



Vaginal or Cesarean Birth:
What Is at Stake for Women and Babies?
A Best Evidence Review

Executive Summary

Contributors

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About Childbirth Connection

Childbirth Connection is a national not-for-profit organization founded in 1918 as Maternity Center Association. Our mission is to improve the quality and value of maternity care through consumer engagement and health system transformation. Childbirth Connection promotes safe, effective and satisfying evidence-based maternity care and is a voice for the needs and interests of childbearing families. Through the *Transforming Maternity Care* Partnership, Childbirth Connection works with stakeholders from across the health care system to implement priority recommendations from the consensus, direction-setting *Blueprint for Action: Steps Toward a High-Quality, High-Value Maternity Care System*. This Blueprint for Action, the companion report, *2020 Vision for a High-Quality, High-Value Maternity Care System*, and other related resources are available at <http://transform.childbirthconnection.org>.

Executive Summary

Introduction and Background

With about one in three babies born surgically, cesarean delivery is the most common operating room procedure in the United States. Over the past two decades, the cesarean rate has increased among women with and without prior cesareans, in both preterm and term pregnancies, in women at low and high risk of complications, and across all ages, races, and ethnicities.^{1, 2} As cesarean rates increase, proportionally more low-risk women experience cesarean delivery.^{3, 4} Overuse of cesarean delivery in low-risk women exposes more women and babies to potential harms of cesarean with minimal likelihood of benefit. Of particular consequence are downstream effects including childhood chronic illness and placental complications in any subsequent pregnancies. These include life-threatening complications that occur more frequently with accumulating surgeries. In light of these and other concerns, in 2012, the National Priorities Partnership, a consortium of major national organizations facilitating coordinated action within targeted areas of health and healthcare improvement, convened a Maternity Action Team to address inappropriate and unsafe maternity care.⁵ A major goal of the Maternity Action Team is to reduce cesarean delivery in low-risk women to 15% or less.

With escalating multi-stakeholder attention on cesarean overuse, an ever-growing body of evidence, and new opportunities for consumer education and shared decision making, Childbirth Connection undertook a scientific review to summarize for all stakeholders the most current best evidence on the health consequences of cesarean delivery. While the expected benefits of cesarean delivery vary depending on the indication and would be minimal in low-risk women, the potential harms are generally intrinsic to surgical delivery. Thus, this report focuses on adverse consequences of cesarean, and also explores adverse outcomes that may be intrinsic to labor or vaginal birth. This report presents the methods, findings, and implications of this best evidence review. Companion consumer-oriented materials, including a downloadable booklet, are available at <http://www.childbirthconnection.org/cesarean>.


Methods

This report intends to present the best available evidence for the direction and strength of the harms associated with cesarean delivery versus vaginal birth measured within contemporary maternity practice in high-resource countries. To be included in this best evidence review, systematic reviews or studies had to have been published in English in the year 2000 or later, been conducted in high-income countries (as defined by the World Bank⁶) and compared outcomes with cesarean delivery versus either actual or planned vaginal birth. To examine outcomes unique to surgery (e.g., cesarean scar ectopic pregnancy, operative injury to internal organs) or vaginal birth (i.e., perineal or genital injury), however, we relied on studies without comparison groups.

Where an eligible systematic review was available—that is, a review of studies on a defined question that described its search methods, specified inclusion and exclusion criteria and used meta-analysis when appropriate—we used it as our exclusive source. If more than one eligible systematic review was identified covering the same topic, we chose the most recent, unless including multiple systematic reviews enabled reporting of additional outcomes. If no eligible systematic review could be identified, we resorted to observational studies of any design including cohort, cross sectional, or case-control. Evidence for some outcomes was only available in case series and reports. In this situation, we included only the largest of the case series, excluding single case reports or series of only a few cases.

Where differences between modes of birth could be quantified, we reported the size of those differences (“absolute risk difference”) on a scale of “very small” to “very large” according to orders of magnitude standardized to a denominator of 10,000.⁷ (See Table 1.) The standardized scale allows readers to make comparisons at a glance, and 10,000 was chosen as the common denominator to capture the wide variation in rates of various outcomes. In some cases, studies reported only odds or risk ratios, which meant that differences could not be quantified. These have been so noted. Unless stated otherwise, all differences are *statistically significant*, that is, unlikely to be due to chance.

Table 1: Magnitude of Absolute Risk Difference in Reported Outcome

Excess number of women or babies having a specific problem	Compared with the safer form of care, the care with more risk may cause problems for an additional	
VERY LARGE	1,000 to 10,000	 <p data-bbox="1166 884 1390 957">of every 10,000 women or babies</p>
LARGE	100 to 999	
MODERATE	10 to 99	
SMALL	1 to 9	
VERY SMALL	less than 1	

Results

Our comprehensive assessment reveals the following: Of 14 maternal adverse outcomes in the current pregnancy, sufficient evidence demonstrates that 8 favor vaginal or planned vaginal birth, and limited evidence suggests the remaining 6 favor vaginal or planned vaginal birth. Of 4 neonatal adverse outcomes, sufficient evidence demonstrates that 1 favors vaginal or planned vaginal birth, limited evidence suggests that 2 favor vaginal or planned vaginal birth and evidence is conflicting for the remaining 1 outcome. Of 4 childhood chronic diseases, sufficient evidence demonstrates that 3 favor vaginal or planned vaginal birth and evidence is limited and conflicting for the remaining 1. Seven adverse outcomes are unique to cesarean delivery while 3 are unique to vaginal birth. Of 3 psychosocial outcomes examined, evidence conflicts but suggests a possible association with cesarean delivery for all 3. In subsequent pregnancies, of 9 adverse maternal outcomes, sufficient evidence demonstrates that 6 favor vaginal birth in the prior delivery and limited evidence suggests the remaining 3 also favor prior vaginal birth. Of 6 perinatal adverse outcomes in subsequent pregnancies, limited evidence suggests that 2 favor prior vaginal birth, and data conflict for the remaining 4. Of 5 outcomes related to pelvic floor dysfunction, none favors vaginal birth, mode of birth makes no difference for 2, and 3 favor cesarean delivery, but of these 3, 2 favor cesarean only in the short term or only with respect to mild or moderate symptoms. Of 4 outcomes related to delivery injury of the baby, mode of birth appears to make no difference for 3, none favors vaginal birth, and limited evidence suggests that 1 favors cesarean.

Individual results are listed below.

What physical effects may occur in women more frequently with cesarean delivery?

Maternal death: More women appear to die as a result of cesarean delivery itself, but the excess number cannot be calculated from the studies examined.

Cardiac arrest: Limited evidence suggests that a MODERATE excess number of healthy women may experience cardiac arrest in association with cesarean delivery compared with similar women planning vaginal birth.

Urgent hysterectomy: A SMALL to MODERATE excess number of women having initial cesarean delivery undergo unplanned hysterectomy compared with women having vaginal birth.

Thromboembolic events (blood clots): A SMALL to MODERATE excess number of healthy women having cesarean delivery experience a blood clot.

Anesthetic complications: Limited evidence suggests that a MODERATE excess number of healthy women having cesarean delivery may experience complications with anesthesia compared with similar women having spontaneous vaginal birth.

Major infection: Limited evidence suggests that a MODERATE to LARGE excess number of healthy women having planned cesarean delivery experience major puerperal infection compared with women having or planning vaginal birth.

Rare, life-threatening complications: Limited evidence suggests that more women experience amniotic fluid embolism or uterine artery pseudoaneurysm after cesarean than after vaginal birth, but the excess number cannot be calculated from the studies examined.

Wound infection (cesarean or genital): A LARGE excess number of healthy women having cesarean delivery have wound infections compared with women planning vaginal birth.

Hematoma (cesarean or genital): Limited evidence suggests that a LARGE excess number of healthy women having cesarean delivery have wound hematomas compared with women planning vaginal birth.

Wound disruption (cesarean or genital): Limited evidence suggests that a SMALL excess number of healthy women having cesarean delivery have wound disruption compared with women planning vaginal birth.

Length of hospital stay: Planned cesarean delivery increases length of hospital stay by at least 0.6 to 2 days compared with planned vaginal birth.

Hospital readmission: A MODERATE to LARGE excess number of healthy women having cesarean delivery require readmission to the hospital. →

Problems with physical recovery: With the exception of the presence of hemorrhoids, which are more common with vaginal birth, a LARGE to VERY LARGE excess number of women having cesarean delivery experience problems with physical recovery, including general health, bodily pain, extreme tiredness, sleep problems, bowel problems, ability to carry out daily activities, and ability to perform strenuous activities, compared with women having spontaneous vaginal birth.

Chronic pelvic pain: More women experience chronic pelvic pain after cesarean delivery than after vaginal birth, but the excess number cannot be calculated from the studies examined.

What physical effects may occur in babies more frequently with cesarean delivery?

Neonatal mortality: Limited evidence suggests that babies of women having elective first cesareans may be at greater risk of neonatal death compared with low-risk women planning vaginal birth, but the excess number of deaths cannot be calculated from the study examined.

Respiratory distress syndrome: When birth occurs before 39 weeks, more babies born by cesarean than by vaginal birth experience respiratory distress syndrome (RDS), but the excess number cannot be calculated from the studies examined.

Pulmonary hypertension: Limited evidence suggests that a MODERATE excess number of babies delivered by elective cesarean may develop pulmonary hypertension.

Not breastfeeding: Conflicting evidence suggests that babies delivered by cesarean may be at excess risk of not being breastfed.

What role may cesarean delivery play in the development of childhood chronic disease?

Asthma: Cesarean delivery increases the likelihood of developing asthma in childhood, but the excess number cannot be calculated from the studies examined.

Type 1 diabetes: Cesarean delivery increases the likelihood of developing Type 1 diabetes in childhood, but the excess number cannot be calculated from the studies examined.

Allergic rhinitis: Cesarean delivery increases the likelihood of developing childhood allergic rhinitis, but the excess number cannot be calculated from the studies examined.

Symptomatic food allergy: Limited and conflicting evidence suggests that cesarean delivery may increase the likelihood of developing food allergy in childhood, but the excess number, if any, cannot be calculated from the studies examined.

Obesity: Limited evidence suggests that a LARGE excess number of children delivered by cesarean may be obese at age 3.

What complications are unique to cesarean delivery?

Operative maternal injury: Among women having first delivery via cesarean, a MODERATE number of women experience bladder puncture, and a SMALL number experience bowel injury or injury to a ureter.

Surgical cuts to the baby: Limited evidence suggests that a MODERATE number of babies are cut during cesarean delivery.

Re-operation: Limited evidence suggests that a MODERATE number of women having cesarean delivery require re-operation.

Persistent pain at the site of the cesarean incision: Limited evidence suggests that a LARGE to VERY LARGE number of women still experience pain at the incision site 6-10 months or more after cesarean delivery.

Cesarean scar endometriosis: Limited evidence suggests that a SMALL to LARGE number of women having cesarean delivery develop cesarean scar endometriomas.

Cesarean scar ectopic pregnancy/early placenta accreta: Some women becoming pregnant after cesarean will experience a cesarean scar ectopic pregnancy or placental implantation within the uterine scar, but the number cannot be calculated from the studies examined.

Dense intra-abdominal adhesions: Limited evidence suggests that a VERY LARGE number of women develop dense adhesions after cesarean delivery.

What complications are unique to vaginal birth?

Anal sphincter injury: A LARGE number of women experience anal sphincter injury at vaginal birth.

Perineal or genital lacerations of any degree: Exclusive of episiotomy, a VERY LARGE number of women experience trauma to the perineum or genitals at vaginal birth that requires suturing.

Persistent perineal pain: Limited evidence suggests that a LARGE number of women experience persistent perineal pain lasting at least six months with spontaneous vaginal birth, and a VERY LARGE number of women experience perineal pain lasting at least six months after instrumental vaginal delivery.

What are potential psychosocial consequences of cesareans?

Adverse effect on maternal-child relationship: Data conflict about whether cesarean delivery has an adverse effect on the mother-child relationship.

Depression: Data conflict on whether cesarean delivery increases the likelihood of postpartum depression.

Posttraumatic distress: Data conflict but suggest that more women may experience PTSD or PTSD symptoms after cesarean delivery in general and unplanned cesareans in particular, but the excess number, if any, cannot be calculated from the studies examined.

What are potential effects of cesareans on women in future pregnancies and births?

Impaired fertility: More women experience impaired fertility after prior cesarean delivery compared with after prior vaginal birth, but the excess number cannot be calculated from the studies examined.

Voluntary infertility: A LARGE to VERY LARGE excess number of women choose not to conceive again after cesarean delivery.

Placenta previa: A SMALL excess number of women with first delivery by cesarean develop placenta previa in the next pregnancy, but the excess number cannot be calculated from the studies examined. A LARGE excess number of women develop placenta previa after two or more prior cesareans.

Placenta accreta: A SMALL excess number of women with first delivery via cesarean develop placenta accreta in the next pregnancy. A LARGE excess number of women develop placenta accreta after multiple prior cesareans.

Placental abruption: A MODERATE excess number of women with first delivery via cesarean have a placental abruption in subsequent pregnancies.

Hysterectomy: A MODERATE excess number of women with prior cesarean delivery require an urgent hysterectomy during the next delivery admission compared with women with only prior vaginal birth. Limited evidence suggests that the excess increases with subsequent pregnancies.

Uterine rupture: A MODERATE excess number of women will experience uterine rupture with prior cesarean delivery compared with prior vaginal birth.

Intensive care admission: Limited evidence suggests that a LARGE excess number of women with prior cesarean are admitted to intensive care at the next delivery compared with women with prior vaginal birth.

Hospital readmission: Limited evidence suggests that a MODERATE excess number of women with prior cesarean are readmitted to the hospital after discharge at the next delivery compared with women with prior vaginal birth.

What are potential effects of a scarred uterus on future babies?

Stillbirth: Data conflict, but suggest that a SMALL to MODERATE excess number of babies developing in a uterus with a cesarean scar are stillborn.

Perinatal or neonatal death: Data conflict, but suggest that more babies developing in a uterus with a cesarean scar may die late in pregnancy or during the first week after birth, but the excess number, if any, cannot be calculated from the studies examined.

Preterm birth and low birth weight: Data conflict on whether prior cesarean delivery imposes increased risk of preterm birth and concomitant low birth weight. →

Small for gestational age (SGA): Data conflict on whether prior cesarean delivery imposes increased risk of SGA in the next pregnancy compared with prior vaginal birth.

Need for ventilation at birth: Limited evidence suggests that a LARGE excess number of babies whose mothers had prior cesarean may require ventilation at birth compared with babies whose mothers had prior vaginal birth.

Hospital stay longer than 7 days: Limited evidence suggests that a LARGE excess number of babies whose mothers had prior cesarean have hospital stays of more than 7 days compared with babies whose mothers had prior vaginal birth.

Does cesarean delivery protect against sexual, bowel, urinary, or pelvic floor dysfunction?

Sexual dysfunction: Cesarean delivery provides minimal or no protection against sexual dysfunction.

Anal incontinence: Cesarean delivery provides no protection against anal incontinence in either the short term or up to 12 years after birth; planned cesarean provides no protection compared with cesareans during labor.

Urinary urge incontinence: Data conflict but suggest that cesarean delivery may provide some protection against urinary urge incontinence of any degree in the short term, but protective effect, if any, has disappeared by one year after birth, and similar percentages experience severe incontinence.

Urinary stress incontinence: A LARGE to VERY LARGE excess number of women having vaginal birth experience urinary stress incontinence of any degree at one year or more after birth compared with women having cesarean delivery, but rates of severe incontinence are low and similar between cesarean and vaginal birth groups.

Symptomatic pelvic organ prolapse: A LARGE excess number of women having vaginal birth experience symptomatic pelvic floor prolapse compared with women having only cesarean delivery. The excess increases as the number of vaginal births increases and with instrumental vaginal delivery compared with spontaneous vaginal birth.

Does cesarean delivery protect against injuries to babies?

Brachial plexus injury: Limited evidence suggests that a MODERATE excess number of babies born vaginally experience brachial plexus injury compared with babies delivered by cesarean, but the excess is influenced by whether delivery is spontaneous vaginal, instrumental vaginal, or cesarean after failed instrumental delivery.

Facial nerve injury: Limited evidence suggests that facial nerve injury rates do not differ by mode of birth.

Neonatal neurologic symptoms: Planned cesarean provides no protection against intracranial hemorrhage, neonatal seizure, or abnormal neurologic status compared with women planning vaginal birth.

Cerebral palsy: Limited evidence suggests that liberal use of cesarean delivery is not associated with a reduction in cerebral palsy rates.

Conclusion

The findings of this report overwhelmingly support striving for vaginal birth in general and spontaneous vaginal birth in particular in the absence of a compelling reason to do otherwise. To improve both the quality and value of maternity care in the United States and promote the optimal health of women and infants, clinicians, policy makers, and other stakeholders should prioritize identifying and promulgating practices that promote safe, spontaneous vaginal birth and reduce the use of cesarean delivery.

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