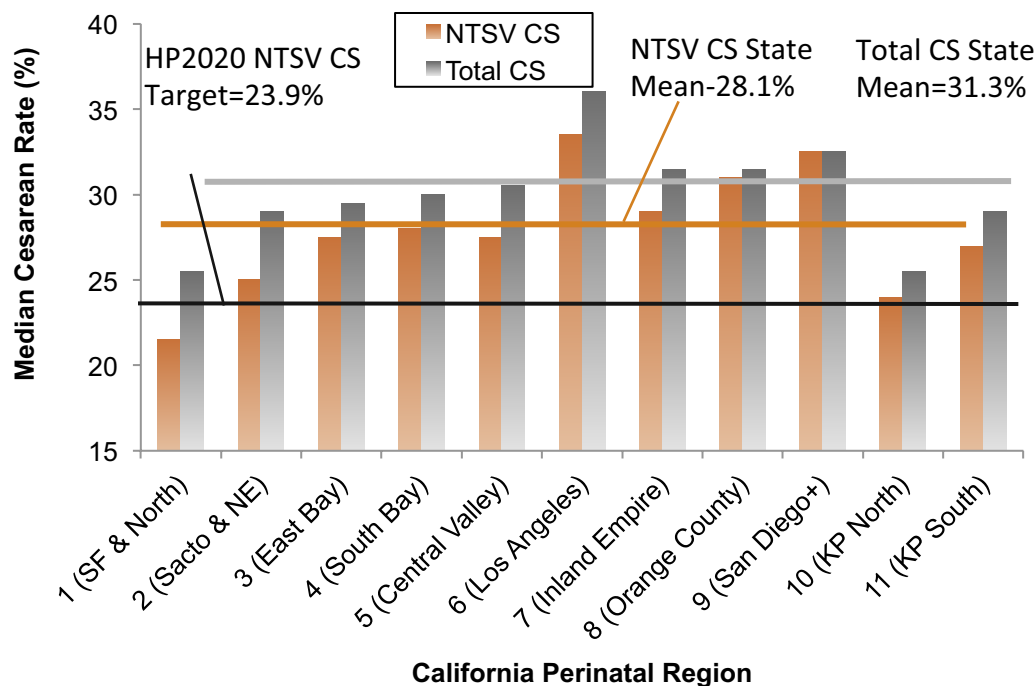
two indications also account for nearly all of the increase in the primary cesarean delivery rate.

Over all, these highly variable rates represent significant opportunities for reducing the use of cesarean delivery, with different opportunities associated with different types of cesarean. Clearly, this is a national issue, and efforts undertaken in California to reduce the cesarean delivery rate can have widespread impact.

### Cesarean Variation among Regions in California: a CMQCC Analysis

The California Maternal Quality Care Collaborative (CMQCC) analyzed variation among cesarean deliveries in California and found dramatic variations in NTSV<sup>a</sup> rates among regions and among hospitals. California has similar payer contracts and liability laws among all regions, so the large geographic variation cannot be explained by payment or liability factors; rather, the variation suggests that local cultural factors may be at play. These factors may include the attitudes toward the desirability of vaginal birth among physicians and nurses on labor and delivery units, as well as hospital practices that affect the likelihood of vaginal birth. These and other sociocultural factors are discussed in Section 4.

**Figure 2: Median Hospital Cesarean Rates for Perinatal Regions, California; 2007**



Source: All-California Rapid Cycle Maternal/Infant Database, CMQCC 2011.

### Why Is the Cesarean Delivery Rate Rising, and What Can Be Done?

After discussing the high rates and wide variations in current practice (Section 1), this white paper presents the evidence of costs and risks associated with cesarean deliveries (Section 2). Because the problem of high cesarean rates cannot be solved until the causes and drivers are understood, the paper then explores the major factors driving the increase. It shows that the rise cannot be explained by medical factors alone (Section 3), and looks at sociocultural factors

<sup>a</sup> The NTSV measure tracks cesarean delivery among women who are nulliparous, at term, with a singleton baby in the vertex position; NTSV represents the lowest-risk, optimal set of conditions for vaginal birth among women—a first birth with a full-term, single baby in the head-down position. See Appendix G: Glossary of Terms for definitions of technical terms used in this White Paper.

that help explain the increasing use of cesarean delivery (Section 4). Finally, the white paper outlines a set of complementary strategies for reducing the rates (Section 5) and offers a number of CMQCC recommendations (Section 6).

Briefly, the reasons for the rapid rise in the cesarean delivery rate over the past decade are a combination of decreasing downward pressures and increasing upward drivers. Most of the pressures on providers and hospitals that kept cesarean delivery rates stable in the past have all but disappeared, including physician pride in a low cesarean rate, peer and professional organization pressures, and women's strong preference for avoiding a cesarean delivery. Today, providers seem to see no "downside" to a high cesarean rate; and women seem increasingly accepting of the prospect of a cesarean.

Meanwhile, the drivers of increasing cesarean rates have grown in influence. These drivers include physicians' concerns about medical liability, increased scheduling of births, and greater use of technology such as electronic fetal monitoring (despite a limited scientific evidence base). Other changes in obstetric practices that have contributed to the rising rates include increasing use of labor induction, early labor admission, lack of patience in labor, and the virtual disappearance of vaginal birth after a prior cesarean.

In short, the "path of least resistance" for both physicians and women now leads to higher and higher cesarean rates.

## 2. LITTLE EVIDENCE OF BENEFITS; CLEAR COSTS AND RISKS

The risks and costs associated with cesarean deliveries are considerable, while there is little evidence for the supposed benefits ascribed to them. Indeed, it has not been possible to document any population-level benefit to women or newborns associated with the increased rate of cesareans. The Joint Commission recently stated this finding succinctly: "There are no data that higher rates improve any outcomes, yet the C-section rates continue to rise."<sup>1</sup>

Primary cesarean delivery today is safer than ever; and because major complications are rare with a first birth, the risks of primary cesarean are not visible to practicing obstetricians. However, repeat cesareans, in particular, carry significant risks and complications. Unfortunately, these "future" risks of repeated cesareans are not well appreciated by either obstetricians or the public.

This section reviews the limited evidence for the benefits ascribed to cesarean deliveries and outlines their well-documented risks and costs.

### Putative Medical Benefits of Cesarean Delivery

The most common medical indications for cesarean deliveries include breech presentation, twin pregnancies, prematurity, and labor complications. With the sole exception of breech presentation, however, the 50 percent increase in cesarean deliveries over the past decade is associated with very little documented benefit for newborns. Although concern for fetal well-being (fetal intolerance of labor) is one of the most frequent indications for cesarean delivery, there is little to suggest that the higher rates of cesarean are providing the intended benefits. And apart from specific medical obstetric indications in the mother (e.g., placenta previa or severe preeclampsia), cesarean delivery offers women few health benefits.

In summary, whatever the motivation for today's more "defensive" approach to delivery, it is not resulting in better outcomes for babies or their mothers. This lack of benefit stands in striking contrast to the risks and costs outlined below.



## Physiological Costs and Risks of Cesarean Deliveries for Mothers and Babies

In contrast with the negligible evidence of benefit, there is considerable evidence that cesarean deliveries put women at risk for obstetric hemorrhage and infection—the most frequent causes of severe maternal morbidity (disease or complications), and the two leading causes of hospital readmission in the first 30 days after delivery. These risks to women’s health rise with each additional cesarean surgery.

Besides these short-term risks, significant long-term consequences for women’s reproductive health are associated with cesarean delivery. They include pain and surgical adhesions as well as a possible increased risk for fertility issues and perinatal complications in subsequent pregnancies. The most serious risk for women undergoing multiple repeat cesarean deliveries is a step-wise, dramatically increased risk for life-threatening hemorrhage and morbidity due to placental implantation problems, including placenta previa and placenta accreta.

*The reasons for the rapid rise in the cesarean delivery rate over the past decade are a combination of decreasing downward pressures and increasing upward drivers.*

One argument for cesarean delivery asserts that this procedure has resulted in improved outcomes and benefits for newborns. However, this assertion is not borne out by the evidence. Cerebral palsy rates have been stable since the mid-1980s, and full-term neonatal outcomes have not improved since the mid-1990s. Moreover, there is strong evidence that babies born by cesarean delivery, particularly when performed without labor (i.e., scheduled), have significantly higher rates of neonatal respiratory problems than those born vaginally.

## Psychological Costs of Cesarean Delivery for Childbearing Women

Some women prefer cesarean birth, or view it as a positive experience. However, there is growing evidence that for the majority of women, having a cesarean (compared with giving birth vaginally) is associated with greater psychological distress and illness, including postpartum anxiety, depression, and post-traumatic stress disorder. Cesarean deliveries can have an adverse influence on maternal-infant contact at birth, women’s satisfaction with and feelings about the birth, their babies’ experiences, and their success with breastfeeding.

## The Economic Cost of Increased Cesarean Delivery Rates in California

There are many problems with the current maternity care payment system that lend further support and urgency to our call for a public agenda for maternity care safety and quality. Beyond the medical burden to mothers and babies, the financial burden of cesarean deliveries is enormous. Commercial reimbursement for a cesarean is higher than the amount for vaginal birth — \$18,500 compared to \$11,500 respectively. The rising cesarean rates represent an increasing financial burden to the state (Medi-Cal), commercial insurers, and women and their families. The Pacific Business Group on Health (PBGH) estimates that the additional cesarean deliveries performed above the year-2000 rate cost public and private payers in California at least \$240 million in 2011 alone. PBGH also estimates that between \$80 million and \$441.5 million a year can be saved by reducing cesarean rates in California, with the amount of the savings dependent on the size of the reduction.

The combination of financial burden, troubled national and state economies, and the lack of medical evidence to justify the rise in cesarean rates has spurred purchasers and payers to seek



ways to reduce the rate of cesarean deliveries. This white paper is designed to point the way to potential solutions.

### 3. MEDICAL FACTORS DRIVING THE RISE IN CESAREAN DELIVERIES

The costs and risks of cesarean delivery and the negligible benefits for most mothers and babies point to the urgent need for efforts to bring about lower rates. These efforts will only be effective if they are based on an understanding of the drivers of the rise in rates. Do medical factors explain and justify the increasing use of cesarean delivery? The evidence suggests that they do not.

#### Primary Cesareans

The medical indications that account for the majority of primary (first) cesarean deliveries are “labor complications”—that is, either dystocia or failure to progress in labor. These indications not only account for most of the rise in rates over the past decade, but are also responsible for 80 to 90 percent of the variation in first-birth cesarean delivery rates among hospitals and providers. Not surprisingly, these indications also have the least well-defined scientific evidence to support them. The quality improvement and payment reform efforts outlined in this white paper focus in particular on reducing first-birth cesareans among low risk women done in the course of labor.

There is growing evidence to support the claim that provider-dependent indications (i.e., those that rely on provider judgment) combined with provider discretion contribute significantly to the overall increase in both primary and repeat cesareans. For example, a study of primary cesarean deliveries showed that more subjective or discretionary indications such as fetal heart-beat, labor arrest, and the size of the fetus accounted for larger proportions of cesarean deliveries than more objective indications such as the orientation of the baby or umbilical cord and placental positions.

The fact that cesarean delivery rates and practices vary widely among states, regions, hospitals, and providers for both primary and repeat cesareans demonstrates that hospitals and clinicians can differ in their responses to the same conditions. This fact suggests the need for more precise clinical practice guidelines and/or greater accountability and incentives for following them.

#### Repeat Cesareans Are Replacing Vaginal Birth after a Prior Cesarean (VBAC)

A prior cesarean is the single largest contributor to the rise in cesarean delivery rates among all indications. Since 1999, about 90 percent of women with a prior cesarean have had their subsequent delivery by cesarean. The majority of women with a prior cesarean are good candidates to have their subsequent children by vaginal birth.<sup>2</sup> Yet despite the conclusion of a 2010 National Institutes of Health (NIH) Consensus Development Conference panel that VBAC was a “reasonable option” for most women with a previous cesarean, repeat cesarean rather than vaginal birth has become common obstetric practice. In 2002, 11.7 percent of all women giving birth had had a prior cesarean, and this number continues to rise. The lack of access to VBAC means that most subsequent births will be repeat cesareans. Without a widespread change in this obstetric practice and the policies that influence it, the percent of women in the U.S. having repeat cesareans will continue to rise as the primary cesarean rate rises.

#### The Fallacy of Maternal Request Cesareans

Popular accounts in the national media during the early and mid 2000s created the misleading impression that maternal request among women “too posh to push” was a significant driver

of the high cesarean rate. However, researchers have not found evidence to support this explanation. Nationally representative surveys conducted in 2006 by Listening to Mothers-II found that providers made the cesarean delivery decision more than twice as often as mothers, under all conditions. In addition, at least one woman in four reported feeling pressure from a health care professional to have a cesarean. Fewer than 1 percent of women reported choosing a non-medically indicated cesarean for their first birth.

#### **4. EXPANDING THE LENS: SOCIOCULTURAL FACTORS ASSOCIATED WITH THE RISING CESAREAN DELIVERY RATE—A CMQCC ANALYSIS**

Since the rise in cesarean rates cannot be explained medically, we must look further for the factors that are influencing decision-makers and driving the rise in cesarean deliveries. CMQCC conducted qualitative research with obstetric clinicians (physicians, nurses, and certified nurse midwives) that offers insight into a number of sociocultural factors affecting the rise in cesarean delivery. The interviews point to wider patterns of thinking and illuminate subtle, difficult-to-document influences on decision-making that go beyond medical factors.

##### **Medico-Legal Factors Affecting Cesarean Rates**

The practice of defensive medicine is likely to be one reason for the high cesarean rate. According to a recent study in the *New England Journal of Medicine*, obstetrician-gynecologists are among the medical specialties most likely to face a malpractice claim, and they have a higher risk of an indemnity payment exceeding \$1 million.<sup>3</sup> Many experts feel that the current medico-legal climate in general and fear of malpractice litigation in particular force physicians to practice “defensive” medicine. States’ liability environment also has been shown to have an impact on rates of VBAC and cesarean delivery.

##### **Clinician Attitudes and Practices**

The sharp rate of increase in cesarean rates has raised questions among observers about the “gray-zone” areas that call for physician judgment. A predominant theme in CMQCC’s interviews was physician practice variation and the hospital and cultural factors (notably, those related to time efficiencies) that affect such variations. Many nurses talked about the timing of cesareans done during labor, citing the competing demands on physicians for clinic appointments and their desire for balance between work and the rest of life. Institutional pressures and the pace of high-volume facilities was another factor mentioned, along with physicians’ impatience with labor progress—a response that can be exacerbated in clinicians and mothers alike by the use of inductions, which can set up an expectation for a quick birth experience.

##### **Economic Factors**

Misaligned or perverse incentives have been described as significant barriers to reducing the cesarean rate. For example, a significant portion of the obstetric global fee is delivery-based, creating incentives for obstetricians to deliver their own patients when they are on call. This, in turn, increases the desire and pressure for physicians to perform more scheduled labor inductions for their call nights. From a physician’s perspective, a vaginal birth after a prior cesarean is typically a long labor, with increased risk exposure and less economic reimbursement than a repeat cesarean delivery. Not surprisingly, few physicians advocate for supportive VBAC policies at their facilities. Given current payment policies, it is not a rational economic choice for either physicians or hospitals.

A complex constellation of factors, then, is at play in obstetric practice. CMQCC’s interviews

referred to several others that also influence the rising cesarean rate: women's lack of information about and understanding of the risks of non-medically indicated cesarean; the need for better clinical training in communication and teamwork skills; the lack of training around normal birth in most residency training programs based in high-risk University centers; and clinician anxieties about the underlying legal climate.

### **Childbearing Women's Need for Education**

Although maternal request does not appear to be driving the rise in the cesarean delivery rate, there is evidence that women are more amenable to, or less able to resist, cesarean delivery for indications that arise in the course of labor than women were in the past. CMQCC's clinician interviews reveal that childbearing women lack information about childbirth options and risks, and need opportunities to be educated about them. Rather than reinforcing such messages by valuing childbirth education and normal, vaginal delivery, many cultural sources, such as reality-based television and some websites, convey the incorrect message that cesarean deliveries are a risk-free way to preserve perineal and sexual integrity and avoid the pain of labor.

## **5. STRATEGIES FOR CHANGE**

This white paper discusses the steep rise in cesarean delivery rates in a single decade, the large variations that point to the influence of physician discretion, the high costs and risks associated with cesarean deliveries, and the lack of medical justification for many cesareans. Providers, payers, purchasers, and childbearing women all need to ask whether society can afford the costs and complications of increasing cesareans, and whether they can work together toward solutions. A first step is for all stakeholders to support cultural change to recognize the value of normal vaginal birth for mothers and their babies.

All of the factors discussed above point to the need for a multi-pronged set of strategies; no single approach is likely to have the desired impact. The most promising strategies include, but are not limited to, clinical improvement strategies, with careful examination of labor management practices to reduce those that lead to the development of indications for cesarean deliveries; hospital policy and payment reform to eliminate negative or perverse incentives; provider and consumer education; and public reporting (transparency). We begin with quality improvement strategies and the related issues.

### **QUALITY IMPROVEMENT (QI)**

#### **Clinical Improvement Strategies**

Restoring the balance will not be an easy or quick proposition, and will require coordinated efforts by multiple stakeholders. Clinical improvement strategies are more than just a matter of adopting and implementing practice guidelines. Improvements arise through tactics that include audit and feedback, education, and strong peer review among physicians. Incentives should be used to motivate physicians and hospital administration, along with nursing staff, to engage together in changing the culture on labor and delivery units.

Hospitals should examine their care processes and consider appropriate QI projects to reduce admissions in early labor, reduce elective inductions in first-time mothers, improve diagnostic and treatment approaches for labor complications, and/or encourage vaginal birth after cesarean through hospital policies and supportive care during labor. Several groups in the United States are working to develop formal Quality Improvement Toolkits with strategies such as these, to stimulate cesarean delivery reduction programs at local, hospital system, and state levels.

## Establishing Targets for U.S. Cesarean Delivery Rates

What is an optimal target rate for an upper limit of cesarean deliveries as a percentage of all births? This question remains to be resolved. In 1985, the World Health Organization proposed a target for the total cesarean delivery rate for all countries of 15 percent—a target that has been widely ignored in the U.S. A 2000 report by the American College of Obstetricians and Gynecologists (ACOG) reached conclusions similar to those presented in this white paper, focusing particular attention to NTSV (low-risk, first-birth) cesareans with a proposed target of 15.5 percent NTSV rate.<sup>4</sup> The Healthy People 2020 objectives, which are more modest than their 2010 predecessor, call for a 23.9 percent NTSV rate and for a doubling of the percentage of vaginal births after a prior cesarean. Some hospitals and geographic areas already meet these targets, while others are far off.

## Measurement Issues and Opportunities

The need for usable, valid quality measures in maternity care is rapidly gaining national attention; and the success of quality improvement efforts depends on the development, implementation, and tracking of such measures. There are two foundational requirements for the success of a multi-strategy initiative to improve maternal quality care and reduce cesarean delivery rates: first, recognition that change is necessary, desirable, and achievable; and second, a reputable source for reliable, timely, and relevant quality data to drive the change efforts. Some hospitals are able to provide such data for internal efforts, but many more are not; and in most cases, outcome data are not publicly reported in sufficient detail or in a timely way.

A California Maternal Data Center with the capacity to provide a robust source of near-real-time outcome data for large-scale maternity quality improvement projects is being created through a collaboration between CMQCC and several state agencies and other stakeholders. Initial planning support has come from the California HealthCare Foundation.

## PAYMENT REFORM

Financial incentive strategies can redirect clinical practices to change the cesarean delivery rate trajectory. Given the budget issues faced by all payers (Medicaid and commercial) and the considerable dollars at stake, reforming payment for cesarean deliveries should be a priority for policy makers and payers. Payment reform could create the proverbial “burning platform” that spurs change more quickly than other strategies. The first step is to remove the perverse financial incentives that currently help drive the rising rate.

Payments can be used to reward providers for high-quality clinical practice and good patient outcomes, and/or to encourage specific practices (e.g., VBAC) or discourage others (e.g., labor induction and repeat cesarean deliveries). Non-payment for undesired services will generate controversy, as there are individual justifications for some of these services. Payment can be linked to provider performance, or bundled/blended to enable health care organizations to make internal quality improvement decisions. Maternity payments should be part of a value-based purchasing program similar to Medicare. An example of a blended payment is a single payment to a hospital for “birth” that is a blend of vaginal and cesarean rates. This sidesteps individual circumstances and any post-hoc review of a particular birth or provider, and rewards hospitals that have lower cesarean rates. It thus keeps the QI activity local rather than having it driven by government or other stakeholder groups.



## EDUCATION AND PUBLIC REPORTING

### Educating the Public and Clinicians, and Encouraging Normal Childbirth

This white paper has demonstrated that despite the abundance of reputable online sites for information on pregnancy and childbirth, most women enter the hospital with little knowledge of common procedures, their indications and risks. There is also need for education among clinicians and other important stakeholders, including payers, purchasers and public health officials, who have limited understanding of the disconnect between dollars spent and outcomes achieved in U.S. maternity care.

A coordinated effort by many organizations and individuals is needed to address these information and awareness gaps, not only about the bigger picture but also about specific ways that the cesarean rate can be lowered through the strategies outlined above. Gaps in clinical awareness and education can be overcome through targeted messages in continuing education offered by professional groups such as ACOG, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), and the American College of Nurse Midwives (ACNM), and by other organizations. The endorsement and adoption of the NTSV measure for cesarean delivery by the National Quality Forum and The Joint Commission has raised clinical awareness of the issue. As more hospitals prepare to report on this measure, organizations, including CMQCC, can and will develop educational webinars and information sessions directed at clinicians. Not all obstetric clinicians see the rising cesarean rate as a problem, or understand that efforts to reduce it will require clinical practice change. Educational efforts are necessary, though not sufficient, to ensure lower cesarean delivery rates. To accomplish this goal, targeted and multiple clinical improvement strategies are needed.

ACOG's revised policy on vaginal birth after a prior cesarean is a positive step, together with the strong scientific evidence for the NIH recommendation that "most women" who are good candidates for VBACs "should be counseled about VBAC and offered a trial of labor."<sup>5</sup> Nevertheless, it will likely take persistent pressure from childbearing women and advocates for evidence-based practice in childbirth, supported by public reporting of VBAC availability at the hospital level, to reverse the current trend and make vaginal birth after a prior cesarean more widely available.

### Public Reporting: Transparency for Providers and the Public

Public reporting can aid consumer health care decision-making and incent or pressure providers to improve their performance. Although the experience of states such as Virginia shows that public reporting on websites is not sufficient to stabilize or reduce the cesarean delivery rate, public reporting and transparency can be an important strategy when combined with others including payment reform, education, and advocacy.

## 6. CONCLUSION: WHAT CAN AND SHOULD BE DONE?

This white paper presents evidence that rising cesarean delivery rates and their associated health and financial costs should be a matter of serious concern for a wide range of Americans. Those who bear the impact include childbearing women and their families, patient advocates, obstetric clinicians, payers, employers, and health plans. The costs and risks of cesarean delivery are particularly disturbing in view of the fact that the current rate of 33 percent is not associated with any additional health benefits in comparison with the 1998 rate of 22 percent. The steep rise in the cesarean delivery rate has been driven by many factors, some relating to medical practice and some reflecting larger sociocultural shifts. Not surprisingly, narrowly defined

approaches have had little impact on reducing cesarean delivery rates. New practices are now deeply embedded and will be resistant to change.

Based on our review of the existing research, data on the variations in cesarean rates in California and elsewhere, and experience with effective quality improvement techniques, we recommend that the following multiple approaches, or a subset of them, be undertaken simultaneously, as appropriate to the specific local context. Many of these interventions interact positively with and reinforce each other. (The recommendations are presented in greater detail on page 65.)

## **CMQCC Recommendations to Reduce Cesarean Delivery**

### **Quality Improvement**

1. Make vigorous use of a balanced set of perinatal quality measures in all hospitals. These can be used in the payment reform schemes, public reporting, and to drive QI activities.
2. Institute systemic and rigorous audit and feedback, including local benchmarking, with transparent reporting.
3. Foster statewide QI activities (toolkits and collaboratives) for improving labor practices including tools, implementation strategies and local change efforts.
4. Encourage VBACs.

### **Payment Reform**

5. Use payment reform and public reporting to focus providers' attention on opportunities for quality improvement, including a Value-Based Purchasing program and blended payment approach for hospitals.
6. Implement simple medical liability reforms such as "safe harbors" for providers following "best practice" policies and protocols.

### **Education**

7. Establish a state-wide maternal quality agenda to foster awareness around health consequences of perinatal outcomes.
8. Further the maternal quality agenda and increase public engagement with education, public service announcements, celebrity spokespersons, and shared decision tools.



# 1. A RISING CESAREAN DELIVERY RATE, WITH WIDE PRACTICE VARIATIONS

## Introduction

This white paper presents evidence that the steep rise in cesarean delivery rates in California and the U.S. as a whole should be a matter of serious concern, and it calls for a public agenda for maternity care safety and quality. Far from improving outcomes, the steady upward trend in cesarean rates to the current 33 percent of all births is causing increasing complications to women and babies, with every successive cesarean bringing a higher risk. The rising rates also represent a growing financial burden to public and commercial insurers.

Yet despite repeated calls in leading obstetric journal editorials and by childbirth advocates for urgent action to reverse this trend, primary and

repeat cesarean delivery rates have continued to rise. The lack of medical evidence to justify the rise in cesarean rates, combined with the large financial burden they impose, have spurred purchasers and payers to seek ways to reduce the rate of cesarean deliveries. This white paper is designed to point the way to potential solutions.

In the following pages, we review the growing body of clinical literature showing the complications and lack of benefit from the rise in cesarean delivery. We also demonstrate how cesarean delivery rates vary widely among states, regions, hospitals, and providers. This variability points to the influence of physician discretion and represents significant opportunities for reducing the use of cesarean delivery, with different opportunities associated with different types of cesarean. Multiple studies show that the greatest opportunity for quality improvement relates to cesareans performed in the course of labor among low risk, first-time mothers, because these labors are significantly affect-

ed by hospital and provider management practices. The rise in first-birth cesareans has combined with a marked decline in the use of vaginal births after cesarean to make cesarean deliveries virtually self-perpetuating. In other words, if a mother has a cesarean in her first birth, over 90% of all of her subsequent births will be by cesarean, each with escalating risks. Without a change in these obstetric practices and the policies that influence them, the percentage of women in the U.S. having cesareans will continue to rise.

This paper stresses the need for a multi-pronged set of strategies to reverse the

*The steep rise in cesarean delivery rates in California and the U.S. as a whole should be a matter of serious concern.*

national rise in cesarean rates, as no single approach is likely to have the desired impact. The most promising strategies include

clinical improvement initiatives focused on labor management practices to reduce those that lead to the development of indications for cesarean deliveries; hospital and provider payment reform to eliminate negative or perverse incentives and introduce positive ones; provider and consumer education; and public transparency and reporting. We recommend a set of specific, complementary approaches in these areas to be undertaken simultaneously, as appropriate to the specific local context.

The success of quality improvement efforts depends on the development, implementation, and timely tracking of quality measures for maternity care. To assist in this process, the California Maternal Data Center has been created through collaboration between CMQCC and several state agencies and other private and public stakeholders. The goal of the California Maternal Data Center is to provide a robust source of near-real-time outcome data for use in large-scale maternity quality improvement projects. In a

# 1

state where more than 500,000 babies—one out of eight in the U.S.—are born each year, changes in California can have a national impact and demonstrate approaches that other states can also use to address this national issue.

The white paper has six sections. After discussing the high rates and wide variations in current practice (Section 1), we present the evidence of costs and risks associated with cesarean deliveries (Section 2). Because the problem of high cesarean rates cannot be

solved until the causes and drivers are understood, we then explore the major factors driving the increase. We show that the rise cannot be explained by medical factors alone (Section 3), and look at sociocultural factors that help explain the increasing use of cesarean delivery (Section 4). Finally, we outline a set of complementary strategies for reducing the rates (Section 5) and offer a number of specific recommendations (Section 6). These sections are followed by seven appendices, including a glossary of technical terms.

## Cesarean Delivery 101

A shared understanding of the terminology, types, and indications for cesarean deliveries is important because the epidemiology, causes, and “drivers” for the increase as well as the associated improvement opportunities vary greatly among cesarean types and indications.

Several interchangeable terms refer to births occurring as a result of cesarean surgery, including cesarean delivery; cesarean section; c-section; cesarean birth, and surgical birth. The terminology reflects political and cultural meanings for maternity caregivers and women. In the medical literature, when discussing rates, the procedure is usually referred to as “cesarean delivery,” so we adopt that terminology in this paper.

### What is a cesarean delivery?

A cesarean delivery is a surgical procedure whereby the baby is removed from the mother’s uterus through an incision in the abdominal wall. Once this incision is made, the surgeon cuts through the layers of muscle and fat until reaching the uterus. A small cut is made in the uterine wall, after which the baby is lifted out by hand or, increasingly, by vacuum extraction. After the baby is born and either placed on the mother’s chest or handed off to the pediatric staff, the obstetrician removes the placenta through the incision, suctions out fluid, and begins closing the uterus and inner tissue layers with stitches. The skin incision may be closed with conventional stitches, staples, or even tape strips. Finally, the surgical wound is covered with a dressing. The entire procedure can take up to 45 minutes in a non-emergent context.

### What are the types of cesareans and why are they performed?

Cesareans are categorized as either primary (meaning the first cesarean a woman experiences) or repeat (a second or subsequent cesarean). There are multiple indications (reasons) for performing a cesarean. Cesareans occurring during the course of labor may be done out of health concerns for the fetus or the mother, and are referred to here as labor cesareans. Those cesareans done in advance of labor are variously referred to as scheduled, planned, or elective. These are typically done when the indication is

known and generally accepted as medically necessary. These include indications for breech (baby is not in the vertex [head-down] position deemed optimal for vaginal birth) and multiples in cases where the first baby is breech (twins can be born vaginally if the first baby is head down). The indications for scheduled cesareans also include other medical conditions associated with the woman that are not favorable for vaginal birth. These include cases in which the placenta is lying over or too close to the cervix, or in which there is an active outbreak of herpes. A prior cesarean as an indication for a repeat procedure has pros and cons, and is discussed later in the paper.

### The problem with terminology: “Elective” is misleading.

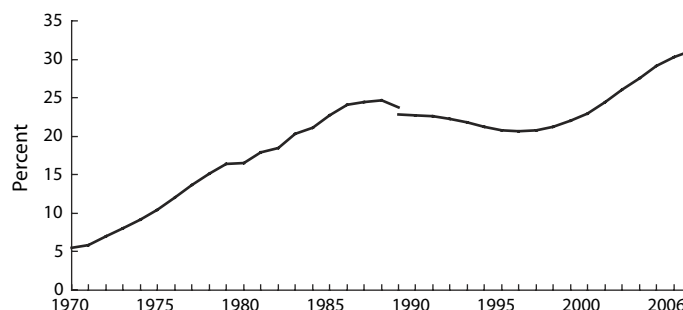
The term “elective” is misleading, imprecise, and variable when used to refer to cesarean delivery. It can refer to a cesarean that has been scheduled in advance of labor and/or one performed without a medical indication. Use of the term often does not distinguish between primary and repeat cesareans (the latter of which are often scheduled, and thus sometimes called “elective”).<sup>6</sup> In such cases, “elective” does not specify who is “electing” the cesarean – the woman or the physician. Even when researchers explicitly examine the cesareans attributed to “maternal request” (which are assumed to be non-medically indicated), many studies do not distinguish between the indications of “medically elective” and “maternal request.” Studies that rely on birth certificate or patient discharge datasets often assume that when no indication is checked, the procedure was “elective.”<sup>7</sup> This was a key (and erroneous) assumption in the 2006 NIH State of the Science Conference on Maternal Request Cesarean. The Conference ignored the fact that the most common reason for “no medical indication” appearing in the medical record data is an absence or incompleteness of documented charting and coding.

In light of the imprecision and misleading nature of the term, several senior authors have called for the abandonment of “elective” in describing types of cesarean delivery along with other interventions common to obstetrics.<sup>8</sup>

## Trends in U.S. and California Cesarean Delivery Rates

Increasing cesarean trends are seen for every type of woman, regardless of her race/ethnicity, age, weight, or the gestational age of her pregnancy. The total cesarean delivery rate in the U.S. (number of cesarean births per 100 live births for any reason) has dramatically increased in the past forty years from a rate of 6 percent in 1970 to over 33 percent in 2011. After being stable in the low 20 percent range during the 1990s, the total cesarean rate has increased again, climbing another 50 percent since 2002.

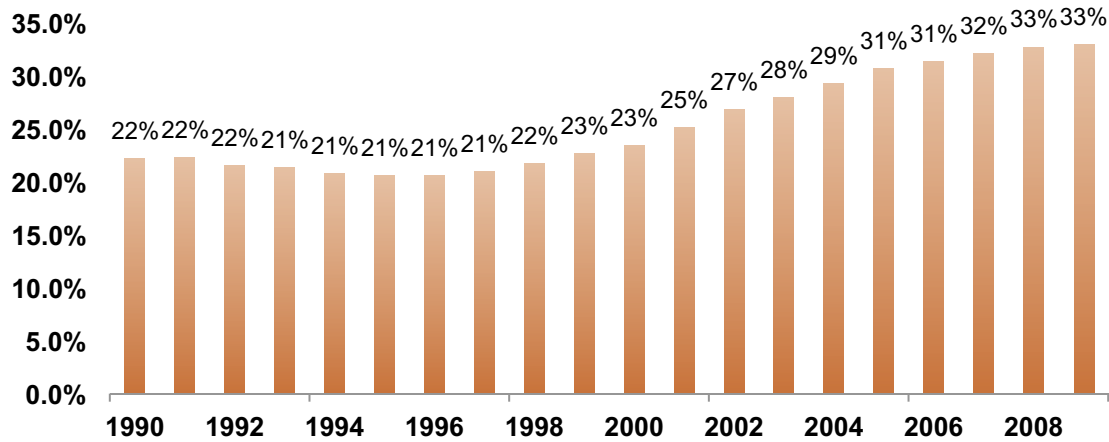
**Figure 3: Total cesarean delivery rate: United States, 1970-2006<sup>9</sup>**



Source: National Hospital Discharge Survey (1970-1988); CDC/NCHS, National Vital Statistics System (1989-2006)

It is helpful to look at historical trends in cesarean delivery rates to place the current situation in context (Figure 3). The cesarean rate climbed rapidly from 1970 to the mid-1980s, and then declined due to a concerted effort to address the 15 percent cesarean rate (considered a high rate at that time). In 1980, the National Institutes of Health spearheaded a national initiative that led to a number of coordinated, widespread policy and practice changes, resulting in the observed downward trend.<sup>10</sup> Although the intention was to reduce all cesarean deliveries, success was achieved largely through encouragement and achievement of vaginal births after cesarean (VBAC), thus reducing the repeat cesarean rate. Subsequently, the overall cesarean rate maintained a steady rate of 21-22 percent for about eight years, before sharply increasing from 2001 onward. For the past several years, the cesarean delivery rate has gone up by one percentage point each year. The actual number of cesarean deliveries increased by 71 percent from 1996 (797,119) to 2007 (1,367,049), making it the most common surgical procedure in the U.S. In 2009, the cesarean rate reached 33 percent, the highest rate ever reported. This marks a 53 percent increase in the overall rate since 1996.<sup>11</sup>

*California trends.* California has the highest number of births of any state in the U.S., with 566,352 births in 2007, accounting for more than one in eight of all U.S. births. The California cesarean delivery trends mirror those of the United States as a whole.

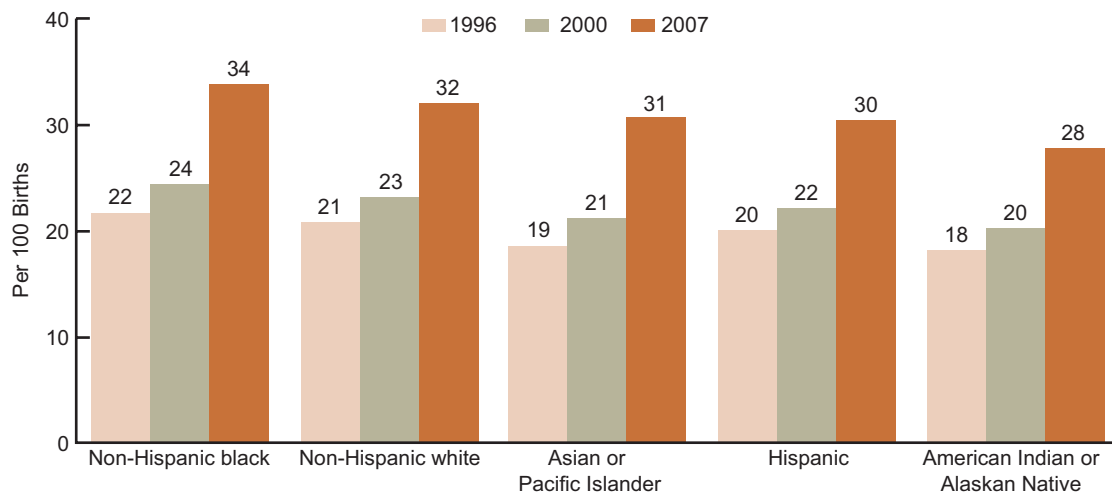
**Figure 4: Cesarean Delivery Rates: California, 1990-2009**

Source: CDC/NCHS, National Vital Statistics System

### Demographic Changes and Increased Cesarean Delivery Rates

Often, reasons for the rise in cesarean are attributed to women's characteristics, such as age, race or weight. Here we examine trends in cesarean delivery rates to show how use of cesarean varies by characteristics of women who give birth—specifically, race/ethnicity, age, and underlying medical conditions. We also show how these reasons cannot explain the increase in cesarean delivery rates since the late 1990s.

*Race and ethnicity trends in cesarean delivery.* The cesarean delivery rate has increased among women of all races and ethnicities, with the highest rates occurring among non-Hispanic Black women. Figure 5 shows moderate increases for all groups from 1996 to 2000 (by about 12 percent), but a sharp acceleration for each group (40 percent) from 2000 to 2007.<sup>11</sup> Although the highest rates occur among Non-Hispanic black women, this group accounted for only 8 percent of all births to U.S. women in 2008. Nonetheless, the racial disparity observed in cesarean is troubling and largely unexplained.<sup>12,13</sup>

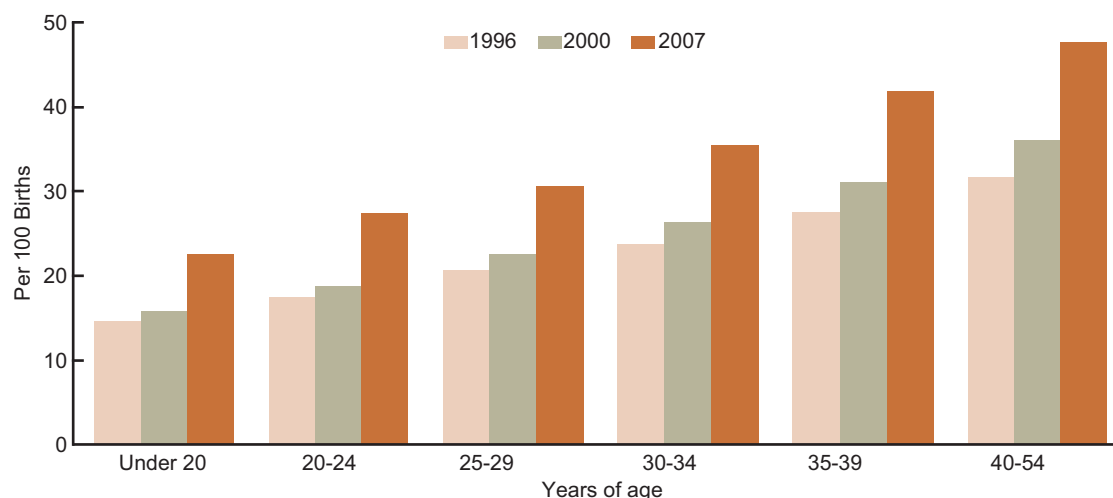
**Figure 5: Total Cesarean Delivery Rates by Race and Hispanic Origin of Mother; U.S.; 1996, 2000, 2007**

Source: CDC/NCHS, National Vital Statistics System



*Age trends in cesarean delivery.* The age of women giving birth is often described as a reason for the increasing cesarean delivery rate. Figure 6 shows that rates among women of all ages rose more than 33 percent from 2000 to 2007.<sup>11</sup> However, while the risk of having a cesarean delivery does increase with maternal age, women under age 25 experienced the greatest increases. Contrary to popular assumptions, the cesarean rate is NOT driven by the increased number of births to women over 40. In absolute terms, women over age 40 represent a very small proportion of births; thus this age group is not a major reason for the overall rise in cesarean deliveries. For example, in 2007, women over 40 accounted for only 2.6 percent of all U.S. births and women 35-39 accounted for 11.5 percent, while women under 25 represented 35.5 percent of all births.<sup>14</sup>

**Figure 6: Cesarean Delivery Rates, by Mother's Age, U.S.; 1996, 2000, 2007**



Source: CDC/NCHS, National Vital Statistics System

*Gestational age and cesarean delivery trends.* The rise in total cesarean rates has been seen at all gestational ages. A “term” pregnancy is defined as one occurring at or after 37 weeks gestation (in utero). Babies born at term are more likely to be healthy. The relationship of preterm (premature) birth (babies born prior to 37 weeks) and cesarean delivery bears further examination. The March of Dimes analyzed national data in 2008 and found large increases in cesarean births for early preterm (<34 weeks gestation), late preterm (>34 and <37 weeks), and early-term (>37 and <39 weeks) as well as full-term infants (39+ weeks).<sup>15</sup> The concern over the rise in cesarean delivery among these early births is that babies born before 39 weeks’ gestation have more breathing problems and other complications compared to babies born at term, as discussed below.

*Maternal weight and cesarean delivery.* Maternal weight is another factor often cited in the popular press as contributing to the higher cesarean rate. While there is currently a high correlation between obesity and cesarean delivery, this has not always been the case. Furthermore, the association is strongest only at the highest levels of obesity; and the link may be more related to lack of patience during labor, making the increased rate a self-fulfilling prophecy.<sup>13</sup> The prevalence of obesity among U.S. women increased tremendously between 1990 and 1999, but the cesarean delivery rates fell from 1991 to 1996 before starting to trend up from 1996 to 2003.<sup>16,17</sup> Even though the prevalence of obesity remained stable between 1999 and 2004 among women of childbearing ages, the rate of cesarean delivery continues to climb. This suggests that obesity is not the main reason behind the increasing cesarean rate in the United States.<sup>13,18</sup>

*Underlying medical conditions and cesarean delivery.* While it is true that over the past decade there has been an increase in rates of chronic health conditions such as hypertension, diabetes, and obesity among women at the time of delivery, these conditions are generally not directly and causally associated with cesarean delivery rates or associated morbidities in the same manner



as fetal position or medical complications with the placenta. These conditions may indirectly affect the pregnancy by contributing to the development of a direct cause for a cesarean (e.g., fetal macrosomia). More commonly, however, these chronic health conditions change how providers manage the pregnancy and birth, leading to more interventions, such as induction and augmentation, all of which may be counter-productive for a normal, vaginal birth.<sup>19-24</sup>

### Variation in Cesarean Delivery Rates among Regions, Hospitals, and Providers

Cesarean delivery rates exhibit very large variation between and within states, regions, hospitals, and providers, suggesting causal factors other than characteristics of women. The variation has been explored in regard to several types of cesarean measures: overall or total cesarean delivery rate, primary cesarean delivery rate, and more recently, the nulliparous, term, singleton, vertex (NTSV) cesarean delivery rate.

NTSV represents the lowest-risk, optimal set of conditions for vaginal birth among women—a first birth with a full-term, single baby in the head-down position.

*Cesarean Variation in the United States.* There is observed variation in the overall cesarean rate among U.S. states, from less than 25 percent in Alaska, Idaho, New Mexico, and Utah to over 35 percent in Florida, Louisiana, Mississippi, New Jersey, and West Virginia.<sup>11</sup> While cesarean rates rose significantly in every state from 1996 to 2007, the magnitude of the increases varied greatly. Six states (Colorado, Connecticut, Florida, Nevada, Rhode Island, and Washington) had increases of over 70 percent. In 34 states, cesarean delivery rates increased by 50 percent or more.<sup>11</sup> This leaves just 10 states in which the magnitude of increase was less

than 50 percent. Clearly, this is a national issue, and efforts undertaken in California to reduce the cesarean delivery rate can have widespread impact.

*Cesarean Variation in International Context.* The United States is not unique in having large variation in cesarean delivery rates; variation in cesarean deliveries and their indications has also been observed in other national contexts. Hanley and colleagues (2010) looked at data from the British Columbia (Canada) Perinatal Database Registry on all deliveries between 2004 and 2007, excluding women with a prior cesarean. They found marked variation across Health Service Delivery Areas (16.1 to 27.5 for crude primary cesarean delivery). After extensive statistical adjustments for possible confounding factors, the cesarean delivery rates still ranged from 14.7 to 27.6 per 100 deliveries. The researchers concluded that levels of patient illness or preference could not explain the substantial regional variation observed. The

researchers also found that labor dystocia (failure to progress) was the most common indication for cesarean delivery, and also highly variable. As we discuss in our

section on the medical factors driving the rise (page 37), this variation likely reflects differences in practitioners' approaches to medical decision-making.<sup>25</sup> These findings suggest that revising the current guidelines regarding the management of labor dystocia may be a good starting point on the road to decreasing unwarranted variation in cesarean delivery and assisted vaginal delivery rates.

In a study of UK National Trusts, Bragg et al. (2010) found that even after adjustment for patient populations and other characteristics, total cesarean delivery rates for individual Trusts ranged from 14.9 percent to 32.1 percent.<sup>26</sup> Most variation in the overall rates was associated with cesareans done during labor. As we discuss below, such cesareans reflect the lack of precise criteria for indica-

tions such as labor dystocia and fetal intolerance of labor as well as differences in providers' labor management practices.

*Cesarean Variation in California.* Paula Braveman et al. (1995) examined California data to assess the association between cesarean delivery, women's socioeconomic characteristics, and hospital type.<sup>12</sup> They found large variation between types of hospital ownership: County hospitals had 47 percent fewer primary cesarean deliveries than private for-profit hospitals. The same researchers also found that African American women were 24 percent more likely to undergo cesarean delivery than whites after controlling for insurance, personal, community, medical, and hospital characteristics. Braveman and her colleagues are conducting a similar analysis and will examine more recent linked hospital discharge and vital statistics data in collaboration with California Maternal Quality Care Collaborative (CMQCC) researchers.

### Cesarean Variation among Regions in California: a CMQCC Analysis

In order to examine the variation in California, CMQCC researchers calculated nulliparous term singleton vertex (NTSV) and overall cesarean delivery rates within regions defined by the Regional Perinatal Programs of California (RPPC). NTSV births were identified from a linked dataset (All-California Rapid Cycle Maternal/Infant Database) that combines patient discharge data (mother and baby) with vital statistics birth records from 2007. Cesarean deliveries were identified among NTSV births and all births in California.<sup>b</sup>

The summary data from the analysis can be found in Table 1, which shows that the mean overall (total) cesarean delivery rate was 31.3 percent and the mean NTSV cesarean delivery was 28.1 percent. The rates were also calculated by percentiles, for the state as a whole and within each region. For comparison purposes, total cesarean delivery rates are approximately 3 to 4 percentage points higher than corresponding NTSV cesarean delivery rates.

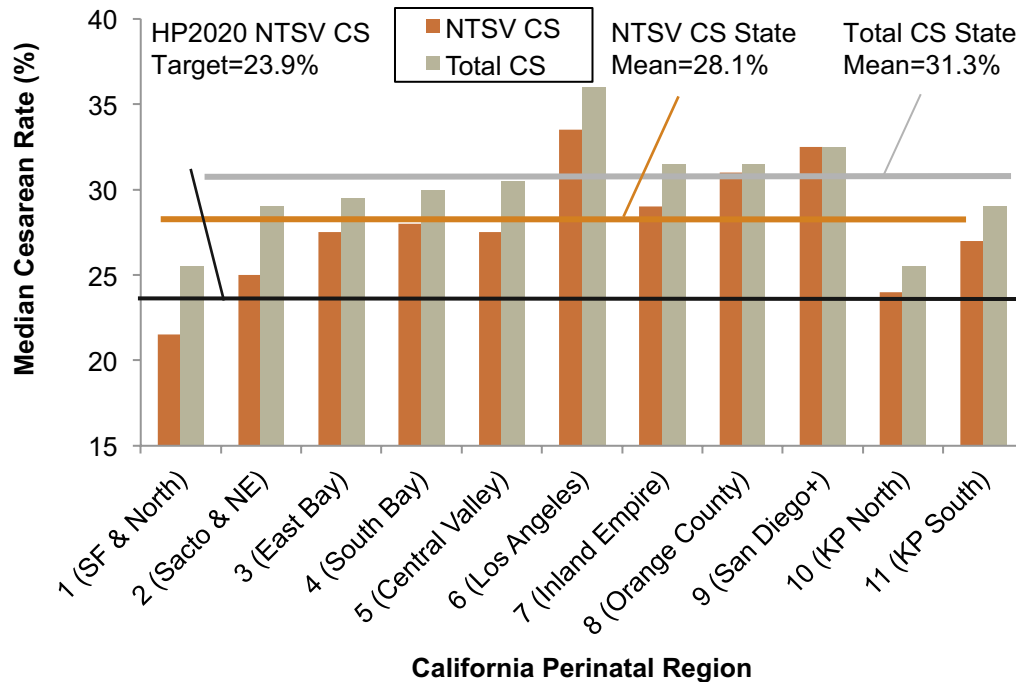
**Table 1: Total and NTSV\* Cesarean Delivery Rates, California; 2007**

California Hospitals	Total Cesarean Deliveries	NTSV Cesarean Deliveries
# Hospitals with >50 Annual Births	256	249
Total Number of Births	533,384	187,780
Number of Cesarean Deliveries	169,5977	53,221
Mean Cesarean Delivery Rate	31.3%	28.1%
Median Cesarean Delivery Rate among hospitals	30.5%	27%
75th Percentile	34.7%	32.3%
25th Percentile	27.1%	23%

\*NTSV: Nulliparous Term Singleton Vertex (Low-risk first birth).

Figure 7 demonstrates the extremely large inter-regional and inter-hospital NTSV cesarean delivery variation seen in California. In Region 6 (Los Angeles), nearly 75 percent of hospitals have NTSV cesarean delivery rates above 28 percent (state mean), with a regional mean of 33 percent, while in Region 1 (San Francisco area), more than 75 percent of hospitals have NTSV cesarean delivery rates below 28 percent, with a regional mean of 22 percent.

<sup>b</sup> Additional information regarding the methods and a map outlining the regions can be found in Appendix B. Detailed tables for each region can be seen in Appendix C and an alternate way to visualize the distribution of NTSV cesarean delivery rates using a box and whiskers plot is found in Appendix D

**Figure 7: Median Hospital Cesarean Rates for Perinatal Regions, California; 2007**

Source: All-California Rapid Cycle Maternal/Infant Database, CMQCC 2011.

Figure 7 also demonstrates major geographic variation in cesarean delivery rates. Northern California Perinatal Regions 1-4 and 10 all have significantly lower median rates for hospitals than state medians for both Total and NTSV cesarean delivery rates. On the other hand, Southern California Regions 6-9 all have higher total cesarean rates and higher NTSV rates as well. For example, the median hospital in Los Angeles has a total cesarean delivery rate of over 36 percent and a NTSV cesarean delivery rate of 33.5 percent, while the median hospital in the San Francisco and Kaiser Permanente (KP) North region has a total cesarean rate of only 25.5 percent and a NTSV cesarean delivery rate of 21.5 percent. Maternal age-adjustment would further reduce rates in Northern California.

Individual hospitals vary in their NTSV cesarean delivery from under 10 percent to over 50 percent. CMQCC analysts have also examined variation through geo-mapping hospital data, as can be seen in Appendix E. Note that NTSV cesarean delivery rates are calculated after excluding all breeches, births less than 37 weeks gestational age, and multiples (conditions with high cesarean delivery rates); so these are relatively low-risk populations of women having their first baby. An additional consideration is that today's first-birth cesareans (NTSV) will return in a "wave" typically two years later, as repeat cesareans. Thus locations with high first-birth cesareans will have even higher repeat and total cesarean rates in the near future. (The significant issue of repeat cesareans is discussed below.)

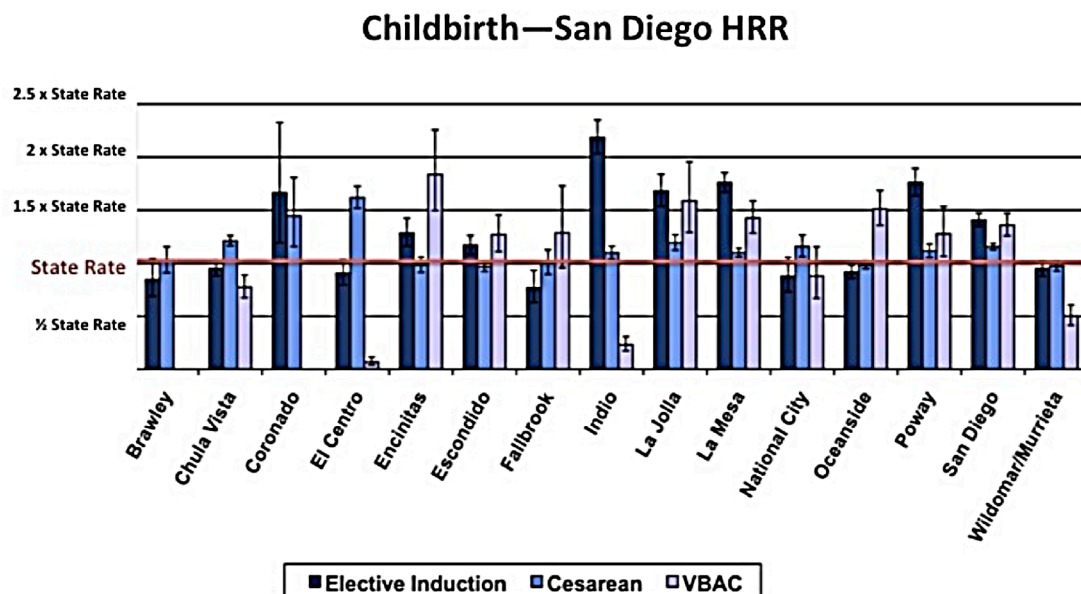
### Cesarean Variation among California Hospital Referral Regions (HRRs) and Service Areas (HSAs)

A September 2011 California HealthCare Foundation (CHCF) Report on geographic variation in elective procedures in California found very large geographic variation in the Agency for Healthcare Research and Quality (AHRQ) measure of primary cesarean delivery, labor induction, and VBAC. The data for the project are from 2005 through 2009 and are based on the patients' place of residence. The data account for age, sex, income, education, insurance status and

race. The data are developed for Hospital Referral Regions (HRRs) and Hospital Service Areas (HSAs) using the definitions developed in the Dartmouth Atlas project.<sup>c</sup> HRRs and HSAs are collections of ZIP codes constructed to define areas appropriate for studying health care utilization.<sup>27</sup>

The CHCF analysis reveals significant variation in childbirth procedures among California HSAs and interactive maps can be seen at: [www.chcf.org](http://www.chcf.org). Looking more closely within a particular HRR as shown in Figure 8, one can see significant variation across the individual HSAs for three childbirth procedures: elective induction, cesarean, and VBAC.

**Figure 8: Variation among Childbirth Procedures in San Diego HRR**



Source: Hurley V, Brownlee S, Baker L. Elective childbirth procedures in California: A close-up of geographic variation. Oakland, CA: California HealthCare Foundation;2011.

Figure 8 shows that women who live in four San Diego HSAs (Coronado, La Jolla, La Mesa, and Poway) undergo elective induction at more than one-and-a-half times the state rate, while women who live in the Indio HSA undergo the procedure at more than twice the state rate. Women who live in El Centro HSA undergo cesarean delivery at more than one-and-a-half times the state rate. In some HSAs, such as Brawley, Coronado or El Centro, vaginal birth after prior cesarean is either rarely or not available.

<sup>c</sup> The Dartmouth Atlas defines HRRs and HSAs as follows: Hospital Referral Regions (HRRs) represent regional health care markets for tertiary medical care that generally requires the services of a major referral center. The regions were defined by determining where patients were referred for major cardiovascular surgical procedures and for neurosurgery. Each hospital service area (HSA) was examined to determine where most of its residents went for these services. The result was the aggregation of the 3,436 hospital service areas into 306 HRRs [for the entire United States]. Each HRR has at least one city where both major cardiovascular surgical procedures and neurosurgery are performed.



## Cesarean Variation: A Lever for Quality Improvement

We have demonstrated that rates of cesarean delivery in California show considerable variation across geographic regions, hospitals, and providers. An important underlying principle in quality assessment of health care is that after adjusting for differences in health, variation in a health care procedure can be an indicator of a quality improvement opportunity—signaling overuse of the procedure that is at best not medically

indicated, or at worst, harmful to patients.<sup>28</sup> Indeed, studies find that regional variation diminishes as quality improves. Thus, studies examining regional variations in cesarean delivery rates across populations provide a compelling initial assessment as to whether the surgical procedure is being used appropriately. Low-risk, primary cesarean delivery rates at some hospitals in California are more than 45 percent, 3-fold higher than the Healthy People 2010 benchmark of 15 percent.

Such large geographic variation within a state that has similar payer contracts and liability laws among all regions (for example, California's Medical Injury Compensation Reform Act [MICRA], which limits non-economic injuries) suggests that local cultural factors are likely at play. Such factors, which are discussed further below, include the culture of physicians and nurses on Labor and Delivery units, the attitudes towards cesarean rates of regional teaching hospitals, as well as the culture of the family and community.

As we will show, an increasing number of studies has shown that physician factors, rather than patient characteristics or obstetric diagnoses, are the major driver for the difference in rates within a hospital or between hospitals in a particular region.<sup>25,29-34</sup> NTSV rates in particular have been shown to be related to hospital and physician-level influences. Main

et al. (2006) found that over 60 percent of the variation among hospitals in NTSV cesarean delivery rates can be attributed to first-birth labor practices including induction rates and early labor admission rates.<sup>35</sup> The results showed that the outcomes were poorer when labor was artificially started when the cervix was not ready. The California

regions that have been working on improving first-birth labor practices (San Francisco and Sacramento) have much lower NTSV cesarean delivery rates than other parts of California, as Figure 7 shows. Alfirevic

et al. (2004) have also shown that labor and delivery guidelines can make a big difference in labor outcomes and cesarean delivery rates.<sup>36</sup>

Reducing excess procedures can increase patient safety, improve outcomes, and reduce costs for payers.<sup>20,37,38</sup> In the particular case of cesarean delivery, the rising rates are increasingly correlated with increasing health and financial costs. These are matters of concern to a wide variety of stakeholders, including childbearing women and their families, patient advocates, obstetric clinicians, payers, employers, and health plans.<sup>19,39</sup> The argument is made more compelling by the fact that we have not been able to identify any additional health benefits of the current cesarean delivery rate of 33 percent when compared to the rate of 22 percent in 1998. We turn next to a discussion of the benefits and costs of a rising cesarean rate.

## 2. LITTLE EVIDENCE OF BENEFITS; CLEAR COSTS AND RISKS

Primary cesarean delivery is safer for women and their babies than ever. Major complications are rare, and thus not readily visible to many practicing obstetricians. However, the risks are considerably higher for the increased number of women having repeat cesarean deliveries, where complications can lead to catastrophic hemorrhage and hysterectomy. The longer-term risks of repeat cesareans are not well appreciated by either

*These risks and costs are considerable; and there is little evidence for the supposed benefits to women or their newborns that are often ascribed to cesareans.*

obstetricians or the public. As we will show, though, these risks and costs are considerable; and there is little evidence for the supposed benefits to women or their newborns that are often ascribed to cesareans.

### The Effects of a Rising Cesarean Delivery Rate on Babies

One argument in support of increased cesareans asserts that this procedure has resulted in improved outcomes and benefits for newborns (neonates). Yet the near doubling of cesarean deliveries over the past decade is associated with very little documented health benefit for babies, with the sole exception of breech presentation. Although concern for fetal well-being (associated with fetal intolerance of labor) is one of the most frequent indications for primary cesarean delivery, there is little to suggest that the higher rates of cesarean are providing benefits. We review several common indications for cesarean, including breech presentation, twin or multiple pregnancies, prematurity, and labor complications, and examine the benefits and risks to newborns and their mothers associated with the rising cesarean delivery rate.

### Putative Medical Benefits of Cesarean Delivery for Babies

*Breech presentation.* Potential benefits to the newborn are highly dependent on the specific indications for cesarean surgery. One indication for which a higher cesarean rate has been associated with positive outcomes is breech presentation, when the baby is not in a head-down position. The “Term Breech Trial,” a multi-center international randomized controlled trial (RCT), showed significant improvement in neonatal death and major injury with cesarean delivery compared to vaginal birth.<sup>40</sup> This resulted in major shifts in practice patterns around the world (though less so in California, since most breeches have been delivered by cesarean for the past 20 years).

It is worth noting that follow-up studies in Denmark and the Netherlands have found a major increase in the proportion of breech babies delivered via cesarean, but without as large an improvement in neonatal outcomes as originally seen in the randomized controlled trial. In any event, as we show later in the paper, breech presentation and multiple births comprise a relatively small proportion of the total cesarean delivery rate and are not driving the overall rise.

*Multiple gestations.* There is little evidence to support the claim that twin pregnancies have beneficial outcomes when cesareans are performed. Hogle et al. (2003) performed a literature review and meta-analysis and found no advantage for cesarean delivery unless baby A was breech.<sup>41</sup> More recently, a review of over 8,000 breeches in Scotland arrived at the same conclusion.<sup>41</sup> The current trend for delivery of all twins via cesarean is likely driven primarily by physician discomfort with the uncertainties that occur during labor in twin births. An RCT is currently under way for twin births (due to be reported in 2012) that should aid decision-making for physicians and childbearing women.



*Prematurity.* Cesarean deliveries have increased for premature infants, but recent studies examining the relationship of cesarean and risk of neonatal death and intracranial hemorrhage have not shown any benefit from this increase except in the very specific case of premature breech babies.<sup>43</sup>

*Little evidence for neonatal benefits among term births.* The greatest proportion of cesarean deliveries, and the greatest drivers for the overall rate increase, occur among two groups of women: those who are at term and experience labor complications, and those having a repeat cesarean delivery at term. Within the population of women giving birth at term in these two scenarios, there have been few if any improvements in term baby outcomes over the last decade. There has been no decrease in the rate of neonatal seizures (an important indicator of perinatal problems) despite the more-

than-doubling of the cesarean delivery rate.<sup>44</sup> Cerebral palsy is not prevented by cesarean delivery, as Nelson and

colleagues found in their review of 30 years of studies and others have confirmed.<sup>45</sup> Lastly, in the largest study to date of birth trauma using ICD-9 codes, the authors showed that babies born via cesarean delivery had significantly fewer cases of clavicle fracture and brachial plexus injuries (by 1 per 1,000), but the overall rate of birth injuries for cesarean deliveries was actually higher than for vaginal births by 1 per 1,000 births.<sup>46</sup>

*Summary.* Newborns have seen very little health benefit in association with the rising cesarean delivery rates. Cerebral palsy rates have been stable for the last 25 years, and term neonatal outcomes have not improved over the last 15 years. The exception is an observed reduction of complications in post-date babies (those born after 42 weeks gestation) that is related more to improved assessment of gestational age and post-date induction than to increased cesarean delivery rates.<sup>47,48</sup>

## Neonatal Morbidity related to Cesarean Delivery

There is now strong evidence indicating that babies born by cesarean delivery experience significant morbidity (health complications) compared to babies born vaginally. The order of magnitude of the increase of neonatal complications with cesarean births is typically two-fold, with the absolute risk of 2 to 4 percent.<sup>23,49-51</sup> In particular, babies born by scheduled cesarean deliveries have significantly higher rates of respiratory complications compared to those born vaginally. The complications include severe breathing problems (respiratory distress syndrome), retained fluid with moderate breathing problems (transient tachypnea of the newborn, or TTN), infections, and prolonged neonatal intensive care unit length of stay.<sup>49-51</sup> These concerns are present among babies at all gesta-

tional ages, but are particularly problematic among those born prior to 39 weeks gestation.<sup>29,49</sup> Kamath et al. (2009) found higher NICU ad-

mission rates and respiratory distress for babies born via repeat cesarean compared to those born vaginally.<sup>52</sup> These are not new data. Annibale et al. (1995) found that cesarean deliveries in uncomplicated pregnancies were a risk factor for low Apgar scores and respiratory distress.<sup>53</sup>

Two large population-based studies that linked patient discharge and vital records found neonatal outcomes were worse when babies were born at hospitals where the facility cesarean rate was either higher or lower than average. In a study using Washington state records from 1995-1996, Bailit and colleagues found a U-shaped curve for the risk of neonatal asphyxia, with increased risk when cesareans were both above and below the average risk-adjusted predicted level.<sup>54</sup> Gould et al. (2004) used data from California births occurring between 1998-2000, and their similar cesarean predictive model also showed a 40 percent chance of worse neonatal outcomes when low-risk women de-

livered at hospitals with either high or low cesarean rates.<sup>24</sup>

In summary, except for breech presentation, very little documented health benefit for newborns is associated with the near-doubling of cesarean deliveries over the past decade. Childbirth is the rare condition where there are two patients to be considered; and although concern for the baby's well-being is one of the most frequent indications for cesarean delivery (related to fetal intolerance of labor), there is little to suggest that higher rates of cesarean are providing benefits. Rather, babies are experiencing higher rates of complications that could have long term health consequences.

As discussed in the section on sociocultural issues, some practice decisions by obstetricians are driven by a "defensive medicine approach" in response to medico-legal worries. Unfortunately, this approach is not optimal for the health and well being of newborns. We next discuss the benefits and costs for their mothers of a rising cesarean delivery rate.

### The Effects of a Rising Cesarean Delivery Rate on Women

There is considerable evidence that cesarean surgery, even among otherwise healthy women, is associated with increased rates of infection, hemorrhage, and other serious medical and psychological complications and hospital readmission. This holds true whether the cesarean was unplanned and occurred during labor or was planned and scheduled prior to labor. Advances in obstetric anesthesia, blood banking, and the use of prophylactic antibiotics have made primary cesarean delivery safer than ever. Major complications are rare for primary cesareans, and because they require large numbers to be recognized, they are less well appreciated by practicing obstetricians.

On the other hand, the risks are consider-

ably higher for repeat cesarean deliveries. The most important of these risks include increased operative injuries related to adhesions and a much-increased risk of placental implantation abnormalities such as placenta previa and placenta accreta in future pregnancies, carrying with them a greater risk of catastrophic hemorrhage and hysterectomy.<sup>55</sup> With the decline in availability of vaginal birth after cesarean, more women

than ever are having repeat cesareans. While the risks to women associated with a first cesarean are somewhat

modest, the future risks of repeat cesareans are not well understood by either obstetricians or the public.

Discussions of the health benefits of cesarean delivery for women have largely focused on a theoretical reduction in future urinary incontinence and avoidance of severe perineal tearing or lacerations. There is little argument that women who have given birth to two or more large babies have higher rates of stress urinary incontinence than women who have not. However, women who have never given birth or done so only via cesarean may also be symptomatic as they age. It appears that other factors including pregnancy per se, connective tissue genetic factors, aging, and even walking upright for a lifetime play significant roles in whether a woman develops incontinence. While recognizing that some women have experienced difficult vaginal births (with severe tearing, for example) and might have had better outcomes with cesarean delivery, current evidence suggests that for the majority of women, cesarean delivery should not be considered a way to prevent future urinary complications.<sup>56,57</sup> Prevention of severe lacerations can be achieved in most cases by careful and sensitive support through controlled pushing, warm compresses, and massaging the perineal tissues by care providers.

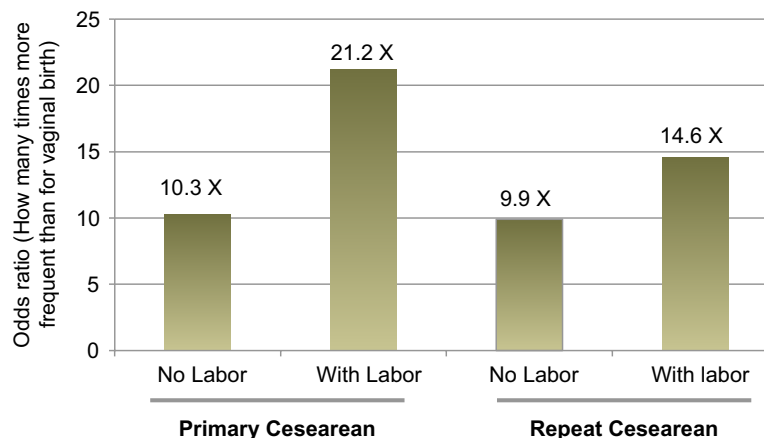
*Very little documented health benefit for newborns is associated with the near-doubling of cesarean deliveries over the past decade.*

*Health complications for women: Hemorrhage and infection.* The most frequent causes of severe morbidity in childbirth for women are obstetric hemorrhage (bleeding) and uterine infection. Besides being significantly more common with cesarean surgery, they also represent the two leading reasons for hospital readmission in the first 30 days post partum. A recent CDC analysis showed that the rate of severe obstetric hemorrhage has significantly increased (by 50 percent) over the last 15 years in the U.S. There has also been a 270 percent increase in blood transfusions, with both hemorrhage and transfusions correlated to the rise in cesarean deliveries.<sup>58</sup> This association between increased cesarean and hemorrhage rates has been seen in other high-resource countries as well.<sup>59</sup> The biggest rise was noted with cesarean deliveries following labor induction (a 240 percent increase) and in vaginal delivery following labor induction (110 percent increase).<sup>60</sup> The overall rate of obstetric hemorrhage in the U.S. rose to 2.5 percent by 2005, similar to the California rate of 2.4.<sup>61</sup>

The best national estimate of the overall rate of severe obstetric morbidity was determined by a careful chart review of a population-based sample in England.<sup>62</sup> The study identified 1.2 percent of women who had severe complications (ICU admissions or near misses) and found that severe obstetric hemorrhage was far and away the most common cause, accounting for more than half of the cases. Furthermore, cesarean delivery was an independent predictor of risk of hemorrhage, even after adjusting for other factors. Most studies have found that cesarean delivery is associated with a 3- to 4-fold increased risk for maternal blood transfusion compared to vaginal birth (for an absolute rate of 1 to 2 percent).<sup>63</sup>

Infection is the most common serious complication of cesarean delivery, with typical rates of 3 to 9 percent. The best way to examine the comparative risk of cesarean delivery over vaginal birth is to look at a large sample from a single hospital and control for confounding factors. Figure 9 shows the results from one of the largest maternity hospitals in the United States, Magee-Women's in Pittsburgh, Pennsylvania. Researchers carefully examined nearly 33,000 women giving birth between 1995 and 2000 for postpartum endometritis (serious uterine infection).<sup>63</sup>

**Figure 9: Increased Risk of Uterine Infection for Cesarean Delivery Compared to Vaginal Birth**



Source: Burrows et al 2004, Magee Women's Hospital, 1995-2000

The data from the Magee study clearly show that all types of cesarean deliveries have much higher rates of uterine infection than vaginal birth (10- to 21-fold higher). However, a more fair and realistic comparison is to combine cases of vaginal birth with those of primary cesarean with labor (since once labor begins, it is not known what mode of delivery will result) and compare those cases to those of primary cesarean without labor. In that comparison, primary cesarean without labor has at least a three-fold higher rate of endometritis than intended vaginal birth. This type of "intended birth" comparison is dependent on the actual rate of primary



cesarean delivery on the unit. No matter how the analysis is done, the findings from this study underscore the benefit of optimizing labor management to reduce the rates of primary cesarean deliveries. We discuss this in more detail below.

*Scheduled cesareans and associated health risks.* It is well documented that planned or scheduled cesareans have less risk and associated morbidity than surgeries done in the course of labor. In the absence of randomized trials, which would not be ethical to carry out, large-scale studies have examined the outcomes for women who had planned vaginal births to those who had planned cesarean births. A large Canadian study compared all low-risk healthy mothers with an elective cesarean for breech presentation (as a model for cesarean risk without labor) to other healthy mothers attempting vaginal birth.<sup>64</sup> It found that women who had cesareans had a three-fold higher rate of severe morbidity. The cesarean surgery carried with it five times the risk of cardiac arrest and wound hematoma, three times the risk of major infection, and more than twice the risk of anesthetic complication and hysterectomy. A different Canada-wide study compared elective repeat cesarean section (ERCS) to women undergoing a trial of labor (TOL).<sup>65</sup> They found a greater risk for maternal death when comparing low-risk women who underwent ERCS (n=179,000) to those having a TOL (n=129,000). There were two maternal deaths among the TOL group for a rate of 1.6/100,000 compared to ten maternal deaths among the ERCS group for a rate of 5.6/100,000. In this study, the risk of maternal death for ERCS is three-and-a-half times higher than that for TOL. Similar findings come from a study in the Netherlands, which found four maternal mortalities (two due to venous thromboembolism and two due to sepsis) for a rate for 1 per 2,127 scheduled cesarean deliveries for breech presentation.<sup>66</sup>

A U.S. Maternal-Fetal Medicine Network study examined records over four years from 19 University Medical Centers all with 24/7 anesthesia and obstetric coverage. They compared outcomes among 14,983 women who had elective repeat cesarean section

(ERCS) (with no medical indication and no labor) with those of 15,323 women who underwent a trial of labor (TOL).<sup>67</sup> There were 12 neonatal deaths in the TOL group compared to 6 neonatal deaths in the ERCS Group, suggesting worse outcomes for babies among the TOL option. However, in the TOL group there was one maternal death compared to five maternal deaths in the ERCS group. The five maternal deaths associated with elective repeat cesarean appeared to be related to the procedure (amniotic fluid embolism [3], hemorrhage [1], and anesthesia [1]).

*Health complications for women: Hospital readmission.* Another significant maternal complication of cesarean delivery is hospital readmission in the first 30 days after delivery, which is increased by two- to four-fold (~0.4 percent to ~1.6 percent).<sup>68,69</sup> The leading reasons for readmission are hemorrhage, infection, and surgical incision complications, all of which are more common with cesarean deliveries, even those that are scheduled before labor. A similar increased rate of readmissions associated with cesarean birth has also been documented in California.<sup>70</sup>

One data gap identified by the expert panel convened for the 2006 NIH State-of-the-Science Conference on “Cesarean Delivery by Maternal Request” was research that explicitly compared planned cesarean to planned vaginal births. In response, Declercq et al. (2007) examined maternal outcomes and costs using Massachusetts data from 1998 to 2003 for women with planned primary cesarean births (N=3,334), compared to women who had planned vaginal births (240,754).<sup>71</sup> They found that women who had primary cesareans with no labor and no complications (planned cesareans) were more than twice as likely to be re-hospitalized in the first month postpartum compared to women with planned vaginal births. The two main causes for postpartum re-hospitalizations occurring within the first 30 days for the women who had planned cesarean births were complications of obstetric surgical wounds and infection. The researchers also found that average length of stay for planned vaginal group was 2.4 days while for the planned cesarean group it was 4.3 days. Average

costs were \$2513 compared to \$4373, respectively. Overall, the researchers concluded that the initial hospital costs were 74 percent higher for elective (planned) cesareans than for planned vaginal births.

These findings are similar to the results of a Canadian study that also found significantly increased risk of readmission after cesarean delivery (compared to vaginal).<sup>29</sup> Liu et al. (2005) conducted a population-based cohort study using the Canadian Institute for Health Information's Discharge Abstract Database between 1997/1998 and 2000/2001, which included 900,108 women aged 15-44 years with singleton live births (after excluding several selected obstetric conditions). They found that compared to women who had a spontaneous vaginal delivery (rate 1.5 percent), women with cesarean deliveries had a significantly increased risk of postpartum readmission (rate 2.7 percent, odds ratio 1.9).<sup>68</sup>

*Health complications for women: Long-term costs.* Most studies of morbidity from cesarean delivery focus on short-term rather than long-term complications. However, there are important long-term consequences for women's reproductive health associated with the cesarean delivery. They include chronic pain and surgical adhesions as well as possible increased risk for fertility issues and perinatal complications in subsequent pregnancies. The risk to women's health rises with each additional cesarean surgery.

The most serious risk for women undergoing multiple repeat cesarean deliveries is a step-wise dramatically increased risk for life-threatening hemorrhage and morbidity due to placental implantation abnormalities.<sup>72</sup> Research from the United Kingdom examined the relationship between cesarean delivery and peripartum hysterectomies (that is, surgeries to remove the uterus during the childbirth hospitalization, usually in response to excessive bleeding or hemorrhage), where the overall rate of the hysterectomy is 1 per 2,500 births.<sup>22</sup> A woman with one prior cesarean doubles her risk of having a hysterectomy, and this increases to 20-fold higher for women with two or more prior ce-

sareans. These findings held true when controlling for maternal age, parity, twins, and medical indication for cesarean.

Several recent multi-hospital studies have documented step-wise increases linked to the number of prior cesarean deliveries for the risk of placenta accreta, bladder and bowel injury, the need for postoperative ventilator use, intensive care unit admission, hysterectomy, blood transfusion requiring four or more units, duration of operative time, and hospital stay.<sup>55</sup> The most feared of these complications among maternity care clinicians are placental implantation abnormalities (placenta previa, accreta, percreta), which in turn increase the chance of peripartum hysterectomy and massive hemorrhage.<sup>22</sup>

### Psychological Costs of Cesarean Delivery for Childbearing Women

In addition to the physical morbidity associated with cesarean sections as described above, there is evidence to suggest that the mode of birth influences psycho-social outcomes, including maternal-infant contact at birth, women's satisfaction with and feelings about their birth, and breastfeeding. Clearly, some women experience cesarean delivery as a routine, even benign or desired mode of birth, and their views and experiences are magnified in some online forums and news reports.<sup>73,74</sup> However, for the majority of women, having a cesarean is associated with greater psychological morbidity, including postpartum depression, post-traumatic stress disorder, and voluntary infertility (foregoing future wanted children to avoid the trauma of pregnancy and childbirth).

### Listening to Mothers Surveys by Childbirth Connection

*Childbirth Connection is a national not-for-profit organization, founded in 1918 as the Maternity Center Association. Their mission is to improve the quality of maternity care through research, education, advocacy, and policy. Childbirth Connection promotes safe, effective, and satisfying evidence-based maternity care and is a voice for the needs and interests of childbearing families.*

*The nationally representative Listening to Mothers surveys are valuable resources for understanding and improving women's childbearing experiences. They focus the discussion on the views of those who care most about maternity issues—mothers themselves. With over 4.3 million births every year in the United States, the surveys are an important source of independent data for health professionals, policy makers, and parents. The findings have been widely used to improve policy, practice, education, and research.*

*Listening to Mothers I, released in 2002, was the first opportunity for women in the U.S. to describe at the national level their maternity experiences and assessment of those experiences. Listening to Mothers II (2006) survey was carried out in January-February 2006 among women who gave birth in U.S. hospitals in 2005, in partnership with Lamaze International. The full report and numerous companion documents are available at [www.childbirthconnection.org](http://www.childbirthconnection.org) free of charge.*

Women's reports of their birth experience differ depending on the mode of delivery. The Listening to Mothers Survey II found that, compared with women who gave birth vaginally, women who had cesarean deliveries were significantly more likely to feel overwhelmed (49 percent vs. 42 percent), frightened (52 percent vs. 30 percent), or helpless (34 percent vs. 19 percent); and less likely to feel capable (24 percent vs. 52 percent), confident (33 percent vs. 47 percent),

or powerful (7 percent vs. 24 percent) during the delivery.<sup>75</sup>

Similar findings emerged from Canadian women's responses to the Maternity Experiences Survey of the Canadian Perinatal Surveillance System.<sup>76</sup> That study examined how interventions used in labor, mother-infant contact, support in labor, breastfeeding, and overall satisfaction with labor and birth differed by mode of delivery. Compared to women who gave birth vaginally, women who had a cesarean birth were significantly less likely to hold their babies within the first five minutes or by the end of the first hour after birth, and more likely to indicate that they had held their babies later than they would have liked too late. The study also found that although breastfeeding initiation rates were similar, women who had cesarean births were less likely to breastfeed their babies at almost all of the time periods assessed in the survey. They were also more likely to experience practices that do not support breastfeeding, such as late initiation of the first feeding after birth, scheduled feedings, receiving free formula samples in hospital, and pacifier use. These less-optimal practices occurred despite the fact that women who had cesarean births experienced longer postpartum hospital stays, which should have increased opportunities for health care practitioners to support breastfeeding.

These findings are consistent with other research demonstrating the negative effect of cesarean delivery on breastfeeding.<sup>77,78</sup> One interesting finding in a recent study by Zannardo et al. (2010) is that elective cesarean delivery is a significant risk factor for not initiating breastfeeding in the delivery room or during the hospital stay, and for not continuing to breastfeed in the six-month postpartum period.

The cesarean experience of some women has been shown to influence their future fertility decisions, referred to as "voluntary infertility." One study found that compared with women who had spontaneous vaginal first birth, women whose first births were via cesarean were more likely to give the following as reasons for not having another child: that



they were “unwilling to experience pregnancy/childbirth again” (38 percent vs. 16 percent), “relationship with child” (13 percent vs. 9 percent), “recovery period in hospital and at home” (67 percent vs. 37 percent), and “initial bonding with child” (33 percent vs. 21 percent).<sup>79</sup> Other studies have reported similar findings.<sup>80</sup>

Research on the psychological impact of a cesarean have examined its relationship to women’s postpartum anxiety and depression.<sup>82</sup> Cesarean delivery was found to be associated with higher rates of depressive symptoms and state anxiety in a community cohort sample of 1,844 low-risk women who had a singleton term baby. This study also found that women undergoing cesarean delivery experienced labor as most negative, reported highest somatic symptoms during the last trimester, and were least efficient in regulating negative mood. These findings suggest that it may be important to provide emotional support to women having a hard time with pregnancy if we want to reduce cesarean delivery.<sup>83</sup>

### The Economic Cost of Increased Cesarean Delivery Rates in California

There are many problems with the current maternity care payment system that lend further support and urgency to our call for a public agenda for maternity care safety and quality. Payment reform is one of the opportunities for improvement that we discuss later in the paper. As Angood et al. (2010) point out in the *Blueprint for Action for Transforming Maternity Care*, the three central problems related to maternity costs are poor return on investment, negative and perverse incentives, and misalignment of the payment system with maternity care goals.<sup>39</sup> In short, the U.S. spends more than other countries, yet lags on maternal and newborn indicators. We have pointed out the comprehensive health costs to women and their babies. These health costs are significant for employers, who pay for 50 percent of births, and taxpayers, who pay for 42 percent of births via Medicaid programs, since childbirth hospi-

talizations account for a significant amount of their expenditures (\$86 billion in 2006).<sup>39</sup> The current maternity payment system has a global fee that creates perverse financial incentives that are not well aligned with optimal health outcomes. The current budget crises affecting all states provide a critical opportunity for implementing payment reform efforts.

#### Childbirth Connection: Blueprint for Action: Steps Toward a High-Quality, High-Value Maternity Care System

*In 2008, Childbirth Connection convened a Vision Team of innovators in maternity care delivery and health systems design to define the fundamental values, principles, and goals for a high-quality, high-value maternity care system. A high-quality, high-value maternity care system means that care is consistently and reliably woman-centered, safe, effective, timely, efficient and equitable. The resulting consensus document, 2020 Vision for a High-Quality, High-Value Maternity Care System, serves as a focal point to inspire improvement strategies and formed the basis for the Blueprint for Action. More than 100 leading experts reached unprecedented consensus on the steps and actions needed to reform this critical and costly segment of the U.S. health care system. The result is a detailed list of actionable strategies to improve maternity care quality and value centered on 11 critical focus areas for change, including performance measurement, payment reform and more. Details can be found at: <http://transform.childbirthconnection.org/blueprint/>*

An important part of the payment reform process is understanding and conveying to the state, commercial insurers, and patients themselves the magnitude of additional financial burden that has accompanied the rise in cesarean delivery rates in California. CMQCC collaborated with researchers at the Pacific Business Group on Health (PBGH) to develop a high-level economic model of this

financial burden. Estimates for professional and facility fees were first gathered for both commercially insured and MediCal patients, and the additional cost of a cesarean delivery over a vaginal delivery was calculated. Current estimates are displayed below in Table 2. These are estimates of the actual payments to the facility and providers, rather than charges, which do not reflect the substantial discounts negotiated – or, in the case of Medi-Cal, stipulated – between health insurance plans and providers.

**Table 2: California Facility and Professional Fee Cost Estimates per Delivery**

Facility cost estimates per delivery:		
	Commercial†	Medi-Cal‡
Estimated paid costs: Vaginal delivery	\$8,500	\$3,320
Estimated paid costs: Cesarean delivery	\$14,700	\$5,940
<b>Additional facility cost of Cesarean delivery</b>	<b>\$6,200</b>	<b>\$2,620</b>
Professional fee cost estimates per delivery:		
	Commercial	Medi-Cal
Estimated paid costs: Vaginal Delivery	\$3,000	\$1,270
Estimated paid costs: Cesarean delivery	\$4,100	\$1,511
<b>Additional professional fee cost of Cesarean delivery</b>	<b>\$1,100</b>	<b>\$241</b>

Several scenarios were considered using the estimates for the additional cost of a cesarean delivery versus a vaginal delivery. Hospital-level data were used for each scenario, which modeled the number of cesarean deliveries that would be reduced if each hospital above the stated target (e.g., the 25<sup>th</sup> or 50<sup>th</sup> percentile) reduced its cesarean deliveries to achieve that target.<sup>84</sup> The savings are then attributed to MediCal and commercial plans, based on the percentage each makes up of total births. According to 2009 data, MediCal paid for 48 percent of total births, and private insurance paid for 47 percent.<sup>85</sup> (See Appendix A).

Several estimates of costs per year that might be saved on a statewide basis are provided below in Table 3. The most conservative estimate is approximately \$80M, and the least conservative is \$441M. These figures represent estimated annual – not just one-time – savings.

- ❑ Scenario 1 estimates cost savings if hospitals in California reached a total cesarean delivery rate of 15 percent, the upper limit recommended by the World Health Organization. An achievement of this kind would require a transformational change in the way maternity care is delivered in the United States.
- ❑ Scenario 2 estimates the cost savings if all hospitals above the 10th percentile moved to the 10th percentile (23.0 percent in 2009). Even though reaching 10th percentile performance appears to be an aggressive target, California's cesarean delivery rate was 23

† Based on 2009 data obtained from a large California insurer, using an annual 4 percent growth rate to estimate 2011 costs. The professional fee includes costs related to anesthesia and delivery, but not prenatal care.

‡ Based on 2006 mean costs for vaginal delivery and cesarean delivery obtained from the state, using an annual 3 percent growth rate (just under current medical inflation rates) to estimate 2011 costs. The MediCal professional fee includes physician delivery fees and physician fees for prenatal and postpartum services.

percent in 2000, only 11 years ago. For this reason, the cost figure in Scenario 2 is a good estimate of the added annual cost of deliveries due to the increasing cesarean delivery rate since 2000.

- ❑ Scenario 3 estimates the cost savings if all hospitals above the 25th percentile moved to the 25th percentile (26.5 percent in 2009). As a benchmark, California's cesarean delivery rate was 27 percent in 2002, only 9 years ago.
- ❑ Scenario 4 estimates the cost savings if all hospitals above the 50th percentile moved to the 50th percentile (31.1 percent in 2009). California's cesarean delivery rate was 31 percent in 2005 and 2006.

**Table 3: Cesarean Delivery Reductions - Estimated Cost Savings for California**

Cost Reduction Scenarios Per Year - based on Total Cesarean Delivery Rates			
	Commercial	Medi-Cal	Total
<b>Scenario 1 - Bring all hospitals above 15% total cesarean delivery rate to 15%</b>			
Estimated # of cesareans reduced	43,299	43,829	84,128
Estimated cost-savings	\$316,079,238	\$125,382,787	\$441,462,025
<b>Scenario 2 - Each hospital above the 10th percentile moves to the 10th percentile rate (23.0% in 2009)</b>			
Estimated # of cesareans reduced	23,723	24,013	47,736
Estimated cost-savings	\$173,175,361	\$68,695,462	\$241,870,823
<b>Scenario 3 - Each hospital above the 25th percentile moves to the 25th percentile rate (26.5% in 2009)</b>			
Estimated # of cesareans reduced	16,067	16,264	32,331
Estimated cost-savings	\$117,288,887	\$46,526,332	\$163,815,219
<b>Scenario 4 - Each hospital above the 50th percentile moves to the 50th percentile rate (31.1% in 2009)</b>			
Estimated # of cesareans reduced	7,889	7,986	35,875
Estimated cost-savings	\$57,590,707	\$22,845,168	\$80,435,876

An important caveat is that the model presented here likely underestimates the overall cost savings, for the following reasons:

- ❑ The model used 2009 birth data, the most recently-available hospital-level data. Since cesarean delivery rates continued to increase from 2009 to 2011, this model underestimates the number of cesarean deliveries and therefore also underestimates the cost savings in reducing those cesarean deliveries.
- ❑ The model does not include costs related to the increased rates of hospital readmissions due to cesarean delivery complications. While maternal readmissions are relatively rare, increased rates are associated with cesarean delivery (2.7 percent compared to 1.5 percent for spontaneous vaginal delivery).<sup>68</sup>

*The added annual financial burden, when compared to the 2000 cesarean delivery rate, amounts to approximately \$240 million for California in 2011 alone.*

- Finally, the model does not include Neonatal Intensive Care Unit (NICU) costs related to excess neonatal respiratory morbidity due to cesarean deliveries.

In conclusion, we estimate that the added annual financial burden, when compared to the 2000 cesarean delivery rate, amounts to approximately \$240 million for California in 2011.<sup>86-89</sup> With attention now being paid by both the public and private sectors to reducing unnecessary costs in health care, it is clear that purchasers and payers will be seeking ways to reduce the rate of non-medically-indicated cesarean deliveries. Future research in this area will calculate the cost savings for employers.

### 3. MEDICAL FACTORS DRIVING THE RISE IN CESAREAN DELIVERIES

The rise in cesarean deliveries is the result of two factors: an increasing primary cesarean rate, and a decreasing rate of vaginal birth after a prior cesarean (VBAC). Together, these two factors result in an increase in the rate of repeat cesareans, which is the single largest contributor to the rise in rates among indications for all cesarean deliveries. About 12 percent of women giving birth have had a prior cesarean, and this percentage is rising as the overall cesarean rate increases. The single largest contributor to primary cesarean deliveries is the indications comprising “Labor Management.” These are the major focus of our recommendations in Sections 5 and 6 around quality improvement approaches to reducing the cesarean delivery rate.

We have looked at cesarean delivery trends in the U.S. and California, and by characteristics of women. Above, we have shown how cesarean delivery rates vary by state, regions, and hospitals in California. We have demonstrated the high costs of the increased cesarean delivery rate in health and economic terms. In this section, we summarize research showing the most frequent indications for cesarean deliveries and which indications have increased and are driving the overall rate of cesarean delivery. We also show the reasons why there is growing support for the claim that provider-dependent indications are contributing to the overall increase among cesareans.

#### Primary Cesarean Deliveries and their Indications

Table 4 below outlines the six most common indications for cesarean delivery and their overall frequency among all pregnant women and all cesareans<sup>90-93</sup>. The two categories of indications marked in the shaded rows denote the labor cesareans that have greatest variation across hospitals and together account for the largest portion of the total cesarean rate.

The medical indications for cesarean deliveries are usually categorized into several general groupings, which have variable scientific support and independent drivers, or causes. Examining them individually permits quality improvement advocates and clinical experts to assess which types of cesarean are likely to be affected by change efforts, enabling us to craft targeted strategies to reduce the use of the procedure.

**Table 4: Frequency of Indications for Cesarean Delivery**

Cesarean Indication (category)	Frequency of this Indication among Pregnant Women	Frequency of Cesarean for this indication	Proportion of Total Cesarean Rate
<b>Repeat (prior Cesarean)</b>	12%	90+%	30-35%
<b>Labor complications</b> (Technical terms: Cephalo-Pelvic Disproportion (CPD) or Failure to progress (FTP); or Macrosomia (>4000 grams))	Large Variation	Large Variation	25-30%
<b>Fetal Intolerance of Labor</b> (Non-reassuring fetal heart rate status)	Large Variation	Large Variation	15-20%
<b>Breech/Malpresentation</b>	3%	98%	6-8%
<b>Multiple Gestation</b>	1-2%	60-90%	4%
<b>Various Maternal Conditions</b> Placenta Previa, Herpes, etc.	5-6%	90%	10-14%



The table shows that the single largest contributor among all indications for cesarean delivery is repeat, or prior, cesarean, which accounts for just over one-third of all cesareans. Over 90 percent of women in this category are likely to have a cesarean. About 12 percent of all women giving birth have had a prior cesarean, and this percentage is rising as the overall cesarean rate increases.<sup>94</sup> We discuss repeat cesarean and the relationship to VBAC in the next section.

The next two categories of indications (shaded) highlight the significance of cesareans done in the course of labor. The various indications for labor complications involve a high degree of individual physician discretion and are highly variable across providers and institutions. Indications falling into the category of labor complications include cephalo-pelvic disproportion (CPD), or a determination that fetal size cannot be accommodated by the maternal pelvis; large fetal size (macrosomia, defined as birth weight greater than 4000 grams); and failure to progress (FTP). The latter indication often involves an assessment of the course of labor, typically using a standardized tool known as Friedman's Curve, to determine whether sufficient cervical dilation takes place within a certain time frame. Together with fetal intolerance of labor, determined from the fetal heart-rate monitor tracing and other clinical signs, these indications account for 40 to 50 percent of all cesarean deliveries.

The high degree of physician discretion and associated variability of cesarean rates reported for labor complications point to significant opportunities for reducing these cesareans by addressing the policies and practices leading to them. The remaining indications for cesarean delivery are for conditions, whether maternal or fetal, that are less variable than those for labor complications, and comprise a relatively small proportion (less than 15 percent) of the overall cesarean rate. These are also

the indications that can be determined objectively—for example, the orientation of the baby, umbilical cord, and placental positions). They have not increased in frequency and have not contributed to the rise in the cesarean delivery rate.

*The high degree of physician discretion and associated variability of cesarean rates reported for labor complications point to significant opportunities for reducing these cesareans by addressing the policies and practices leading to them.*

Further evidence that provider-dependent indications are contributing to the overall increase among cesareans can be seen from the results of two recent studies examining the drivers for the increase in cesarean deliveries. Barber (2011) and colleagues at Yale analyzed primary and repeat cesareans from 2003 to 2009.<sup>92</sup> Among primary cesarean deliveries, more subjective indications (non-reassuring fetal status and arrest of dilation) contributed larger proportions than more objective indications (malpresentation, maternal-fetal, and obstetric conditions). Similarly, Getahun et al. (2009) examined the causes for the rise in cesarean deliveries among different racial and ethnic groups in Kaiser Permanente Southern California over the last 17 years.<sup>13</sup> Table 5 below shows their results recalculated to compare to those from Yale. The findings are quite similar.

**Table 5: Indications Driving the Rise in Primary Cesarean Delivery: A Comparison of Two Studies**

Cesarean Indication	Percent of the Increase in Primary Cesarean Rate Attributable to this Indication	
	Yale University <sup>92</sup> (~4,000 births/year, one tertiary medical center)  Focus: all primary Cesareans, 2003 to 2009	Kaiser Permanente S. California <sup>13</sup> (~48,000 births/year, 11 hospitals)  Focus: all primary <u>singleton</u> Cesareans, 1991-2008
<b>Labor complications</b> (Cephalo-Pelvic Disproportion (CPD) Failure to progress (FTP); or Macrosomia)	28%	~38%
<b>Fetal Intolerance of Labor</b> (Non-reassuring fetal heart rate status)	32%	~24%
<b>Breech/Malpresentation</b>	<1%	<1%
<b>Multiple Gestation</b>	16%	Not available (Only examined singletons)
<b>Various Obstetric and Medical Conditions</b> (Placenta Abnormalities, Hypertension, Herpes, etc.)	6%	20% (Did not separate preeclampsia from other complications)
<b>Preeclampsia</b>	10%	
<b>“Elective” (defined variously)</b>	8% (Scheduled without “medical indication”)	18% (Those “without a charted indication”)

In both studies, indications for labor cesareans — labor complications and fetal intolerance of labor— accounted for about 60 percent of the increase. These are the same indications noted in Table 4 to have great variation from hospital to hospital. Other indications for cesarean did not contribute much to the overall rates, including those procedures done for breech presentation or other fetal positions not conducive to vaginal birth. The rise in multiple gestations may contribute to the increase of cesarean deliveries, but only at large urban tertiary centers impacted by Assisted Reproduction Centers. Underlying medical and obstetric problems have contributed to the primary cesarean rate by as much as 20 percent. However, contrary to popular media accounts, “elective” or cesarean delivery on maternal request appears to represent only a modest contribution to the rise, as we discuss below.

In a similar study in Ireland, Brennan and colleagues examined the drivers for the increase in cesarean deliveries in one hospital.<sup>95</sup> The total cesarean delivery rate rose from 5 percent in 1974 to 19 percent in 2008 (a 3.8-fold increase). They analyzed subgroups by parity (number of prior births over 20 weeks gestation) and indication and found that the overall increase could be largely explained by the increase in the rate among women having their first birth at term with a single baby in the head-down position (non-breech presentation). This subpopulation of childbearing women has been formally referred to as nulliparous, term singleton

*The variation observed among different indications for cesarean delivery represents a key area for improving clinical practice, especially around the indications for labor complications among first births.*

vertex (NTSV). In addition, the major contributor to the NTSV cesarean delivery rate was an increased rate in inductions among first-time pregnant women at term (37+ weeks gestation), which increased from 19.7 percent to 32.7 percent during this time period.

Brennan and colleagues (2009) also examined several different ways of measuring cesarean birth and compared a number of sub-measures.<sup>96</sup> They found significant variation between institutions, with greatest institutional variation in spontaneously laboring women, both nulliparas (giving birth for the first time) and multiparas. (Nulliparas showed a 3.7-fold variation, but had by far the highest impact on the total cesarean rate; multiparas showed a 6.7-fold variation, but had a lower impact because of the lower overall rate.) The hospital total cesarean delivery rates were highly correlated with the NTSV cesarean rates. Indeed, they found that nearly 98 percent of inter-institutional variation in overall cesarean delivery rates could be attributed to NTSV rates. This confirms earlier studies showing wide variation in NTSV among hospitals in Arizona, Northern California, and among obstetricians in one large hospital.<sup>35,97,98</sup>

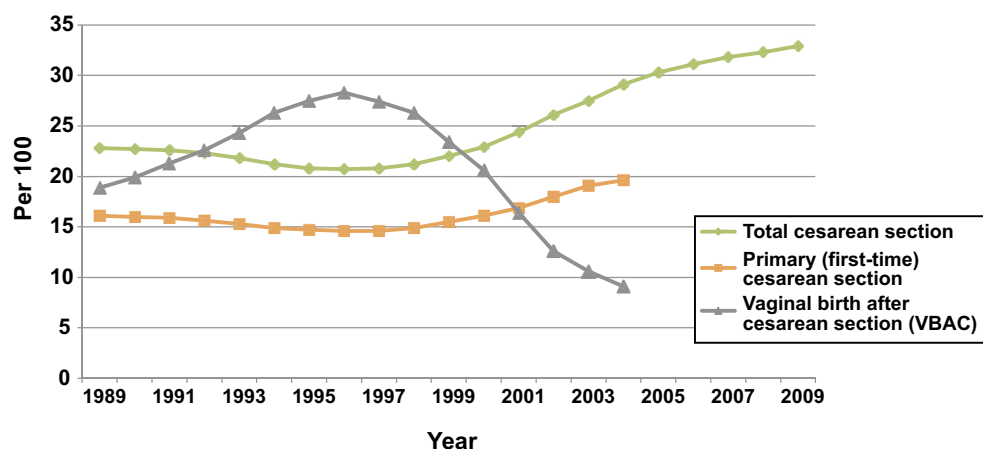
The variation observed among different indications for cesarean delivery represents a key area for improving clinical practice, especially around the indications for labor complications among first births. This is increasingly recognized among obstetric leaders. Recent mainstream obstetrics publications have highlighted the drivers of the increased cesarean delivery rate and called for systematic change. An August 2011 editorial by Dr. John Queenan in *Obstetrics and Gynecology*, entitled “How to stop the relentless rise in cesarean deliveries,” predicts that the combination of an increasing primary cesarean and the decreasing VBAC rate will soon lead to a total cesarean delivery rate of over 50 percent.<sup>101</sup>

Given the challenges of changing current obstetric practice and making VBAC more widely available, avoiding the first cesarean is a critical area for quality improvement. We also recommend that more be done to encourage VBACs by highlighting best practices and research on strategies to minimize the risk and provide all women who desire a trial of labor after a prior cesarean with that option. We discuss these issues further in the next section.

### Repeat Cesareans and Vaginal Birth After Cesarean (VBAC)

There is a direct relationship between rates of primary cesarean, repeat cesarean, and VBAC. Patterns of clinical behaviors associated with each one appear to be linked, especially around the value of and practices supporting vaginal birth. Figure 10 shows the relationship between the primary and total cesarean rate and the VBAC rate in the U.S. from 1989-2009.

**Figure 10: Total Cesarean, Primary Cesarean and Vaginal Birth After Cesarean (VBAC) Rates, U.S.; 1989-2009**



Source: U.S. National Center for Health Statistics; image from Childbirth Connection. (NCHS stopped reporting primary and VBAC rates after 2005).

The decreasing availability of and access to VBAC has resulted in an unprecedented and ever-increasing proportion of pregnant women who have repeat cesarean births. This trend began after recognition of a small (0.5 percent to 1 percent) but serious risk of uterine rupture during VBAC attempts. These ruptures can lead to serious fetal and maternal injuries. Yet for most women with a prior cesarean, the risk of rupture is low and most women are good candidates to have a vaginal birth. While a number of factors are involved, not all of which can be determined prior to labor, the overall rates of VBAC success average 74 percent. Even among women who are not ideal candidates, at least 50 percent successfully have a vaginal birth after a trial of labor.<sup>99</sup>

For women with a prior cesarean, then, the lack of access to and availability of VBAC means that nearly all of subsequent births will be repeat cesareans—bringing back the pre-1980s adage, “Once a cesarean, always a cesarean,” that was temporarily retired in the 1990s. In 2002, the percent of childbearing women who had a prior cesarean reached a record 11.7 percent (468,668) of all U.S. women giving birth in that year.<sup>94</sup> This number has continued and will continue to rise sharply as the primary cesarean rate increases, unless there is a widespread change in current VBAC policy in the U.S.

There has been significant debate around the policies governing availability and access to VBAC since an ACOG policy change in 1999. In that year, ACOG introduced a Practice Bulletin recommending that facilities only support women who want a trial of labor after cesarean (TOLAC) when the hospital has immediate availability of staff to perform a cesarean delivery (obstetricians, operating room nurses and anesthesia services). Most medical liability insurance providers required their hospitals and providers to follow these guidelines. The guidelines were a very difficult and expensive standard to meet, particularly for smaller hospitals, and they resulted in a dramatic reduction of the number of facilities and providers offering VBAC. The guidelines also contained an apparent contradiction in that they did not require immediate availability of obstetric emergency staff for women with other major obstetrical complications (e.g., placental abruption and prolapsed cord) that are more common than uterine rupture and also require rapid cesarean delivery.

In response to growing national concern over the precipitous drop in VBAC availability, the National Institutes of Health convened the 2010 NIH Consensus Development Conference on Vaginal Birth After Cesarean: New Insights.<sup>5,86</sup> In addition to examining the current evidence related to VBAC and offering recommendations for future research on this topic, the NIH panel concluded that VBAC was a “reasonable option” for most women with a previous cesarean section. The NIH panel strongly recommended that ACOG revise its policy, and as a result, ACOG released very modestly-relaxed guidelines later that year.<sup>38</sup> ACOG reconfirmed its recommendation for immediate availability of surgical staff during a VBAC, but specified that if distances were too great to transfer a patient to a center with such capabilities, after informed consent, “patients should be allowed to accept increased levels of risk.” Needless to say, few hospitals and even fewer medical liability insurance companies have embraced this opportunity. Furthermore, VBACs are not popular with many obstetricians because of the much longer time commitments and perceived increased liability involved.

In the present environment, it is unlikely that increased access to VBACs will come without persistent pressure from patients and advocacy groups, supported by public reporting of VBAC availability. In addition, the challenge of VBAC decisions underscores the importance of efforts to reduce the primary (first-birth) cesarean delivery rate, to prevent women from ever becoming a “prior cesarean.”

*Repeat cesarean and maternal risk.* Much like the overall cesarean delivery rate, it appears that the increased rates of repeat cesarean rate and the reduced rate of VBAC cannot be attributed to maternal characteristics. Menacker et al. (2010) examined this relationship and looked at trends



and characteristics of repeat cesareans from 1998 to 2002 for women in three groups: (1) all women; (2) those at low risk as defined by ACOG (women with singleton, full term [37+ weeks] births in vertex (head down) presentation), and (3) women at “no indicated risk” (NIR). Births among the women at NIR were all in the singleton, term, vertex presentation that is not reported to have any of 16 medical risk factors or 15 complications of labor/delivery listed on the 1989 revision of the U.S. Standard Certificate of Live Birth. The researchers found virtually no differences in the trends across all three groups, with all having nearly a 90 percent repeat cesarean rate in 2002.<sup>100</sup> They also found significant variations among states in repeat cesarean rates for women without any additional reason other than having had a previous cesarean delivery.

We have discussed the indications for both primary and repeat cesareans, and have presented data to support the claim that provider-dependent indications are contributing to the overall increase among cesareans. A common misperception, held by many, is that women’s request for cesarean delivery, whether for their first or subsequent births, is a significant factor in this increase, when in fact this is not the case.

### The Fallacy of Maternal Request Cesareans

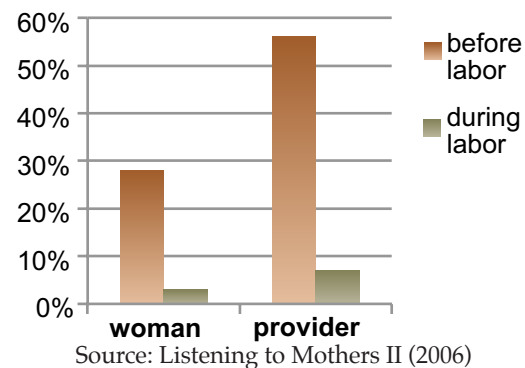
Despite media accounts in the mid-2000s in national publications such as *Time* and *US News and World Report* claiming a new trend among women “too posh to push,” the data do not support such claims.<sup>73,74</sup> The resulting debate was complicated by a November 2003 ACOG opinion stating that it is ethical for doctors to perform elective cesarean deliveries as long as the procedure does not imperil the health of the mother or child. The ACOG committee fell short of offering guidelines, citing lack of evidence. In the ensuing debate, *Listening to Mothers II* asked respondents whether their cesareans were medically elective, and also whether they had made the request for planned cesarean before labor began.<sup>75</sup> The survey found that

10 percent of mothers indicated that prenatally, they had discussed (but not necessarily preferred) a planned cesarean with their provider. In 79 percent of that group, the woman had had a prior cesarean. Of the remaining 21 percent, most (15 percent) had a vaginal birth and the rest had a cesarean for a medical reason.

Overall, the survey asked women for the reasons for a primary cesarean (n=252, unweighted), with only 2 percent reporting that there was no medical reason. Other reasons given for primary cesarean included: baby in wrong position (25 percent); fetal monitoring showed a problem (25 percent); labor too long/mother exhausted (14 percent); maternity care provider worried that baby was too big (12 percent); and problem with placenta (3 percent).

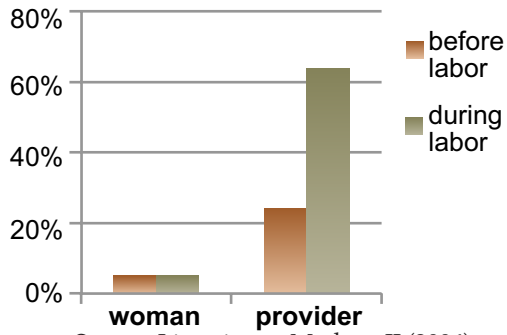
Finally, the survey asked women when the decision about cesarean was made and whose decision it was. The results are shown in Figure 11 and Figure 12, revealing an interesting difference between decision-making for primary and repeat cesareans. Among women having both types of cesarean, providers were more likely to be making the decision for the surgery.

**Figure 11: Repeat Cesarean Decision-Making by Women & Providers, U.S.; 2005**



**Figure 12: Primary Cesarean Decision-**

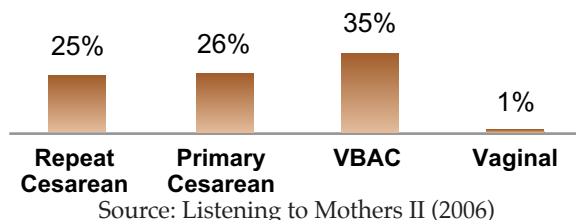


**Making by Women & Providers, U.S.; 2005**

Source: Listening to Mothers II (2006)

Listening to Mothers II found that just one woman out of 252 (0.4 percent) had a planned primary cesarean for no medical reason. A few mothers overall cited pressures to accept a cesarean (9 percent); however, when that group was subdivided by method of delivery, about 25 percent of women who had primary and repeat cesareans reported pressure to have a cesarean, while 35 percent of women who had a VBAC reported such pressure (See Figure 13). These findings indicate that maternal request is not likely to be driving the increase in cesareans.

**Figure 13: Percentage of Women Reporting Pressure to Have a Cesarean by a Health Professional, by Mode of Delivery, U.S.; 2005**



Source: Listening to Mothers II (2006)

Since the rise in cesarean rates cannot be explained solely by women's characteristics or choices, nor by medical drivers, we must look further for the factors that are influencing decision-makers and driving the rise in cesarean delivery rates. In the next section, we expand our lens and look at the myriad and complex ways that sociocultural issues are embedded in the politics, economics, and culture of childbirth and cesarean delivery.

---

## 4. EXPANDING THE LENS: SOCIOCULTURAL FACTORS ASSOCIATED WITH THE RISING CESAREAN DELIVERY RATE

Murray Enkin, an obstetrician who promoted evidence-based care in childbirth in the 1980s, acknowledges the great strides made in the management of simple and even complicated care issues in maternity, such as doing episiotomies and managing diabetes. Yet as he and his colleagues point out, many remaining problems in maternity care, including the rising cesarean rate, require a “new approach” because they have “multiple, interrelated, interconnected, hopelessly tangled causes” and “respond in unexpected ways to well-intentioned interventions, even ones based on good intentions.”<sup>102</sup>

Looking through a sociocultural lens allows us to briefly note and begin to explore a variety of non-clinical factors not fully under clinical control. These factors include changes in the wider culture around the value (and risks) of elective surgery, technological interventions, and childbirth itself. To explore how sociocultural factors are embedded into clinical practice decisions and identify barriers to reducing the cesarean delivery rate among low-risk women, we conducted key informant interviews with obstetric clinicians (3 physicians, 2 certified nurse midwives and 10 nurses) across the state through a convenience sampling procedure.<sup>d</sup> Each clinical role—physician, midwife, nurse—provides its own lens on the complex issue of maternal quality and efforts to reduce the cesarean delivery rates. Physicians and certified nurse midwives (CNMs) offer perspectives as direct providers of care who are subject to liability and accountability in public reporting initiatives. Nurses provide an important, and often overlooked, perspective on maternal care delivery due to their experience in working with various physicians or midwives; their direct contact with women during triage, labor and delivery, and postpartum; and in their role as institutional representatives (employees) of the hospital.

<sup>d</sup> Further details on the methodology for this research study can be found in Appendix F.

Although we have stressed the role of physician discretion in the rise of the cesarean delivery rate, especially for the indications around labor complications, it is important to stress that physicians’ care, practice, and attitudes around cesarean delivery occur within a larger context. Our interviews unearthed many influences beyond physician discretion that affect the decision for a cesarean. They include the need for better training in communication and teamwork skills to manage high-risk situations; the challenges of training new obstetricians in academic medical centers, where high-risk and interventive birth practices are the norm; the underlying legal climate, in which a clinician is more often sued for not doing a cesarean; the labor management practices leading up to the cesarean; lack of education or information among childbearing women; and a media portrayal of “both sides,” leaving the impression that maternal request cesareans are a greater influence than they in fact are.

The medical research literature we have reviewed can illuminate how various indications for cesarean delivery are distributed; however, these studies cannot fully explain why the previous pressures to keep the cesarean delivery rate from increasing throughout the mid 1990s have been lifted and are no longer in effect. Such an analysis is beyond the scope of this paper; but in this section we outline several sociocultural factors that affect cesarean delivery trends among childbearing women, clinicians, and institutions.

Table 6 summarizes the diverse and multiple factors that are important to consider in a strategy to reduce cesarean delivery rates. These interrelated factors operate and may play out differently at different levels of analysis. The interviews point to wider patterns of thinking and illuminate subtle, difficult-to-document influences on decision-making that go beyond medical factors. The purpose of this qualitative approach in collecting and

systematically analyzing diverse perspectives and considering multiple factors is to create a more nuanced and textured picture of what is happening in hospitals and among providers, amid the backdrop of sociocultural influences.

### Findings: Clinicians' Views of Maternal Quality and Safety in California

Clinicians derive their sense of the most pressing maternal quality issue through the lenses provided by their training, career experience, and current role. For example, a nurse in charge of the electronic medical record system at a large, regional NICU hospital (which serves as the recipient for transfers across multiple counties and large distances) identified obstetric hemorrhage as the most pressing patient safety and quality issue. In contrast, nurses who worked at community NICU hospitals with a large number of private or community physicians cited nurse-patient ratios (or staffing) as the most critical quality and safety issue.

Several, but not all, clinicians identified the rising cesarean rate as one of the most pressing patient safety and maternal quality issues facing California. A certified nurse midwife who had worked with a wide range of women in several clinical contexts, ranging from academic medical center to rural public health clinics, provided an assessment of the causes and effects of a rising cesarean rate on maternal health:

*I think the rising cesarean rate has huge impacts on maternal safety. I think many things are leading to increased cesarean rates – this cascade of interventions we fall into: inducing labor when a woman's body isn't ripe or ready; epidural anesthesia given too early, interfering with process of labor and second stage (pushing baby out); fetal monitoring, which has never been proven to improve outcomes but increases the cesarean rate. I think we overreact ... to prevent lawsuits rather*

*than to promote safety. So we have this epidemic of cesareans, and now we are seeing abnormal placental attachment and severe problems with recurrent cesarean including massive hemorrhage and hysterectomy. I think that the negative repercussions of cesarean are significant for many, many thousands of women. (Certified Nurse Midwife)*

This midwife captures much of the complexity of the problem as we have laid it out in these pages. A complex problem needs to be addressed from multiple angles, involving a wide spectrum of stakeholders including payers, providers, women as patients, and health care institutions.

As shown earlier in this paper, cesarean delivery rates have increased for all groups of women and in the majority of states, and there is significant variation in cesarean de-

**Several clinicians identified the rising cesarean rate as one of the most pressing patient safety and maternal quality issues facing California.**

livery rates by provider, hospital, and state. However, there is less consensus or strong evidence regarding the relative contribution of various factors to the observed trends in cesarean delivery rates, nor has there been a comprehensive outline of the factors invoked in popular and scientific writing on the topic. Based on the research literature and the results of our interview study, we have outlined the sociocultural factors affecting cesarean delivery trends among three levels: childbearing women, clinicians (physicians, nurses, and midwives), and institutions (healthcare, policy and media). In this section, we discuss the issues that arose most often in our interviews; other issues, especially around payment models and changing unit culture and physician practice, are discussed in subsequent sections.

**Table 6: Sociocultural Constellation of Factors Affecting U.S. Cesarean Delivery Trends**

<b>Factors</b>	<b>Childbearing Women</b>	<b>Clinicians (Physician/Nursing/Midwifery)</b>	<b>Institutions (Healthcare, Policy, Media)</b>
<b>Demographic and Economic</b>	Changing maternal physical characteristics (obesity, co-morbid conditions, age) Racial disparities in outcomes	Changing physician and midwifery practice style and workforce characteristics (generational; on-call vs. shift work)	Low reimbursements for more complicated care Misaligned payment models Medicaid as dominant payer
<b>Employment</b>	More childbearing women in the work force; scheduling birth appealing for arranging time off work and for family support	Economic and time efficiency incentives Scheduled procedures allow more time in outpatient settings	Lack of national U.S. maternity leave policy
<b>Medico-Legal</b>	Decreased tolerance of risk of neonatal morbidity; expectation of perfect outcomes, every time	Defensive medicine Poor communication after adverse outcomes “You don’t get sued for the cesarean you do, but for the one you don’t”	Malpractice climate and variable state laws on caps for pain and suffering award Lack of universal insurance policy for costs of care for catastrophically injured newborns Reduced access to midwives and birth centers
<b>Values and Culture</b>	Maternal preference for cesarean among some women (avoidance of pain and uncertainty of labor, preservation of perineal function) Diverse perspectives within childbearing women; not a unified group	Reduced recognition by physicians that a low cesarean rate is desired by women, public health, and payers Labor & Delivery Unit culture (practices, local attitudes, lack of patience in labor, high intervention rates; staffing ratios)	Media portrayal of pregnancy as dangerous, risky, requiring dramatic high-technology intervention Hospital resources limited for maternal QI efforts Obstetrics as a “silo” among hospital departments
<b>Advocacy</b>	Fragmented organizational advocacy for childbearing women; multiple organizations	Reduced medical leadership and ineffective internal and external peer review	Lack of hospital policies requiring physician accountability and adherence to evidence based guidelines Polarization of birth philosophies
<b>Education and Training</b>	Reduced attendance at childbirth education Most women get knowledge of childbirth from television reality shows	Reduced use of forceps and vacuum for delivery; loss of clinical skills in managing difficult births Knowledge and education deficit around maternity care best practices	Lack of availability of VBAC Reduced support for clinician continuing education and training around best practices
<b>Technology</b>	Perception of safety/cultural acceptance of elective surgery; use of technology assumed to improve outcomes	Inherent uncertainty and weak scientific evidence in assessing fetal well-being via fetal heart monitor tracings	Cultural belief that technology can reduce or eliminate uncertainty and result in improved outcomes



## Medico-Legal Factors Affecting Cesarean Delivery Rates

The practice of defensive medicine may be one reason for the high cesarean rate. According to a recent study in the *New England Journal of Medicine*, obstetrician-gynecologists are among the medical practitioners most likely to face a malpractice claim, and they have a higher risk of an indemnity payment exceeding \$1 million.<sup>3</sup>

Many experts feel that the current medico-legal climate and fear of malpractice litigation force physicians to practice defensive medicine. In fact, physician surveys confirm that many obstetricians view cesarean sections as a way to decrease their exposure to litigation.<sup>103,104</sup> Numerous studies have examined the association between malpractice litigation and cesarean section rates. While some have shown no association between malpractice claims and cesarean section rates, a growing body of evidence demonstrates a positive association. One study found that the likelihood of cesarean delivery was positively impacted by the physician's malpractice premiums, the number of claims against physicians and hospitals, and physicians' perception of the risk of litigation.<sup>105</sup> Another study investigated the impact of states' liability environments on the rates of VBAC and cesarean section in each state, using data on births in the U.S. between 1991 and 2003. The study found that states with high malpractice premiums had lower rates of VBAC deliveries and higher rates of cesarean sections than states with lower premiums. This suggests that tort reforms that limit malpractice premium increases may help lower cesarean delivery rates over time.<sup>106</sup>

## Education for Childbearing Women

Our interviews revealed that a lack of information and need for education is an issue for all parties involved in childbirth, including physicians and nurses, childbearing women, and the general public. The Listening to Mothers II survey found that far more pregnant women were exposed to the childbirth experience through often-sensational TV

shows than through a didactic and interactive process of childbirth education provided by trained educators.<sup>75</sup> National studies in the U.S. and Canada have found that fewer women are attending childbirth classes, and most do not approach their labor and birth with a strong desire to avoid unnecessary medical interventions.<sup>71,107</sup>

Several clinicians interviewed in this study noted that women lack a critical perspective on the role of non-medically-indicated interventions in labor, in contrast to women from a generation or two ago.

*I'd say maybe 3 percent of the patients come in with the mindset of "I'm not having a c-section," and so they may be the ones that negotiate it; but I would say the majority of our population is fairly accepting that that's the end result [c-section]. (Nurse)*

All the clinicians interviewed referred to the increased cultural perception of cesarean as a safe mode of delivery compared to vaginal births, and commented on the need to provide more information to women regarding the risks of this major abdominal surgery.

*One is people's perception that a c-section is absolutely safe and as safe as vaginal birth, and is no big deal. We [as clinicians] perpetuate that, because we don't want people to be afraid if they get a c-section. We're not going to be saying, "Well, down the road you could have this or this or this." So I don't think people get real informed consent when they have a c-section. (Nurse)*

*I think VBAC is important for a couple of reasons. First, there are so many patients with a previous cesarean. There are too many to ignore and just take the option off the table. But if we just adopt the "once a cesarean, always a cesarean" [attitude], then everyone thinks—providers believe and it becomes a community understanding—that cesareans don't matter; they're not a big deal. There's no downside risk to doing it, and it's easier and quicker, versus doing VBACs. [In contrast, if you provide VBAC], it forces*



*everyone into the realization that we have to talk about the negative effects of another cesarean. All of a sudden, providers and patients are faced with that reality, and it forces people to understand the problem better. (Obstetrician)*

When some women do express a preference for, or more commonly do not express a strong desire to avoid, cesarean delivery, clinicians may infer that there is little benefit to encouraging vaginal birth. As our interviews show, both women and providers have come to see cesarean as “not a big deal,” with no “downside risk.” Yet despite the desire not to frighten women about the health risks associated with cesarean, concern is growing that because women do not have a full and complete picture, they are not being given genuinely informed consent. The decisions and actions of both women and clinicians are driven by these sociocultural factors, as well as by a belief that cesareans provide a mechanism to avoid the pain and uncertain timing associated with normal, unscheduled vaginal birth, as well as preserving perineal and pelvic floor integrity (with fewer vaginal tears and a decreased likelihood of urinary or fecal incontinence).

In summary, although maternal request does not appear to be driving the rise in the cesarean delivery rate, there is evidence that women are more amenable to, or less able to resist, that option than in the past. CMQCC’s interviews show that childbearing women lack information about childbirth options and risks, and need opportunities to be educated about them. Rather than reinforcing such messages by valuing childbirth education and normal, vaginal delivery, the general culture today conveys the incorrect message that cesarean deliveries are a risk-free way to avoid the pain of labor.

### Clinician Attitudes and Practices

Many cesarean deliveries are done for established medical indications and meet current standards of practice. These include the surgeries performed when women have unequivocal risk factors such as a placental implantation. The sharp rate of increase in

the cesarean rates, however, raises many questions among observers about the “gray-zone” areas that require physician discretion. Much as the medical research literature has shown a high degree of variation among the more “subjective” indications for cesareans, especially during labor,<sup>13,34,92</sup> a predominant theme in our interviews is that physician practice variation and hospital and cultural factors, as well as medical ones, affect the decision to perform a cesarean. The clinicians expressed the view that hospitals could do more to both reduce cesareans and hold physicians accountable for ongoing practice improvement.

Many nurses talked about the timing of cesareans that are done during labor, candidly acknowledging the competing demands on physicians’ time:

*I don’t know what the hospital is doing to try [to reduce c-sections] and what the rates are. I see a lot of c-sections right after dinnertime and right after shift change at eleven o’clock ... because doctors want to go home and go to sleep. Our doctors— because the vast majority of them are in private practice— don’t want to get up in the middle of the night. So they’re very comfortable doing sections that we think are unwarranted, because they can. (Nurse)*

Studies of the distribution of births by time of day, day of week, and holiday versus non-holiday show that birth in the United States takes place disproportionately during non-holiday weekday hours.<sup>19</sup> While some of this variation reflects scheduling for appropriate inductions and cesareans, CMQCC interviews suggest that nurses can point to a proportion of these procedures as discretionary.

Clinicians whom we interviewed also referred to the institutional pressures of a high-volume facility where laboring women need to progress within a standardized time frame or be subject to efforts to speed up labor through the use of synthetic oxytocin (a process known as active management of labor). Freidman’s curve, a graphic representation of the hours of labor plotted against

cervical dilation in centimeters, is used to detect labor complications, yet can be used inappropriately in cases where pressures for a bed are strong or when physicians are unwilling to allow more time for labor.

*I think the number one indication for a first-time mother who does attempt labor is CPD (cephalopelvic disproportion) or failure to progress. Many first-time moms are having primary c-sections.... Those aren't elective, but there's definitely a high degree of c-sections for that reason, especially at a hospital that encompasses active management of labor and a timeframe where things need to move along. You don't have all day to be here. (Nurse)*

One nurse described a recent case of what she considered an unnecessary cesarean due to the physician's impatience, even though the woman had a history of vaginal birth and had nearly reached full dilation of 10 centimeters:

*The doctor was insistent that the baby was never going to fit, she was taking too long, she was dilating too slowly. After the c-section, he came to talk to her and told her, "Oh, you're so lucky. You would never have been able to have this baby vaginally. It's a good thing I was there to do the c-section when I did. The baby was so big." The baby was 7 lbs. 8 oz. And the mother said, "I don't understand what was different, this baby is smaller than my other two." And the doctor said, "Oh, you are so lucky I was there to give you a c-section." He was just tired. He had done two deliveries that evening and he was kind of waiting around for her to deliver, and he just decided at 9 cm to go ahead and do the section. (Nurse)*

Nurses see indications for cesareans that are medically questionable, yet are in a relatively powerless position to provide an alternative perspective—especially when the physician's office has not provided comprehensive information regarding risks and benefits to a first-time mother.

*I think some of that education needs to come from the OB's office. I can think of one case where the woman elected to have a cesarean because her arm was in a cast. That was not medically indicated; you can certainly labor with your arm in a cast. But, you're the provider, you want your patients to return, to be happy, and so in that particular instance, it was done. (Nurse)*

Many clinicians echoed the theme that it is important to do inductions only when medically indicated, since the process sets up expectations for a quick birth experience. Some hospitals have reduced the cesarean rate by developing and enforcing policies to eliminate non-medically-indicated inductions and inductions done when the woman's body is not ready (evaluated using a Bishop score, a pre-labor scoring system that grades cervical dilation, effacement, consistency, position, and fetal station). Nurses who handle hospital admissions stated in the interviews that most women do not know the reason behind the induction, nor what the process entails or how long it can take. An obstetrician explained the circumstances under which some women request a cesarean, noting how labor management approaches can set the stage for a challenging experience:

*[When you] induce someone, after 36 or 48 hours, everyone is tired. The patient and her family are now saying, "Why not just do a cesarean? My daughter/wife is exhausted." We [maternity care providers] can't guarantee she is going to have a vaginal birth at that point in the labor. I bet you these happen more with inductions done for no medical indication. That pressure happens, and you have to re-convince the patient [to try for a vaginal birth]. That is a typical scenario. What we've done is make birthing such a miserable situation for women, they are demanding to be operated on. (Obstetrician)*

Physician attitudes are an important barrier to lowering the cesarean rate. Many obstetricians do not see a high cesarean rate as a problem; thus, they have limited interest in

changing their clinical practice and are resistant to external efforts. Additionally, the prominence of cesarean in media and social discourse together with the rising cesarean rate have influenced an increasing number of women and their families to no longer value or expect a vaginal delivery. This trend in attitudes continues despite the small number of women who actually request a primary cesarean delivery. The trend removes the patient-driven incentive to persevere through a long labor or attempt straightforward operative vaginal birth through the use of forceps or vacuum extraction.

In addition to the other influences cited above, the culture of a labor and delivery unit can be paramount in establishing the cesarean delivery rate. The unit culture includes the attitudes of both the providers and the nursing staff and can be driven by the leadership, both nursing and medical. Units with high cesarean delivery rates often have high rates of many other interventions—for example, non-medically indicated inductions, artificial rupture of membranes, augmentations, episiotomies, and scheduled repeat cesarean deliveries.

*Misaligned or perverse economic incentives also have been described as significant barriers to reducing the cesarean rate.*

## Economic Factors

Misaligned or perverse incentives also have been described as significant barriers to reducing the cesarean rate.<sup>39</sup> For example, a significant portion of the obstetric global fee is delivery-based, creating incentives for obstetricians to deliver their own patients when they are on call. This, in turn, increases the desire and pressure for physicians to perform more scheduled labor inductions for their call nights. Similarly, a physician can easily regard VBAC as typically a long labor with some increased risk exposure and lower economic reimbursement than a repeat cesarean delivery. Therefore, not surprisingly, few physicians advocate for supportive VBAC policies at their facilities; it is not a rational economic choice for either physicians or hospitals.

---

## 5. STRATEGIES FOR CHANGE: MULTI-FACETED APPROACHES FOR QUALITY IMPROVEMENT, BETTER MEASUREMENT, PUBLIC REPORTING, AND EDUCATION

### Introduction

In this white paper, we have discussed the steep rise in cesarean delivery rates in a single decade, the large variations that point to physician discretion, the high costs and risks associated with cesarean deliveries, and the lack of medical justification for many cesareans. Providers, payers, purchasers, and childbearing women all need to ask whether society can afford the costs and complications of increasing cesareans and whether they can work together toward solutions. All stakeholders must support cultural change to recognize the value of normal vaginal birth for mothers and their babies.

All of these factors point to the need for a multi-faceted strategy, as no single approach is likely to have the desired impact. The most promising strategies include, but are not limited to, 1) quality improvement, involving careful examination of labor management practices to reduce those that lead to the development of indications for cesarean deliveries; 2) reform of hospital and payment policies to eliminate negative or perverse incentives; 3) provider and patient education; and 4) public reporting (transparency).

### QUALITY IMPROVEMENT (QI)

#### Clinical Improvement Strategies

The complex causes for the rise in cesarean delivery rates necessitate a multi-faceted systems approach to reverse them. Public reporting and/or ACOG practice guidelines alone have not decreased cesarean delivery rates. Several recent reviews of obstetric clinical quality improvement initiatives have

concluded that multiple concurrent strategies are required for effective results.<sup>7,35,108</sup> These interventions generally involve two or more strategies targeting different barriers to change. All of the favored strategies include audit and feedback (reporting rates to individual providers and their peers), which is seen as a necessary element although on its own it has not been sufficient to reduce rates. To be effective, the audit and feedback strategy needs to be combined with other approaches such as provider and nurse education, guidelines, and strong peer review.

In contrast with other cesarean delivery measures, (described below) NTSV cesarean delivery rates can be influenced by clear-cut quality improvement activities to address the differences in rates. Main et al. (2006) found that over 60 percent of the variation among hospitals was attributed to first-birth labor induction rates and first-birth early labor admission rates.<sup>35</sup>

The results showed that when labor was induced when the cervix was unfavorable (long, closed, and firm), the cesarean delivery rate was much higher. Two other recent intervention studies have shown that reduction in elective inductions with unfavorable cervixes can lower first-birth Cesarean rates without compromising fetal outcomes.<sup>109</sup> Similarly, several authors have confirmed that admitting a woman in early labor (1-3 cm dilated) doubles the cesarean delivery rate. Alfievic et al. (2004) also showed that labor and delivery guidelines can make a difference in labor outcomes.<sup>36</sup> As noted, many authors have shown that physician factors rather than patient characteristics or obstetric diagnoses are the major driver for the difference in rates within a hospital.<sup>29-31,110</sup>

*The complex causes for the rise in cesarean delivery rates necessitate a multi-faceted systems approach to reverse them.*



The dramatic variation in NTSV cesarean delivery rates seen in every population studied is striking.<sup>111</sup> Hospitals within a state and physicians within a hospital have rates with a 3-to-5-fold variation.<sup>10,97,98</sup>

With these factors in mind, a proposal to implement a quality improvement effort must include a significantly robust and appropriately designed, run, and analyzed trial with the ability to address the effectiveness of specific interventions, optimally timed, that are broadly generalizable.<sup>112</sup> A foundation of good-quality, reliable, and timely data is essential. To identify the most appropriate approach for a particular hospital or community, preliminary data collection should be performed to determine the specific issues to target and the barriers to overcome.

Table 7 lists a number of key clinical strategies for improving labor management that can be addressed at the local level and measured adequately to evaluate an intervention's success. Hospitals should examine their own care processes and consider appropriate QI projects to reduce admissions in early labor, reduce elective inductions in first time mothers, improve diagnostic and treatment approaches for labor complications, and encourage vaginal birth after cesarean with hospital policies and supportive care in labor. Other projects include training and implementation of safety protocols to standardize diagnosis and management of fetal heart rate abnormalities in labor and reduce uterine over-stimulation associated with oxytocin use. Several groups in the U.S. are working to expand these strategies (as outlined in Table 7) into formal Quality Improvement Toolkits, to inform cesarean delivery reduction programs at local, hospital system, and state levels.

**Table 7: Clinical Labor Management Improvement Strategies to Reduce Cesarean Delivery Rates**

Clinical Improvement Strategies to Reduce Cesarean Delivery Rates	
Reduce admissions in early labor (Latent Phase) <sup>35,113</sup>	
Eliminate <u>elective</u> labor induction before 41 weeks, especially in first births with an unfavorable cervix <sup>109,114</sup>	
Improve diagnostic and treatment approaches for labor disorders (dystocia and failure to progress) <sup>115</sup>	
Standardize diagnosis and management of fetal heart rate abnormalities while in labor <sup>116</sup>	
Reduce uterine hyper-stimulation associated with oxytocin (oxytocin safety protocols) <sup>117</sup>	
Encourage patience in the active phase of labor and in the second stage of labor (pushing)	
Encourage easy operative vaginal delivery as alternative to cesarean delivery in appropriate cases	
Encourage Trial of Labor after Cesarean (TOLAC) and Vaginal Birth After Cesarean (VBAC) with hospital policies and supportive care in labor <sup>118</sup>	



The importance of having a multi-faceted strategy cannot be over-emphasized. Any single approach, including financial incentives, may not have the desired impact if other approaches are not introduced simultaneously. The incentives and strategies of any quality improvement initiative must involve all stakeholders, including obstetric providers as well as the hospital administration and nursing staff. In addition, these strategies must be complemented by extensive public education, discussed below.

### Establishing Targets For U.S. Cesarean Delivery Rates

Given the increased costs and complications and small benefit from higher cesarean delivery rates, what is an optimal target rate for an upper limit of cesarean deliveries as a percentage of all births? American academic obstetric leaders have long decried the ever-rising cesarean delivery rate. Editorials in leading obstetric journals have called for urgent action over the past several decades, as cesarean delivery rates hit 15, then 20, then 25, then 29, and most recently 33 percent.<sup>101</sup> The question is, What is the best target rate?

Targets have been proposed in the past. In 1985, the World Health Organization (WHO) recommended a total cesarean delivery rate of not more than 15 percent in any country.<sup>119</sup> WHO cited an increased risk of morbidity and mortality for mothers and infants above that rate, with no identified neonatal benefits. This target was widely ignored in the United States. Then, with U.S. cesarean delivery rates reaching 21 percent in 1997, an ACOG Task Force on Cesarean Delivery Rates, chaired by Dr. Roger Freeman, performed a careful analysis of the risks and benefits associated with cesarean delivery. The Task Force focused on how best to measure cesarean delivery rates, and identified and recommended targets for various types of cesarean delivery rates.<sup>4</sup> The ACOG report, "Evaluation of Cesarean Delivery," was published in 2000. Its conclusions were similar to the ones in this white paper, recognizing the importance of the NTSV population as the optimal focus of measurement and

quality improvement efforts. Furthermore, the report identified a target of 15.5 percent for NTSV births, one also recommended by the National Center for Health Statistics. Although the ACOG target rate was directed at the NTSV cesarean delivery rate, it has been widely misread as recommending a 15.5 percent total cesarean delivery rate, and so many dismissed it as unreasonable or unattainable.

In its 2000 report, ACOG formally recommended that the NTSV Cesarean Delivery Rate be used to benchmark all U.S. hospitals and practitioners. This measure and target was then endorsed by the United States 2010 Healthy People objectives (objective 16-9, though they called the measure "Cesarean birth among low-risk first-birth women," which has led to some confusion).<sup>17</sup> This same measure has been reaffirmed in Healthy People 2020 (MICH-7.1), but with a more modest target for the NTSV rate of 23.9 percent. Healthy People 2020 also identified a target for VBAC rates, using the AHRQ measure which defines the denominator as only those VBACs among women with a prior cesarean who were term singleton vertex (TSV) (MICH-7.2). This measure therefore tracks only women who are more likely to succeed in a VBAC attempt, due to their low-risk status. The Healthy People 2020 goal for the U.S. is to raise this specific VBAC rate from 9.2 percent to 18.3 percent.

As noted, achieving these goals and reducing the upward trend in cesarean delivery rates will require multiple stakeholders working in a coordinated manner on several fronts, including quality improvement, measurement, payment reform, and education.

### Measurement Issues

Many observers have noted that quality measures and the quality movement have come only lately to obstetrics, compared to other medical specialties that have been measuring, reporting, and improving care using defined quality metrics for many years.<sup>35,98</sup> Unpacking the relationship between maternal quality measures and current obstetrics practice raises a number of interrelated mea-

surement issues.

For the purposes of hospital-based quality improvement, it is necessary to develop quality measures that are easy to define and observe and important to patients and physicians, and which identify specific areas that are ripe for improvement.<sup>7,35,120</sup> Quality measures can be described as interventions that create change by providing organizations with timely feedback as well as consumers with a vehicle for evaluating and choosing healthcare providers, in turn pressuring organizations to change their practices. Quality measures are generally categorized as safety indicators or outcome, process, or utilization measures. There is some debate about how to categorize cesarean delivery rates within these general categories, since they do not fit as safety measures (such as falls or infections), nor are they exactly an outcome in and of themselves (such as health complications). AHRQ considers cesarean delivery rates to be utilization measures (as in over-utilization for primary cesarean delivery and under-utilization for VBAC). This appears to be the best category, with the understanding that the measure refers to the provider's overall rate rather than to any individual patient.

Two issues emerge in obstetrics that affect and hinder the measurement of quality and evaluation of the effectiveness of patient safety initiatives: first, the flawed and limited quality of the data available for constructing such measures; and second, the limited utility of any given measure in directing and informing quality improvement initiatives. Cesarean delivery is a notable case in point. Many different cesarean measures have emerged over time. In this section, we describe and assess their ease of measurement and usefulness.

*Total cesarean delivery rate.* The initial rate reported by obstetric and public health professionals was the total cesarean rate, used for its simplicity, accuracy, ease of collection, and clear meaning over many years. This measure was sufficient when the total rate was low (<10 percent in the 1960s) and not terribly variable. However, at the present time, cesarean deliveries occur at far higher rates

than in the past, with a large degree of variation driven by expanded indications with less basis in scientific evidence. For example, as discussed above, some cesarean indications such as breech presentation are clearly defined and have strong clinical consensus, while other indications are vague and show the greatest variation (e.g., labor complications). Furthermore, some indications not present on admission develop as a result of specific labor management practices.

The current usefulness of the total cesarean rate as a quality measure is therefore limited. Since it combines primary and repeat cesarean deliveries, it is also inextricably linked with the controversy associated with VBAC availability policies. When obstetric professional societies could not reach a consensus for a Total Cesarean Delivery target rate, many obstetricians misinterpreted this as meaning there was no problematic upper limit. Consequently, the total cesarean delivery rate no longer resonates with providers as a valid measure; nor does it provide direction for quality improvement: It fails to distinguish between medically- and non-medically-indicated cesareans or between primary and repeat cesareans, and it does not adjust for risk.

*Primary cesarean delivery rate.* Another older measure, the primary cesarean delivery rate, does exclude the issues around VBAC since it focuses on the first cesarean. However, otherwise it suffers from limitations similar to those of the total cesarean delivery rate discussed above. It is not focused enough for quality improvement actions.

*Low-risk Primary Cesarean Delivery Rate, an AHRQ measure.* One variant of the primary cesarean delivery rate is the term singleton vertex cesarean rate in women without a prior cesarean birth (called the low-risk primary cesarean rate in AHRQ IQI #33). This measure does focus on labor management practices, but combines two groups with very different cesarean risks—women having their first birth (nulliparas) and women having their second or subsequent birth (multiparas). The risk factors for nulliparous and multiparous women are widely divergent. Women who

have had a prior vaginal birth have a labor cesarean risk that is 10-fold lower than women having their first birth. Thus, a limitation of this rate is that it will be greatly skewed in hospitals that have a higher proportion of first births. This measure also directs the focus of quality improvement away from the care of the woman in her first labor. This is a critical shortcoming, as nulliparity (first birth) is the single most important risk factor for labor complications, which are the leading indication for cesarean deliveries.

### Cesarean Delivery Measures with Quality Improvement Potential

Of all the cesarean delivery measures reviewed here, the following two have the greatest potential for quality improvement initiatives. We support efforts to reduce repeat cesareans and increase utilization of vaginal birth after a prior cesarean (VBAC); but this paper focuses more on the need to reduce cesareans among women having their first births, who are up to 10 times more likely to have a cesarean than women having their second or subsequent child. With current U.S. obstetric practices, if the first birth results in a cesarean delivery, then over 90 percent of all subsequent births will be cesarean. The opposite also holds true: if the first birth is vaginal, more than 90 percent of all subsequent births will be vaginal.

*Repeat Cesarean Delivery Rate and Vaginal Birth after Cesarean (VBAC) rate.* The repeat cesarean delivery rate is usually paired with the VBAC overall rate (a combination of the attempted and success rate).

*Nulliparous, Term, Singleton, Vertex (NTSV) Cesarean Delivery Rate.* This measure tracks cesareans among nulliparas presenting with term, vertex (non-breech), singletons.

Reducing the labor (or NTSV) cesarean rate is the current focus of many quality improvement projects. One strategy for accomplishing this adopts the goal of changing labor practices in ways that reduce the likelihood that indications for cesarean delivery will develop. This strategy is more successful than one that tries to convince physicians not to do a cesarean once an indication develops in the course of labor. This measure allows for

reasonable risk stratification, and focuses on a very large subset of cesarean deliveries that is the main source of variation among hospitals and is most affected by physicians' subjectivity. Given the current lack of access to VBAC at many birthing facilities, the NTSV cesarean is also the major driver for subsequent repeat cesarean delivery. In addition, better defined and focused QI activities are available for NTSV cesarean deliveries than for other measures.

The main disadvantage of NTSV cesarean delivery rate measure as a widely-used quality measure is its requirement for parity (number of prior births), which is not yet an ICD-9 code and thus not available in discharge diagnosis databases. This limitation can be overcome by using birth certificate data or by linking discharge diagnosis files to birth certificate data or by hospital chart review. ACOG and other organizations are petitioning to add parity as an ICD-10 code, effective 2013. In the meantime, California, Washington, Louisiana and other states are using birth certificate data to calculate this measure for hospitals.

*Who uses quality measures, and how.* The various ways that cesareans are measured are shown in Table 8. Measures used by governmental agencies at the federal level—for example, by the National Center for Health Statistics (NCHS), the Agency for Healthcare Research and Quality (AHRQ), and the Centers for Disease Control (CDC)—as well as by California's Office of Statewide Health and Planning Department (OSHPD) are outlined below. Other organizations that use cesarean delivery measures for quality measurement and/or public reporting include the National Quality Forum (NQF), The Joint Commission (TJC), The Leapfrog Group (Leapfrog), and the California Hospital Assessment and Reporting Taskforce (CHART). There are different uses for the range of cesarean delivery measures outlined above. For general public health purposes, total, primary, and repeat cesarean delivery rates are often sufficient. For quality measurement and for driving quality improvement actions, the NQF, TJC, Healthy People 2010/2020, and ACOG have adopted the NTSV cesarean delivery rate.



**Table 8: Definitions and Characteristics of Cesarean Delivery Quality Measures, U.S.; 2011**

Measure	Organizations (Source)	Numerator	Denominator	Pros/Cons
<b>Total Cesarean Delivery Rate</b>	NCHS, others  (either Birth Certificate, or ICD-9 codes)	All cesareans among the denominator	All women giving birth >20 weeks	Easy to collect; but includes many indicated cesareans, difficult to focus QI
<b>Primary Cesarean Delivery Rate</b>	NCHS  (either Birth Certificate, or ICD9 codes)	All cesareans among the denominator	All women giving birth >20 weeks who have not had a prior cesarean	Fairly easy to collect (prior cesarean not always accurately charted); does not identify first births and difficult to focus QI
<b>Low-risk Primary Cesarean Delivery Rate</b>	AHRQ, CHART, OSHPD  (ICD-9 codes)	All cesareans among the denominator	Women giving birth >20 weeks who have not had a prior cesarean excluding breech or transverse presentations, preterm births, fetal deaths, and multiple gestations	Fairly easy to collect (prior cesarean not always accurately charted); does not identify first births but a better QI focus on labor issues
<b>Standard First Birth Cesarean Rate, aka Nulliparous, Term, Singleton, Vertex (NTSV) Cesarean Delivery Rate</b>	ACOG, HP2010, HP2020, NQF, TJC, Leapfrog  (Birth Certificate, or ICD-9 codes + chart review)	All cesareans among the denominator	Nulliparous (first birth) women >20 weeks excluding breech or transverse presentations, preterm births, fetal deaths, and multiple gestations	Best measure for QI; focuses on first births in labor; requires parity, which currently is only available from birth certificate data
<b>Vaginal Birth After Cesarean (VBAC) Rate</b>	NCHS, others  (either Birth Certificate, or ICD-9 codes)	All vaginal births among the denominator	All women >20 weeks who have had a previous cesarean delivery	Most commonly used; some concern as it does not exclude standard indications that have newly arisen in this pregnancy
<b>Vaginal Birth After Cesarean (VBAC) Rate (uncomplicated)</b>	OSHPD, AHRQ, HP2010, HP2020  (ICD-9 codes)	All vaginal births among the denominator	All women >20 weeks who have had a previous cesarean excluding breech or transverse presentations, preterm births, fetal deaths, and multiple gestations	Focuses on VBACs for women who do not have a new standard cesarean indication; confusing; not commonly used, neither of these two VBAC measures exclude multiple prior cesarean

## A California Maternal Data Center

The need for usable, valid quality measures in maternity care is rapidly gaining national attention because their development, implementation, and tracking are essential for quality improvement efforts. Some hospitals are able to provide such data for internal efforts, but many are not; and in most cases, outcome data are not publicly reported in great detail or in a timely way.

The foundation for large-scale quality improvement projects to reduce cesarean rates is a robust source of near-real-time outcome data. Efforts to create a California Maternal Data Center are under way by the California Perinatal Quality Care Collaborative (CPQCC) and California Maternal Quality Care Collaborative (CMQCC) (with initial support from the California HealthCare Foundation and ongoing funding to come from the U.S. Centers for Disease Control and Prevention). In addition, the California Maternal Data Center is supported with the cooperation and engagement of multiple state agencies, including California Department of Public Health, Maternal Child and Adolescent Health Division (CDPH/MCAH), Office of Statewide Health and Planning Department (OSHPD), MediCal, and Office of Vital Records (OVR).

The goals of the California Maternal Data Center are to

1. Evaluate and implement perinatal quality metrics;
2. Match quality improvement strategies to perinatal quality metrics;
3. Operationalize a rapid-cycle data and benchmarking reporting system; and
4. Expand future communications with collaborative organizations and stakeholders, including state agencies and hospitals.

## PAYMENT REFORM

### Opportunities for Payment Reform

When education and outcome reporting alone are not able to change the trajectory, financial incentive strategies are a reasonable approach. The hard work of changing providers' attitudes and practices can be facilitated by building the proverbial "burning platform" that necessitates action. Both commercial and public payers have considerable dollars at stake. Medicaid programs pay for roughly half of U.S. births, and average mother-baby costs are nearly one quarter of many states' Medicaid budgets. In California Medi-Cal paid for 48% of births in 2009 and this is growing every year. Similarly, maternity care is a significant cost issue for commercial insurers and large employers.<sup>19</sup> There is concern that the payment economics of childbirth are not aligned with quality goals and, in fact, may be so misaligned that they contribute to the high and increasing rates of medical intervention.<sup>39</sup> Given the budget issues faced by all payers, reforming payment in this area to drive better clinical practice and reduce unnecessary costs should be a front-burner priority.

### Two Maternity Payment Reform Models

In general, there are two basic questions to consider when proposing a payment model with the goal of reducing undesired outcomes:

1. Should we financially reward health care providers for high quality and good patient outcomes?
2. Should we use payment to encourage or discourage certain obstetric practices (e.g. VBAC, vaginal deliveries, fewer inductions, especially those occurring under 39 weeks gestation)?

We consider these two questions below as we explore two models for maternity payment reform. It will be important to experiment and evaluate the effectiveness of particular approaches in varying contexts.



## Model 1: Payment Linkage to Provider Performance

- A. Use quality measure rewards/incentives.** A large payer or group of payers could reward providers and hospitals for achieving targeted rates of elective deliveries at less than 39 weeks gestation, low-risk primary cesarean deliveries, VBACs, and so on. Alternatively, rewards/incentives could be given for demonstrated improvement in these rates. Such “pay-for-performance” programs are in effect in many parts of the country, including in California, but they have rarely been applied to maternity care. Such strategies work best with quality measures that have logical optimal values (such as 100 percent for a typical process measure). They work less well in situations such as deliveries, where the optimal cesarean delivery rate is not established. Negative incentives are unpopular; but whether negative or positive, it is difficult to determine what size of withhold/incentive would actually change practice. Furthermore, if a payer only has a small market-share, the incentive would have limited impact. However, this could be very attractive for managed-care Medicaid programs.
- B. Adjust specific hospital payment codes and fee schedules.** Maternity care has traditionally been paid by Diagnosis Related Groups (DRGs) or by case rates. More than 90 percent of births fit into just four DRG codes (see Appendix A). Adjustments could include paying more for VBAC attempts, perhaps reducing payments for cesarean delivery and increasing them for vaginal births. A variant is to add certain practices such as elective delivery before 39 weeks to a “Do not pay list.” Other possible adjustments could be a reduced payment, a large co-pay, or requiring second opinions for elective maternity procedures such as maternal request cesarean (comparable to other elective procedures). As will be discussed below, large co-pays and other such direct patient incentives and disin-

centives could have a significant impact on consumer-driven choices. Fee-for-service Medi-Cal could make such changes in its fee schedules unilaterally, it typically does not employ patient incentives. Market dynamics would present a challenge to commercial payers attempting to do the same, at least in some parts of the state where competition for patients is strong. In past efforts, such strategies have not worked well for obstetric conditions. There are enough legitimate exceptions that hard rules lead quickly to anger and resistance. An example is the VBAC mandate by commercial payers in the 1990s, which was discontinued after a few years of strong negative feedback and publicity. It would likely be beneficial to convene a multidisciplinary workgroup to examine such proposed changes, to attempt to balance and anticipate as many of the unforeseen consequences as possible.

- C. Review all questionable cases and adjust payment after the fact.** This is the approach taken by several Medicaid programs for primary cesarean deliveries. Cases are reviewed by a physician panel *ex post facto*, and based on an assessment of medical indication, a reduced payment is made for those determined to be not medically indicated. Obviously, this creates a large burden of review activities, not to mention the difficulty of after the fact review cases, made even more challenging by the lack of clarity in the professional guidelines.
- D. Increase oversight or reduce payments for those hospitals or providers not at a benchmark.** If a hospital is over a benchmark, then extra justification (e.g., documentation of medical necessity) would be required for inductions under 39 weeks or cesarean delivery payments. If the case were judged not to meet medical necessity, then payment would be set at a lower rate. This is a direct, focused action and involves only hospitals that are not meeting the benchmark (so there is incentive for the entire hospital collectively

to meet the target). The downside to this approach is that it involves considerable paperwork for both provider and payers, and requires unpopular judgments. In addition, it may be difficult to set benchmarks that are sufficiently risk-adjusted to withstand scrutiny.

These approaches might be seen as putting payers in the business of directing clinical care. As such, they are likely to create ongoing conflicts with providers about the relative merits of care for specific cases, and endless discussions over the applicability of the measure targets appropriate for a given hospital's population. They would also require a significant amount of ongoing supervision and analysis. In addition, there may be medical liability issues around restricting care if the program is not well designed.

While they may be useful as a means of getting attention from providers, the foregoing approaches are likely to be controversial for the reasons cited. Some of these concepts may be useful when combined with clinical strategies; but they must be applied with sufficient finesse and must apply to a significant proportion of the birthing population at the hospital. Some payers have already moved in this direction by insisting that hospitals put into place and demonstrate enforcement of policies for Joint Commission quality measures, such as elimination of elective deliveries at less than 39 weeks gestation.

What may be needed is for several purchasers (perhaps including Medicaid) to institute a more global approach to demanding quality outcomes and/or quality activities, similar to the Value Based Purchasing program for Medicare services. That program sets aside a significant portion of the Medicare budget (\$850 million in FY 2013) to be allocated to hospitals based on their performance on a set of established quality measures for adults covered by Medicare. The size of the withholds and potential quality allocations has captured the full attention of hospital administrators and become a major focus of hospital QI departments. Unfortunately, this focus on Medicare patients has in some instances drained QI resources away from women's

services. What we propose for consideration is a similar Value Based Purchasing program for maternity care.

## Model 2: Blended/Bundled Payments for Maternity Care

The second set of options consolidates maternity payments into a blended payment or bundle and lets providers sort out the process for improvement internally. This restores provider autonomy for the management of individual cases, and allows payers to cap their maternity costs in the face of rising rates of interventions such as cesarean delivery and induction of labor.

**A. Blend all components of the hospital birth payment into a single rate.** Instead of different rates for vaginal birth or cesarean birth, set a single rate for "birth." The blend would be set at a reasonable national target, say around 25 percent, which has been achieved by many hospitals today. For mothers with major obstetric complications requiring admission to the hospital prior to the delivery (e.g., preterm labor, preeclampsia, placenta previa), the hospital could get per-diem rates for the days antepartum. For severe complications (e.g., DRG 765 for cesarean delivery with clinical complications) a different bundled fee could be charged. This approach removes any unjustified economic reward for doing a cesarean delivery and rewards hospitals with lower cesarean rates without the payer directing them exactly how to accomplish it. It nevertheless incents hospitals to engage in cesarean delivery quality improvement activities. Research would be needed to detect whether any risk-adjusters should be introduced based on patient populations—e.g., parity and age—that could skew or disadvantage a given hospital. Risk adjustment should be done with limited, well-established factors; it could be, for example, that a hospital's blended rate is based on its risk-adjusted population. A simple approach to this option is to blend the DRGs for vaginal birth without

complications, vaginal birth with complications, and cesarean delivery without complications into a single payment and leave cesarean delivery with complications as a separate payment. This very approach has recently been implemented by the Washington State Medicaid program.

**B. Bundle the hospital birth payment for both mother and infant into a single payment.** This option would extend the concept developed in option A by including payments for neonatal care. Many commercial contracts already bundle well-baby care into the mother's maternity payment during her inpatient stay. The difference here is that NICU care would also be bundled. This is likely to work only for term infants ( $\geq 37$  weeks gestation), and specifically for those without "pre-existing conditions" such as congenital anomalies or poor intrauterine growth. NICU care for premature infants and for congenital anomalies and poor fetal growth would then be an add-on to the "birth bundle." Further research would be needed to identify additional justified exclusions. As obstetric management can improve or reduce term infant outcomes, bundling the two payments would align incentives in the right way. In today's terminology, this is essentially a form of "accountable care."

**C. Bundle the hospital birth payment (with or without the infant) and the provider payment (professional fee) into a single payment.** This option, which includes the hospital and the provider, creates a narrow version of an "accountable care organization." Again, it would work best only for term infants and not for those with congenital anomalies. There are ICD-9 diagnostic codes, used for billing for preterm infants and for the appropriate list of serious anomalies, that could be used to support this approach without adding to the hospitals' data collection burden. The major challenge would be determining how to divide up the payment "pot" between the hospital and

the clinician(s). This is not easy even in a fully integrated HMO model like Kaiser, let alone in a private practice, fee-for-service environment. Obstetricians' payments for birth in some jurisdictions are not much different for cesarean and vaginal births. In those settings, the driver of physician practice behavior is time and convenience. As noted above, certain practices such as ordering an induction of labor when one is scheduled to be "on call" rather than waiting until labor naturally begins are often more efficient for the clinician, and therefore the clinician may have incentives to intervene.

## Discussion

It may be best to begin with a simple approach to payment reform. Implementation of bundle A above (a single bundle for the hospital payment for birth) might have the greatest and quickest impact; the payer could then move to more complicated approaches if and when more significant incentives seemed necessary. A great advantage to this strategy is that the bundles largely remove the payer from micro-managing individual cases ex post facto, and return decision-making to providers on the scene. Essentially, in this approach, the payer tells providers, "You can do what you want for individual cases; you just won't get paid for extra interventions if your overall frequencies are beyond the targets." Quality improvement oversight thus lies with the hospital and clinician group, not the payers.

On another note, every quality effort that potentially could restrict care should have a balancing measure to document that changing practices is causing no harm. The major struggle with the bundled payments will be calculating fair payment rates that are appropriate and balanced for hospitals, providers, and payers alike.

Several states have experimented with Model 1-type payment reform and received great pushback from providers. New York State recently attempted to establish a plan to judge every Medicaid primary cesarean delivery to determine whether it was medically nec-



essary under new guidelines, and to pay 25 percent less if the delivery did not meet the standards.<sup>121</sup> After intense opposition from hospitals, which questioned whether the state had the capacity to scrutinize the decision-making behind tens of thousands of cesarean deliveries a year, the policy was rescinded. The state then tried to reduce payments for all cesarean deliveries by 11 percent, but that also met strong resistance, with hospitals arguing that the proposal would have penalized everyone including those with low rates. Negotiations are still under way.

Oklahoma attempted a similar standards-based (review and appeals) payment approach for Elective Delivery under 39 weeks and met with united opposition from obstetric providers. In contrast, the state of Washington has seen success: Its Medicaid program is using withholds and then incentives to encourage hospitals to participate in maternity QI programs focused on elective delivery <39 weeks and NTSV cesarean deliveries. Additionally, Washington (as noted above) has introduced a program to blend the DRGs for birth. After debates regarding proper benchmarks and risk adjustment (“My hospital has sicker patients than the state norm”), the program is moving forward. The early reviews indicate both positive impact on outcomes and cost containment.

The Medicare Hospital Value-Based Purchasing program described at the end of Model 1, above, has captured the full attention of hospital administrators. Hospitals are moving quickly to ensure that they meet the quality standards and will not lose payment income under these rules. A similar approach for maternity services could be successful on its own or as an adjunct to bundled payments. This is quite close to the approach evolving in Washington state. Value-Based Purchasing could be attractive to both Medicaid managed care and commercial payers, although to be most effective, the programs should be coordinated as to defining the values (and targets) being purchased.

In many jurisdictions, physicians are already accustomed to a blended single rate for the professional fee for birth. Therefore, such an

approach may be preferable where it can be implemented. Bundling payment with the hospital is new, but it is fully aligned with the accountable care organization movement. Pregnancy is an ideal condition for payment by “episode of care,” with its defined beginning and end and relatively small number of involved providers. We expect to see considerable interest in, and support for, this approach.

## Consumer Economic Incentives

Clearly, some part of the increase in cesarean deliveries and early inductions results from demand on the part of childbearing women, or more likely, limited push-back from them against the routinization of non-medically-indicated interventions. Therefore, it is equally important to attempt to introduce “right care” incentives for childbearing women themselves.

Large employers can work with their insurance carriers to use benefit designs to incent appropriate consumer behavior, for example by requiring a larger payment from those who choose unwarranted medical interventions such as early elective delivery or non-medically-indicated cesarean delivery. Insurers also can offer such products to their small-group and individual customers with reduced premiums. Another variation on this theme is the concept of “tiering,” in which providers whose interventions are medically necessary are offered to the payer (insurance companies and/or childbearing women) at lower costs than providers whose interventions are less medically justified. At the very least, women should be aware of the rates of interventions among the providers from which they can choose, as discussed in the following section on public reporting.

Economic incentives for consumers can play an important role in drawing their attention to the importance of making good decisions, and providers’ attention to improving maternity care. However, such efforts must be matched with professional quality improvement projects, public education, and reporting on provider performance.

## EDUCATION AND PUBLIC REPORTING

### Education: Collaborative Efforts to Increase Awareness

This white paper has demonstrated that despite the abundance of reputable online sites for information on pregnancy and childbirth, most women enter the hospital with little knowledge of common procedures, their indications and risks. As noted, a nationally representative study found that most U.S. women get information from sensational television shows, and there is little public awareness of the gaps between best evidence and current obstetric practice. As this paper has shown, there is also need for education among clinicians and other important stakeholders, including payers, purchasers and public health officials, who have limited understanding of the disconnect between dollars spent and outcomes achieved in U.S. maternity care.

A coordinated effort by many organizations and individuals is needed to address these information and awareness gaps, not only about the bigger picture but also about specific ways that the cesarean rate can be lowered through the strategies outlined above. Gaps in clinical awareness and education can be overcome through targeted messages in continuing education offered by professional groups, such as ACOG, AWHONN, and ACNM, and by other organizations. The endorsement and adoption of the NTSV measure for cesarean delivery by the National Quality Forum and The Joint Commission has raised clinical awareness of the issue. As more hospitals prepare to report on this measure, organizations, including CMQCC, can and will develop educational webinars and information sessions directed at clinicians. Not all obstetric clinicians see the rising cesarean rate as a problem, or understand that efforts to reduce it will require clinical prac-

tice change. Educational efforts are necessary, though not sufficient, to ensure lower cesarean delivery rates. To accomplish this goal, targeted and multiple clinical improvement strategies are needed, as we have outlined above.

Gaps in public education are being addressed by organizations such as Childbirth Connection, which has recently partnered with the Foundation for Informed Medical Decision Making to develop tools and resources for expectant parents. Organizations such as Childbirth Connection and Lamaze International have expanded their efforts to reach childbearing women and the public with evidence-based information to achieve safe and healthy births, including greater availability of VBAC. Both organizations have adopted innovative social media strategies using social networking sites (Facebook), blogs (Transforming Maternity Care, Science and Sensibility) and microblogs (Twitter) to reach a broader and younger audience. Consumer Reports has begun to focus more on pregnancy and childbirth information, reaching a more mainstream audience. The March of Dimes has developed useful educational materials for the public on the issue of elective deliveries at less than 39 weeks. Given March of Dimes' focus on prevention and treatment of prematurity, the organization has a critical role to play in raising public awareness of the troubling increase in cesarean delivery and the associated risks to the newborn.

Research on the rise of childbirth education in the U.S. has shown that public, grassroots advocacy by childbearing women for improvements in maternity care resulted in important practice and policy changes by physicians and hospitals. Fathers are now routinely able to witness the birth of their children, and babies are no longer routinely separated from their mothers in the first hour after birth. Advocacy, in partnership with strong scientific evidence for changing such practices, has proven successful in the past. Nevertheless, it will take persistent

*Coordinated educational efforts are necessary, though not sufficient, to ensure lower cesarean delivery rates.*



and coordinated pressure from childbearing women and advocates for evidence-based practice in childbirth to reverse the current trend of increasing cesarean delivery and make vaginal birth after a prior cesarean more widely available.

We recommend that key stakeholders work collaboratively to further the maternal quality agenda and increase public engagement with education, public service announcements, celebrity spokespersons, and shared decision tools to accomplish the goal of decreasing cesarean delivery, especially among first time, low risk women.

### Public Reporting: Transparency for Public and Providers

Public reporting is an important potential use of quality measure data, both to aid consumer health care decision-making and to incent or pressure providers to improve their rates. Several states have begun to use either birth certificate or ICD-9 data to calculate and publicly report one or more of the various cesarean delivery measures outlined above. Public reporting entities should be very clear about which cesarean delivery measure is being reported, its benefits and limitations, as well as the time period involved, in order to avoid confusion on the part of the data's end-users. As an example, each of the three states with public reporting sites reports different cesarean measures, with limited discussion or disclosure about which measure is being reported. Since 1996, the state of Virginia has had an interactive website for hospital-level and physician-level reporting of primary and repeat cesarean delivery as well as episiotomy rates. In California, CHART, a hospital-payer collaborative, has been reporting hospitals' AHRQ primary cesarean delivery rate and VBAC availability on [www.Cal-HospitalCompare.org](http://www.Cal-HospitalCompare.org). Public Citizen, a nonpartisan, nonprofit consumer advocacy organization, published a report in April 2010 showing hospital-level data for the total cesarean delivery rate in New York State.<sup>122</sup>

All of these measures as reported by these entities show very large variation across

hospitals and regions. All these entities report publicly available data, but there are several significant limitations. The data are outdated, in some cases by four years; and in the meantime, local rates are likely to have increased, giving consumers a false picture of the hospital's current rate. As a corollary, older data are deniable—that is, hospitals can claim that they are “much better now” without having to show valid and recent comparative data. Finally, data on public sites can be confusing to consumers if they try to compare the reported local data with the more recent national data that are typically used in media reports, or if the reported data do not apply to the total cesarean delivery rate. This has the unintended effect of making the older local data look favorable if care is not taken to verify the years reported, or if the reported cesarean delivery rate is not the total rate but rather the AHRQ primary cesarean rate. In short, unless the particular measure is carefully constructed, defined, and examined, public reporting can be misleading and result in unfounded conclusions on the part of the local user.

Public reporting may be a necessary but not sufficient strategy to stabilize or reduce the cesarean delivery rate. Witness the fact that although Virginia has posted statewide data since 1996, the state's cesarean delivery rates have actually risen faster than those of the U.S. as a whole. Research is needed to examine the relationship between the traffic (hit rates) and content of quality reporting websites and consumer choices of providers and/or hospitals, to guide efforts to make public reporting more effective.

Nevertheless, public reporting is a critical part of our proposed multi-faceted system change strategy to reduce cesarean delivery. The solution is to make vigorous use of a balanced set of perinatal quality measures in all California and U.S. hospitals, including NTSV cesarean delivery rate and associated sub-measures. These can be used in public reporting, to drive QI activities, and in payment reform schemes. For all these purposes, reliable, valid, and current data and measures should be publicly reported to both patients and providers.



## 6. CONCLUSIONS: WHAT CAN AND SHOULD BE DONE?

This white paper presents evidence that rising cesarean delivery rates and their associated health and financial costs are a matter of grave concern for a wide range of Americans. Those who bear the impact include childbearing women and their families, patient advocates, obstetric clinicians, payers, employers, and health plans. The costs and risks of cesarean delivery are particularly compelling in view of the fact that the current rate of 33 percent is not associated with any additional health benefits in comparison with the 1998 rate of 22 percent. The steep rise in the cesarean delivery rate has been driven by many factors, some relating to medical practice and some reflecting large sociocultural shifts. New practices are now deeply embedded and will be resistant to change. Not surprisingly, narrowly defined approaches have had little impact on reducing cesarean delivery rates.

Based on our review of the existing research, data on the variations in cesarean rates in California and elsewhere, and experience with effective quality improvement techniques, we recommend that the following multiple approaches, or a subset, be undertaken simultaneously, as appropriate to the specific local context. Many of these interventions interact positively with and reinforce each other, making the whole greater than the sum of its parts.

### CMQCC Recommendations to Reduce Cesarean Delivery

#### Quality Improvement

1. Institute systemic and rigorous audit and feedback, including local benchmarking against regional/state/national norms, with transparent reporting to both the public and providers with reliable, valid, and current data and measures.
2. Make vigorous use of a balanced set of perinatal quality measures in all hospitals, including NTSV cesarean delivery rate and associated sub-measures. These can be used in the payment reform schemes, public reporting, and to drive QI activities.
3. Foster statewide QI activities (toolkits and collaboratives) for improving labor practices including tools, implementation strategies and efforts to change local culture. This would include a significant education effort for both physicians and nurses who work in Labor & Delivery units.
4. Encourage VBACs by highlighting best practices and research on strategies to minimize the relatively low risk of uterine rupture.

#### Payment Reform

5. Use payment reform and public reporting to focus providers' and hospitals' attention on opportunities for quality improvement. Implement payment reform with blended or bundled payments that eliminate extra payments for cesarean delivery and encourage vaginal birth. These efforts should include both hospitals and clinicians, and ideally would be complemented by changes in benefit design.
6. Implement simple medical liability reforms such as "safe harbors" for providers following "best practice" policies and protocols.

#### Education

7. Establish a statewide maternal quality agenda that fosters awareness around the health consequences of perinatal outcomes among key policy makers and other stakeholders.
8. Further the maternal quality agenda and increase public engagement with education, public service announcements, use of celebrity spokespersons, and shared decision-making tools for consequential elective practices such as early labor admission and choosing between vaginal birth after a prior cesarean and repeat cesarean delivery.



## APPENDICES:

### Appendix A. California Births by DRG and Payer

DISCHARGES BY PAYER							
MSDRG	MediCal	Private Ins	Uninsured	Other	Medicare	Total	% of Total
<b>765</b> (C SECTION W CC/MCC)	23,093	26,512	809	776	289	51479	10%
<b>766</b> (C SECTION W/O CC/MCC)	56,422	56,194	1,988	1,758	370	116732	23%
<b>767</b> (VAG DEL W STERILIZATION &/OR D&C)	6,978	3,483	80	110	34	10685	2%
<b>768</b> (VAG DEL W OR PROC EXCEPT STERIL &/OR D&C)	87	139	*	*	*	226	0%
<b>774</b> (VAG DEL W COMPLICATING DIAGNOSIS)	16,709	17,794	553	555	131	35742	7%
<b>775</b> (VAG DEL W/O COMPLICATING DIAGNOSES)	143,150	139,333	5,769	4,576	711	293539	58%
<b>Total</b>	246439	243455	9199	7775	1535	<b>508,403</b>	
<b>% of Total Discharges</b>	48%	47%	2%	2%	0%		
<i>Data obtained from HCUPnet, based on 2009 California data</i>							

\*CC/MCC: Complications and Comorbidities/Major Complications and Comorbidities



## Appendix B: CMQCC Methods for Analysis of Regional Variations

Methods: Nulliparous term singleton vertex (NTSV) births were identified from a linked dataset (All-California Rapid Cycle Maternal/Infant Database) that combines patient discharge data (mother and baby) with vital statistics birth records from 2007. Cesarean deliveries were identified among NTSV births and all births in California. Standard descriptive statistics were used to calculate means and to create distribution plots by Regional Perinatal Programs of California (RPPC) Region using SAS (Statistical Analysis Software for Windows, version 9.2).

The RPPC was established in 1979 as a comprehensive, cooperative network of public and private health care providers within geographic areas to assure the well being of pregnant women and their babies and to promote access to appropriate levels of high quality care. Funding is provided by Federal Title V MCH Block Grant Funds. The Regional Perinatal Program Directors and staff provide resources, consultation, and technical assistance to hospitals and health care providers.



## Appendix C: Data Tables: NTSV and Overall Cesarean Delivery Rates by California RPPC regions, 2007

RPPC REGION	REGION 1 Northwest Coast		REGION 2 Northeastern CA		REGION 3 East Bay	
Cesarean Delivery Rate	Overall	NTSV	Overall	NTSV	Overall	NTSV
Total number of Hospitals with annual births >50 (N)	22	21	35	33	10	10
Total # of births in region	22872	9305	45955	15467	22404	8300
Mean rate (%)	24.5%	21.6%	28.4%	24.6%	29.5%	26.9%
Median rate (%)	25.2%	20.8%	28.1%	24.7%	27.8%	24.9%
% Hospitals: ≥75th state-wide percentile	0	9.5%	8.6%	6.1%	20%	20%
% Hospitals: ≥50th state-wide percentile	13.6%	19.1%	20%	24.2%	40%	30%
% Hospitals: ≤25th state-wide percentile	68.2%	61.9%	34.3%	33.3%	40%	40%

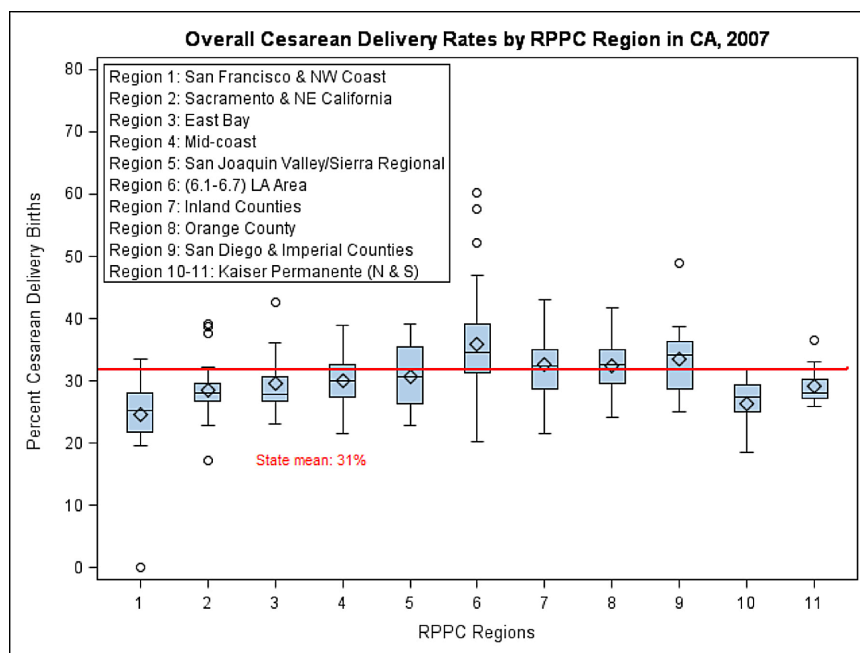
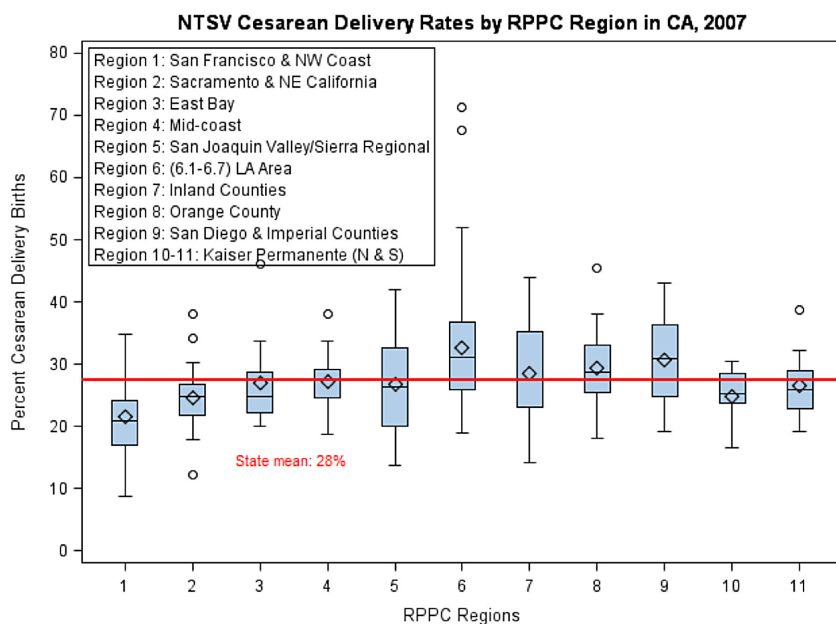
RPPC REGION	Region 4 Mid-coastal CA		Region 5 San Joaquin/ Sierra Regional		Region 7 Inland Counties	
Cesarean Delivery Rate	Overall	NTSV	Overall	NTSV	Overall	NTSV
Total number of Birth Hospitals with annual births >50 (N)	20	20	23	23	25	22
Total # of births in region	39526	14459	54084	16716	44586	14285
Mean rate (%)	29.9%	27.3%	30.6%	26.9%	32.7%	28.4%
Median rate (%)	30.1%	27.6%	30.6%	26.3%	32.4%	27.4%
% Hospitals: ≥75 <sup>th</sup> state-wide percentile	10%	15%	30.4%	26.1%	32%	31.8%
% Hospitals: ≥50 <sup>th</sup> state-wide percentile	45%	55%	52.2%	47.8%	60%	54.6%
% Hospitals: ≤25 <sup>th</sup> state-wide percentile	20%	15%	34.8%	30.4%	16%	27.3%

RPPC REGION	Region 6 (6.1-6.7) Los Angeles area (Santa Barbara, Ventura)		Region 8 Orange County		Region 9 San Diego & Imperial Counties	
Cesarean Delivery Rate	Overall	NTSV	Overall	NTSV	Overall	NTSV
Total number of Birth Hospitals with annual births >50 (N)	64	63	18	18	15	15
Total # of births in region	152811	53617	42687	15047	41980	15383
Mean rate (%)	35.8%	32.6%	32.5%	29.3%	33.5%	30.7%
Median rate (%)	34.5%	31.1%	32.7%	28.7%	34.1%	30.8%
% Hospitals: ≥75 <sup>th</sup> state- wide percentile	46.9%	42.9%	27.8%	33.3%	40%	40%
% Hospitals: ≥50 <sup>th</sup> state- wide percentile	81.3%	71.4%	66.7%	61.1%	66.7%	66.7%
% Hospitals: ≤25 <sup>th</sup> state- wide percentile	10.9%	15.9%	5.6%	11.1%	13.3%	6.7%

RPPC REGION	Region 10-11 Kaiser Permanente (North and South)	
	Overall Cesarean Delivery Rate	NTSV Cesarean Delivery Rate
Total number of Birth Hospitals with annual births >50 (N)	24	24
Total # of births in region	66479	25201
Mean rate (%)	27.7%	25.7%
Median rate (%)	27.4%	25.3%
% Hospitals: ≥75 <sup>th</sup> state-wide percentile	4.2%	4.2%
% Hospitals: ≥50 <sup>th</sup> state-wide percentile	16.7%	41.7%
% Hospitals: ≤25 <sup>th</sup> state-wide percentile	29.2%	25%

## Appendix D: California Regional Variation -- Box and Whiskers Plot

This is an alternate representation of the data shown in Figure 7: Median Hospital Cesarean Rates for Perinatal Regions, California; 2007. Here, a box and whisker plots shows the distribution of hospital NTSV cesarean and overall cesarean rates for each RPPC Region. The top and bottom edges of the box represent the interquartile range (IQR)--values between the 75<sup>th</sup> and 25<sup>th</sup> percentiles; the middle band is the hospital at the median (50<sup>th</sup> percentile). The diamond represents the mean value, and the whiskers indicate the range of values outside the intra-quartile range, but within an additional 1.5 times the IQR. The circles are outliers, or values greater than (or less than) an additional 1.5 times the IQR.



---

## Appendix E: GeoMaps – The California Maternity Atlas prototypes

### Documenting Variation in Risk-Adjusted Care by Region, Hospital, and Provider

The Dartmouth Atlas of Health Care ([www.dartmouthatlas.org/](http://www.dartmouthatlas.org/)) has proven to be an extraordinarily useful tool for both policy makers and quality improvement efforts. It has unrivaled ability to showcase extreme variation in care for which there is no medical rationale. However, the Dartmouth Atlas, which uses Medicare data, does not include maternity care. One of the key arguments for the lag in maternity care quality improvement behind other branches of medicine is the lack of comparative data highlighting variation. A primary goal of the California Maternal Data Center is to use multiple California data sets to create a California Maternity Atlas that can aid providers, purchasers and consumers in their quest for better care. To ensure high relevance for quality improvement, comparative data need to be as contemporary as possible.

### Examples of CA Maternity Atlas: “Low Risk Primary Cesarean Births”

The geo-maps on the next pages were developed by Nikki Stoddart for her Master’s thesis in the Division of Epidemiology, Department of Health Research and Policy at Stanford University, School of Medicine with consultation from Rudolph Rull, PhD (Northern CA Cancer Center), Dee West, PhD (Stanford Consulting Professor), Debra Bingham, DrPH, RN (AWHONN) and Elliott Main, MD (CMQCC). The geo-maps show the Agency for Healthcare Research and Quality (AHRQ) measure, low-risk primary cesarean births. This represents the number of cesarean births per 100 live births among low-risk women who have a term delivery and have not previously had a cesarean. These cesarean births are age- and risk-adjusted—excluding stillbirths and abnormal presentation (for example breech, preterm, and multiple gestation, which occur in 2-8% of births). This measure focuses on the largest segment of the cesarean rate—those performed during labor for indications related to poor progress or fetal well-being. A number of studies have shown that primary, low-risk cesarean deliveries account for the majority of cesarean variation among hospitals. Given the high rates of repeat cesarean deliveries, preventing the first cesarean is critical to the remainder of the woman’s reproductive life. Many maternity leaders, and most recently The Joint Commission, have identified primary cesareans as an important quality improvement opportunity. Other priority Geo-Map projects include perinatal measures such as Exclusive Breastfeeding; Elective Deliveries Prior to 39 weeks; Episiotomy; and Infants under 1500g not delivered at an appropriate facility.

The Geo-Maps show hospitals at the top and bottom quintiles of low-risk, primary cesarean delivery rates. The data are taken from OSHPD public release website (volume and utilization quality indicators)for 2006. ( [www.oshpd.ca.gov/HID/DataFlow/HospQuality.html](http://www.oshpd.ca.gov/HID/DataFlow/HospQuality.html) )

The number of live births per hospital is represented by the size of the circles, while the quintiles of the cesarean delivery rates are represented by the color grid. Quintile ranges are per 100 births.

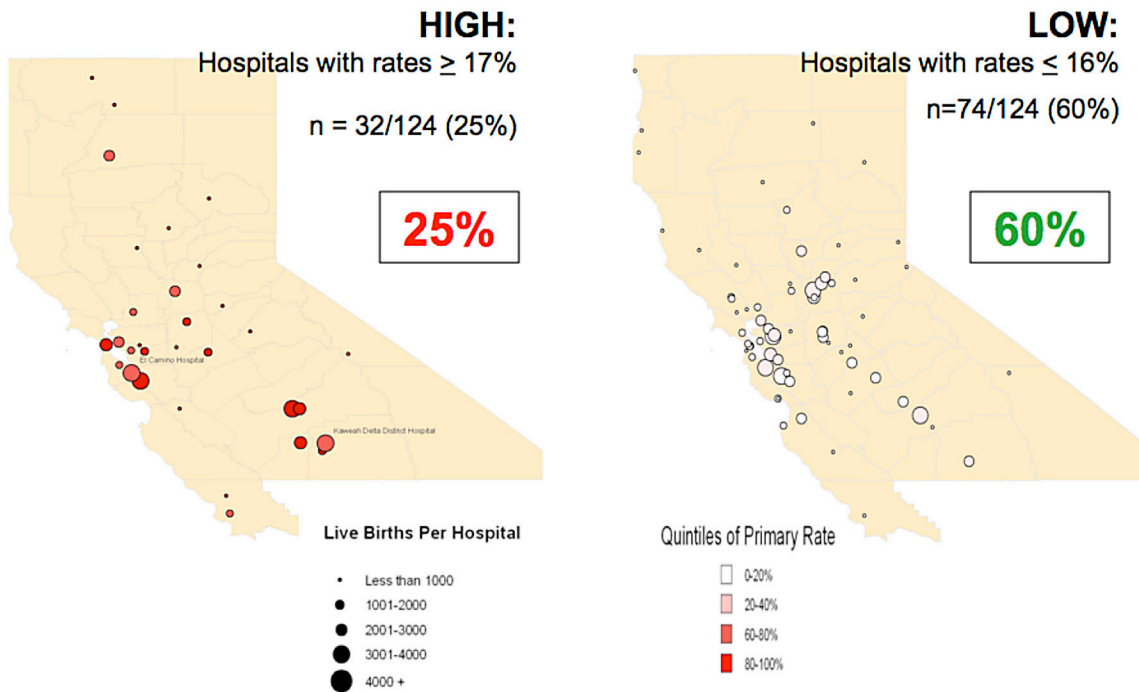
### Age-Adjusted Low-Risk Primary Cesarean Birth (CB) Rates

#### Quintile Distribution:

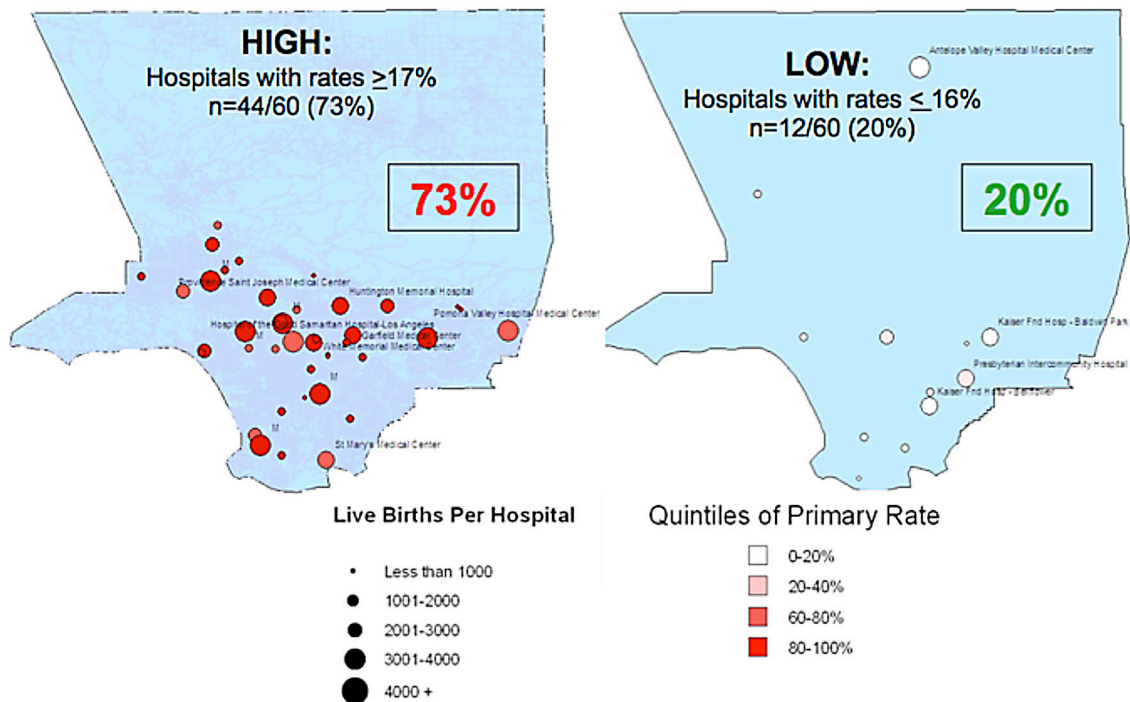
0-20%	(Quintile 1: CB rate: 5-13.9%)
20-40%	(Quintile 2: CB rate: 14-15.9%)
40-60%	(Quintile 3: CB rate: 16.1-16.9%)
60-80%	(Quintile 4: CB rate: 17-19%)
80-100%	(Quintile 5: CB rate: >19%)



## Top and Bottom two Quintiles (40%) of Age-adjusted Low-Risk Primary C/S Rates: Northern CA



## Top and Bottom two Quintiles (40%) of Age-adjusted Low-Risk Primary C/S Rates: LA County CA



---

## Appendix F: Key Informant Interviews with California Maternity Care Providers: Methods and Sample

Fifteen key informant interviews were conducted with obstetric clinicians (3 physicians, 2 certified nurse midwives and 12 nurses) across the state through a convenience sampling procedure. Participants were recruited through regional perinatal network director offices across California and professional communication networks. Participants ranged in age from 37 to 78 years. Years of experience in maternal child health ranged from 6 to 37. The participants represent a snapshot of California birthing facilities in urban areas, with delivery volumes ranging from just over 1000 to over 7000 births per year. Among the 15 participants, 10 worked at hospitals that are part of a larger system. Hospital levels are designated in terms of the Neonatal Intensive Care Unit (NICU); and among the 15 participants, 4 worked at hospitals with Regional NICUs, seven at Community NICUs, two at intermediate/basic NICUs, and two unknown. Patient mix includes both large Medi-Cal and privately insured populations. Characteristics of the hospitals where interviewees work are not associated with a particular respondent in order to avoid potentially identifying information.

Participants were assured confidentiality and anonymity, and the study protocol was approved by Stanford University Institutional Review Board (IRB). Semi-structured interviews were conducted by phone and lasted between 50 and 75 minutes in length. They were transcribed and coded for emerging themes related to the key questions in the study, including maternal quality and safety issues in California in general and issues around implementation of The Joint Commission measure on NTSV cesarean deliveries in particular.

---

## Appendix G: Glossary of Terms

ACNM – American College of Nurse-Midwives, a professional association that represents certified nurse-midwives and certified midwives in the U.S.

ACOG – American Congress of Obstetricians and Gynecologists, a private, voluntary, nonprofit membership organization for professionals providing health care for women.

Adhesions – Fibrous bands of scar tissue that form between internal organs and tissues, joining them together abnormally.

AHRQ – Agency for Healthcare Research and Quality, a federal agency charged with improving the quality, safety, efficiency, and effectiveness of health care services.

Amniotic fluid embolism – (AFE) A rare obstetric emergency in which it is postulated that amniotic fluid, fetal cells, hair, or other debris enter the maternal circulation, causing cardiorespiratory collapse.

Anesthesia – A drug, administered for medical or surgical purposes, that induces partial or total loss of sensation and may be topical, local, regional, or general, depending on the method of administration and area of the body affected.

Apgar score – A measure of the physical condition of a newborn infant. It is obtained by adding points (2, 1, or 0) for heart rate, respiratory effort, muscle tone, response to stimulation, and skin coloration. A score of ten represents the best possible condition.

Arrest of dilation – Failure of the cervix to dilate to a full 10 cm despite active labor.

Asphyxia – A condition in which an extreme decrease in the concentration of oxygen in the body accompanied by

an increase in the concentration of carbon dioxide leads to loss of consciousness or death.

AWHONN – Association of Women's Health, Obstetric and Neonatal Nurses, a nonprofit membership organization that promotes the health of women and newborns.

Brachial plexus – Major nerve plexus formed of the ventral primary rami of the fifth cervical to first thoracic spinal nerves for innervation of the upper limb

Breech – Presentation of any part of the pelvic extremity of the fetus, the buttocks, knees, or feet; frank breech refers to presentation of the buttocks.

Cephalo-pelvic disproportion (CD) – The capacity of the pelvis is inadequate to allow the fetus to negotiate the birth canal.

Cerebral palsy – A disorder usually caused by brain damage occurring at or before birth and marked by muscular impairment. Often accompanied by poor coordination, it sometimes involves speech and learning difficulties.

Cesarean delivery – Incision through a pregnant woman's abdominal wall and uterus for extraction of the fetus.

Clavicle fracture – A break in the double curved long bone that forms part of the shoulder girdle.

DRG – Diagnosis-Related Group, a system to classify hospital cases into one of approximately 500 groups, expected to have similar hospital resource use, developed for Medicare as part of the prospective payment system. DRGs have been used in the U.S. since 1983 to determine how much Medicare pays the hospital, since patients within each category are similar clinically and are expected to use the same level of hospital resources.

---

Elective cesarean – A cesarean section performed for no medical reason.	ic arterial blood pressure to a level likely to induce cardiovascular damage or other adverse consequences.
Endometritis – Inflammation of the endometrium, the mucous membrane comprising the inner layer of the uterine wall.	Hysterectomy – Removal of the uterus; unless otherwise specified, usually denotes complete removal of the uterus (corpus and cervix).
Epidural – Regional anesthesia produced by injection of local anesthetic solution into the peridural space.	ICD-9 code – Numeric classification system used for identification and billing purposes of medical conditions or procedures.
Episiotomy – Surgical incision of the vulva to prevent laceration at the time of delivery or to facilitate vaginal surgery.	Induce – To cause or bring about labor, usually with medication; See also Labor induction.
Evidence-based care – aims to apply the best available evidence gained from the scientific method to clinical decision making.	Intervention – An action or ministration that produces an effect or is intended to alter the course of a pathologic process.
Failure to progress (FTP) – Lack of progressive cervical dilatation or lack of descent; See also Labor Dystocia.	Intracranial hemorrhage - Bleeding within the cranial vault; includes cerebral hemorrhage and subarachnoid hemorrhage.
Fetal intolerance of labor – Abnormal fetal heart rate pattern that indicates the fetus is not tolerating labor.	Labor dystocia – Stoppage of further cervical dilation for longer than 2 hours after labor has entered the active phase (generally defined as active contraction with at least 4 cm of cervical dilatation); See also Failure to Progress.
Fetal monitor(ing) – Electronic monitoring of the fetal heart rate and uterine contractions during labor.	Labor induction – To cause or bring about labor, usually with medication; See also Induce.
Gestational diabetes – Carbohydrate intolerance of variable severity with onset or first recognition during pregnancy.	Macrosomia – Abnormally large size of the body.
Hematoma – A localized collection of blood that accumulates in an organ, tissue, or body space as the result of leakage from a broken blood vessel.	Malpresentation – Faulty presentation of the fetus; presentation of any part other than the occiput (back of the head).
Hemorrhage – A loss of a large amount of blood in a short period, either externally or internally.	Maternal – Relating to or derived from the mother.
Hospitalist – A physician specializing in hospital inpatient care who assumes the care of hospitalized patients in the place of the patient's primary care physician.	Maternal morbidity – Medical complications in a woman caused by pregnancy, labor, or delivery.
Hypertension – High blood pressure; transitory or sustained elevation of system-	Morbidity – Disease or complication.
	Multiparous (adj.) – Having given birth to

---

more than one baby; Multipara (n.)—A woman who has given birth more than once.	Placenta accreta – A placenta that invades the uterine muscle, making separation from the muscle difficult.
Multiple gestation – Pregnancy with more than one fetus.	Placenta previa – Placenta previa is a condition that occurs during pregnancy when the placenta is abnormally placed, and partially or totally covers the cervix.
Neonatal – Relating to the period immediately succeeding birth and continuing through the first 28 days of extra-uterine life.	Placental implantation abnormality – A condition where the placenta does not properly implant itself in the uterine wall.
Neonatal morbidity – An abnormal outcome or condition for a baby due to birth or delivery.	Post-traumatic stress disorder – Development of characteristic long-term symptoms following a psychologically traumatic event that is generally outside the range of usual human experience.
NICU – Neonatal intensive care unit.	Postpartum – Referring to the time period following childbirth, related to the mother.
NTSV – The measure which tracks cesarean delivery among women who are nulliparous, at term, with a singleton baby in the vertex position; NTSV represents the lowest-risk, optimal set of conditions for vaginal birth among women—a first birth with a full-term, single baby in the head-down position.	Postpartum depression – A mental state or chronic mental disorder after childbirth, characterized by feelings of sadness, loneliness, despair, low self-esteem, and self-reproach; accompanying signs include psychomotor retardation (or less frequently agitation), withdrawal from social contact, and vegetative states such as loss of appetite and insomnia.
Nulliparous (adj.) – Never having borne a child; Nullipara (n.) A woman who has never given birth.	Preeclampsia – Development of hypertension with proteinuria or edema, or both, due to pregnancy or the influence of a recent pregnancy; it usually occurs after the 20th week of gestation, but may develop before this time in the presence of trophoblastic disease.
Parity – The condition of having given birth to an infant or infants, alive or dead.	Preterm birth – A birth of an infant with gestational age of more than 20 weeks and less than 37 completed weeks (259 completed days).
Perineal – Relating to the perineum, the surface area between the thighs extending from the coccyx to the pubis that includes the anus posteriorly and the external genitalia anteriorly.	Primary cesarean – Any first cesarean birth for a woman.
Peripartum – Occurring during the last month of gestation or the first few months after delivery, with reference to the mother.	
Placenta – The organ that allows interchange between the fetus and the mother. Blood from the fetus and the mother do not directly mix, but the thin placental membrane allows the fetus to absorb nutrients and oxygen from the mother. Waste products from the fetus can exit through the placenta.	



---

Prophylactic – Any medical or public health procedure whose purpose is to prevent, rather than treat or cure a disease.

Repeat cesarean – Any cesarean that is not a first cesarean birth.

Respiratory distress syndrome – A syndrome in premature infants caused by developmental insufficiency of surfactant production and structural immaturity in the lungs.

Risk stratification – Ability to predict outcomes from a given intervention by arranging patients according to the severity of their illness. The usefulness of any risk stratification system arises from how the system links severity to a specific outcome.

Sentinel event – Any unanticipated event in a healthcare setting resulting in death or serious physical or psychological injury to a patient or patients, not related to the natural course of the patient's illness.

Sepsis – A bacterial infection in the bloodstream or body tissues. This is a very broad term covering the presence of many types of microscopic disease-causing organisms.

Term (pregnancy) – A pregnancy with an infant born with gestational age between 37 completed weeks (259 completed days) and 42 completed weeks (294 completed days).

Term singleton vertex – A single fetus at term in the vertex (head down) presentation.

Transient tachypnea (TTN) – A syndrome of generally mild tachypnea (rapid breathing) in otherwise healthy newborns, lasting usually only about 3 days.

Uterine rupture – A full-thickness separation of the uterine wall and the overlying serosa.

VBAC – Vaginal birth after a prior cesarean birth.

Venous thromboembolism – Formation of a clot of one or more deep veins, usually of the lower limb, with swelling, warmth, and erythema, frequently a precursor of pulmonary embolism.

Vertex presentation – Presentation of any part of the fetal head, usually the upper and back part lying over the pelvic inlet; the optimal presentation for vaginal birth.

---

## REFERENCES

1. The Joint Commission. Specifications manual for Joint Commission national quality measures (v2011A): PC-02 NTSV Cesarean Section. 2011; <http://manual.jointcommission.org/releases/TJC2011A/MIF0167.html>.
2. American College of Obstetricians and Gynecologists. Practice Bulletin Number 5: Vaginal Birth After Previous Cesarean Section 1999.
3. Jena AB, Seabury S, Lakdawalla D, Chandra A. Malpractice risk according to physician specialty. *N Engl J Med*. Aug 18 2011;365(7):629-636.
4. American Congress of Obstetricians and Gynecologists ACOG. Task Force on Cesarean Delivery Rates. Evaluation of Cesarean Delivery. 2000.
5. National Institutes of Health. NIH Consensus Development Conference Statement. Vaginal birth after cesarean: New Insights. *Obstet Gynecol*. June 2010;115(6):1279-1295.
6. Risser A, King V. Rapid Review: Elective cesarean section. 2010; <http://www.ohsu.edu/xd/research/centers-institutes/evidence-based-policy-center/med/index.cfm>.
7. Janakiraman V, J E. Quality in obstetric care: measuring what matters. *Obstet Gynecol*. 2010;Sep(116(3)):728-732.
8. Berghella V, Blackwell SC, Ramin SM, Sibai BM, Saade GR, et al. Use and misuse of the term “elective” in obstetrics. *Obstet Gynecol*. 2011;117:372-376.
9. MacDorman MF, Menacker F, Declercq E. Cesarean birth in the United States: epidemiology, trends, and outcomes. *Clin Perinatol*. Jun 2008;35(2):293-307.
10. Healthcare Information Division: Hospital volume and utilization indicators for California. California Office of Health Statistics and Development; 2007. [http://www.oshpd.ca.gov/HID/Products/PatDischargeData/ResearchReports/HospIPQualInd/Vol-Util\\_IndicatorsRpt/](http://www.oshpd.ca.gov/HID/Products/PatDischargeData/ResearchReports/HospIPQualInd/Vol-Util_IndicatorsRpt/). Accessed January 30, 2009.
11. Menacker F, Hamilton BE. Recent trends in cesarean delivery in the United States. NCHS data brief, no. 35. Hyattsville, MD: National Center for Health Statistics;2010.
12. Braveman P, Egerter S, Edmonston F, Verdon M. Racial/ethnic differences in the likelihood of cesarean delivery, California. *American Journal of Public Health*. May 1995;85(5):625-630.
13. Getahun D, Strickland D, Lawrence JM, et al. Racial and ethnic disparities in the trends in primary cesarean delivery based on indications. *American Journal of Obstetrics and Gynecology*. Oct 2009;201(4):422 e421-427.
14. Martin JA, Hamilton BE, Sutton PD, et al. Births: Final data for 2007. National vital statistics reports. In: National Center for Health Statistics, ed. Vol 58. Hyattsville, MD: National Center for Health Statistics;; 2010.
15. Bettgowda VR, Dias T, Davidoff MJ, Damus K, Callaghan WM, Petrini JR. The relationship between cesarean delivery and gestational age among US singleton births. *Clin Perinatol*. Jun 2008;35(2):309-323, v-vi.

- 
16. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among United States adults, 1999-2000. *Journal of the American Medical Association*. Oct 9 2002;288(14):1723-1727.
  17. Martin JA, Hamilton BE, Sutton PD, et al. Births: final data for 2003. *National vital statistics reports : from the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System*. Vol 54. 2005 / 09 / 24 ed2005:1-116.
  18. Ogden CL, Carroll MD, Curtin LR, et al. Prevalence of overweight and obesity in the United States, 1999-2004. *Journal of the American Medical Association*. Apr 5 2006;295(13):1549-1555.
  19. Sakala C, Corry MP. Evidence-based maternity care: What it is and what it can achieve. New York: Milbank Memorial Fund;2008.
  20. Plante LA. Public health implications of cesarean section on demand: CME review article. *Obstetrical and Gynecological Survey*. 2006;61(12).
  21. Kuklina E, Meikle S, Jamieson D, Whiteman M, Barfield W, Hillis S, Posner S. Severe Obstetric Morbidity in the US, 1998-2005. *Obstetrics and Gynecology*. 2009;113:293-299.
  22. Knight M, Kurinczuk JJ, Spark P, Brocklehurst P, et al. Cesarean delivery and peripartum hysterectomy. *Obstetrics & Gynecology*. January 2008;111(1):97-105.
  23. Tita ATN, Landon MB, Spong CY, et al. Timing of elective cesarean delivery at term and neonatal outcomes. *N Engl J Med*. January 2009;360:111-120.
  24. Gould JB, Danielsen B, Korst LM, et al. Cesarean delivery rates and neonatal morbidity in a low-risk population. *Obstet Gynecol*. Jul 2004;104(1):11-19.
  25. Hanley G, Janssen P, Greyson D. MLIS regional variation in the cesarean delivery and assisted vaginal delivery rates. *Obstet Gynecol*. 2010;115:1201-1208.
  26. Bragg F, Cromwell D, Edozien L, et al. Variation in rates of caesarean section among English NHS trusts after accounting for maternal and clinical risk: Cross sectional study. *British Medical Journal*. 2010;341:c5065.
  27. Hurley V, Brownlee S, Baker L. Elective childbirth procedures in California: A close-up of geographic variation. Oakland, CA: California HealthCare Foundation;2011.
  28. Wennberg J. Unwarranted variations in healthcare delivery: Implications for academic medical centres. *British Medical Journal*. 2002;325:961-964.
  29. Berkowitz G, Fiarman G, Mojica M, et al. Effect of physician characteristics on the cesarean birth rate. *American Journal of Obstetrics and Gynecology*. 1989;161:146-149.
  30. Goyert GL, Bottoms SF, Treadwell MC, Nehra PC. The physician factor in cesarean birth rates. *N Engl J Med*. Mar 16 1989;320(11):706-709.
  31. Luthy D, Malmgren J, Zingheim R, Leininer C. Physician contribution to a cesarean delivery risk model. *American Journal of Obstetrics and Gynecology*. 2003;188:1579-1586.
  32. Luthy DA, Malmgren JA, Zingheim RW. Cesarean delivery after elective induction in nulliparous women: The physician effect. *American Journal of Obstetrics and Gynecology*. 2004;191:511-515.

- 
33. Baicker K, Buckles K, Chandra A. Geographic variation in the appropriate use of cesarean delivery. *Health Affairs*. 2006;25(5):w355-2357.
  34. Joesch JM, Gossman GL, Tanfer K. Primary cesarean deliveries prior to labor in the United States, 1979-2004. *Maternal and Child Health Journal*. May 2008;12(3):323-331.
  35. Main EK, Moore D, Farrell B, et al. Is there a useful cesarean birth measure? Assessment of the nulliparous term singleton vertex cesarean birth rate as a tool for obstetric quality improvement. *American Journal of Obstetrics and Gynecology*. Jun 2006;194(6):1644-1651; discussion 1651-1642.
  36. Alfirevic Z, Edwards G, Platt M. The impact of delivery suite guidelines on intrapartum care in "standard primigravida". *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 2004;115:28-31.
  37. Miller T, Brennan T, Milstein A. How can we make more progress in measuring physicians' performance to improve the value of care? *Health Affairs*. 2009;28(5):1429-1437.
  38. American Congress of Obstetricians and Gynecologists ACOG. Vaginal birth after previous cesarean delivery. Practice Bulletin No. 115. *Obstetrics and Gynecology*. 2010;116:450-463.
  39. Childbirth Connection. Blueprint for action: Steps toward a high-quality, high-value maternity care system. *Women's Health Issues*. 2010;20:S18-S49.
  40. Hannah ME, Hannah WJ, Hewson SA, et al. Planned caesarean section versus planned vaginal birth for breech presentation at term: A randomised multicentre trial. Term Breech Trial Collaborative Group. *Lancet*. Oct 21 2000;356(9239):1375-1383.
  41. Hogle KL, Hutton EK, McBrien KA, Barrett JF, Hannah ME. Cesarean delivery for twins: a systematic review and meta-analysis. *American Journal of Obstetrics and Gynecology*. Jan 2003;188(1):220-227.
  42. Smith G, Shah I, White I, Pell J, Dobbie R, et al. Mode of delivery and the risk of delivery-related perinatal death among twins at term: A retrospective cohort study of 8073 births. *British Journal of Obstetrics and Gynaecology*. 2005;112(8):1139-1144.
  43. Riskin A, Riskin-Mashiah S, Bader D, et al. Delivery mode and severe intraventricular hemorrhage in single, very low birth weight, vertex infants. *Obstet Gynecol*. Jul 2008;112(1):21-28.
  44. Foley ME, Alarab M, Daly L, Keane D, Macquillan K, O'Herlihy C. Term neonatal asphyxial seizures and peripartum deaths: Lack of correlation with a rising cesarean delivery rate. *American Journal of Obstetrics and Gynecology*. Jan 2005;192(1):102-108.
  45. Scheller JM, Nelson KB. Does cesarean delivery prevent cerebral palsy or other neurologic problems of childhood? *Obstet Gynecol*. Apr 1994;83(4):624-630.
  46. Moczygemba CK, Paramsothy P, Meikle S, et al. Route of delivery and neonatal birth trauma. *American Journal of Obstetrics and Gynecology*. Apr 2010;202(4):361 e361-366.
  47. Strauss D, Shavelle R, Reynolds R, Rosenbloom L, Day S. Survival in cerebral palsy in the last 20 years: Signs of improvement? *Developmental Medicine and Child Neurology*. Feb 2007;49(2):86-92.

- 
48. Surman G, Hemming K, Platt MJ, et al. Children with cerebral palsy: Severity and trends over time. *Paediatric and Perinatal Epidemiology*. Nov 2009;23(6):513-521.
  49. Sinha A, Bewley S, T M. Myth: Babies would choose prelabour caesarean section. *Seminars in Fetal Neonatal Medicine*. 2011(May 11).
  50. Go M, Emeis C, Guise J, Schelonka R, et al. Fetal and neonatal morbidity and mortality following delivery after previous cesarean. *Clinical Perinatology*. 2011;Jun;38(2):311-319.
  51. Villar J, Carroli G, Zavaleta N, et al. World Health Organization 2005 Global Survey on Maternal and Perinatal Health Research Group - Maternal and neonatal individual risks and benefits associated with caesarean delivery. *British Medical Journal*. 2007;Nov 17(335(7628)):1025.
  52. Kamath BD, Todd JK, Glazner JE, Lezotte D, Lynch AM. Neonatal outcomes after elective cesarean delivery. *Obstet Gynecol*. Jun 2009;113(6):1231-1238.
  53. Annibale DJ, Hulsey TC, Wagner CL, Southgate WM. Comparative neonatal morbidity of abdominal and vaginal deliveries after uncomplicated pregnancies. *Arch Pediatr Adolesc Med*. Aug 1995;149(8):862-867.
  54. Bailit JL, Garrett JM, Miller WC, McMahon MJ, Cefalo RC. Hospital primary cesarean delivery rates and the risk of poor neonatal outcomes. *American Journal of Obstetrics and Gynecology*. Sep 2002;187(3):721-727.
  55. Silver RM, Landon MB, Rouse DJ, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. *Obstet Gynecol*. Jun 2006;107(6):1226-1232.
  56. Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. Urinary incontinence after vaginal delivery or cesarean section. *The New England Journal of Medicine*. Mar 6 2003;348(10):900-907.
  57. Buchsbaum GM, Duecy EE, Kerr LA, Huang LS, Guzick DS. Urinary incontinence in nulliparous women and their parous sisters. *Obstet Gynecol*. Dec 2005;106(6):1253-1258.
  58. Kuklina EV, Meikle SF, Jamieson DJ, et al. Severe obstetric morbidity in the United States: 1998-2005. *Obstet Gynecol*. Feb 2009;113(2):293-299.
  59. Knight M, Callaghan WM, Berg C, et al. Trends in postpartum hemorrhage in high resource countries: A review and recommendations from the International Postpartum Hemorrhage Collaborative Group. *BMC Pregnancy Childbirth*. 2009;9(55).
  60. Callaghan WM, Kuklina EV, Berg CJ. Trends in postpartum hemorrhage: United States, 1994-2006. *Obstet Gynecol*. 2010;202:353.e351-356.
  61. Lu MC, Fridman M, Korst LM, et al. Variations in the incidence of postpartum hemorrhage across hospitals in California. *Maternal Child Health Journal*. September 2005;9(3):297-306.
  62. Waterstone M, Wolfe C, Hooper R, Bewley S. Postnatal morbidity after childbirth and severe obstetric morbidity. *British Journal of Obstetrics and Gynecology* Feb 2003;110(2):128-133.
  63. Burrows L, Meyn L, Weber A. Maternal morbidity associated with vaginal versus cesarean delivery. *Obstetrics and Gynecology*. 2004;103(5):907-912.



- 
64. Liu S, Liston, R.M., Joseph, K.S., Heaman, M., Sauve, R., Kramer, M.S. Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term. *Canadian Medical Association Journal*. 2007;175:455-460.
  65. Wen SW, Rusen ID, Walker M, et al. Comparison of maternal mortality and morbidity between trial of labor and elective cesarean section among women with previous cesarean delivery. *American Journal of Obstetrics and Gynecology*. Oct 2004;191(4):1263-1269.
  66. Schutte JM, Steegers EA, Santema JG, Schuitemaker NW, van Roosmalen J. Maternal deaths after elective cesarean section for breech presentation in the Netherlands. *ACTA Obstetrica et Gynecologica Scandinavica*. 2007;86(2):240-243.
  67. Spong CY, Landon MB, Gilbert S, et al. Risk of uterine rupture and adverse perinatal outcome at term after cesarean delivery. *Obstet Gynecol*. Oct 2007;110(4):801-807.
  68. Liu S, Heaman M, Joseph K, et al. Risk of maternal postpartum readmission associated with mode of delivery. *Obstet Gynecol*. 2005;105(4):836-842.
  69. Ophir E, Strulov A, Solt I, et al. Delivery mode and maternal rehospitalization. *Archives of Gynecology and Obstetrics*. 2008;277(5):401-404.
  70. OSHPD. Outcomes for Maternal Hospital Care in California, 1999-2001. 2008.
  71. Declercq E, Barger M, Cabral HJ, et al. Maternal outcomes associated with planned primary cesarean births compared with planned vaginal births. *Obstet Gynecol*. Mar 2007;109(3):669-677.
  72. Silver RM. Delivery after previous cesarean: Long-term maternal outcomes. *Seminars in perinatology*. Aug 2010;34(4):258-266.
  73. Brink S. Too Posh to Push? Cesarean sections have spiked dramatically. Progress or convenience? *US News and World Report* 2002.
  74. Song S, Downie A, Gibson H, Kloberdanz K, McDowell J, al e. *Medicine: Too posh to push?* Time 2004.
  75. Declercq ER, Sakala C, Corry MP, Applebaum S. Listening to mothers II: Report of the second national U.S. survey of women's childbearing experiences. New York: Childbirth Connection; 2006.
  76. Chalmers B, Kaczorowski J, Darling E. Cesarean and Vaginal Birth in Canadian Women: A Comparison of Experiences. *Birth*. 2010;37:44-49.
  77. Rowe-Murray HJ, Fisher JR. Baby friendly hospital practices: Cesarean section is a persistent barrier to early initiation of breastfeeding. *Birth*. Jun 2002;29(2):124-131.
  78. Zanardo V, Svegliado G, Cavallin F, et al. Elective cesarean delivery: Does it have a negative effect on breastfeeding? *Birth*. Dec 2010;37(4):275-279.
  79. Bhattacharya S, Porter M, Harrild K. Absence of conception after caesarean section: Voluntary or involuntary? *British Journal of Obstetrics and Gynecology*. 2006;113(3):268-275.
  80. Bahl R, Strachan B, Murphy D. Outcome of subsequent pregnancy three years after previous operative delivery in the second stage of labour: Cohort study. *British Medical Journal*. 2004;328(7435):311.

- 
81. Tollanes M, Melve K, Irgens L, Skjaevern R, et al. Reduced fertility after cesarean delivery: A maternal choice. *Obstetrics and Gynecology*. 2007;110(6):1256-1263.
  82. Lobel M, deLuca R. Psychosocial sequelae of cesarean delivery: Review and analysis of their causes and implications. *Social Science and Medicine*. 2007;64(11):2272-2284.
  83. Weisman O, Granat A, Gilboa-Schechtman E, et al. The experience of labor, maternal perception of the infant, and the mother's postpartum mood in a low-risk community cohort. *Archive of Womens' Mental Health*. 2010;13(6):505-513.
  84. OSHPD. Annual Financial Data Set. Hospital-level data was obtained from the OSHPD Healthcare Information Division - Annual Financial Data set. (The "Selected Data - Calendar Year" subset for 2009 was downloaded on 2005/2010/2011 from the OSHPD website at <http://www.oshpd.ca.gov/hid/Products/Hospitals?AnnFinanData/SubSets/SelectedData/default.asp>). Corrected data on two hospitals was provided by OSHPD via personal communication on 2005/2017/2011 and 2015/2019/2011. Available at: <http://www.oshpd.ca.gov/hid/Products/Hospitals/AnnFinanData/SubSets/SelectedData/default.asp>. Accessed 5/10/112009.
  85. AHRQ. HCUPnet, Healthcare Cost and Utilization Project In: United States Agency for Healthcare Research and Quality, ed. Rockville, MD.
  86. IHI Time Line. <http://www.ihl.org/ihl/about>. Accessed January 21, 2007.
  87. National Quality Forum: Elective Delivery Prior to 39 Weeks Gestation. Available at: [http://www.qualityforum.org/Standards/Measures/elective\\_delivery\\_prior\\_to\\_39\\_completed\\_weeks\\_gestation.aspx](http://www.qualityforum.org/Standards/Measures/elective_delivery_prior_to_39_completed_weeks_gestation.aspx).
  88. California HealthCare Foundation. California Health Care Spending: Quick Reference Guide, 2010. 2010; <http://www.chcf.org>. Accessed July 27, 2011, 2011.
  89. California HealthCare Foundation. U.S. Health Care Spending: Quick Reference Guide 2011. 2011; <http://www.chcf.org>. Accessed July 27, 2011, 2011.
  90. Penn Z, Ghaem-Maghami S. Indications for Cesarean Section. *Best Practice & Research Clinical Obstetrics & Gynaecology*. 2001;15(1):1-15.
  91. Zhang J, Troendle J, Reddy UM, et al. Contemporary cesarean delivery practice in the United States. *American Journal of Obstetrics and Gynecology*. Oct 2010;203(4):326.e321-326.e310.
  92. Barber EL, Lundsberg LS, Belanger K, et al. Indications contributing to the increasing cesarean delivery rate. *Obstet Gynecol*. Jul 2011;118(1):29-38.
  93. Adams MG, Hirsch E, MacGregor S, Kirschner C, Silver R. Commentary: how to respond to the trend of increasing cesarean delivery. 2010; <http://www.modernmedicine.com/modernmedicine/Modern+Medicine+Now/Commentary-How-to-respond-to-the=trend-of-increasi/ArticleStandard/Article/detail/673948>. Accessed June 1, 2010.
  94. Declercq E. VBAC 2010: Establishing the link between research, evidence and practice. Normal Labour and Birth Conference: The Benefits and Challenges of Preserving Physycologic Birth. Vancouver, British Columbia, Canada 2010.
  95. Brennan D, Murphy M, Robson M, O'Herlihy C, et al. The Singleton, Cephalic, Nulliparous Woman After 36 Weeks of Gestation. *Obstetrics & Gynecology*. 2011;117(2):273-279.

- 
96. Brennan DJ, Robson MS, Murphy M, O'Herlihy C. Comparative analysis of international cesarean delivery rates using 10-group classification identifies significant variation in spontaneous labor. *American Journal of Obstetrics and Gynecology*. Sep 2009;201(3):301e-308e.
  97. Coonrod DV, Drachman D, Hobson P, Manriquez M. Nulliparous term singleton vertex cesarean delivery rates: Institutional and individual level predictors. *American Journal of Obstetrics and Gynecology*. Jun 2008;198(6):694 e691-611; discussion 694 e611.
  98. Main EK. Reducing cesarean birth rates with data-driven quality improvement activities. *Pediatrics*. Jan 1999;103(1 Suppl E):374-383.
  99. Grobman WA, Lai Y, Landon MB, et al. Development of a nomogram for prediction of vaginal birth after cesarean delivery. *Obstet Gynecol*. Apr 2007;109(4):806-812.
  100. Menacker F, MacDorman MF, Declercq E. Neonatal mortality risk for repeat cesarean compared to vaginal birth after cesarean (VBAC) deliveries in the United States, 1998-2002 birth cohorts. *Maternal and Child Health Journal*. Mar 2010;14(2):147-154.
  101. Queenan JT. How to stop the relentless rise in cesarean deliveries. *Obstet Gynecol*. Aug 2011;118(2 Pt 1):199-200.
  102. Enkin MW, Glouberman S, Groff P, Jadad AR, Stern A. Beyond Evidence: The Complexity of Maternity Care. *Birth*. 2006;33(4):265-269.
  103. American Congress of Obstetricians and Gynecologists ACOG. Professional liability and its effects: Report of a survey of ACOG's membership. *Journal of American Medical Association*. 1993;269:366-373.
  104. US Congress Office of Technology Assessment. Defensive Medicine and Medical Malpractice. Washington, DC: Office of Technology Assessment;1994.
  105. Locolio A, Lawthers A, Bengston J, et al. Relationship between malpractice claims and cesarean section. *Journal of the American Medical Association*. 1993;269:366-373.
  106. Yang YT, Mello MM, Subramanian SV, Studdert DM. Relationship between malpractice litigation pressure and rates of cesarean section and vaginal birth after cesarean section. *Medical Care*. Feb 2009;47(2):234-242.
  107. Klein M, Kaczorowski J, Hearps S, et al. Birth technology and maternal roles in birth: Knowledge and attitudes of Canadian women approaching childbirth for the first time. *Journal of Obstetrics and Gynecology*. 2011;33(6):598-708.
  108. Bingham D, Main E. Effective implementation strategies and tactics for leading change on maternity units. *Journal of Neonatal and Perinatal Nursing*. 2010;24(1):32-42.
  109. Reisner DP, Wallin TK, Zingheim RW, Luthy DA. Reduction of elective inductions in a large community hospital. *American Journal of Obstetrics and Gynecology*. Jun 2009;200(6):674 e671-677.
  110. Callaghan WM, Mackay AP, Berg CJ. Identification of severe maternal morbidity during delivery hospitalizations, United States, 1991-2003. *American Journal of Obstetrics and Gynecology*. Aug 2008;199(2):133 e131-138.

- 
111. Menacker F. Trends in cesarean rates for first births and repeat cesarean rates for low-risk women: United States, 1990-2003. National vital statistics reports: from the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System. Sep 22 2006;54(4):1-8.
  112. Khunpradit S, Tavender E, Lumbiganon P, et al. Non-clinical interventions for reducing unnecessary caesarean section. Cochrane Database of Systematic Reviews. 2011(6 Art. No.: CD005528).
  113. Bailit JL, Dierker L, Blanchard MH, Mercer BM. Outcomes of women presenting in active versus latent phase of spontaneous labor. Obstet Gynecol. Jan 2005;105(1):77-79.
  114. Fisch JM, English D, Pedaline S, Brooks K, Simhan HN. Labor induction process improvement: A patient quality-of-care initiative. Obstetrics and Gynecology. Apr 2009;113(4):797-803.
  115. Kjaergaard H, Olsen J, Ottesen B, Nyberg P, Dykes A. Obstetric risk indicators for labour dystocia in nulliparous women: A multi-centre cohort study. BMC Pregnancy Childbirth. 2008;6(8):45.
  116. Macones GA, Hankins GD, Spong CY, Hauth J, Moore T. The 2008 National Institute of Child Health and Human Development workshop report on electronic fetal monitoring: Update on definitions, interpretation, and research guidelines. Obstet Gynecol. Sep 2008;112(3):661-666.
  117. Clark S, Rice Simpson K, Knox E, Garite T. Oxytocin: New perspectives on an old drug. American Journal of Obstetrics and Gynecology. 2009;1:35.e31-33.36.
  118. Scott JR. Vaginal birth after cesarean delivery: A common-sense approach. Obstet Gynecol. Aug 2011;118(2 Pt 1):342-350.
  119. Appropriate technology for birth. Lancet. Aug 24 1985;2(8452):436-437.
  120. Pronovost PJ, Holzmueller CG, Ennen CS, Fox HE. Overview of progress in patient safety. American Journal of Obstetrics and Gynecology. Jan 2011;204(1):5-10.
  121. Geshman J. Health cut hits hurdle: Plan to reduce spending by discouraging C-sections falters after hospitals balk. Wall Street Journal. July 13, 2011.
  122. Wolfe S. Guide to Avoiding Unnecessary Cesarean Sections in New York State 2010; <http://www.citizen.org/documents/1906.pdf>. Accessed September 30, 2011.